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Patenting AI Inventions in India: An Eco-Legal Analysis

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Abstract

The Proliferation of AI Technologies has led to a surge in patent filings, reflecting heightened competition amongst market players to secure proprietary rights over AI-related innovation. AI has emerged as a novel intervention with far-reaching implications for market sustainability in the context of a shifting market scenario. Integration of AI tools into daily life would represent an intersection of digital innovation and social welfare. This interaction necessitates re-evaluation of strategies for protecting intellectual property, ensuring that the patent system fosters innovation while safeguarding the rights of creators in an era defined by rapid technological advancement. However, the current AI market trend must create a synergy between Digital India initiatives while exploring sustainability metrics and future projections. This also necessitates thorough analysis, given long-term market viability, legal and regulatory compliance, as well as ethical concerns, which can be evaluated by incorporating performance indices, such as a sustainability scorecard, quality management (including risk management), to ascertain market readiness. Another critical point of contention arises concerning patenting AI innovations because the present IP Laws in India do not correspond to it. This seems to pose a stumbling block in achieving development initiatives. Patenting AI technologies can penetrate over 70% of the target demographic, driven by policy incentives and digital infrastructure enhancement. This would additionally increase consumer confidence and promote sustainable investment. This paper examines the implications of AI-driven inventions within the legal framework and the broader market sustainability agenda, focusing on the challenges and opportunities presented by this emerging technology. Furthermore, this study aims to provide evidence-based recommendations for fostering an ecosystem that resonates with the long-term aspiration of a digitally empowered and environmentally conscious India.

Keyword: Patent, Artificial Intelligence, Market, Sustainability, Legal Monopoly.

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1. Introduction

The era of artificial intelligence (AI) has dramatically reshaped the landscape of technological innovation, thereby changing the way inventions are conceived and developed. We are witnessing the transformative power of AI to generate novel solutions and 'inventions' with minimal human intervention. This paradigm shift raises critical questions about the implications of intellectual property (IP) and patent law, which were originally designed to protect human inventors and their creations. In recent years, there has been a notable increase in patent filings related to AI inventions, reflecting a growing recognition of the technology's potential to drive significant advancements across sectors such as healthcare, automotive, and telecommunications. This trend highlights the need for a comprehensive understanding of how traditional patent systems must adapt to AI's unique characteristics. Issues surrounding inventorship, ownership, and the patentability of AI-generated innovations are becoming increasingly pertinent, as legal frameworks struggle to keep pace with technological progress.

As companies and researchers seek to navigate the complexities of patenting AI inventions, the landscape is marked by both opportunities and challenges. Organizations must remain vigilant in developing strategies for IP protection that align with the rapid pace of AI development while also considering the ethical implications and societal impact of their innovations. This sets the stage for a deeper exploration of patent trends in the wake of AI, examining the intersection of technology and intellectual property rights in an ever-evolving landscape.

Given the commercial benefits and industrial applications of inventions, a critical question arises: Can developments in artificial intelligence (AI) be patented? This question can be examined from two perspectives. *First*, AI is a product of human intellect, which falls under the category of intellectual property rights. *Second,* we must consider whether inventions created with the help of AI are eligible for patent protection. Understanding the answers to these questions is crucial, as virtually every sector is now influenced by AI.

Instances of patenting AI inventions date back to 1963 within the U.S. patent system. The U.S. Patent and Trademark Office (USPTO) recognizes patents for AI inventions, provided they meet the necessary criteria of novelty, non-obviousness, utility, and patent eligibility. However, complications arise regarding the designation of inventorship. For example, a patent application that was developed entirely by an AI system was denied because a "machine does not qualify as

an inventor" under Section 100 of the Patent Act of 1952 *(Thaler v. Vidal)*[3]. The Patent Act of 1952 explicitly defines an "inventor" as a natural person. Although the Act does not define the term "individual," guidance can be found in *Mohamad v. Palestine Authority,*[4] where the Supreme Court clarified that "individual" typically refers to a human being. Additionally, the Oxford English Dictionary defines an individual as a single human distinct from other artificial entities, which include groups such as corporations, companies, associations, firms, partnerships, societies, and joint stock companies.

In Yates v. United States[5] an attempt was made to analyze the Patent Act in a broader context, but, an analysis of the Act in its entirety, confirms that 'inventors' must be human beings. The same was affirmed in *Univ. of Utah v. Max- Planch- Gesellschaft zur Forderung der Wissenschaften E.V.*[6]and *Beech Aircraft Corp v. EDO Corp.*[7]

However, the *Thaler*[8]decision leaves a critical gap unaddressed i.e., AI-human collaborative invention. To this, USPTO has issued guidelines whereby, for an invention to be patentable there must be significant human contribution. A question arises regarding how to evaluate human contributions in the context of AI inventions. To address this, the USPTO has established the following guidelines based on the Pannu factors:

(i) The use of AI does not eliminate a person's role as an inventor.

(ii) AI should assist in addressing specific problem-solving prompts.

(iii) A person can be considered an inventor if they develop a key foundational element, even if they did not participate in every step of the process.

(iv) Significant contributions to the AI output are recognized.

(v) A person must make substantial contributions to the overall invention concept.

