

**INTERNATIONAL JOURNAL OF LAW
MANAGEMENT & HUMANITIES**
[ISSN 2581-5369]

Volume 9 | Issue 5

2026

© 2026 *International Journal of Law Management & Humanities*

Follow this and additional works at: <https://www.ijlmh.com/>

Under the aegis of VidhiAagaz – Inking Your Brain (<https://www.vidhiaagaz.com/>)

This article is brought to you for free and open access by the International Journal of Law Management & Humanities at VidhiAagaz. It has been accepted for inclusion in the International Journal of Law Management & Humanities after due review.

In case of **any suggestions or complaints**, kindly contact support@vidhiaagaz.com.

To submit your Manuscript for Publication in the **International Journal of Law Management & Humanities**, kindly email your Manuscript to submission@ijlmh.com.

AI Inventorship in Patent Law: Comparative Doctrine, Regulatory Divergence, and Harmonized Reform

R. SOWJANYA YAMINI* AND DR. MOHD SALEEM**

ABSTRACT

Artificial intelligence (AI) is increasingly embedded in invention workflows, yet patent systems continue to define inventorship in human terms. The central problem is not whether AI contributes to technical creativity, but whether existing legal doctrines can allocate ownership, responsibility, and evidentiary accountability when inventive processes are distributed across humans and AI systems. Prior scholarship has examined DABUS disputes and personhood debates, but the literature remains fragmented across jurisdictions and often under-specifies operational reform pathways for patent offices and courts. This article addresses that gap through a comparative doctrinal design covering the United States, United Kingdom, European Union/Germany, Australia, South Africa, India, China, and selected emerging jurisdictions. The analysis triangulates statutes, judicial decisions, patent-office guidance, and Scopus-indexed legal scholarship from 2019–2026. The findings show convergence on human-only inventorship, but persistent divergence in disclosure expectations, contribution tests, and evidentiary practices. These divergences produce transparency deficits, cross-border uncertainty, and uneven enforcement risk for multinational portfolios. The article's original contribution is a six-part harmonized reform model that preserves human-centered inventorship while modernizing AI-contribution disclosure, contribution assessment, evidentiary protocols, interoperability standards, targeted supplementary protection for edge cases, and governance integration. The model is explicitly grounded in an accountability architecture framework that separates legal status from evidentiary governance. This framework offers a practical route to doctrinal stability and policy coherence without requiring full AI legal personhood.

Keywords: *AI inventorship, patent law, comparative law, DABUS, legal personhood, harmonization*

I. INTRODUCTION

AI systems now participate in technical ideation, optimization, and solution selection in sectors such as pharmaceuticals, engineering, materials science, and software. This development

* Author is a Research Scholar at School of Law, Presidency University, Bengaluru, Karnataka, India.

** Author is an Associate Professor at School of Law, Presidency University, Bengaluru, Karnataka, India.

challenges a foundational assumption of patent law: the inventor is a natural person capable of holding rights and bearing legal duties. The DABUS litigation cycle made this tension visible across major jurisdictions and exposed a recurring legal dilemma. Patent institutions are willing to accept AI-assisted innovation, but they continue to reject AI as a legal inventor.¹

The research problem addressed in this article is how patent systems can maintain legal accountability while accurately governing invention processes that involve non-human computational agency. Existing doctrine has delivered formal clarity in many systems, yet practical uncertainty persists in inventorship attribution, ownership vesting, disclosure obligations, and cross-border prosecution strategy.²

A core research gap remains in current scholarship. Much of the literature is either jurisdiction-specific, heavily normative, or focused narrowly on personhood debates. Fewer studies provide an integrated comparative framework that links doctrine, institutional practice, and implementable reform design across multiple legal systems.³ This article fills that gap by combining comparative legal analysis with a policy-operational lens.

The study addresses three research questions: How and why are jurisdictions converging on human-only inventorship despite technical change? Where do current legal frameworks fail in operational terms for AI-assisted invention? Which harmonized reform pathway is doctrinally feasible and institutionally scalable across jurisdictions?

The study contributes in three ways. Theoretically, it reframes AI inventorship as an accountability architecture problem rather than a binary creativity dispute. In policy terms, it develops a structured harmonization model oriented to examination practice and transnational coordination. Practically, it identifies implementable evidentiary and disclosure mechanisms that can reduce litigation uncertainty while preserving innovation incentives.

¹ Daria Kim, *The Paradox of the DABUS Judgment of the German Federal Patent Court*, 71 GRUR Int'l 1162 (2022), <https://doi.org/10.1093/grurint/ikac125>; Rita Matulionyte, 'AI Is Not an Inventor': *Thaler v Comptroller of Patents, Designs and Trademarks and the Patentability of AI Inventions*, 88 MOD. L. REV. 205 (2025), <https://doi.org/10.1111/1468-2230.12907>.

² Mateo Aboy, Kathleen Liddell & Aparajita Lath, *Inventorship in the Age of AI: Examining the USPTO Guidance on AI-Assisted Inventions*, 20 J. INTELL. PROP. L. & PRAC. 495 (2025), <https://doi.org/10.1093/jiplp/jpaf019>; Joanna Wang, *Navigating the USPTO's AI Inventorship Guidance in AI-Driven Drug Discovery*, 12 J.L. & BIOSCIENCES lsaf014 (2025), <https://doi.org/10.1093/jlb/lsaf014>.

