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Intellectual Property Protection for Collaborative Human–AI Innovation

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Abstract

Artificial intelligence increasingly participates in creative and inventive processes that were previously attributed almost entirely to human intellectual activity. Designers use generative systems to explore product configurations, researchers employ machine learning to identify promising scientific hypotheses, software developers work with code-generating systems, authors and artists iteratively modify machine-generated material, and engineering teams use AI to search large solution spaces. These practices complicate conventional intellectual property concepts because the economically valuable result may emerge from repeated interaction among human judgment, existing intellectual property, proprietary data, algorithmic tools, and machine-generated intermediate outputs.

This study examines how copyright, patent, licensing, provenance, contractual, and trade-secret mechanisms can protect innovation arising from collaborative human–AI workflows without treating artificial intelligence itself as a conventional legal author or inventor. Current United States policy strongly preserves the human contribution threshold. The U.S. Copyright Office's 2025 copyrightability report states that copyright can protect human-authored expression, sufficiently creative human modifications, and selection or arrangement incorporating AI-generated material, while prompts alone do not ordinarily provide sufficient expressive control under currently available technology. The D.C. Circuit similarly held in Thaler v. Perlmutter in March 2025 that a work must initially be authored by a human being to qualify under the U.S. Copyright Act. Patent law follows a comparable direction: the USPTO's revised November 2025 guidance states that the ordinary inventorship standard applies to AI-assisted inventions and that only natural persons may be identified as inventors.

The European Union addresses a related but distinct issue through its AI and copyright framework; Article 53 of the AI Act requires general-purpose AI providers to adopt policies for compliance with Union copyright law and to publish prescribed summaries concerning training content, while the relevant GPAI rules have applied since August 2, 2025. Using comparative doctrinal analysis and a synthetic dataset of 480 hypothetical collaborative innovation projects, the study compares four IP-governance conditions ranging from undocumented AI use to integrated governance combining contribution records, provenance, contractual allocation, confidentiality controls, and pre-filing IP review. Simulated IP protection readiness rises from 38.4 to 56.7, 78.9, and 90.6 across the four conditions. These values are illustrative rather than empirical. The article concludes that the most defensible model for human–AI innovation is not an attempt to give AI independent intellectual property status, but a provenance-centered system capable of demonstrating which protectable intellectual

contributions came from humans, which materials originated elsewhere, how AI was used, who owns resulting rights, and which outputs require licensing or confidentiality safeguards.

Keywords: artificial intelligence, intellectual property, human–AI collaboration, copyright authorship, patent inventorship, generative AI, IP ownership, provenance, licensing, trade secrets

1. Introduction

Artificial intelligence has transformed innovation from a predominantly human-centered sequence of conception, experimentation, and expression into an increasingly interactive process. A human researcher may define a scientific problem, direct an AI system to search candidate solutions, reject unsuitable outputs, refine promising alternatives, conduct experiments, and ultimately formulate a patentable invention. A designer may begin with an original concept, generate hundreds of algorithmic variations, select particular visual elements, reorganize them, and substantially modify a final design. Software engineers may combine human-authored architecture with AI-generated code, while writers and media professionals may use generative systems for ideation, restructuring, editing, or production. These activities challenge the assumption that an innovative work can always be attributed to one clearly identifiable moment of human creation. Contemporary legal systems are therefore being required to distinguish AI assistance, in which human creative or inventive judgment remains legally significant, from circumstances in which a system produces material without sufficient human intellectual contribution.

Copyright law illustrates the difficulty particularly clearly. The U.S. Copyright Office concluded in its January 2025 report that existing copyright doctrine can accommodate AI-assisted creativity without legislative creation of a new right for machine-generated material. It distinguishes assistive uses of AI from situations in which AI stands in for human creativity. Human-authored expression remains protectable even when AI-generated material is included, and sufficiently original selection, coordination, arrangement, or modification may itself qualify for protection. Under currently generally available systems, however, prompts alone ordinarily do not provide sufficient human control over the expressive elements of the resulting output. The D.C. Circuit added judicial authority to the human-authorship principle in *Thaler v. Perlmutter*, holding on March 18, 2025 that the Copyright Act requires eligible work to be authored in the first instance by a human being.