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[3] Thaler v. Vidal, 43 F.4th 1207, 1210 (Fed. Cir. 2022)
[4] Mohamad v. Palestine Authority, 566 U.S. 499 (2012)
[5] Yates v. United States, 574 U.S. 528, 537, 135 S.Ct. 1074, 191 L.Ed. 2d 64(2015).
[6] Univ. of Utah v. Max- Planch- Gesellschaft zur Forderung der Wissenschaften E.V., 734 F. 3d 1315, 1323 Fed. Cir (2013).
[7]Beech Aircraft Corp v. EDO Corp., 990 F. 2d 1237, 1248 Fed. Cir (1993).
[8] *Supra* Note 1.

WIPO reports a significant increase in patent activity related to advancements in generative AI, particularly following the release of the ChatGPT chatbot in 2022. The report notes that the number of generative AI patents has risen from 733 in 2014 to 14000 in 2023, with China at the forefront of generative AI patent families.[9]

In June 2020, India has launched a dedicated portal (https://indiaai.gov.in) aimed at promoting and encouraging advancements in AI. Furthermore, in 2021, the Indo-U.S. Science and Technology Forum (IUSSTF) initiated a program to foster AI innovation and stimulate partnerships. In the recent BRICS summit the honourable Prime Minister of India has called for the creation of global standards for the use of AI thereby stressing on concerns about risks, ethics, and biases.[10] This shows India's commitment towards achieving a digitalized and developed country in line with its Vikshit Bharat goals by 2047.

1.1 Objectives

1. To understand the scenario of AI patent in different countries.
2. To analyze the nature of AI ownership and possession.
3. To highlight AI marketing pattern.
4. To focus on the future of AI patent and challenges faced.

1.2 Review of Literature

Jyh-An, Reto M Hilty and Kung-Chung Liu[11] in their book examined the emerging patent law and policy issues associated with AI including patentability of AI inventions. This book also explores how AI inventions have raised the concern for standards of inventive step thereby reshaping the IP administration.

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[9] Patent Landscape Report, "Generative Artificial Intelligence", WIPO, 2024, https://www.wipo.int/web-publications/patent-landscape-report-generative-artificial-intelligence-genai/en/index.html.

[10] The Assam Tribune, "Brics must work to secure critical minerals supply chain: Modi", July 8 (2025), Tuesday, Guwahati, www.assamtribune.com.

[11] JYH-AN et.al, ROADMAP TO ARTIFICIAL INTELLIGENCE AND INTELLECTUAL PROPERTY, 1-7 (1st ed. 2021).

WIPO[12] stated that advancements in AI has revolutionized the industries and reshaped our lives. It also asserts that high computing power has fueled the AI growth which intersects with intellectual property in a number of ways which mandates regulation.

James Godfrey[13] asserts that AI innovation thus have a positive impact on how we interact with technology and the internet but is not devoid of potential risk. The author also expresses his concern on the fact that there is little or no regulation in place to regulate the rapid pace of AI advancement.

Arvind Virmani[14] asserts that AI driven system has the potential to transform governance, accelerate structural and inclusive growth. Therefore, India must ensure provision of hard and soft infrastructure, develop policy structure that creates competitive market scenario.

1.3 Research Question

1. Whether AI inventions are eligible for IP protection?
2. Whether AI inventions can be explained through market analysis?
3. What are the implications of AI patents for innovation and industry practices?

1.4 Methodology

To ensure quality information on the topic and deeper understanding, the study will be doctrinal and analytical. The study primarily relies on secondary sources such as books, journals, research articles and other web sources.

2. Present trends in AI inventions

The patent landscape for AI is dynamic as the commercial potential of AI technologies, particularly in healthcare, automotive, finance and telecommunication sectors, are on the rise. Therefore, the stakeholders in the innovation ecosystem are keen to protect their innovation and reap commercial benefits from it. An analysis of the AI patent applications highlights that a major

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[12] WIPO, *9th Session on Training the Machines- Bytes, Rights and the Copyright Conundrum* (Nov. 5 2024 at 12:28 pm), https://www.wipo.int/about-ip/en/frontier-technologies/ai_and_ip.html.

[13] James Godfrey, *How Does Artificial Intelligence Affect Intellectual Property Protection?* ROUSE (Nov. 5, 2024 at 12:43 pm), https://rouse.com/insights/news/2024/how-does-artificial-intelligence-affect-intellectual-property-protection.

[14] Arvind Virmani, *NITI Working Paper- Vikshit Bharat: Unshackling Job Creator, Empowering Growth Drivers,* July 2024, https://www.niti.gov.in/sites/default/files/2024-07/WP_Viksit_Bharat_2024-July-19.pdf.

proportion of the applications focus on Machine Learning and Deep Learning Processes like data processing, analysis and management, which encompasses a broader range of applications.

This necessitates a regulatory framework to ensure compliance of ethical standards, establish a quality and risk management system, achieve levels of accuracy, robustness and cybersecurity, data privacy, enforcement and penalties and above all implement human oversight.