³ Edward Koellner, *AI and Intellectual Property Law in the Digital Age: Creating a Cohesive Global System for Ethical Innovation and Societal Benefit*, JUSLETTER IT (Apr. 30, 2025), <https://doi.org/10.38023/c0b9fea3-d2ed-41b2-9f00-031b9c4ac0df>; Peter Georg Picht & Florent Thouvenin, *AI and IP: Theory to Policy and Back Again – Policy and Research Recommendations at the Intersection of Artificial Intelligence and Intellectual Property*, 54 IIC 916 (2023), <https://doi.org/10.1007/s40319-023-01344-5>; Viktor Popov et al., *Intellectual Property Law in the Age of Artificial Intelligence: Legal Challenges and Regulatory Perspectives*, 4 INT'L J.L. & SOC'Y 165 (2025), <https://doi.org/10.59683/ijls.v4i1.133>.

For terminological consistency, three terms are used in a fixed sense throughout. The significant human contribution test refers to the doctrinal threshold used to evaluate whether human actors made legally relevant inventive contributions in AI-assisted workflows. The contribution test is used as shorthand for this same threshold and not as a separate standard. The accountability chain refers to the auditable sequence linking model governance, human constraints, validation decisions, claim drafting, and legal responsibility.

II. LITERATURE REVIEW

Scholarship on AI inventorship has developed around four themes. The first concerns the AI inventorship debate itself. A substantial strand argues that patent law should remain anchored to human inventors because inventorship is embedded in legal personality, responsibility, and enforceability structures rather than descriptive causation alone.⁴ A competing strand argues for broader recognition of AI contribution, contending that strict anthropocentric attribution can misstate inventive reality and create incentive distortions in AI-intensive research ecosystems.⁵

The second theme centers on DABUS jurisprudence and post-DABUS institutional responses. Comparative commentary shows broad rejection of AI as inventor by courts and patent offices, but with different justificatory styles: textual statutory interpretation, purposive institutional reasoning, or procedural pragmatism.⁶ Recent work on the USPTO's February 2024 guidance, since rescinded, illustrates how systems can preserve human inventorship while operationally accepting AI-assisted invention through contribution-based standards, though implementation concerns remain significant.⁷

The third theme concerns legal personhood and attribution theory. Proposals for electronic or quasi-personhood seek to align legal status with AI autonomy, yet most analyses acknowledge unresolved problems of liability allocation, procedural representation, and institutional fit.⁸

⁴ Latika Choudhary, Himani Kaushik & Hardik Daga, *Why AI Cannot Be an Inventor: A Post-Humanist Rejection of AI as Legal Inventor*, 20 J. INTELL. PROP. L. & PRAC. 732 (2025), <https://doi.org/10.1093/jiplp/jpaf063>; Andreas Engel, *Can a Patent Be Granted for an AI-Generated Invention?*, 69 GRUR Int'l 1123 (2020), <https://doi.org/10.1093/grurint/ikaal17>.

⁵ Arunabha Banerjee, *Autonomy of AI in Patents: Reconciling Commercial Incentive with Traditional Inventorship*, 30 J. INTELL. PROP. RTS. 12 (2025), <https://doi.org/10.56042/jipr.v30i1.3714>; Akansha Yadav & Satish Kumar, *Autonomy of Artificial Intelligence in Patent Laws: Reconciling Business Incentive with Traditional Rules of Inventorship with Special Reference to the Jurisdictions of European Union, United States of America and Japan*, 3220 AIP CONF. PROC. 040011 (2024), <https://doi.org/10.1063/5.0235003>.

⁶ Kim, *Paradox of the DABUS Judgment*, *supra* note 1; Rita Matulionyte, *AI as an Inventor: Has the Federal Court of Australia Erred in DABUS?*, 13 J. INTELL. PROP. INFO. TECH. & ELEC. COM. L. 99 (2022), <https://www.jipitec.eu/jipitec/article/view/348>; Matulionyte, *AI Is Not an Inventor*, *supra* note 1.

⁷ Aboy et al., *supra* note 2; Wang, *supra* note 2.

⁸ Prabuddha Ganguli, *Recognising Generative and Autonomous AI as a 'Juridical Person'*, 6 J. DATA PROT. & PRIV. 392 (2024), <https://doi.org/10.69554/AYHZ2687>; Fatima Rizq Moustafa, *Towards Recognition of the Legal Personality of Artificial Intelligence (AI): Recognizing Reality and Law*, 19 INT'L J. CRIM. JUST. SCIS. 271 (2024), <https://ijcjs.com/menu-script/index.php/ijcjs/article/view/885>.

Hybrid approaches instead propose retaining human or organizational accountability while formally documenting AI causal roles.⁹

The fourth theme addresses patent doctrine and governance integration. Scholars increasingly link inventorship to broader questions of transparency, fairness, cross-border interoperability, and data governance. This literature suggests that inventorship cannot be treated as an isolated formal issue when AI-assisted innovation creates evidentiary opacity and international enforcement frictions.¹⁰

Critically, the literature still under-delivers on comparative synthesis that converts these debates into a coherent, implementation-ready reform architecture. This unresolved gap motivates the methodology and analytical framework adopted below.

III. METHODOLOGY

This study uses comparative doctrinal analysis as its primary research design. The approach is appropriate because the central inquiry concerns the interpretation and operation of legal norms across jurisdictions rather than quantitative causal inference. Comparative doctrinal analysis is used here to identify convergences, divergences, and institutional consequences in the regulation of AI-assisted invention.