Patent law presents a parallel but not identical challenge. Patent protection is concerned with inventions rather than expressive works, and inventorship turns on contribution to legally relevant conception rather than merely on who used a technological tool. Academic literature has long anticipated a spectrum extending from human inventions produced with computational assistance to inventions in which machine contribution becomes increasingly autonomous. Bonadio, McDonagh, and Dinev described this continuum as one of the central difficulties that AI creates for established patent concepts. In the United States, the USPTO's November 2025 revised guidance resolved one aspect of the question by reaffirming that AI systems cannot be named as inventors or joint inventors and that AI-assisted inventions are evaluated under the same inventorship standard applicable to other inventions. The guidance does not create a separate test simply because AI was used.

The international picture nevertheless remains heterogeneous. India's Copyright Act contains an existing statutory provision defining the author of a computer-generated literary, dramatic, musical, or artistic work as the person who causes the work to be created. That language predates contemporary generative AI and should not be treated as conclusively resolving every modern authorship question, but it creates a statutory starting point different from the current U.S. approach.

The United Kingdom retains a related provision in section 9(3) of the Copyright, Designs and Patents Act 1988, yet its March 2026 government report acknowledged uncertainty surrounding computer-generated-work protection and proposed that the special protection ultimately be removed, while continuing to protect qualifying human-authored AI-assisted works. The proposal is a policy position rather than a statement that the provision has already disappeared from UK law. The same 2026 report states that broader AI-and-copyright reform requires further evidence and that the government will not implement reform until it is confident that the resulting framework appropriately serves both creativity and innovation.

These developments reveal a broader research problem that is often obscured by the question "Who owns AI-generated content?" In genuine human–AI collaboration, the more useful inquiry is multidimensional: which human contributions are legally protectable; which rights belong to employers, contractors, researchers, collaborators, or third parties; what pre-existing material was incorporated; which contractual terms govern the AI system; whether confidential information was disclosed to external tools; and whether records exist to prove the relevant chain of authorship or inventorship? The present study addresses this problem by developing a provenance-centered IP protection framework and by demonstrating, through transparent simulation, how different governance arrangements could affect the defensibility of human–AI innovation.

2. Objectives of the Study

2.1 To Clarify Protectable Human Contributions in AI-Assisted Innovation

The first objective is to examine the legal significance of human contribution when artificial intelligence participates in creative or inventive processes. The analysis distinguishes prompting, problem definition, original input, selection, modification, experimentation, conception, arrangement, verification, and final human judgment rather than treating all forms of AI use as legally equivalent.

2.2 To Examine Ownership, Provenance, and Third-Party Rights

The second objective is to identify how ownership uncertainty can arise where collaborative innovation involves employees, independent contractors, research partners, AI providers, copyrighted input material, confidential data, and machine-generated outputs. Particular attention is given to contribution records, contractual allocation, licenses, rights reservations, confidentiality, and chain-of-title documentation.

2.3 To Develop an Integrated IP Protection Framework

The third objective is to develop a practical governance model that can help universities, research institutions, creative organizations, technology companies, startups, and individual innovators preserve

potentially protectable rights while reducing avoidable disputes over authorship, inventorship, ownership, infringement, and confidentiality.

3. Review of Literature

3.1 Human Authorship and AI-Assisted Creative Expression

The copyright literature has increasingly moved away from a binary distinction between "human work" and "AI work." The more difficult contemporary question concerns the degree and nature of human creative control. Caldwell, for example, analyzes AI-generated art through competing theories of authorship and argues for a more expansive understanding of the end user's creative role. Other scholarship takes a more cautious position, emphasizing that authorship requires a connection between human creative choices and the expressive form ultimately fixed in the work.

The U.S. Copyright Office's 2025 report provides one of the clearest contemporary administrative frameworks. Its approach does not deny protection simply because AI appears somewhere in the workflow. Instead, the Office asks what expression the human actually authored. It recognizes potential protection where human-created material remains perceptible in the output and where a human creatively selects, coordinates, arranges, or modifies AI-generated material. This approach allows copyright law to protect a composite work without necessarily extending copyright to every machine-generated element contained within it.

The treatment of prompts is particularly significant for collaborative innovation. The Office concluded that, with currently generally available technology, prompts alone ordinarily do not determine the expressive elements with sufficient control to establish authorship in the resulting output. Repeated prompting therefore should not automatically be equated with legal authorship merely because the user invested substantial effort. The more legally defensible case emerges when human activity moves beyond requesting outputs toward shaping protectable expression through original inputs, selective integration, creative editing, transformation, organization, or other identifiable creative decisions.