India's legal stance on patentability of AI inventions is strongly reinforced by cases like *V.B Mohammad Ibrahim v. Alfred Schafranek*[15] which maintains that only a human can be an inventor.[16] Other relevant cases highlighted the necessity of novelty (*Gopal Glass Works Ltd. V. Assistant Controller of Patents, 2007*) and, laid the detailed tests for inventiveness/ non-obviousness *(Biswanath Prasad Radhey Shyam v. Hindustan Metal Industries, 1982)* whereas *(Cipla Ltd. V. Hoffman-La Roche Ltd. & Anr)* emphasized industrial applicability. These case found reliance u/s 2 (1) (y)[17], Sec 3 (k)[18] and Sec 6[19] which reinforces that a natural person who contributes skill or expertise can claim inventorship.[20]

2.1 Scenario of AI Patents in Different Countries- A Summary

The scenario of AI patents varies significantly across different jurisdictions, reflecting diverse legal frameworks, cultural attitudes towards intellectual property, and levels of technological development. There is a mixed response concerning AI patentability where majority of the countries like Australia, UK, USA, India, Canada, Germany, Brazil Taiwan, Israel, Korea, and New Zealand has rejected AI Patent applications on the ground that only a natural person can be an inventor whereas, notable exceptions can be seen in South Africa and Saudi Arabia. The EPO requires human inventorship and maintains that an inventor must have legal capacity, which an AI does not have in the present scenario. However, analyzing the role of law from the angle of Sociological jurisprudence, Roscoe Pound's theory of "*Social Engineering*", rightly propounds the need for balancing competing interest in the society i.e. to say law cannot be put into water tight compartments rather it should be capable of molding itself according to the changing circumstances.

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[15] AIR 1960 Mysore 173.

[16] Nayantara Sanyal & Simran Lobo, *Inventions by Artificial Intelligence Patentable or not?,* www.btgadvaya.com.

[17] The Patent Act, 1970

[18] Ibid.

[19] Ibid.

[20] Global Patent Filing, 2023.

In such a scenario, the Computer-Related Inventions (CRI) Guidelines, 2017, offer some respite, whereby an AI-based invention may qualify for patent protection. i.e., to say that while the present trend aligns with the human-centric approach adopted by many other jurisdictions, the CRI guidelines encouraged that AI systems providing "technical solutions/effects are eligible for patents. The CRI guidelines, 2025 further recognize AI, Machine Learning, Blockchain, and other disruptive technologies as potentially patentable if they demonstrate a technical effect, such as enhanced computation efficiency or improved accounting, for example, in medical diagnostics or industrial control. This is evident through many case laws. For e.g.: In *Ferid v. UOI*[21] the Delhi High Court affirmed that CRI's demonstrating technical advancements beyond ordinary computing processes and offering real-world application and technical effects, would be eligible for patents and would not fall under Sec 3(k) of Patent Act 1970.[22] Similarly, in *Microsoft Technology Licensing LLC v. Controller of Patents and Designs*[23] the Madras High Court clarifies that the presence of a mathematical formula does not disentitle a patent claim. *Opentv Inc v. Controller of Patents and Designs*[24], the Delhi High Court addresses the gap in Indian law as business methods are excluded under Sec 3(k). The Delhi High Court reiterated in *Raytheon Company v Controller General of Patents*[25] that a novel hardware is not a legal requirement for patentability. In the light of these developments the significant challenges to Patenting AI inventions in India lies in determining two aspects- How to determine whether a 'technical effect' is patentable or not? And Does AI qualify to be a 'natural person' as stipulated under section 6 of the Patents Act?

Amidst evolving jurisprudence, India is also experiencing interventions and investments in artificial intelligence (AI). This resonates with the Digital India initiative envisioned by Vikshit Bharat@2047. AI in India is used for its accuracy and efficiency in various sectors including Judiciary. For example: **SUVAS** (translate Judgments and orders in vernacular language), **SUPACE** (Assist in Court's efficiency like Legal Research and case management). Other citizen-centric services AI uses initiated by the Ministry of Electronic and Information Technology include **AI Satyapikaanan** (Facial recognition and verification), **AI VANI** (Virtual assistance, chatbots

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[21] Ferid v. UOI, W.P.(C) No. 7 of 2014, Delhi High Court.

[22] Asia IP, 2025, https://asiaiplaws.com

[23] (T) CMA (PT)/175 of 2023.

[24] SCC OnLine Del 2771.

[25] C.A.(COMM.IPD-PAT) 29/2022.

and voicebots), **AI Panini** (Text Transalation), **AI Shruti** (text-to- speech) **AI Saransh** (document summarization), **ATMAN** (detect lung abnormalities), **ePaarwai** (screening for cataracts) etc. In light of these developments, the Parliamentary Standing Committee under the Department of Commerce has also recommended significant revisions in the Patent Act 1970 and the Copyright Act 1957 to incorporate the emerging technologies of AI and AI inventions.

The idea of Vikshit Bharat refers to structural transformation and sustainable financing, keeping in view socially responsible investment and sustainability reporting, aligns with the Sustainable Development Goals (SDGs). AI patenting can contribute to market sustainability in the context of Vikshit Bharat by fostering innovation, promoting economic growth and enabling solutions for environmental challenges i.e., to say that combining AI with India's development objectives can be a breakthrough for India.[26]

The precision of AI-powered works in sectors like agriculture, healthcare, education, infrastructure etc., is undeniable. India has great potential to increase productivity, spur innovation by incorporating AI into governance, industry, and public service sectors.