To improve methodological transparency, the doctrinal design is integrated with a systematic literature review (SLR)-style protocol focused on Scopus-indexed legal and policy scholarship from 2019–2026. Search and screening were conducted in title, abstract, and keyword fields using three core query families:

TITLE-ABS-KEY(("artificial intelligence" OR "generative AI" OR "machine learning") AND (inventor* OR inventorship) AND (patent* OR "patent law")); TITLE-ABS-KEY((DABUS OR "AI inventor") AND (jurisdiction* OR comparative OR doctrinal)); and TITLE-ABS-KEY(("significant human contribution" OR "human-in-the-loop" OR conception) AND patent*).

Records were deduplicated and screened in two stages (title and abstract review followed by full-text eligibility assessment).

⁹ Siina Raskulla, *Hybrid Theory of Corporate Legal Personhood and Its Application to Artificial Intelligence*, 3 SN SOC. SCI. 78 (2023), <https://doi.org/10.1007/s43545-023-00667-x>; Shlomit Yanisky-Ravid & Alec Goldstein, *Artificial Inventor Project*, in ELGAR CONCISE ENCYCLOPEDIA OF ARTIFICIAL INTELLIGENCE AND THE LAW 40 (Ryan Abbott & Elizabeth Rothman eds., 2025), <https://doi.org/10.4337/9781035336906.00016>.

¹⁰ Ahmed Bahgat, *AI Governance and Data Privacy in Cross-Border Contexts: A Comparative Analysis of Regulatory Frameworks*, 8 J. DATA PROT. & PRIV. 8 (2025), <https://doi.org/10.69554/BOJL3033>; Xukang Wang & Ying Cheng Wu, *Balancing Innovation and Regulation in the Age of Generative Artificial Intelligence*, 14 J. INFO. POL'Y 385 (2024), <https://doi.org/10.5325/jinfopoli.14.2024.0012>.

Inclusion criteria required direct relevance to AI inventorship, patent attribution doctrine, legal personhood debates connected to patentability, or cross-border patent governance. Exclusion criteria removed non-legal technical papers, commentaries without doctrinal content, duplicate abstracts, and sources without sufficient analytical depth for comparative inference. The final corpus was triangulated with primary legal materials to reduce single-source bias and to strengthen the reproducibility of interpretive claims.

Jurisdictions were selected using four criteria: global patent-system significance, documented engagement with DABUS or AI inventorship controversies, diversity of legal traditions, and policy relevance for transnational applicants. On this basis, the analysis includes the United States, the United Kingdom, the European Union and Germany, Australia, South Africa, India, and China, with selective reference to emerging jurisdictions where relevant scholarship offers transferable lessons.¹¹

Data sources are triangulated across four categories: primary legal materials (statutes, judicial decisions, patent-office guidance), policy and institutional documents, Scopus-indexed journal and book-chapter literature, and focused comparative commentary from 2019–2026. The Scopus-based corpus is used to strengthen external validity by capturing peer-reviewed doctrinal and policy analyses across regions and disciplines.

The analytical framework compares jurisdictions on five dimensions: inventor identity rule, threshold for human contribution, AI-disclosure expectations, ownership attribution logic, and evidentiary traceability requirements. Each jurisdiction is examined for both doctrinal text and operational consequences. This design permits movement from descriptive comparison to explanatory and normative inference, enabling the development of a harmonized reform pathway grounded in institutional feasibility.

Methodological limitations are acknowledged. First, legal developments are dynamic and guidance may evolve. Second, jurisdictions differ in examination architecture, reducing direct equivalence. Third, the analysis is doctrinal and policy-oriented rather than empirical on grant outcomes. These limitations are addressed through triangulation and explicit boundary-setting in the interpretation of results.

¹¹ Anna Bashir, *Prospects and Challenges of Artificial Intelligence Protection in Indian IPR Regime vis-à-vis EU, China and the US*, 30 J. INTELL. PROP. RTS. 65 (2025), <https://doi.org/10.56042/jipr.v30i1.7403>; Wen Ding & Shemin Deng, *The Patentability of AI-Generated Technical Solutions and Institutional Responses: Chinese Perspective vs. Other Countries*, 16 INFORMATION 629 (2025), <https://doi.org/10.3390/info16080629>.

IV. COMPARATIVE JURISDICTIONAL ANALYSIS

Comparative findings reveal a stable doctrinal core and an unstable operational perimeter. The stable core is human-only inventorship. The unstable perimeter concerns how institutions interpret human contribution, how much AI involvement applicants must disclose, and what documentary evidence is needed to support inventorship claims.

In the United States, AI cannot be named as an inventor, but AI-assisted inventions remain patentable where a natural person conceived the claimed invention. The USPTO's February 2024 guidance tested human contribution through a *Pannu*-style logic of contribution to conception, non-trivial participation, and input beyond merely explaining established knowledge;¹² in November 2025 the Office rescinded that guidance, confined the *Pannu* factors to joint inventorship among natural persons, and now treats AI as a tool, asking whether a natural person conceived the claimed invention under the ordinary conception standard.¹³ The doctrinal difficulty persists under either approach, because AI-assisted workflows fragment conception across human and computational steps. In AI-driven drug discovery, for example, model outputs may determine candidate generation while human actors validate, refine, and claim-select, making it difficult to identify a stable moment of legally relevant conception.¹⁴ As a result, US doctrine preserves flexibility but risks inconsistent evidentiary thresholds across examiners and sectors. The United Kingdom maintains clearer statutory formalism after *Thaler*,¹⁵ but this clarity shifts uncertainty toward evidentiary practice because disclosure obligations for AI workflow detail remain under-specified.¹⁶