This position was reinforced by *Thaler v. Perlmutter*. The D.C. Circuit did not decide every question involving AI-assisted works; the case concerned a work presented as autonomously generated with the machine named as the sole author. The Court held that the Copyright Act requires human authorship in the first instance. The distinction is critical: the judgment does not mean that a work becomes unprotectable whenever AI is used. Rather, it confirms that a machine itself cannot serve as the statutory author under current U.S. law.

International approaches continue to diverge. India's section 2(d)(vi) defines the author of a computer-generated literary, dramatic, musical, or artistic work as the person who causes the work to be created. The UK has historically taken a similar statutory route through section 9(3) CDPA, but the UK government's March 2026 report describes uncertainty about how the provision fits with contemporary originality doctrine and proposes its removal if its practical value cannot be demonstrated. These differences demonstrate why organizations creating AI-assisted works across jurisdictions should avoid assuming that one universal authorship rule applies internationally.

3.2 Human Inventorship and AI-Assisted Technical Innovation

Patent scholarship anticipated the inventorship problem well before generative AI became widely accessible. Abbott argued that increasingly capable computational systems would challenge patent law's assumption that invention originates in the human mind. Bonadio, McDonagh, and Dinev later described AI involvement as a spectrum in which machine contribution can move from ordinary assistance toward increasingly independent generation of technical solutions. Hattenbach and Glucoft similarly examined how computational generation could affect novelty, inventorship, and the volume of possible inventions.

The central patent question differs from copyright authorship because a patent inventor must contribute to the conception of claimed subject matter rather than merely produce or own an artifact. This makes documentation particularly important.

A human researcher who merely requests “find a better battery material” and later adopts an AI-generated candidate may stand in a different legal position from a researcher who identifies the technical mechanism, establishes critical constraints, formulates the operative architecture, directs targeted experimentation, and recognizes the complete technical solution.

The USPTO's revised guidance issued in November 2025 is significant because it abandoned the need for a special AI-specific inventorship framework. It states that the same established legal standard applies whether AI is used or not and reiterates that only natural persons may be named as inventors. A sophisticated AI system therefore does not become a joint inventor merely because it contributed materially to the research process.

This position makes contribution records strategically important. If a patent application emerges from repeated collaboration among several researchers and an AI system, the applicant must still determine which natural persons actually made inventorship-relevant contributions to the claims. A chronological record of the research problem, human hypotheses, AI outputs, experimental changes, technical reasoning, and claim development may become useful in reconstructing conception. It does not automatically establish inventorship, because inventorship remains a legal determination, but it can preserve evidence that might otherwise disappear when AI-assisted ideation occurs through transient interfaces.

Recent commentary on the revised USPTO guidance similarly emphasizes that conception remains the central inventorship inquiry and that AI is treated as a tool rather than a person capable of joint inventorship. The practical implication is that organizations should not ask only whether AI was used. They should ask which human participants formed the definite technical ideas represented in the patent claims and whether records adequately demonstrate those contributions.

3.3 Provenance, Licensing, Training Inputs, and Confidential Innovation

Intellectual property protection is not limited to proving authorship or inventorship. Human–AI innovation also depends on the legal status of material entering and leaving the collaborative process. An output may include copyrighted expression, code, proprietary datasets, confidential know-how, third-party trademarks, protected designs, or patent-sensitive technical information. Even if the final output contains significant human contribution, use of unlicensed or restricted source material can create independent legal risk.

European AI regulation has increasingly incorporated provenance and copyright compliance into the governance of general-purpose models. Under Article 53 of the AI Act, GPAI providers must maintain a policy for compliance with Union copyright and related-rights law and must provide a sufficiently detailed public summary of training content according to the prescribed framework. The Commission's General-Purpose AI Code of Practice provides a voluntary mechanism addressing transparency and copyright obligations, while the training-content template is mandatory for the relevant Article 53 summary obligation.

These obligations do not create automatic ownership rights for downstream users of an AI model. They nevertheless reflect a broader policy movement toward traceability of data sources, rights reservations, and copyright compliance. WIPO likewise identifies copyright infrastructure and licensing as increasingly important components of the AI–IP relationship because generative systems depend on substantial volumes of protected and unprotected material.