According to BCG report 2024, 80% of Indian Companies consider AI as a strategic priority while 69% of the companies have already allocation of investment to AI initiatives. On one hand, NASSCOM report, 2024 stated that Indian Gen AI startup funding surged over *six* times every quarter. It also suggested that since AI has the potential to add $500 billion to India's GDP by 2025. 78% of the Small and Medium Enterprises using AI reported that AI has contributed in revenue growth. In the light of this, it has become essential that a regulatory framework should be adopted. It can be strongly established by the number of strides made by India towards innovation and technology that AI is a major factor in India's progress towards Vikshit Bharat.[27]

The European Patent Convention (EPC) under Articles 52-57 allows for the patenting of new inventions that involve an inventive step and have industrial applicability. According to the European Patent Office (EPO) Guidelines, AI inventions must have a "technical character" and provide a technical solution to a technical problem. The European Union Act 2024 is a

[26] Prof. (Dr.) Jagdev Singh Rama, *Study on Significance Role of Artificial Intelligence for Development of India for achieving goal of Vikshit Bharat @ 2047*, IJFMR, E-ISSN-2582-2160, www.ijfmr.com/papers/2025/240012.pdf.
[27] Institute of Directors, *India's AI Revolution: An enabler to Vikshit Bharat by 2047,* May 8 (2025), www.iodglobal.com/blog/details/indias-ai-revolution-an-enabler-to-vikshit-bharat-by-2047.

comprehensive piece of legislation on Artificial Intelligence. This legislation categorizes the risk that may be encountered owing to use of AI systems and has laid different rule for the same as- High Risk (most regulated as it has potential to cause significant harm if they fail/ are misused), Minimal Risk (can be deployed without additional restrictions), Unacceptable Risk (highest level of risk e.g.: subliminal manipulation or social snoring) and, Limited Risk (risk of manipulation or deceit). Sec 4 mandates AI literacy of the deployer. Sec 5 provides that AI posing unacceptable risk will be banned. Therefore, this law mandates responsible allocation of risk management systems, providing robust security and enforcement mechanism.

U.K has a number of AI Legislations and Regulations which includes the Online Safety Act 2023, Data Protection and Digital Information Bill, 2024, Algorithmic Transparency Standard (Central Digital Data Office, 2021), National AI strategy, 2018, Pro-innovation Approach to AI Regulation, 2023. The National AI Strategies of 2018 and 2021 aim to establish the UK as a global superpower by promoting responsible AI development, increasing sustainability, and encouraging long-term investment, thereby ensuring ethical compliance by AI.[28] That is to say, this strategy aims to create an AI-centric ecosystem, ensuring public trust and long-term benefits to the economy.[29]

The U.S lacks comprehensive legislation relating to AI but numerous policies revolve around fostering innovation and managing risks. For e.g. the National AI Initiative Act, 2020, focuses on innovations across Federal Agencies. Few States within the US are also shaping their legislative framework for AI compliance in business. Two executive orders were also issued for ethical use and development of AI.[30]

China's strategy to incorporate AI into the patent system focuses on healthcare, education, defence and developments through R&D with the vision to transform itself into a global leader in AI by 2030 (China's Artificial Intelligence Development Plan 2017). China has also formulated various AI policies and regulations namely- the New Generation AI-Ethics Specifications 2019, New Generation AI Code of Ethics, 2021, White Paper on Trustworthy AI, 2021 and, Artificial Intelligence Development Plan, 2017. The Patent Law of the People's Republic of China, 1984

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[28] Dr. Hamza Khan, 'Comparative Study of AI Regulations', Study Material of the Certificate course on AI and Law, 9th July (2025).

[29] Ibid.

[30] Software Improvement Group, "AI Legislation in the US- A 2025 Overview", https://www.softwareimprovementgroup.com/us-ai-legislation-overview/, 24th Jan 2025.

under Article 22 also provides that AI inventions are patentable if they meet the standard criteria of novelty, inventiveness, and applicability. The China National Intellectual Property Administration (CNIPA) to encourage innovation in this area has formulated specific guidelines to facilitate the patenting process for AI technology and emphasizes the importance of practical applications.

Japan recognizes AI advancements in its patent system, allowing for the patenting of both hardware and software that utilizes AI. The Patent Act of Japan under Article 29 allows the patenting of AI inventions if they contribute to a technical field. Algorithms such may not be patentable unless they are applied in a specific way that results in a new product or process. The Japan Patent Office (JPO) provides guidelines to ensure that AI inventions are adequately assessed for their technical contributions.

Patent Act, RSC, 1985, C. 33 of Canada allows for the patenting of new and useful inventions, including those involving AI, provided they meet the criteria of utility, novelty, and non-obviousness. However, the interpretation of what constitutes a "patentable invention" in the context of software and algorithms is still evolving, particularly in light of decisions like *Amazon.com Inc. v. Commissioner of Patents.*[31]

The Australian legal framework allows for the patenting of AI-related inventions, provided they meet the standard criteria. The Patents Act 1990 under section 18 permits the patenting of AI inventions, as long as they are a "manner of manufacture". Recent cases, such as *Research Affiliates LLC v. Commissioner of Patents*[32], are examining the applicability of the law to AI and software innovations, particularly concerning the idea of "manner of manufacture" which is integral to determining patent eligibility.