In Europe, discourse emphasizes trustworthy AI, transparency, and accountability, but these governance principles do not automatically resolve patent inventorship tests. German reasoning has signaled openness to descriptive AI acknowledgment without inventorship recognition, offering a bridge model between doctrinal continuity and factual transparency.¹⁷ The unresolved issue is operational translation: trustworthy AI values require traceability and human oversight, yet patent procedures still lack harmonized instructions on what level of model documentation

¹² *Inventorship Guidance for AI-Assisted Inventions*, 89 Fed. Reg. 10,043 (Feb. 13, 2024) (applying the factors in *Pannu v. Iolab Corp.*, 155 F.3d 1344, 1351 (Fed. Cir. 1998)).

¹³ *Revised Inventorship Guidance for AI-Assisted Inventions*, 90 Fed. Reg. 54,636 (Nov. 28, 2025) (rescinding the February 2024 guidance), <https://www.federalregister.gov/documents/2025/11/28/2025-21457/revised-inventorship-guidance-for-ai-assisted-inventions>.

¹⁴ Aboy et al., *supra* note 2; Wang, *supra* note 2.

¹⁵ *Thaler v. Comptroller-General of Patents, Designs & Trade Marks* [2023] UKSC 49 (appeal taken from Eng.).

¹⁶ Matulionyte, *AI Is Not an Inventor*, *supra* note 1.

¹⁷ Kim, *Paradox of the DABUS Judgment*, *supra* note 1; Daria Kim, *The Illusory Standard of Significant Human Contribution to AI-Assisted Inventions after the DABUS Decision of the German Federal Court of Justice*, 56 IIC 369 (2025), <https://doi.org/10.1007/s40319-025-01567-8>.

is necessary to prove human inventive contribution in complex fields such as AI-driven biomedical innovation. This creates a principle-to-procedure gap in which governance norms are stronger than evidentiary implementation pathways.¹⁸ Australia returned to human-only orthodoxy after initial judicial openness, while South Africa's DABUS-linked acceptance remains institutionally exceptional and difficult to generalize given examination differences.¹⁹ India and China illustrate adaptive procedural trajectories under doctrinal conservatism, with growing attention to attribution and patentability management in AI-intensive contexts.²⁰ In recent discourse, Indian analysis increasingly emphasizes contribution-governance templates that preserve human inventorship while improving assignment certainty for AI-assisted R&D partnerships, especially in pharmaceutical and software-heavy portfolios.²¹ Contemporary Chinese-oriented scholarship similarly points to procedural experimentation in examination practice, suggesting a model of policy agility under inventor-identity conservatism, with implications for evidentiary standard-setting beyond China itself.²²

The comparative balance also improves when these trajectories are read institutionally rather than only doctrinally. In India, current debate increasingly centers on practical prosecution artifacts (inventor declarations, assignment timing, and documentary substantiation of human decision nodes) as mechanisms to stabilize AI-assisted filings without reopening inventor identity categories. In China, procedural experimentation appears more office-centered, including practice-oriented emphasis on technical-effect substantiation and documentation sufficiency for AI-assisted claims. Together, these developments suggest that both systems are using procedural adaptation to absorb computational agency while maintaining human-only inventorship as the formal legal anchor.

V. ANALYSIS AND DISCUSSION

The analysis shows that jurisdictions are not divided primarily on whether AI contributes to invention; they are divided on how to preserve legal accountability under conditions of distributed human-machine agency. This distinction is important because it explains why human-only inventorship persists even in systems that actively support AI-enabled innovation.

¹⁸ Picht & Thouvenin, *supra* note 3; Wang & Wu, *supra* note 10.

¹⁹ *Commissioner of Patents v. Thaler* [2022] FCAFC 62, (2022) 289 FCR 45 (Austl.); Matulionyte, *AI as an Inventor*, *supra* note 6; Popov et al., *supra* note 3.

²⁰ Ding & Deng, *supra* note 11; G. R. Raghavender & Gurujit Singh, *Can Artificial Intelligence (AI) Machine Be Granted Inventorship in India?*, 28 J. INTELL. PROP. RTS. 123 (2023), <https://doi.org/10.56042/jipr.v28i2.1268>.

²¹ Bashir, *supra* note 11.

²² Ding & Deng, *supra* note 11; Popov et al., *supra* note 3.

A. Why jurisdictions diverge: legal tradition and computational agency

The deeper source of divergence lies in legal tradition. Common-law systems generally operationalize computational agency through open-textured standards and case-by-case calibration, while civil-law-oriented systems tend to prioritize category coherence, statutory clarity, and administrative consistency. The consequence is not opposite outcomes on inventor identity, since both traditions largely retain human-only inventorship, but different pathways for accommodating AI contribution. Common-law approaches may tolerate flexible interpretation of contribution thresholds, whereas civil-law approaches more often relocate adaptation into procedural documentation and policy guidance. This explains why formal convergence coexists with institutional divergence in evidentiary design and examiner discretion.²³

Jurisdiction	Inventor identity rule	Operational approach	Main tension
United States	Human-only	Ordinary conception standard for AI-assisted inventions (the 2024 significant-contribution guidance was rescinded in November 2025)	Inconsistent threshold application across sectors
United Kingdom	Human-only	Textual statutory continuity after <i>Thaler</i>	Limited operational guidance on AI disclosure
EU/Germany	Human-only	Recognition of AI involvement without personhood	Balancing transparency with doctrinal stability
Australia	Human-only	Re-alignment after appellate reversal	Reduced flexibility for edge-case autonomy
South Africa	Formally permissive outcome in DABUS filing context	Distinct institutional pathway	Limited transferability to examined systems
India/China	Human-only trend	Procedural adaptation and policy experimentation	Attribution and ownership certainty in AI pipelines

Table 1: Comparative Regulatory Patterns in AI Inventorship

Source: Author’s compilation.

