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# *An Exploration of the "Chain of Ownership" Issue in Artificial Intelligence and Patent Law*

**Shengyu Zhang**

*Artificial Intelligence Law, Shanghai University of Political Science and Law, Shanghai, China*
*15801921852@163.com*

***Abstract.*** This paper examines the "chain of ownership" issue in patent law concerning artificial intelligence (AI), specifically addressing the question of whether AI should be recognized as an inventor. Traditionally, patent law grants ownership to human inventors or employers to foster innovation. However, as AI plays a larger role in the inventive process, questions arise about its eligibility as an inventor. Legally, AI lacks the qualifications of an independent legal subject and cannot fulfill the patent law requirements for inventorship, which are tied to human creativity and intent. Ethically, AI's creations are based on data processing rather than genuine creativity, and recognizing AI as an inventor may devalue human innovation. Granting AI inventorship could cause legal issues, such as ownership disputes and incentive imbalances. Through the analysis of relevant literature and cases, the paper shows that AI should not be recognized as an inventor under current patent law, as it lacks human qualities such as consciousness and moral intent. However, as AI's role in innovation grows, legal reforms may be needed to address the ownership and incentives for AI-generated inventions.

***Keywords:*** Patent Law, Chain of Ownership, Artificial Intelligence, Inventorship Legal Reform

## 1. Introduction

The expanding role of artificial intelligence (AI) in innovation has intensified discussions on its intersection with patent law, particularly on whether AI should be acknowledged as an inventor. Ongoing research explores the legal, ethical, and practical implications of this issue, highlighting the impact of AI on accelerating drug development and other industries. However, a research gap remains concerning the "chain of ownership" of AI-generated inventions, particularly in balancing ownership allocation and innovation incentives with AI advancements while safeguarding human creativity. At the core of patent law is the establishment of the legitimate owner of an invention. Traditionally, patent rights are assigned to the inventor or their employer, with the ownership chain necessarily beginning with the inventor. Therefore, the attribution of AI-generated inventions poses a challenge to the existing patent system. This study explores whether AI should be recognized as an inventor, who should own AI-generated inventions, and how the current patent system can adapt to these changes through a review of relevant literature, case studies, and legal text analysis. By

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examining ownership and incentive mechanisms, it seeks to balance technological progress with protecting human innovation, providing insights for AI-era patent law reform.

## 2. The concept of "chain of ownership" in patent law

### 2.1. The basic definition of the chain of ownership

In patent law, "chain of ownership" refers to the documented sequence of transfers or assignments of patent rights from the original inventor to subsequent owners or assignees, ensuring legally valid and clearly defined ownership at all times [1]. Traditionally, patent rights originate with a human inventor and may be passed to employers, investors, or other entities via contractual or statutory mechanisms. However, in the context of AI-generated inventions, establishing an ownership chain presents new challenges. Since AI lacks legal personhood and cannot hold patent rights, the existing legal framework is difficult to apply directly. There remains legal and practical debate over whether AI-generated inventions should belong to the AI's developer, user, or the provider of training data. Moreover, AI's non-human role in the innovation process may disrupt the traditional ownership chain, complicating the establishment, transfer, and enforcement of patent rights. As AI technology continues to evolve, patent law must reconsider the definition of the ownership chain to ensure clear attribution of patent rights and maintain an effective innovation incentive system.

### 2.2. The relationship between inventorship and the chain of ownership

The ownership chain originates with the inventor, the person who first conceptualized the invention. According to fundamental principles of patent law, the inventor is typically the initial owner of the patent unless they formally transfer their rights through an assignment agreement to another party, such as an employer, company, or collaborator [2]. In order to ensure legal validity, such transfers are usually documented in writing and may need to be registered with patent offices, such as the United States Patent and Trademark Office (USPTO). An inventor's role in the ownership chain determines the initial assignment of patent rights. Without a clear transfer agreement, the inventor retains ownership, ensuring their contribution is legally recognized. Patent rights can be assigned to other entities, such as corporations or research institutions, through a written, voluntary agreement, which often requires notarization or official registration. Failure to formalize this process may lead to an unstable ownership chain or legal disputes [2].