South Korea is active in the field of AI patents and has established a system that supports the patenting of AI innovations. The Korean Patent Act under Article 29 recognizes the patentability of AI-related technologies if they fulfill the criteria of being novel, inventive, and industrially applicable. The KIPO is actively promoting innovation in AI and has guidelines to assist in the patent examination of AI technologies.

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[31] Amazon.com Inc. v. Commissioner of Patents, 934 F.3d 976 (9th Cir. 2019).
[32] Research Affiliates LLC v. Commissioner of Patents, 300 ALR 724 (2013).

2.2 Whether an AI invention patentable?

From the above discussion, it is clear that an Inventions can be eligible for patent protection, provided it is new, non-obvious and has industrial application, but there are several important factors to consider that vary by jurisdiction concerning patentability of an AI invention. Most patent systems around the world require some form of human contribution to the invention. For e.g., The U.S. Patent and Trademark Office (USPTO) allows for AI-assisted inventions to be patented, provided they fulfill the standard criteria. The human inventor must be named. The European Patent Office (EPO) also allows for AI-generated ideas to be patentable if they meet the patent criteria. Similar to the U.S., a human inventor must be listed. Even in China AI inventions can be patented, but they need to show practical applicability. Again, the application must list a human as the inventor. This brings another criterion, i.e. whether significant human contribution is required or simply a human name to the inventor is required to seek patent protection? If significant human contribution is required, how to ascertain that contribution? This has been answered by USPTO guidelines while addressing the loopholes in the *Thaler* decision pertaining to human- AI collaborative invention as follows:

    a.   The use of AI does not eliminate a person's role as an inventor.

   (i) AI should assist in addressing specific problem-solving prompts.

   (ii) A person can be considered an inventor if they develop a key foundational element, even if they do not participate in every step of the process.

   (iii) Significant contributions to the AI output are recognized.

This implies that for an AI-assisted invention to be patentable, it typically must demonstrate a technical contribution or solve a technical problem in a specific application, rather than being merely an abstract idea generated by AI with substantial human intervention.

It may be added here that there is enough scope for generating a new concept to be introduced in the field of AI to ease the matter of patenting AI-innovations which may make more specific, convenient and differentiated from traditional approaches that are being recognized and tailored in different jurisdictions. The concept of "Independent Inventor" attached to AI-mechanism apart from the "Natural Human Being", if developed properly to include the AI's invention itself while working independently with no human control, i.e. under self- guidance for public good or welfare

of the greater human community, such inventions can, no doubt, be brought under the category of Independent Inventor or creator, though AI for this context is not a natural human innovator; and in such cases, AI's self-creation may, without any dispute, be allowed to be patented. However, in this case, the AI self-generated output must be clearly distinguished and separated from the human inventor, making him not liable for any harm or damage caused to human rights, property, etc. provided the human creator acts within the formula prescribed by him.

The ability to patent AI innovations can create greater certainty and trust in technology. If companies or developers know that patents protect their AI models and algorithms, they may be more inclined to adopt and deploy these technologies. The presence of patents also signals that the technology has been rigorously developed and is legally safeguarded, which can reduce concerns over copying or misuse. This benefit extends to consumers and end-users, as patent protection can encourage the widespread adoption of AI innovations.

3. AI Inventions: An Eco-Legal Analysis

This is the most critical aspect of patenting AI inventions, and it is even more complex if analyzed from marketing points of view as to who owns AI inventions or who possesses in the eye of law. Therefore, AI raises unique questions about inventorship and ownership of inventions. Traditionally, patents require a human inventor, but AI systems can, in some cases, autonomously generate solutions without human intervention. This leads to questions about who should be credited as the inventor and who owns the patent rights. Even if a human inventor is involved, there may still be ambiguity about ownership, especially in the case of AI systems developed by multiple parties or institutions. For example, who owns the patent rights to an AI model developed by a corporation, where the AI is trained on proprietary data, or where the invention was generated by an AI system working autonomously?

Ownership of AI as said above is the legal right to control and exploit an invention or innovation. In the context of patents, ownership typically involves the right to make, use, sell, license, or assign the rights to the patented invention. Ownership confers the authority to enforce the patent, defend against infringement, and profit from the invention. On the other hand, Possession of AI is also important which usually implies the physical or intellectual control or access to the invention but does not necessarily equate to ownership. In patent law, possession can

refer to the possession of the rights associated with the invention, but it can also refer to the access or use of the underlying technology, tools, or methodologies that led to the invention.