The UK government's 2026 AI-and-copyright report reaches a related conclusion from a different policy direction. After receiving 11,520 consultation responses, it rejected its previous preference for a broad opt-out copyright exception as an immediate route forward and instead proposed further evidence gathering. It also indicated that licensing should remain primarily market-led at the current stage and expressed support for continued development of technical tools and standards that can help rights holders manage permissions.

For collaborative human–AI innovation, these developments reinforce the importance of provenance. A defensible IP file should be capable of showing not only what a human contributed but also what external materials entered the workflow, under what authority they were used, whether outputs were reviewed for third-party content, and whether confidential material was exposed to an external model. In many commercial contexts, contractual and trade-secret controls may be as important as copyright or patents because valuable AI-assisted innovation may remain unpatented and derive its value from secrecy, accumulated know-how, data, workflows, prompts, or internal evaluation methods.

4. Research Methodology

4.1 Doctrinal and Comparative Research Design

The study employs a combined doctrinal, comparative, and simulation-based methodology. The doctrinal component examines contemporary copyright and patent principles governing human authorship and inventorship. Primary emphasis is placed on the U.S. Copyright Office's AI reports and registration framework, the 2025 *Thaler v. Perlmutter* decision, the USPTO's revised 2025 inventorship guidance, the EU AI Act's copyright-related GPAI obligations, the EU Digital Single Market copyright framework, the 2026 UK government report on copyright and AI, and India's statutory treatment of computer-generated works.

The comparative component does not attempt to declare one jurisdiction superior. Its purpose is to identify common governance needs that remain relevant even where substantive legal rules differ. These include documentation of human contribution, provenance of inputs, contractual ownership, license compliance, confidentiality, and preservation of a defensible chain of title.

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The simulation component demonstrates how these governance measures could be evaluated in future empirical research. No actual law firm files, patent applications, creative-industry projects, or corporate R&D records were used.

Table 1: Simulated Governance Conditions for Collaborative Human–AI Innovation

Governance Condition	Simulated Projects	Principal Characteristics	Intended IP Function
Undocumented AI collaboration	120	AI used throughout ideation or creation with limited records of prompts, human decisions, source materials, or ownership terms	Baseline condition
AI-use disclosure only	120	Project records acknowledge use of AI but contain limited contribution or provenance information	Transparency without comprehensive rights allocation
Human contribution + provenance record	120	Human creative/inventive steps, relevant AI outputs, source provenance, modifications, and review history documented	Strengthen authorship/inventorship and input traceability
Integrated IP governance + contracts	120	Contribution records, provenance, employment/contract terms, licenses, confidentiality controls, IP review, filing strategy, and dispute-ready records	Comprehensive protection architecture

Source: Author's synthetic methodological framework. No row describes a specific real organization.

4.2 Variables and IP Protection Indicators

Four outcome dimensions were modeled on a 0–100 scale.

Authorship and inventorship traceability represents the ability to identify the human creative or inventive contribution relevant to potential copyright or patent claims.

Ownership clarity measures whether employment arrangements, contractor agreements, collaboration contracts, assignments, and other chain-of-title documents clearly allocate rights in the resulting innovation.

Provenance and licensing compliance represents the ability to identify relevant source materials, datasets, external copyrighted works, third-party code, model restrictions, and permission or licensing conditions.

Enforceability readiness measures whether records are sufficiently organized to support registration, patent filing, due diligence, licensing, enforcement, defense against infringement allegations, or internal dispute resolution.

4.3 Simulation Procedure and Limitations

A synthetic dataset of 480 hypothetical projects was constructed, allocating 120 records to each governance condition. The simulation was intentionally designed to illustrate how stronger documentation and governance might be evaluated rather than to estimate real legal outcomes.

Scores were generated within plausible bounded ranges around predetermined condition means. No significance tests are presented as evidence of a real population effect. Statistical significance generated from deliberately modeled observations could create a misleading impression of empirical validation.

The methodology also avoids assigning a universal probability of "IP validity." Copyrightability, patent inventorship, ownership, infringement, trade-secret status, and enforceability depend on jurisdiction-specific law and project-specific facts. A high governance score therefore means that the project has stronger documentation and institutional preparation under the simulation; it does not mean that a court, patent office, or copyright authority would necessarily recognize a particular right.