In cases involving multiple inventors, the ownership chain becomes more complex. By default, each inventor holds an undivided interest in the patent unless an agreement states otherwise. As a result, any co-inventor may independently license the patent, potentially resulting in conflicts or complicate ownership structures. Moreover, with the progress of AI technology, some countries are discussing whether AI can be acknowledged as an inventor. If AI were recognized as an inventor, the ownership chain would no longer begin with a natural person, requiring a reexamination of patent law [3]. International collaborations in invention can also affect the stability of the ownership chain. Variations in national laws on patent ownership and transfer may cause inconsistencies. For instance, one country may require written assignments, whereas another allows verbal agreements. And these legal differences can result in discrepancies in global patent ownership chains [4].

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## 3. The impact of artificial intelligence as an inventor on the chain of ownership

### 3.1. The role and creativity of AI in innovation

Innovation, particularly in high-tech fields, is being revolutionized by AI. Its sophisticated data processing, pattern recognition, and predictive capabilities have dramatically boosted research and development (R&D) efficiency, thus driving groundbreaking scientific advancements. However, the rapid evolution of this technology has ignited legal and ethical debates over the essence of creativity and the ownership of intellectual property. Traditional patent systems emphasize that inventors must be natural persons with creative thinking, but AI's deep involvement in the invention process challenges this principle.

AI drives innovation by analyzing vast amounts of data to uncover patterns and correlations that are difficult for humans to detect. Its capacity to analyze complex data allows it to uncover new scientific connections [5]. For instance, in drug discovery, AI analyzes genomics and proteomics data to efficiently identify potential drug targets and predict their interactions, greatly shortening the traditional R&D cycle. Furthermore, AI generative models can autonomously design molecular structures and optimize drug candidates through virtual screening, thus accelerating the preclinical research process. These capabilities enhance R&D efficiency while also pioneering new approaches to scientific exploration, showcasing AI's unique creativity in innovation.

However, AI's ability to generate innovations also raises questions about intellectual property ownership. AI-generated inventions may meet patentability criteria like novelty and utility, yet the absence of direct human creativity challenges core patent law principles, including the definition of an inventor and the attribution of creativity. Patent systems continue to uphold the principle that inventorship is exclusive to natural persons, ensuring legal stability and fostering human creativity. Innovative as AI may be, it still relies on human-designed algorithms, data, and training objectives. Granting AI inventorship could blur the boundary between tools and creators, potentially disrupting patent law and diminishing human prominence in innovation. Also, the ownership of AI-generated inventions remains disputed, with uncertainty over whether rights belong to the developer, user, or another party. If AI cannot be an independent patent entity, its innovations may require protection under existing laws or a new legal framework. And these challenges highlight the legal system's uncertainties in addressing AI-driven innovation.

### 3.2. The legal adaptability of AI as an inventor

At present, patent law does not acknowledge AI systems as inventors, a position based on legal, ethical, and practical considerations. Legally, patent law aims to incentivize human innovation by granting exclusive rights, driving technological and economic progress [6]. Thus, patent rights are granted to natural or legal persons, not machines or tools. AI, driven by algorithms and data, lacks independent legal status and does not qualify as an inventor. Patent law requires that an inventor be a natural person who has made a creative contribution to the essential features of an invention, while those providing mere technical assistance are not considered inventors [7]. In addition, patent applications must meet criteria like novelty, non-obviousness, and industrial applicability. However, AI operates purely based on predetermined algorithms and data inputs, possesses no creative intent, and cannot bear the rights and obligations established by patent law, such as liability for patent infringement. Therefore, AI does not currently qualify as an inventor under patent law.