The legal consideration of ownership of a patent for AI inventions is typically determined by the individual or entity that files the patent application and is granted the rights to the invention. The current legal frameworks around patent law generally require human inventors. In cases where an AI system autonomously generates an invention as said above as "Independent Inventor", e.g., machine inventorship, i.e. an AI-driven machine learning algorithm that discovers a novel solution without human input, presents the question of who owns the resulting intellectual property. If an AI is involved in the creation process, should the ownership lie with the developer, the AI system's creator, or the entity that deployed the AI? For instance, if an AI system autonomously generates an algorithm or discovers a new chemical compound, a traditional view of ownership would assign the rights to the person or organization that created or deployed the AI, even if the AI did not act under direct human supervision. Some jurisdictions, such as the United States and Europe, maintain that only humans can be named as inventors, meaning that AI can never "own" a patent. In these systems, a corporation or an individual who develops or owns the AI system may hold the ownership rights. In Australia, however, the legal position is evolving, and a 2021 court decision allowed an AI system, specifically the "DABUS" system, to be named as an inventor in a patent application, though the rights still belonged to the entity that deployed the AI. In many AI-related patent cases, especially in corporate research and development (R&D) settings, ownership of AI inventions typically resides with the employer or the company that funds and oversees the development. This is determined by employment contracts, where inventors (typically employees) assign their IP rights to their employer as part of their job duties. In this scenario, the corporation becomes the owner of the patent, even though the actual inventive work may have been carried out by individual engineers or researchers. AI innovations often involve collaboration between multiple entities, for example, between academic institutions, technology firms, and industrial partners. In such cases, ownership of the resulting patent can be jointly held. The terms of joint ownership, such as licensing, commercialization, and enforcement rights, are often outlined in contracts or collaborative agreements between the parties involved.

The cases of Possession of AI are more nuanced. While ownership refers to the legal right to control and monetize the invention, possession often refers to the access to and control over the

underlying technology, algorithms, datasets, and models that make up the invention. In AI, possession involves practical control over the creation, deployment, and use of the system that generates inventive results. In AI, the possession of the model or algorithm may not equate to ownership of the resulting innovation or patent. For instance, a company that possesses the rights to a trained AI model or has access to proprietary data may not automatically hold ownership of a patent if they do not contribute to the inventive aspect of the AI solution. The distinction is especially important in cases where an AI system is employed by one party but generates intellectual property that might be patented by another. The ownership and possession of training data can significantly impact who controls the output of an AI system. If proprietary or private datasets are used to train an AI model, the owner of the data may have a claim to ownership of any resulting innovation, even if the AI itself is generating new insights or solutions. For example, an AI system developed by one entity that is trained on proprietary datasets owned by a different entity may lead to a situation where the company providing the data has a claim to ownership or co-ownership of the resulting patent. The legal agreements governing data use (e.g., licensing agreements or data sharing contracts) will be key in determining possession and ownership of the resulting inventions. Similarly, a company that possesses an AI system and uses it to generate a new invention may not automatically be the owner of the patent, especially if it is working under a licensing agreement or if the system was developed by a third party. The concept of possession in this case would imply the ability to use the AI system, but ownership would depend on the underlying agreements regarding IP rights. A company with possession of a patented AI model or algorithm may not necessarily control the rights to that patent if it does not own the intellectual property itself.

However, the legal distinction between AI as a tool and AI as an independent creator has profound implications for ownership and economic control. If AI is viewed strictly as a tool, then the ownership of the invention rests with the human or corporate entity that controls the tool. But exceptions to this general rule cannot be ruled out at all.

3.1 AI Inventions: Market Analysis

Market analysis is totally a unique task and more difficult for easy determination of the market forces like that of traditional monopoly as to patents in AI inventions. This is mainly due to the fact that the modern legislative trend creates a legal monopoly in the case of ownership and control

over AI inventions by original creators, including patent rights which require understanding of legal and regulatory structure of intellectual property in every jurisdiction. Second is the tradition of treating intellectual property as somewhat different from physical property. It says that intellectual property is special because it also protects information, and information has unique attributes that are not generally shared with physical property. Adam Smith also rejected the notion that copyrights and patents could be thought of as a natural species of property; he classified them as "monopolies", though he thought them desirable monopolies.[33] It is found that intellectual property is mainly the brainchild of human being and created by human labor, efforts, and devotion at the cost of investments. The truth is that all the properties are created by human endeavors except the free gifts of nature which cannot be created at all. Third is that intellectual property has also been referred to as a "Public good" which is "non-rival" and "non-excludable". Richard Posner and William Landes define public good in the economic sense as that consumption of it by one person does not reduce its consumption by another.[34] Thus, a non-rival public good is one that once produced, can be consumed by all without any person's consumption impairing any other's consumption which clearly indicates that additional "units "of the good can be produced or consumed with zero marginal cost. Similarly, intellectual property is "non-excludable" means that when once produced, is available to all because it is not possible to exclude anyone from consumption of that good. If we consider these attributes of intellectual property, then it will be found that Intellectual Property law is all about granting rights to exclude. Thus, if under the intellectual law, the underlying innovations, writings and other informational products were really non-excludable, then the law in this field would be trying to do the impossible. Stanford economist, Paul Romer also explains, "[e]ven though the information from discoveries is non-rival …, economically important discoveries usually do not meet the other criterion for a public good; they typically are partially excludable, or excludable for at least some period of time."[35]

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[33] Adam Smith, *Lectures on Jurisprudence* 83 (R.L.Meek, D.D. Raphael & P.G. Stein eds., Oxford University Press 1978) (1896)

[34] William M. Landes and Richard A. Posner, *The Economic structure of Intellectual Property Law* (Harvard 2003) p.14