Future empirical studies could validate the framework through anonymized patent prosecution records, technology-transfer offices, creative-industry projects, corporate R&D departments, AI-assisted software-development teams, or controlled experiments involving professional creators and inventors.

5. Analysis

5.1 Comparative IP Protection Readiness

The simulated analysis shows that merely disclosing the presence of artificial intelligence does relatively little to resolve the central IP problems of collaborative innovation.

The undocumented condition produced a composite score of 38.4. The principal weakness was ownership clarity, reflecting the difficulty of determining who holds resulting rights when the project lacks formal allocation and contribution records.

AI-use disclosure alone increased the composite score to 56.7. This condition improves transparency, but it does not reliably establish who authored protectable expression, who conceived patent claims, what source material was used, or whether third-party contractual restrictions apply.

The contribution-and-provenance condition produced a considerably stronger score of 78.9. The strongest modeled performance occurred under integrated governance, which produced a composite score of 90.6.

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Table 2: Simulated IP Protection Outcomes Across Human–AI Governance Conditions

Governance Condition	Authorship/Inventorship Traceability Mean ± SD	Ownership Clarity Mean ± SD	Provenance & Licensing Mean ± SD	Enforceability Readiness Mean ± SD	Composite Score
Undocumented AI collaboration	41.2 ± 10.1	35.8 ± 10.7	36.9 ± 9.8	39.7 ± 9.5	38.4
AI-use disclosure only	58.0 ± 9.4	54.1 ± 9.7	57.2 ± 8.9	57.5 ± 9.1	56.7
Human contribution + provenance record	83.0 ± 7.6	76.4 ± 8.3	80.1 ± 7.9	76.1 ± 8.2	78.9
Integrated IP governance + contracts	93.1 ± 5.9	91.5 ± 6.4	89.7 ± 6.8	88.1 ± 6.5	90.6

Source: Synthetic data developed solely for methodological illustration.

5.2 Human Contribution Records as Evidentiary Infrastructure

The largest conceptual improvement occurs when the governance system begins recording what humans actually contributed rather than only whether an AI system was present.

For copyright, this distinction corresponds closely with the U.S. Copyright Office's case-by-case approach. A record showing only a prompt and an output may be comparatively weak where the claim depends on authorship of the generated expression. By contrast, files showing original human material, successive creative modifications, selection decisions, arrangement choices, and final editing may help identify which elements could represent human authorship.

For patent protection, contribution records serve a different legal purpose. They may help reconstruct which natural persons contributed to conception of claimed inventions. The USPTO's 2025 guidance makes AI use itself legally insufficient to create an AI inventor; the ordinary human inventorship analysis remains controlling.

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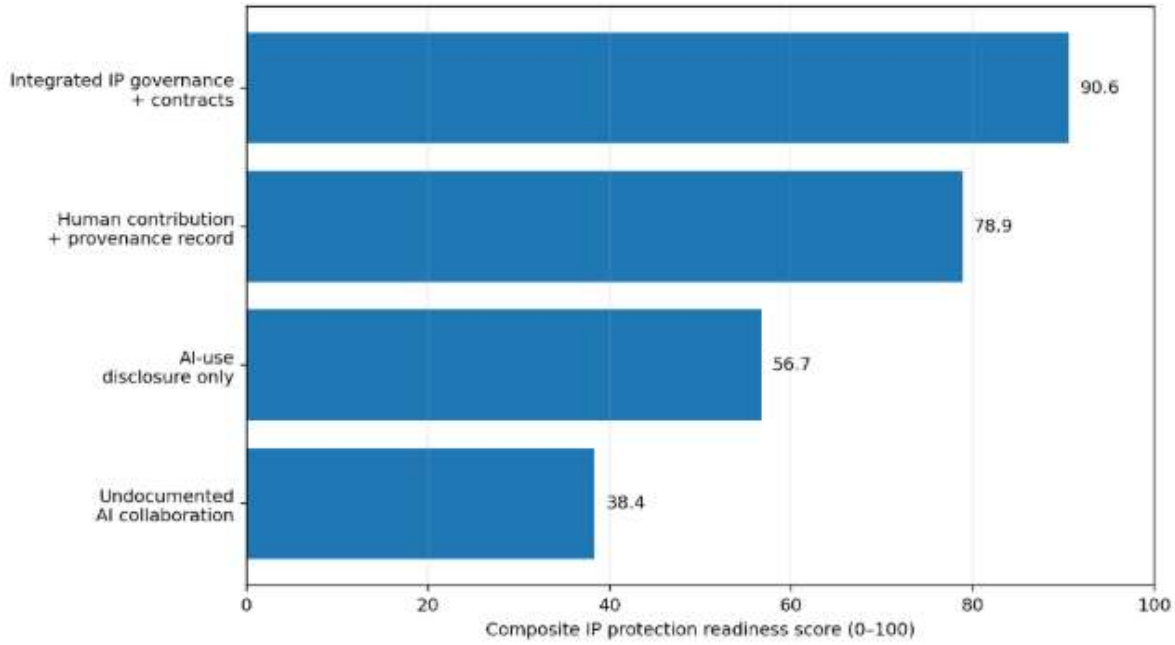
The contribution record should therefore be substantive rather than ceremonial. Recording "AI used for research" provides less value than documenting the human-defined technical problem, constraints established by researchers, AI-generated alternatives, reasons particular options were rejected, experiments designed by humans, modifications introduced following test results, and the point at which a researcher formed the operative technical solution.