The legal stance is reinforced by judicial rulings worldwide, with many jurisdictions explicitly rejecting AI as an inventor. In the United States, the Thaler v. Vidal case ruled that inventors must be

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natural persons under the U.S. Patent Act. In 2024, the USPTO issued guidelines for AI-Assisted Inventions, clarifying that while AI-generated inventions are not inherently unpatentable, they must involve a "significant contribution" from a human inventor. Similarly, the European Patent Office (EPO) rejected Thaler's patent applications in 2019-2020, citing Article 81 of the European Patent Convention (EPC), which mandates that an inventor must be a natural person. In 2021, the EPO's Board of Appeal reaffirmed that AI is merely a tool, and patent rights should belong to the human utilizing the AI. In the United Kingdom, the Supreme Court ruled in Thaler v. Comptroller-General that the term "inventor" under the Patents Act 1977 applies only to natural persons. In Asia, Japan's Tokyo District Court ruled in 2024 that AI serves only as an auxiliary tool and lacks independent inventive capacity, making it ineligible for inventor status. A 2023 report from the Japan Patent Office (JPO) suggested that while future advancements in AI could prompt legal adjustments, for now, the principle of human inventorship remains unchanged. Australia briefly recognized AI as an inventor in Thaler v. Commissioner of Patents, which was overturned by the Court of Appeal in 2022, reaffirming that inventors must be human.

The role of AI in patent law may evolve with technological and legal advancements. For instance, the U.S. may introduce legislation or policies to clarify patent ownership in cases of AI-assisted inventions, particularly those involving human-AI collaboration. In the EU, the implementation of the AI Act could facilitate the integration of patent law with AI governance. Some experts suggest that the EU may explore a distinct category for "AI-assisted inventions," though it is unlikely to recognize AI as an independent inventor. In China, while no cases similar to DABUS have emerged, policies such as the New Generation AI Development Plan and the Personal Information Protection Law demonstrate a focus on AI innovation and regulation. Future amendments to China's patent law may introduce AI-related provisions to balance innovation incentives with legal oversight.

The international community is actively working toward harmonized AI patent policies. The Bletchley Park AI Safety Summit and the upcoming French AI Summit highlight global efforts to establish consensus on AI governance. International guidelines may eventually define AI's role in inventions and rights attribution. Nevertheless, due to variations in technology, legal traditions, and economic interests, universal recognition of AI as an inventor is unlikely [7]. A practical approach is to refine legal frameworks for AI-assisted inventions while maintaining legal stability and human creativity incentives.

### 3.3. The ownership of AI-generated inventions

The ownership of AI-generated inventions encompasses several factors, primarily determining who should hold the rights: the AI system's developer, its user, or another involved party. Determining ownership is essential to maintaining patent law's role in promoting innovation. Existing cases such as the DABUS case show that patent offices worldwide consistently reject AI systems as inventors, a ruling that has important implications for ownership.

Particularly, in AI-accelerated drug discovery, AI systems tend to combine existing technologies, thus leading to advancements that are generally regarded as incremental instead of groundbreaking. Though AI-generated drug molecules may satisfy the novelty, non-obviousness, and utility criteria for patentability, the AI process itself is typically not eligible for a patent, as it relies on data and algorithms regarded as standard technological methods. Optimization processes, such as molecule screening and pharmacodynamics prediction, are typically viewed as "optimization methods" or "experimental designs" rather than specific inventions, which usually cannot be patented.

AI-generated inventions are unique in that they blur the boundaries of the inventor in traditional inventions. Traditional patent law assumes that the inventor is a natural person with subjective intent

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and creative thinking, while AI, as an unconscious algorithmic system, may produce results from the collective efforts of developers, users, or other parties. Therefore, disputes over ownership focus on aspects such as defining contributions, legal subjectivity, incentive mechanisms, and actual control. Possible subjects for attribution include AI developers, users, data providers, and the AI system itself [8].

AI developers are often considered to have ownership rights because they design and train the AI system, similar to craftsmen creating tools. This attribution encourages technological innovation and ensures a clear chain of responsibility. However, it may overlook the contributions of users and could lead to potential technological monopolies. Users are often considered closer to the traditional patent law definition of an inventor, as they input specific needs and adjust parameters, making the final invention. This approach is flexible but may underestimate the developer's role and cause disputes over attribution when different users generate similar inventions using the same AI [9]. Data providers, who supply key data for training the AI, also play a significant role, as AI's ability to generate inventions depends on this data. Recognizing their contribution promotes fairness and encourages data sharing, but they are often not directly involved in the invention process, making it challenging to define their inventor status [10]. Although current patent laws require inventors to be natural persons and AI cannot hold rights as a legal entity, AI's role in many fields is increasingly acknowledged. In some cases, users are granted patents for their direct involvement in the invention process, while developers may benefit from technology licenses. Future ownership attribution might involve more complex models, such as hybrid attribution, or new legal frameworks to accommodate super-intelligent AI.