[35] Paul M.Romer, *The Origin of Endogenous Growth*, 8 J. of Eco. Perspec. 3, 13 (1994) (also noting that "[b]ecause people and firms have some control over the information produced by most discoveries, it cannot be treated as a public good". Quoted from law.utexas.edu/wp-content/uploads/sites/25/duffy-intellectual-property-natural-monopoly.pdf., p.11}

3.2 AI Inventions: A Legal Monopoly

The modern trend of law favors that in order to provide incentives to create intellectual products or properties, the innovators or creators must be given some degree of control over the use or marketing of their products prohibiting others from copying their ideas or expressions, products, or in other words, to exclude others from infringing their patents over the subjects. In that sense, it should better be referred to as a "limited monopoly." Because patents granted to the innovators or IPR holders are limited in time and scope and are allowed only for certain definite period of time to enjoy some sort of monopoly power in the markets. On important view on this is that strong legal protection is the best, if not the only, means of stimulating innovation and economic growth. From an economic perspective, the primary purpose of IP laws, like other laws, is to produce a desired result that market forces or competition fail to produce. Specifically, IP laws are designed, in part, to protect future economic gain from IP products as an incentive for investing in research and development (R & D) today. Without such protections, it is assumed that innovation would decline because initial costs cannot be recovered in a free market environment.[36] Paul Romer also holds that innovation requires some degree of monopoly power which, of course, is consistent with current practices of protecting IPR.[37] Thomas Jefferson was also a proponent of the "monopoly" view. At the time of framing the U.S. Constitution, Jefferson viewed both copyrights and patents as dangerous government "monopolies" that should be strictly limited, if they were to be granted at all.[38]

The short-term costs of providing property rights to the creator of AI are justified by the long-term benefits of promoting economic growth. However, there exists some opposite views also. Thus, by definition, a legal monopoly accorded in respect of AI invention is only a grant of

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[36] NW3C, *Intellectual Property and White-Collar Crime: Report of Issues, Trends, and Problems for Future Research*, (2004) p.4

[37] Romer, Paul, *Are Non-convexities Important for Understanding Growth*? The American Economic Review (Papers and Proceedings) 80 (1990): 97-103

[38] Jefferson's view is evident in his 1789 recommendation to James Madison that the then-circulating draft of the Bill of Rights should include the following provision restricting the government's ability to grant the "monopolies" of copyright and patent:

Article 9. Monopolies may be allowed to persons for their own productions in literature, and their own inventions in the arts, for a term not exceeding …. years, but for no longer term, and no other purpose.

Letter to James Madison, august 28, 1789, in 7 The Writings of Thomas Jefferson,444,451 (Andrew A. Lipscomb. Ed., 1904

an exclusive right by the state for achieving certain short-term and long-term objectives. It usually intends to give protection to and control over patented AI in specified markets.

3.3 Whether AI inventions fit into Economic Monopoly

The debate whether AI inventions confer economic monopoly is still not well settled due to divergent opinions put forward on this issue. Harvard Professor Lloyd Weinreb confidently asserts that "the most that can be said confidently about copyright or patent is that it confers a monopoly."[39] Economists Michele Boldrin and David Levine asserted that modern rights in copyright and patent "create a socially inefficient monopoly, and what is commonly called intellectual property might be better called "intellectual monopoly."[40]

AI inventions are exclusive rights, and monopoly also denotes merely "exclusive possession or control of something" usually granted either by the state or work through certain market forces dominated by the private individuals or company. If we take this into account, then patents certainly qualify as monopolies.

As we know, a monopoly market has very low cross-elasticity of demand with other products as the firm is the sole producer of a single product having no close substitutes. There is the presence of full competition on the demand side on the part of buyers so that none is in a position to influence the price of the product by his individual actions. This implies that monopoly price is uncontrolled. There are no restrictions on the power of the monopolist who is free from any threat of entry of other firms into the market. As the monopolist aims at maximizing profits, two conditions are very essential from an economic point of view:

> (1). Marginal revenue must be equal to marginal cost (MR=MC); and

> (2). Marginal cost curve must cut the Marginal revenue curve from below.

Given these conditions, the price, output and profits under monopoly are determined by the forces of demand and supply. Whatever price the AI inventor or company fixes and whatever output decides to produce is determined by the conditions of demand. The demand curve faced by a monopolist is definite and is downward sloping to the right, which is also his sales curve or

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[39] Lloyd L. Weinreb, *Copyright for Functional Expression*,111 Har.L.Rev.1149,1205 (1998)

