CROSS JURISDICTIONAL COMPARISON OF PATENTABILITY STANDARDS FOR AI AND BLOCKCHAIN: GLOBAL CHALLENGES AND LEGAL RESPONSES

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CHAPTER 1

INTRODUCTION

Artificial intelligence and blockchain have emerged as game-changing technologies in recent years. With the growing importance of AI-based inventions and blockchain, the issue of patentability of such inventions has become a topic of great interest and debate. AI is a digital technology that emphasizes intelligent data processing and digital decision-making, whereas blockchain focuses on decentralized secure record-keeping without relying on a single centralized party. The question here is whether these technologies can be patented. The answer is yes, they can, but it depends. The Delhi High Court ruling in Ferid Allani v. Union of India established that inventions demonstrating a 'technical effect' or 'technical contribution' are patentable even if they involve computer programs or software[1].

Another question lies in how different designations access the patentability of AI- and blockchain-based inventions. Both technologies pose challenges to establishing a patent system worldwide. Patentability standards vary significantly from jurisdiction to jurisdiction, with critical issues related to subject matter eligibility, innovative step novelty, non-obviousness, and enforceability, unlike traditional inventions. For example, the United States has adopted a relatively restrictive approach and often rejects software based on algorithmic inventions. In contrast, the European Union applies a technical effect test to determine eligibility, while Japan have issued more detailed guidelines in context of AI and blockchain patents. This research will explore and compare how different jurisdictions across the world treat the patentability criteria of artificial intelligence and blockchains. It will highlight the legal challenges and

[1] Ferid Allani v. Union of India, W.P. (C) No. 7 of 2014, Delhi High Court.

policy responses which have been done so far. this paper will contribute to ongoing discussion and debate about the need for better legal framework that can support innovation while balancing the ethical legal and economic concerns.

LITERATURE REVIEW

1. The Patentability of AI Invention[2]

This paper examines legal hurdles faced by AI inventions. The paper focuses on Saudi-specific challenges and legislative gaps. It identifies significant gaps in existing legal structure and proposes reform to better address inventiveness. The author highlights certain challenges like human-centric inventorship, which means only humans can be recognized as inventors. AIgenerated inventions challenge this assumption and raise questions about ownership and legal recognition. It also identifies that the concept of creativity and innovation embedded within patent law accounts for non-human contributions. The study also notes that some jurisdictions, like the UK, require explicit human inventorship, while others, for example, China, are experimenting with more flexible guidelines.

2. Foundational Patents in Artificial Intelligence[3]

This paper provide an analysis of how major technology companies are increasingly securing patents on a core building block of AI technologies it analysis patent filings in US, European Patent Office, and Japan Patent Office emphasising foundational AI- AI blockchain hybrid patents. The author cautious that broad patents can have anti competitive effects and discuss the policy framework needed to preserve innovation incentives while preventing monopolisation of basic method the author suggested striker patent eligibility criteria and enhanced disclosure obligation to prevent overboard claims that could lockdown foundational AI technique.

3. The Future of Intellectual Property: The Complementary Role of Artificial Intelligence and Blockchain[4]

[2] Reem Almarzoqi, Mohamad Albakjaji, "The Patentability of AI Invention*", International Journal of Service Science, Management, Engineering, and Technology*, Volume 13, Issue 1, 2022,
[3] Zingg, Raphael, "foundational patents in artificial intelligence"*, oxford Academic*, 2021
[4] Christos Makridis, Tim Bates, "The Future of Intellectual Property: The Complementary Role of Artificial Intelligence and Blockchain, vol. 104:293,*journal of the patent and trademark office society,*2025

In this paper the author argue that generative AI poses complex challenges to IP systems particularly regarding the protection, attribution and valuation of novel work.It evaluate blockchains as a tool to complement and perhaps transform existing IP infrastructure via mechanism like NFTs for digital right Assertion. The core strength of this paper is rather than pitting AI against IP frameworks the author suggested a model whereby AI escalates innovation and blockchain preserve integrity. It explores novel approaches for safeguarding AI created work that escapes current human centric patent law framework.