5.3 Graphical Interpretation

Graph 1: Simulated IP Protection Readiness Across Human–AI Collaboration Controls



The increase from 38.4 to 56.7 suggests that disclosure is useful but limited. Transparency establishes that AI participated in the process but does not itself determine authorship, inventorship, ownership, or clearance of third-party rights.

The increase to 78.9 under contribution and provenance documentation reflects the importance of reconstructing both sides of the collaborative process: the human intellectual contribution and the external material entering the workflow.

The highest score of 90.6 arises only when contribution and provenance records are combined with contractual ownership, licensing, confidentiality, and formal IP review.

The resulting analytical proposition is that AI disclosure is an information practice, whereas IP protection requires an evidence-and-rights architecture.

6. Discussion

6.1 The Human–AI Innovation Record Should Become a Standard IP Document

Organizations commonly maintain laboratory notebooks, version-control histories, invention disclosures, design files, source-code repositories, authorship records, and contractual assignment documents. AI collaboration creates a need to integrate these practices.

The objective is not to save every token or every machine interaction indefinitely. Excessive documentation can become costly and may create privacy, security, or litigation problems of its own. The more defensible approach is risk-based documentation focused on legally material human decisions. For a copyright-sensitive project, relevant records may include original human inputs, substantial revisions, editorial decisions, selected alternatives, rejected versions, compositional choices, and the relationship between AI-generated components and the human-authored whole.

For patent-sensitive research, records should concentrate on the development of claimed technical concepts. A raw record showing that an AI suggested thousands of alternatives is less useful than a traceable account of which researchers framed the problem, identified operative constraints, recognized a particular solution, refined it, and linked it to the claimed invention.

This approach is compatible with the contemporary U.S. position. Copyright protection is directed toward human expression rather than machine-generated material standing alone, while patent inventorship remains confined to natural persons under the ordinary inventorship standard.

A well-designed collaboration record therefore serves three purposes simultaneously. It helps creators and inventors identify protectable contributions, helps organizations allocate ownership, and helps counsel determine which AI-derived elements should be excluded or separately described in filings and registrations.

6.2 Ownership Should Be Determined by Law and Contract, Not by Assumptions About the AI Tool

One of the most persistent commercial mistakes is assuming that possession of an AI output automatically produces complete intellectual property ownership.

Several distinct questions must be separated.

First, does copyright or patent protection arise at all? A wholly machine-generated output may not qualify for U.S. copyright protection, while an AI system cannot be named as a U.S. patent inventor.

Second, if legally protectable human contributions exist, who owns them? Employment rules, works-made-for-hire provisions, research agreements, university policies, commissioning contracts, assignments, and local statutes may alter ownership even where the human author or inventor can be identified.

Third, what does the AI provider's contract permit? Contractual rights to use outputs do not necessarily create statutory copyright where copyright otherwise does not exist, nor can private contractual language transform an AI system into a statutory patent inventor.

Fourth, does the output implicate third-party intellectual property? Ownership of a user's own contribution does not authorize copying of protected material belonging to another person.

Fifth, was confidential or patent-sensitive information supplied to the system? Disclosure of unpublished technical information to an external AI service can raise confidentiality, contractual, data-security, and potentially patent-strategy concerns depending on the service architecture, terms, and jurisdiction.