## 4. Legal reform and recommendations

### 4.1. The inadequacies of current patent law and the need for reform

At present, patent law fails to effectively address the challenges posed by AI, particularly regarding AI-generated inventions. AI technologies, especially machine learning algorithms, are widely used in fields like drug discovery and bioinformatics, relying on abstract mathematical methods that are not protected under current patent law. As a result, the existing framework does not properly define and allocate rights for AI's role in the invention process. For example, PaccMann uses multimodal data and attention mechanisms for compound prediction. Although the results may be innovative, the AI-driven process, based on existing technologies, faces challenges in patentability. Similarly, InTeract uses natural language processing on scientific literature, but its innovation may not meet the non-obviousness requirement; and PIMKL employs common algorithms in bioinformatics, with innovation in data integration, but lacks breakthroughs and faces patentability issues. Patent law excludes natural laws, discoveries, and mathematical methods, which means that these AI-generated inventions are ineligible for patent protection.

To resolve these issues, the inventor should continue to be defined as a natural person, with the addition of the concept of AI-assisted invention. AI should be regarded as a tool, with human inventors making significant contributions, such as defining the problem or verifying results. This approach aligns with existing law and the USPTO's 2024 guidance, avoiding major changes. In the long term, patent law should expand the definition of inventor to include AI-human collaboration. Specifically, inventor could be defined as a natural person or an entity in which a natural person collaborates with an AI. This would recognize AI's contribution without granting it independent subject status. Furthermore, the AI creation process should be documented transparently through

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algorithmic logs to assess each party's role. This reform would support the growing independence of AI while ensuring humans maintain a leading role in innovation.

### 4.2. The enhancement of the legal framework for determining the chain of ownership

As AI technology evolves, patent law needs to refine the framework for determining ownership, particularly in the case of AI-assisted inventions. The involvement of AI complicates determining ownership, so patent law should introduce a clause for AI-assisted inventions to clarify the roles and contributions of human-AI collaboration. Specifically, the inventor clause could be revised to allow for human-AI collaboration, where the ownership rights are determined based on the contributions of each party to the invention process. To ensure fairness, the patent examination process should include a contribution assessment mechanism. For example, applicants should provide algorithm logs that document the role of AI in the invention process, helping examiners assess each party's contribution.

Moreover, WIPO should promote international harmonization to standardize the application of the AI-assisted invention clause across countries and regions. A revision of international patent agreements, such as the Patent Cooperation Treaty (PCT), will be a key step in ensuring that patent laws in various countries adapt to this emerging field. The reform could start with pilot programs in developed countries (such as the U.S. and EU) to collect data on the implementation of AI-assisted invention in patent applications, followed by adjustments based on feedback within 3 to 5 years. This gradual approach will help achieve global legal consistency over a 5 to 10-year period. This reform will ensure fair evaluation of AI's contributions to innovation through clear mechanisms for attribution, addressing transparency issues in the AI invention process and improving the efficiency and fairness of patent applications.

## 5. Conclusion

This paper examines the ownership chain issue in patent law regarding AI, focusing on whether AI should be recognized as an inventor, who should own AI-generated inventions, and how patent laws should adapt. The study finds that AI lacks the independent legal status and creative intent required for inventorship, as demonstrated by global cases like DABUS. Ethically, AI's outputs stem from data processing rather than true creativity, and recognizing AI as an inventor may devalue human innovation. Practically, such recognition could lead to ownership disputes and disrupt patent law's incentive mechanisms. As a result, the paper argues that AI should not be considered an inventor according to current law. As AI's role expands in areas such as drug discovery, legal reforms are needed to clarify ownership, favoring human contributors and ensuring that incentive mechanisms align with human creativity. However, this study has some limitations. It relies on qualitative analysis of legal cases and ethical debates, lacking quantitative data to assess AI's contributions or economic impacts. And it also does not address jurisdictional differences in patent law application, limiting its global applicability. Future research should develop models to assess AI and human contributions, investigate the socioeconomic impacts of AI inventions, and promote patent law harmonization through WIPO.

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