RESEARCH OBJECTIVES

The objective of research are as follows :

1. to examine the differences and patentability standard for aim blockchain inventions in jurisdictions such as US,EU, India, Japan etc.

2. Identify the global challenges in regards to patent law for emerging technologies, focusing on enforcement, inventorship, and eligibility.

3. To critically review recent legal and regulatory responses to the challenges posed by AI and blockchain patenting.

4. to study recent case laws and judicial precedents relating to the above subject.

5. to suggest possible frameworks or recommend policies direction for improved cross border patent protection and recognition of AI- blockchain hybrid technology

RESEARCH QUESTIONS

1. How do patentability standard for AI and blockchain inventions differ across different jurisdictions?

2. What are the legal challenges and responses emerging in the context of cross border intellectual property protection?

3. To what extent do current patent framework account for unique characteristics of AI and blockchain ?

4. How have courts and patent offices interpreted "technical effect"," inventive step" and "novelty" in relation to AI and blockchain invention?

HYPOTHESIS

If patent laws are clear, then AI and blockchain inventions will have better patent protection.

METHODOLOGY

Search adopt a comparative legal analysis of patentability standards for artificial intelligence and blockchain technology across key jurisdiction including United States, European Union, Japan and India. Involves examination of patent loss, Patent Office guidelines and case law to identify difference in commonalities.

CHAPTER 2: UNDERSTANDING AI AND BLOCKCHAIN

CONCEPT OF BLOCKCHAIN

blockchain in simple terms can be defined as a digital record of transactions. As the name implies, 'block' has the individual record of transactions and these are linked in a single list called 'chain'.[5] It is based on distributed digital Ledger that allows multiple participants to conduct transactions in a decentralized environment with a consensus mechanism to ensure security and trustworthiness. The term digital Ledger refers to a computer file that is used for recording and tracking of transaction which may not be always monitoring in nature but can be used interchangeably with modification of data in computer file.

The structure of a blockchain is a distributed, growing data structure consisting of a series of blocks, each containing multiple transactions or records. When building a blockchain, there is first an initial block, often referred to as the 'genesis block'. Each new block is then connected to the previous block in chronological order. Blockchain users participate in building the blockchain through a process called 'mining', which is the process of finding a solution that corresponds to a particular hash value. When a user finds a solution, they broadcast it across

[5] Roopika J," Blockchain Technology: History, Concepts, and Applications",vol.07 *International Research Journal of Engineering and Technology*, 2020

the network. Other users verify the solution to ensure it is valid. This process is repeated over and over again, and the entire blockchain is built.[6]

CONCEPT OF ARTIFICIAL INTELLIGENCE

Artificial intelligence essentially refers to the stimulus of human brains and machine. These can learn to solve problems, recognise patterns, and make decisions. Some AI power technologies include chatbox assistance, facial recognition, and self-driving cars. It is extensively used in industries such as healthcare, finance, and education to improve effectiveness and correctness. This system operates on data and process a huge amount of individual information to make improve decisions.earlier definition of artificial intelligence was focused on replicating intelligence on a machine level.

The first definition was given by John McCarthy from Stanford University, who coined the term in 1956. He defined AI as “the science and engineering of making intelligent machines[7]

Whereas Nilsson defined AI as "That activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment."[8]

Kaplan and Haenlein defined AI as “A system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation”.[9]

Patrick Mikalef and Manjul Gupta says “AI is the ability of a system to identify, interpret, make inferences, and learn from data to achieve predetermined organizational and societal.[10] Key concepts of AI include machine learning, neural networks, and deep learning.