[40] Michele Boldrin and David Levine, *The Case Against Intellectual Property*, 92 American Economic Review (Papers and Proceedings) ,209 (2002)

average revenue curve. Its corresponding Marginal curve is also downward-sloping and lies below it. As a monopolist, the AI inventor will go on producing additional units of products as long as MR> MC. The profits will be maximum at the equilibrium level of output at which MR=MC. In fig.1.1 below, MR=MC at OQ level of output. The AI firm will be making maximum profits and will, there, be in equilibrium when it is producing and selling the OQ quantity of the product. If output increases beyond OQ, then MC will be more than MR. Therefore, the AI firm will incur losses. At output OQ, the price (= Average revenue) is OP and the total profits earned by the AI firm are equal to the shaded area PRST. From fig.1.1, it becomes clear that Marginal cost QE< Average revenue or price OP=QR. Thus, price under monopoly is higher than Marginal cost, i.e. Price> MC.[41]
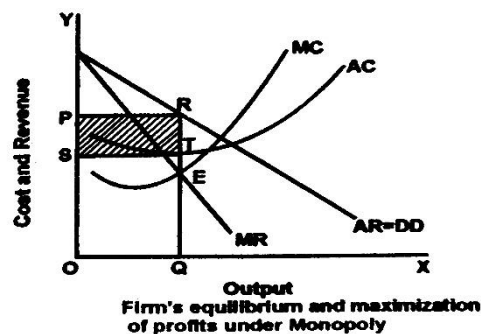

Fig. 1.1

It is to be noted that we have analyzed above the equilibrium under monopoly in general terms without introducing any time period. But in fact, in order to make it real and very near to the actual world, it would be just and proper to study equilibrium price and output-determination with respect to two important time periods: the Short-run and the Long-run.

The popular view is that the owner of an AI invention right possesses an economic monopoly, based on the presumptions that an intellectual property right is an exclusive right which enables the owner to exclude others from the use of the subject matter of the right and in that sense,

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[41] Hiren Ch. Nath, *Re-defining the IPR Market- An Economic Analysis*, NLUA journal of Intellectual Property Rights, Vol. 1, Issue 1, July 2022, 41-48.

an AI holder's right is protected from competition and able to sell into a market with a downward sloping demand curve. For example, patents, which confer the exclusive right to make, use or sell the invention covered by the claims of the patent, are the intellectual property right most plausibly characterized as a monopoly. But this is true only if the claims cover all of an economically relevant market, i.e. there is no alternative way for competitors to provide the same economic functionality to their customers without infringing the claims. Trademarks, which protect the exclusive right to commercial identity, are much more difficult to characterize as a monopoly, since the ability of a firm to identify itself would seem to be an essential prerequisite for competition, not a limit on competition. Moreover, exclusive Control over an AI innovation through patenting can allow the patent holder to dominate a niche market. For instance, if a company patents a unique AI algorithm for speech recognition, it can license or commercialize the technology in a way that secures a leadership position in the market, leading to higher profits.

4. Conclusion and Suggestions

Once perceived as science fiction has now turned into a reality, the rapid evolution of which has outpaced the regulatory framework. The omnipresence of AI is a testament to the immense potential of this technology and its ability to reshape the future of technology. Government initiatives of Start-up India and Stand-up India laid the foundation for India's knowledge-powered economy through innovation and entrepreneurship.

Taking into consideration that AI inventions cannot be put into any straitjacket legal provisions, the mandate becomes clearer that the legal and regulatory framework must keep pace with this fast evolution. It can be prophesied that soon the traditional definition of a "Legal Personality" will include "Artificial Intelligence" within its canopy. Legal history would witness a milestone in the evolving jurisprudence of Artificial Intelligence.

It is pertinent to mention that Companies holding AI patents would gain competitive advantages, both legal and economic, enabling them to dominate market sectors and potentially stifle competition from smaller firms that lack the resources to navigate the patent landscape. But, this advantage is not devoid of any competitive challenges. The most important one is the assumption of having rival competitors in the market.[42] Mark A. Lemley has rightly stated that "While some IP Rights may give their owner some power in an economically relevant product

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[42] Ibid.

market, most do not; they merely prevent others from competing to sell copies of a particular product, not from selling a different product that compete with the original".[43]That is to say, an individual/ firm developing an AI product may enjoy an economic monopoly as a legal right during the period of protection as prescribed by law. But, as we know that patent protection is subject to jurisdiction, identical/substituted products developed within/ outside the protected jurisdictions gives the consumers the opportunity to opt for the best-suited product for themselves in terms of price and quality. This gives rise to rival owners competing with each other. Such a scenario leads to a monopolistic competition in the market. Therefore, it can be summarized that even though the owner of a product enjoys an eco-legal monopoly for that particular product, they have to face monopolistic competition owing to the fast pace of research and innovation, even during and after the legal protection given as prescribed by law, if the number of firms/innovators are few operating in the market, to be consumed/used by the ultimate consumers/users.

The focus on patent protection can either drive innovation by offering incentives for research or, conversely, slow down the pace of technological advancements due to the fear of legal repercussions and high costs associated with navigating the patent system. This presents both significant opportunities as well as considerable challenges. Therefore, a holistic approach can bridge the gap, thereby encouraging inventions and ensuring the protection of IP rights. Some of these recommendations might shed light in this aspect:

1. AI education should be expanded.
2. Expansion of the Centre of Excellence to equip youth with industry-relevant expertise.
3. STEM Departments of Indian Universities can be strengthened by establishing Data and AI labs.
4. A robust National Strategy on AI can harness growth and address challenges across industries.
5. As legal and economic monopoly is guaranteed through patenting, formulating a universal patenting system, registration to which can provide an adage to AI patents globally.

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[43] William Mark A. Lemley, "The Economic of Improvement in Intellectual Property Law," 75 TEX. L. Rev. 989 (1997).

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