A first pattern is convergence in doctrine but divergence in implementation. Human-only rules provide formal stability, yet contribution standards and evidentiary expectations vary enough to create strategic uncertainty for applicants. The “significant human contribution” standard is especially vulnerable to indeterminacy if not supported by procedural metrics tied to

²³ Koellner, *supra* note 3; Michal Malacka, *AI Legislation, Private International Law and the Protection of Human Rights in the European Union*, 11 EUR. STUD. 122 (2024), <https://doi.org/10.2478/eustu-2024-0006>; Michiel Poesen, *Private International Law and Artificial Intelligence: An EU Perspective*, 31 EUR. REV. PRIV. L. 365 (2023), <https://doi.org/10.54648/erpl2023013>.

verifiable human decision points.²⁴ This creates a contradiction: systems preserve doctrinal certainty but may undermine practical predictability.

B. Black-box evidentiary opacity

A second pattern is an expanding transparency deficit. Where AI-contribution disclosure is minimal, examiners and courts face asymmetric information about model autonomy, prompt strategy, output filtering, and human validation. This deficit weakens both inventorship determinations and downstream validity analysis. It also risks inflating *post hoc* narratives of human conception in prosecution and litigation records.²⁵

In high-technology prosecution practice, a central doctrinal tension is whether prompt engineering can satisfy conception-like requirements or whether it remains only instrumental interaction with a computational tool. A workable distinction treats conception as a definite and permanent idea of the operative inventive solution, while prompting is evidentiary only when prompts encode purposive technical constraints, selection criteria, and iterative human judgment that materially shape the claimed solution. In AI-driven drug discovery, generic prompts (e.g., broad optimization requests) are weak indicators of conception. By contrast, structured iterative prompting tied to hypothesis refinement, candidate rejection reasons, and human validation checkpoints can support contribution-linked inventorship narratives. This mapping converts an abstract doctrinal dispute into examiner-oriented rules of thumb: prompt specificity, iteration traceability, and decision-linked human intervention become practical proxies for evaluating whether human intent directed inventive substance rather than *post hoc* curation.²⁶

This evidentiary opacity has three layers with distinct doctrinal effects. Input opacity concerns uncertain training-data provenance and model constraints, which can obscure whether claimed inventive steps were meaningfully human-directed. Process opacity concerns limited explainability of inference pathways, reducing the ability to verify conception and non-obviousness narratives. Attribution opacity concerns uncertainty about which human act should count as legally relevant conception when model outputs are iteratively curated. Together, these layers shift litigation burdens and can produce inconsistent judicial treatment of similarly structured AI-assisted inventions.

²⁴ Banerjee, *supra* note 5; Choudhary et al., *supra* note 4; Kim, *Illusory Standard*, *supra* note 17.

²⁵ Akanksha Bisoyi, *Ownership, Liability, Patentability, and Creativity Issues in Artificial Intelligence*, 31 INFO. SEC. J.: GLOBAL PERSP. 377 (2022), <https://doi.org/10.1080/19393555.2022.2060879>; Rama G. Elluru, *Patent Law, Inventorship*, in ELGAR CONCISE ENCYCLOPEDIA OF ARTIFICIAL INTELLIGENCE AND THE LAW 274 (Ryan Abbott & Elizabeth Rothman eds., 2025), <https://doi.org/10.4337/9781035336906.00073>; Wang, *supra* note 2.

²⁶ Aboy et al., *supra* note 2; Banerjee, *supra* note 5; Kim, *Illusory Standard*, *supra* note 17; Wang, *supra* note 2.

The transition from doctrinal diagnosis to applied testing is illustrated in the hard-case box below (Figure 3), where a machine-surprising drug scaffold tests whether attribution can still be resolved through purposive technical constraints and auditable records rather than classical mental-conception narratives.

A third pattern is cross-border fragmentation. Multinational portfolios must navigate heterogeneous inventorship practices, raising transaction costs and forum-shopping incentives. Private international law and regulatory scholarship indicate that this fragmentation can affect not only prosecution strategy but also ownership and enforcement disputes in transnational settings.²⁷

Against this background, the article advances a six-element harmonized reform model. First, mandatory structured disclosure should capture material AI involvement. Second, a measurable contribution test should evaluate problem framing, output selection, validation, and claim shaping. Third, evidentiary protocols should require reproducible documentation of model and human decision chains. Fourth, soft-law interoperability should align cross-jurisdictional procedural baselines. Fifth, narrow *sui generis* supplements may address extreme autonomy edge cases without displacing patent-system fundamentals.²⁸ Sixth, inventorship governance should be integrated with broader responsible-AI compliance obligations.