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[6] Yiwen Wang,” The integration of blockchain technology and artificial intelligence: Innovation, challenges, and future prospects”, *School of Computer, Beijing Jiaotong University,* 2024

[7] Prof Dalvinder Singh Grewal, “A Critical Conceptual Analysis of Definitions of Artificial Intelligence as Applicable to Computer Engineering”,16 IOSR Journal of Computer Engineering 10 (2014)

[8] Stanford University,” Artificial Intelligence and Life in 2030: The One Hundred Year Study on Artificial Intelligence(AI100)”12(2016)

[9] Andreas Kaplan and Michael Haenlein,”Siri, Siri, in my hand: Who’s the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence”, 62 Business Horizons 15,2019

[10] Patrick Mikalef and Manjul Gupta,” Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organizational creativity and firm performance,58 Information and Management, 2021

- Machine learning is a subset of AI that enables systems to learn from data without explicit programming, and it includes supervised, unsupervised, and reinforcement learning.

- Neural networks are biologically inspired systems that can be trained to perform tasks, and deep learning involves neural networks with multiple layers.

- Natural language processing, which involves the interaction between computers and human language, and robotics, which involves the use of AI to create machines that can perform tasks autonomously or semi-autonomously.[11]

Patenting blockchain technology and artificial intelligence is necessary because it encourages innovation, protects investments, grant exclusivity, enable monitization, and promotes trust in emerging technologies. Both AI and blockchain are rapidly evolving field with wide applications in healthcare, finance supply chain and data security. Backgrounding patents for novel algorithms applications or improvements, inventors and companies can save guard their intellectual property gain competitive advantages and attract funding for research and development. Patent protection is seen as critical step in global innovation landscape.

PATENT LAW PRINCIPLES RELEVENT TO AI AND BLOCKCHAIN

general law principal relevant to artificial intelligence and blockchain based on main core principles which are novelty, inventive steps and industrial applicability. Yet both the technologies faces some unique challenges for traditional legal framework. Patent law historically centered on human creativity, struggle to accommodate the increasingly autonomous role of artificial intelligence generating inventions.

globally, jurisdictions require patentable inventions to be newcomer non obvious common and useful. However the issue of inventory ship complicates the matter when AI is involved. For instance several patent offices, including the US, European Union and UK have rejected the application naming AI systems as in winters insisting that inventor ship must be attributed to a natural person. This generates ongoing debate regarding how to handle inventor ship in cases where AI play a significant role and the human guidance. [12]

[11] Himanshi Bhatt, Kalpesh Sharma, Dr. Anamika Ahirwar," An Overview of Artificial Intelligence: Key Concepts and Real-World Applications",vol 2, *International Journal Of Innovative Research In Technology,*2024
[12] Dr. Rahul Kailas Bharati, "AI and intellectual property: Legal frameworks and future directions", 4(2)

Additionally determining the inventive step for AI generated inventions is complex due to its ability to process large number of data sets. Patent applications must also include sufficient disclosure, retelling how the AI contributed to the inventions and ensuring reproducibility. blockchain technology meanwhile, affects patent law both as subject of innovation and as infrastructure for managing IP. Patent involved blockchain must show concrete technical advances such as new consensus, method security protocol for efficient data structure beyond mere abstract use of distributed ledger.[13]

Both artificial intelligence and blockchain add push in legal system to reconsider the scope of patentable subject matter especially around abstract algorithms, common mathematical methods and business processes. while patent law traditionally excludes these, technical implementations that solve practical problems such as new neural network architecture for AI or improved smart contract mechanism for blockchain may be granted patent protection.

KEY CHALLENGES IN PATENTIBILITY OF AI AND BLOCKCHAIN

Challenges in patentability of AI

1. One of the biggest challenges to the patentability of AI generated innovation is the issue of inventory., it was said that an invention must be attributed to a human inventor,. however in the case of AI generated innovations it can be difficult to determine who is the inventor as the invention may be created entirely by AI.this raises question that who should be held Liable In Event Of Patent Infringement.

2. another challenge is the issue of originality. Invention must be novel and non obvious but in the case of AI generated innovations it can be difficult to determine whether the invention is truly novel or non obvious stop the air system may have been trained on existing data and can simply combined existing ideas in a new way.this raises question about the level of originality required for AI generated innovations to be considered patentable.