For these reasons, organizations should separate authorship, inventorship, ownership, license rights, and freedom to use. They are related concepts but are not interchangeable.

The same distinction is visible in international policy. EU GPAI rules require model providers to establish copyright-compliance policies and publish prescribed training-content summaries, but those obligations do not automatically determine ownership of every downstream output. Similarly, India's computer-generated-work provision provides an authorship rule in statutory language but does not eliminate the need to analyze originality, ownership, infringement, contractual rights, and other questions surrounding a specific AI-assisted work.

6.3 A Seven-Layer IP Protection Model for Collaborative Innovation

The study supports a seven-layer governance model.

The first layer is AI-use classification. Organizations should determine whether AI is functioning as a research assistant, editing tool, generative creator, coding assistant, optimization engine, predictive system, or autonomous search mechanism. Different uses create different IP questions.

The second layer is human-contribution mapping. The project record should identify the people responsible for protectable creative expression or inventorship-relevant technical conception rather than merely recording who operated the AI interface.

The third layer is input provenance. Teams should distinguish original organizational material, licensed content, open-source components, public-domain material, third-party confidential data, and unknown-source content.

The fourth layer is contractual allocation. Employment agreements, consultant contracts, collaboration agreements, research partnerships, commissioned-work terms, and AI-service contracts should be examined before disputes arise.

The fifth layer is confidentiality and trade-secret control. Proprietary datasets, unpublished inventions, source code, commercial strategies, and valuable internal know-how should not be exposed to AI services without an appropriate security and contractual assessment.

The sixth layer is rights clearance and filing review. Before publication or commercialization, organizations should determine which parts of the result can properly be claimed as human-authored copyright, which technical concepts may require patent analysis, whether third-party rights require permission, and whether publication could compromise confidential or patent-sensitive information.

7. Conclusion

Collaborative human–AI innovation does not fit comfortably within simplistic descriptions of either “human creation” or “machine creation.” Contemporary creative and inventive processes often involve repeated interaction among human expertise, AI-generated alternatives, protected source materials, proprietary data, experimental validation, editing, selection, and institutional resources.

The resulting intellectual property problem is therefore not adequately answered by asking whether artificial intelligence owns the output.

Under the current U.S. approach, AI itself does not become the copyright author of an autonomously generated work, and the U.S. Copyright Office distinguishes human-authored expression and sufficiently creative human selection, arrangement, or modification from machine-generated material standing alone. Patent law similarly preserves human inventorship; the USPTO's November

2025 guidance states that AI-assisted inventions are evaluated under the ordinary inventorship standard and that an AI system cannot be identified as an inventor or joint inventor.

Other jurisdictions demonstrate that the legal debate is not globally uniform. India's Copyright Act expressly addresses computer-generated works through the person who causes the work to be created. The UK retains a comparable statutory history but, as of its March 2026 policy report, proposes removal of special computer-generated-work protection while continuing further evidence gathering before broader reform. The European Union is developing another dimension of the IP–AI relationship by imposing copyright-policy and training-content transparency obligations on providers of general-purpose AI models.

The simulation presented in this study demonstrates how these legal developments translate into organizational governance. Undocumented AI collaboration generates the weakest modeled IP position. Disclosure alone provides greater transparency but leaves central questions unresolved. Contribution and provenance records substantially improve the ability to reconstruct human authorship, inventorship, and source legitimacy. The strongest modeled result emerges only when these records are integrated with contractual allocation, licensing, confidentiality, and formal IP review.

The numerical scores are illustrative and should not be interpreted as measurements of actual legal validity. Their value lies in demonstrating an operational principle: intellectual property protection is strengthened when organizations can reconstruct the innovation process.

Accordingly, a legally resilient human–AI innovation record should be capable of answering six questions: Who made the legally relevant human contribution? What exactly did that person contribute? What materials and AI systems entered the process? Under what permissions or contractual conditions were they used? Who owns the resulting protectable rights? What records can demonstrate those answers if the innovation is later registered, patented, licensed, financed, acquired, or challenged?

The future of intellectual property protection in AI-assisted innovation is therefore likely to depend less on recognizing artificial intelligence as an independent legal creator and more on improving the precision with which human contribution, machine assistance, source provenance, contractual allocation, and downstream rights are documented.

In this sense, provenance becomes the bridge between collaborative innovation and enforceable intellectual property.

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