C. Feasibility stress test: substitution effects of *sui generis* rights

The feasibility of the fifth element requires specific caution about substitution effects. If *sui generis* protection is drafted with broader scope, lower thresholds, or comparable duration relative to patent rights, applicants may strategically shift away from patent filing, reducing disclosure quality and weakening cumulative innovation incentives. To avoid this displacement dynamic, supplementary rights should be strictly narrower in subject matter, shorter in duration, and conditioned on disclosure duties that do not undercut patent-system transparency. Under these constraints, *sui generis* mechanisms can function as a residual safety valve for extreme autonomy cases rather than as a parallel route that disincentivizes conventional patent participation.²⁹

²⁷ Bahgat, *supra* note 10; Malacka, *supra* note 23; Poesen, *supra* note 23.

²⁸ Iana Kazeeva, *Sui Generis Intellectual Property Protection for Works Generated by AI Systems*, in SUI GENERIS INTELLECTUAL PROPERTY PROTECTION: COMPARISON OF EU AND U.S. REGULATORY APPROACHES 65 (2024), https://doi.org/10.1007/978-981-99-8897-6_5; Anna Shtefan, *Sui Generis Protection of AI-Generated Outputs in Ukraine*, 12 INTEREULAWEST 79 (2025), <https://doi.org/10.22598/iele.2025.12.2.3>.

²⁹ Kazeeva, *supra* note 28; Yurii Khodyko, *Legal Regime of Inventions Created by Artificial Intelligence*, 16 L., STATE & TELECOMM. REV. 322 (2024), <https://doi.org/10.26512/lstr.v16i1.48972>; Shtefan, *supra* note 28.

The theoretical contribution of this discussion lies in reframing inventorship from personhood symbolism to accountability architecture. Its policy contribution lies in converting comparative doctrine into implementable harmonization components. Its practical contribution lies in proposing auditable documentation pathways usable by patent applicants, examiners, and courts.

Stage	AI-assisted inventorship accountability chain
1	Data and model governance
2	AI-supported ideation
3	Human selection and validation
4	Patent claim construction
5	Rights allocation and legal responsibility

Figure 1: Operational logic of human-centered inventorship with structured AI attribution.

Source: Author’s compilation.

Hypothetical case box: AI-driven materials science
A research team uses a generative materials model to propose 4,800 candidate polymer compositions for thermal-resistant battery casings. The outputs are filtered through three human-defined constraints: decomposition threshold, manufacturability, and toxicity limits. Scientists iteratively revise prompts after each wet-lab cycle, discard high-risk classes, and converge on one composition that meets the target profile. In prosecution, accountability is demonstrated through model-card disclosure, iterative prompt history, validation logs, and claim-drafting memos linking each claim limitation to a human decision node. Under the proposed framework, inventorship remains human-centered because the legally relevant contribution lies in purposive constraint design, iterative selection, and experimental validation, while AI remains a causally significant but non-accountable generator.

Figure 2: Hypothetical application of the accountability chain to AI-assisted materials science invention.

Source: Author’s compilation.

VI. IMPLICATIONS FOR POLICY AND PRACTICE

The comparative evidence suggests that the most defensible policy path is not immediate reclassification of AI as inventor, but staged procedural harmonization that addresses evidentiary opacity while preserving accountability anchors. This implication is supported by studies that emphasize institutional feasibility and enforcement coherence,³⁰ but it also contradicts scholarship arguing that only direct legal recognition of AI can solve attribution mismatch.³¹ The contradiction is consequential: personhood-oriented proposals seek conceptual symmetry with technical causation, whereas reform through procedure prioritizes administrability, litigation predictability, and compatibility with existing assignment and liability structures.

³⁰ Koellner, *supra* note 3; Picht & Thouvenin, *supra* note 3.

³¹ Ganguli, *supra* note 8; Moustafa, *supra* note 8.

From a legal-design perspective, the key implication is that convergence on human-only inventorship does not mean convergence in legal certainty. Common-law systems often tolerate standards-based flexibility that can absorb AI-assisted invention, but this may produce higher variance in examiner interpretation and courtroom outcomes; civil-law-leaning systems often preserve stronger categorical coherence, but may under-specify operational pathways for proving human contribution in black-box contexts.³² Existing literature therefore reveals a structural contradiction between doctrinal clarity and evidentiary functionality: jurisdictions that appear stable at the level of statutory language may remain unstable at the level of proof architecture.³³

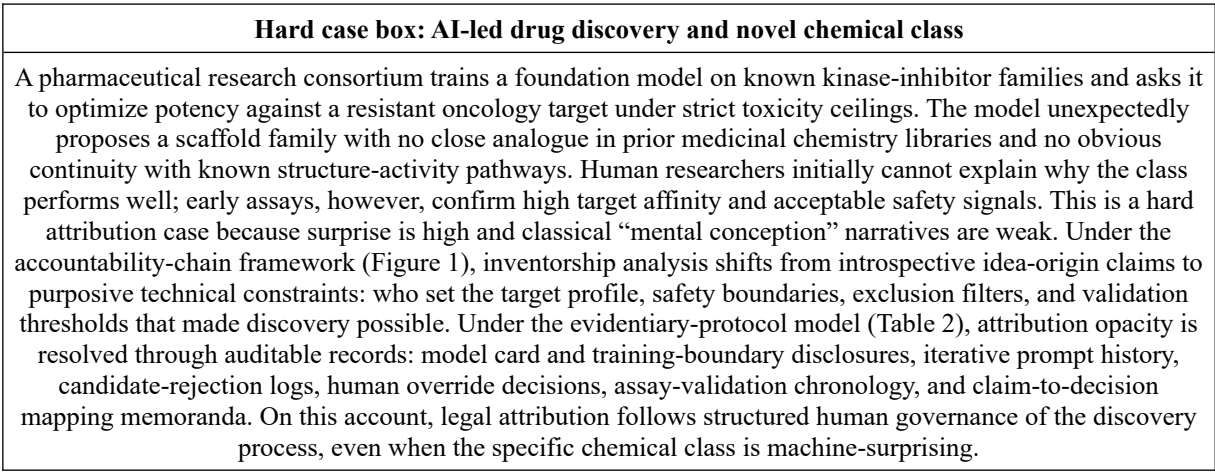


Figure 3: Hard-case illustration showing how purposive technical constraints and evidentiary protocols address attribution opacity in AI-led drug discovery.