3. Creativity is also a challenge to the patentability of AI generated innovation.according to traditional hello an invention must be the result of human creativity. however in the case

International Journal of Law, Justice and Jurisprudence, 2024

[13] Anusha Unnikrishnan, "Analyzing The Impact Of Emerging Technologies On Intellectual Property Rights (Ipr): A Comprehensive Study On The Challenges And Opportunities In The Digital Age",10(1*) International Journal Of Law: "Law And World"66-79,* 2024

of AI generated innovations, it can be difficult to determine whether the invention is truly the result of human creativity The a system may have created the innovation entirely on its own without any input.[14]

4. AI inventions faces rejection as they are consider abstract ideas without sufficient technical innovation. To overcome abstractness patently must emphasise concrete AI modular architecture, training methods common data sources, and improvement in system performance rather than just eating a is used [15].

Challenges in patentability of Blockchain

1. Blockchain inventions are often considered abstract because they are decently software processes with no direct physical interaction, lending to acquisition on whether the server concrete technical purpose or not. Challenging to differentiate technical advancement from mere abstract concepts or standard block chain processes like cryptographic hashing and consensus algorithms.

2. Utility or the practical application of invention is another hurdle that blockchain technology face in the patent process. Blockchains decentralised nature often means it lacks a single, physical application which can make demonstrating utility difficult.

3. Another hurdle is prior art and novelty. The open source nature and vast prior publications in blockchain technology make it difficult to prove novelty and inventive step.

4. One of the major challenges jurisdictional variation. different patent offices around the world have varying standards for blockchain patentability, requiring tailored application for each region.

CHAPTER 3 PATENTABILITY STANDARDS UNDER INDIAN LAW

Indian patent actress shamed in 1970 and is officially known as the patents act. This act governs the patent system in India and lays down the rules, procedures, and responsibilities for granting

[14] "The challenges to patentability posed by artificial intelligence ". *Minesoft* 2024
[15] Interview with Roozbeh Gorgin, Counsel at Sterne, Kessler, Goldstein & Fox P.L.L.C., *Data Bird Business Journal,* 2025

patents, defining patentable inventions, and protecting the rights of patent holders.

There are certain features of patent act as follows:-

1. **Exclusive Rights**: A patent grants the inventor exclusive rights to make, use, and sell their invention for a limited period, typically 20 years from the filing date of the patent application.

2. **Legal Protection**: It provides legal protection against others from making, using, selling, or importing the patented invention without the inventor's permission.

3. **Territorial**: Patent rights are typically limited to the country or region where the patent is granted. Separate applications are needed for protection in different countries.

4. **Limited Duration**: Patents have a finite duration, after which the invention enters the public domain, allowing others to use and build upon it freely.

5. **Public Disclosure**: In exchange for the exclusive rights, inventors must disclose their invention to the public in a patent application, contributing to the collective knowledge base.

6. **Encouragement of Innovation**: Patents incentivize innovation by rewarding inventors with exclusive rights, providing a financial incentive to invest in research and development.

7. **Property Rights:** Patents are considered intellectual property rights, akin to physical property, and can be bought, sold, licensed, or transferred like any other form of property.

8. **Subject Matter**: Patents can cover a wide range of inventions, including products, processes, methods, and compositions of matter provided they meet the criteria of novelty, utility, and non-obviousness.

Section 3 (k) of Indian patent act 19 70 is one of the most significant and debated exclusion as a directly impact The patentability of software, algorithms run business methods in India.

Section 3(k) states that: *"A mathematical or business method or a computer programme per se*

or algorithms are not inventions within the meaning of this Act and are thus not patentable.[16]

Section 3(K) targets intellectual creation such as mathematical methods, business methods, computer program per se, algorithms. this means that this categories, in their abstract form are not patentable in India.The addition "per se" that only the computer programmes itself is not patentable but may be patentable, when combined with other things are having some technical effects For example improved computer system functionality, enhance data security of processing efficiency, and intangible improvement in technical field can we consider as technical effect and included in criteria of patentability.

Farid Allani vs Union of India, 2014

Farid Allani filled a patent application for method and device for accessing information sources and services on the web.the Indian Patent Office rejected this application under Section 3 (k), arguing it was a computer program per se and thus not patentable.the rejection was upheld by the intellectual property appellate board on the grounds that the invention did not disclose any technical effect or advancement Allani challenged this before Delhi High Court.The Delhi High Court ruled in December 2019 that Section 3 (K)bars only computer program per se and not all computer related inventions.The court emphasised that the legislative intent behind the term per se was to ensure inventions that provide a technical effect or technical contribution are not excluded from patent protection even if they rely on software. The technical effect could include benefits like improved speed, reduced hardware uses, more efficient database searching or an improved user interface. The court directed the Patent Office to re examine allani's application, considering evidence of technical effect and contribution after subsequent examination, a patent was ultimately granted to Farid Allani.[17]

This case re defined the boundaries for softwares and computer implemented inventions under section 3(k).

While filing a patent for AI inventions or blockchain, it is crucial to present it in a way that meet patentability requirements such as :

1. Demonstrating a technical contribution:

[16] The Indian Patent act, 1970 (amended in 2000), S.3(K)
[17] Farid Allani vs Union of India,2014

For a software or AI/ML or blockchain technology to be patentable, it must demonstrate a clear technical effect or technical contribution beyond just an algorithm. patent offices should assess that an invention must solve a real-world technical problem and exhibit practical application.

Microsoft's AI Patent (IN440185)

Microsoft filed a patent application for an AI-powered filtering user interface. The Indian Patent Office (IPO) initially rejected the application under Section 3(k), stating that it was merely routine programming with no inventive step. Microsoft appealed, arguing that the IPO had overlooked the technical contribution of their invention. The court ruled in Microsoft's favor, and after re-examination, the patent was granted in 2023. This case highlights the importance of clearly demonstrating the technical impact of AI inventions.[18]

2. Linking software or AI /ML or blockchain to industrial applicability :

for a software or blockchain technology or AI/ML to be patentable, they must have a clear and demonstrable application in specific field of technology or industry.

NiramAI: AI-Based Breast Cancer Screening (IN365539)

Traditional mammograms can be uncomfortable and involve radiation. NiramAI uses AI and thermography (heat-based imaging) to detect cancer early—without pain or radiation. A thermal camera scans the breast, and AI analyzes heat patterns to check for abnormalities. If there's an unusual temperature difference, it could signal early-stage cancer, prompting further medical evaluation. This invention proves how AI can drive medical innovation and improve healthcare outcomes.[19]

3. Avoiding algorithm claims :

Technological inventions must go beyond just mathematical models or data processing to be patentable. If an invention is purely an algorithm without any real world technical application, it is likely to be rejected under Section 3 (K) of Indian patent act.

[18] Linda raj," Decoding Section 3(k) of the Indian Patent Act: Challenges and the Road Ahead for Software and AI Patents",*dex patent blog* 2025
[19] Supra 17

In case of *BlackBerry vs. IP India* BlackBerry's patent application for "Administration of Wireless Systems" was rejected under Section 3(k) for being a software-based invention without inventive hardware features. Despite arguing that it provided a technical solution, the court ruled that the invention was merely an algorithmic process without additional technical enhancement, making it unpatentable.[20]

4. Emphasizing novelty and inventive step

Technological invention must meet novelty and inventive step requirement to be patentable. Mayur automation of an existing process is not enough. the invention approach must enhance accuracy, efficiency, or cost effectiveness over prior art.

In the case of *Google LLC vs. The Controller of Patents*, Google filed Indian Patent Application for managing instant messaging sessions across multiple devices. The Indian Patent Office (IPO) rejected the application in 2019, citing a lack of inventive step under Section 2(1)(ja) and arguing that the invention was obvious in view of prior art. Google appealed to the Delhi High Court, which analyzed the claims and found that the invention provided a technical advancement over existing solutions. On April 2, 2024, the court ruled in Google's favor, setting aside the IPO's decision and directing the grant of the patent. This case highlights the importance of demonstrating technical advancements in software-based patent applications.[21]

CRI GUIDELINE 2025 (VERSION 2.0)

The controller general of patents, design, and trademarks Released the draft guidelines for examination of computer related inventions on June 29, 2025, following an initial draft published on March 25, 2025[22]. these guidelines represent a significant revolution from 2017 CRI guidelines, aiming to modernize India's patent examination process in response to rapidly advancing technology in the information and communication technology and artificial intelligence sector.