Source: Author’s compilation.

Reform component	Core design	Expected effect	Proposed metrics
Structured AI disclosure	Standardized statement on model role, autonomy level, and human intervention points	Greater transparency and stronger examination quality	Model-card summary; provenance note; autonomy-tier declaration
Significant human contribution test	Domain-sensitive criteria for substantial human inventive input	Reduced interpretive inconsistency	Iterative prompt history; claim-to-decision map; validation sign-off logs
Evidentiary protocols	Documentation of prompts, filters, validation and override decisions	Better prosecution and litigation reliability	Time-stamped lab records; rejection-rationale matrix; override audit trail
Interoperability baselines	Soft-law alignment on terminology and documentary minimums	Lower cross-border transaction costs	Cross-jurisdiction disclosure template; concordance checklist

³² Kim, *Illusory Standard*, *supra* note 17; Malacka, *supra* note 23; Poesen, *supra* note 23.
³³ Aboy et al., *supra* note 2; Wang, *supra* note 2.

Reform component	Core design	Expected effect	Proposed metrics
Targeted supplementary rights	Narrow, time-limited fallback for exceptional autonomy cases	Flexibility without doctrinal displacement	Patent-vs-sui-generis filing ratio; disclosure-completeness index
Governance integration	Link inventorship practice to auditability and fairness compliance	Improved legitimacy and public trust	Internal governance attestation; periodic compliance review logs

Table 2: Harmonized Reform Framework

Source: Author's compilation.

The innovation-policy implication is similarly double-edged. Greater disclosure and traceability requirements can improve patent quality, reduce strategic over-claiming of human contribution, and support cross-border portfolio management.³⁴ Yet part of the literature warns that excessive compliance burdens may discourage filing in high-velocity sectors such as AI-driven drug discovery or encourage relocation to more procedurally permissive venues.³⁵ This tension indicates that reform should calibrate burden by materiality: high-impact AI contribution should trigger robust disclosure, while low-impact tool use should not generate disproportionate formal requirements.

A further implication concerns asymmetric compliance capacity between startups and large corporations. Large firms are generally better positioned to maintain structured prompt archives, validation pipelines, and compliance documentation teams. Early-stage firms, by contrast, may face disproportionate fixed costs under expanded disclosure obligations. If uncalibrated, disclosure-heavy regimes may unintentionally privilege incumbents by turning evidentiary governance into an entry barrier. A proportionate design should therefore combine baseline mandatory fields with tiered documentation depth linked to claim complexity and risk profile, preserving transparency while limiting anti-competitive compliance asymmetry.³⁶

A realistic institutional pathway is phased implementation through patent-office practice instruments rather than immediate statutory overhaul. Phase 1 can introduce optional structured disclosure templates and examiner training modules; Phase 2 can move to mandatory minimum fields for materially AI-assisted applications; Phase 3 can integrate quality-control audits and cross-office interoperability pilots. This staged model reduces applicant shock, allows iterative

³⁴ Bahgat, *supra* note 10; Wang & Wu, *supra* note 10.

³⁵ Banerjee, *supra* note 5; Raghavender & Singh, *supra* note 20.

³⁶ Bashir, *supra* note 11; Koellner, *supra* note 3; Zhen Li, Baomin Wang & Xiaoying Zhao, *Legislation of Artificial Intelligence Research from the Perspective of New-Quality Productivity*, in PROCEEDINGS OF THE 2025 INTERNATIONAL CONFERENCE ON EDUCATIONAL TECHNOLOGY AND ARTIFICIAL INTELLIGENCE 487 (2025), <https://doi.org/10.1145/3766557.3766640>; Popov et al., *supra* note 3; Wang, *supra* note 2.

calibration by sector, and gives offices empirical feedback before hardening standards into binding procedural rules.

The comparative findings also imply that harmonization strategies should focus first on evidentiary interoperability rather than substantive unification of inventor identity. Cross-jurisdiction alignment on documentation baselines, contribution terminology, and review heuristics can reduce forum shopping and transaction costs even where deeper doctrinal differences persist.³⁷ This position diverges from scholarship favoring broad *sui generis* expansion as a primary response to AI autonomy, because comparative analyses caution that poorly bounded supplementary rights can produce substitution away from conventional patents, weakening disclosure incentives and cumulative innovation spillovers.³⁸

Two productive tensions should be made explicit for doctrinal clarity. First, the personhood-versus-procedure paradox: the model rejects AI as a legal subject while requiring detailed documentation of AI causal significance. This is not a conceptual inconsistency but a governance choice. Rights and duties remain human-centered, while AI is treated as an evidentiary object whose role must be auditable for inventorship and validity determinations. Second, the harmonization-versus-tradition paradox: jurisdictions converge on human-only inventorship yet diverge in legal method because common-law systems calibrate standards through adjudicative flexibility, whereas civil-law-oriented systems prioritize categorical coherence and procedural formality. The reform response is therefore deliberately procedural rather than constitutional: interoperability of evidence standards, not forced statutory unification. Framed this way, the model's coherence lies in separating normative status (who can hold legal rights) from evidentiary governance (what must be documented to justify legal attribution).³⁹

Finally, the broader governance implication is that inventorship doctrine can no longer be treated as an isolated technical issue within patent law. Literature on algorithmic accountability, fairness, and regulatory legitimacy indicates that evidentiary traceability in patent prosecution increasingly overlaps with wider public-law concerns, especially in health and infrastructure domains where opaque AI systems can generate high social externalities.⁴⁰ The critical takeaway

³⁷ Bashir, *supra* note 11; Popov et al., *supra* note 3.

³⁸ Kazeeva, *supra* note 28; Khodyko, *supra* note 29; Shtefan, *supra* note 28.

³⁹ Kim, *Illusory Standard*, *supra* note 17; Koellner, *supra* note 3; Malacka, *supra* note 23; Picht & Thouvenin, *supra* note 3.

⁴⁰ Mohammad Abdallah & Mousa Salah, *Artificial Intelligence and Intellectual Properties: Legal and Ethical Considerations*, 12 INT'L J. INTELLIGENT SYS. & APPLICATIONS ENG'G 368 (2024), <https://ijisae.org/index.php/IJISAE/article/view/3911>; Vanessa G. L. Pessoa & Valdecir Becker, *Righteous Principles in AI: The Essential Role of Ethical Governance in Effectively Reducing Bias*, in APPLICATIONS AND USABILITY OF INTERACTIVE TV 155 (María José Abásolo, Carlos De Castro Lozano & Gonzalo F. Olmedo Cifuentes eds., 2026), <https://doi.org/10>

is that doctrinal reform will be durable only if it links patent attribution standards to auditable governance practices that are credible to examiners, courts, innovators, and affected publics.

VII. LIMITATIONS OF THE STUDY

This study has four limitations. First, it is doctrinal and policy-analytic rather than empirical on examination outcomes and litigation statistics. Second, legal guidance in this field is rapidly evolving, so conclusions should be read as time-bounded to the 2019–2026 analytical window. Third, jurisdictional comparability is imperfect because examination architectures differ. Fourth, although the Scopus-indexed corpus is broad, language and database filters may omit non-indexed regional scholarship.

VIII. FUTURE RESEARCH DIRECTIONS

Future research should test the proposed harmonized framework using empirical prosecution datasets and office-action records. Longitudinal studies could evaluate whether structured AI-disclosure requirements improve examination consistency and reduce inventorship disputes. Comparative work is also needed on how contractual practices in AI-enabled R&D consortia interact with inventorship doctrine across legal systems. Finally, interdisciplinary studies should assess whether accountability-oriented patent governance can be aligned with sector-specific safety and fairness regimes in health, energy, and public-interest technologies.

IX. CONCLUSION

This study set out to answer three core questions: (1) Why are jurisdictions converging on human-only inventorship despite technical change? (2) Where do current legal frameworks fail operationally for AI-assisted invention? (3) Which harmonized reform pathway is doctrinally feasible and institutionally scalable?

First, the comparative analysis demonstrates that convergence on human-only inventorship reflects a deeper commitment to accountability rather than a denial of AI's creative role. Across common-law and civil-law traditions, the inventor remains human because legal responsibility, rights allocation, and liability structures cannot be transferred to computational agents. Yet this convergence masks significant divergence in evidentiary practice, disclosure expectations, and contribution thresholds.

[.1007/978-3-032-01162-6_10](https://doi.org/10.1007/978-3-032-01162-6_10); Pedro Robles & Daniel J. Mallinson, *Advancing AI Governance with a Unified Theoretical Framework: A Systematic Review*, 8 PERSPS. ON PUB. MGMT. & GOVERNANCE 213 (2025), <https://doi.org/10.1093/ppmgov/gvaf013>.

Second, the operational failures of current frameworks lie in black-box evidentiary opacity and cross-border fragmentation. Patent offices and courts struggle to verify human contribution when AI systems generate outputs through opaque processes. Disclosure obligations remain under-specified, leading to inconsistent examiner standards and litigation risks. Multinational applicants face heightened uncertainty as they navigate heterogeneous inventorship doctrines, raising transaction costs and enforcement challenges.

Third, the harmonized reform pathway advanced here offers a feasible and scalable solution. By embedding structured AI disclosure, measurable contribution tests, auditable evidentiary protocols, soft-law interoperability baselines, narrowly tailored supplementary rights, and governance integration, the model preserves human-centered inventorship while modernizing the operational perimeter. This accountability-chain framework reframes inventorship not as a personhood dispute but as a governance architecture, ensuring doctrinal stability and policy coherence without requiring AI legal personhood.

In closing, the article argues that the future of patent law lies not in redefining inventorship identity but in re-engineering inventorship governance. By harmonizing evidentiary and procedural standards across jurisdictions, patent systems can reduce litigation uncertainty, strengthen innovation incentives, and maintain legitimacy in an era of distributed human-machine creativity. The path forward is clear: doctrinal convergence on human inventorship must be matched by procedural convergence on how AI contributions are disclosed, assessed, and documented. Only then can global patent systems achieve both stability and adaptability in the age of AI-assisted invention.