The 2025 guidelines introduced legally grounded definition beyond the dictionary

[20] Supra17
[21] Google LLC vs. The Controller of Patents [C.A. (COMM.IPD-PAT) 395/2022
[22] Office of controller General of Patents, Designs and Trademarks, Guidelines for Examination of Computer related inventions, version 2.0 (IP,India, 2025)

interpretation that characterize the 2017 guideline. Key definitions include:

1. **Algorithm**: the guidelines adopt the definition from Madras High Court in *Microsoft technology licensing LLC vs assistant controller of patents and designs*[23], stating that an algorithm may be defined as a set of rules or instruction for solving a problem typically through a sequence of steps or operations. Therefore, an algorithm would also be an intellectual exercise and intellectual property protection would be limited to copyright protection, subject to originality for the form of expression. This clarification helps distinguish between patentable implementations and unpatentable abstract algorithm [24]

2. **Per se** : the term is defined as "of, in or by itself ', standing alone, without reference to additional facts; this phrase denote that something is being considered alone, and not other collected things. this definition reinforces that computer programs themselves remains excluded from patentability while innovations incorporating computer programs that demonstrate technical effect may be eligible.

3. **Secure system** : a new term introduced from the information technology Act 2000, defined as computer hardware, software, and procedure that are reasonably secure from unauthorised access and misuse and provide a reasonable level of reliability and correct operations also are reasonably suited to perform intended functions and adhere to journalist accepted security procedure.[25]

The guideline provide redefined interpretations for each excluded category under Section 3 (k):

1. **mathematical methods**: the guideline clarify that the exclusion is intended to cover mere expression of intellectual exercise such as methods of calculation or formulation of equation. The mere presence of mathematical formula in a claim does not automatically render it mathematical claim.

2. **business methods**: the guideline emphasise that the exclusion for business method is absolute without analysing technical effect, implementation, or technical contribution. This

[23] Microsoft technology licensing LLC vs assistant controller of patents and designs, 2023 SCC online Del 11867
[24] Supra 22 pg 5
[25] Supra 22 pg 22-36

establishes a stricter standard for business method invention compared to other excluded categories.

3. **computer program per se**: the guideline says that if a subject matter implemented on a general-purpose computer result in a technical effect that improves functionality and effectiveness, it cannot be rejected as a computer program per se.

The guideline incorporate the technical effect and technical contribution test as fundamental to determine patentability of CRIs. it requires that inventions demonstrate attachable technological advancement that contribute to solving technical problem. it provides a nonexhaustive list of potential technical effect including :

1. higher speed or improved processing efficiency
2. reduced hard disk or memory access time
3. better control of robotic arm or physical device
4. improved perception or transmission of radio or electromagnetic or communication signals
5. real time monitoring and control of device leading to technical solution
6. security enhancement in computer network or system
7. image processing or signal processing to solve technical problem [26]

The guideline introduced a structured 7 step approach to novelty assessment. which is as following:

1. understanding the claim
2. identifying relevant prior art
3. analysing prior art
4. determining explicit and implicit disclosure

[26] Supra 22 pg 22-28

5. assessing material differences

6. verifying novelty

7. documenting analysis [27][28]

The guideline maintain the existing 5 step test for inventive step assessment :

1. identifying the person skilled in the art

2. determining the relevant common general knowledge of that person at priority date

3. Identifying the inventive concept of claim

4. identifying differences between the prior art and inventive concept

5. determining whether those differences would have been obvious to the person skilled in art 28

However, the guidelines emphasises that technical advance must not arise solely from excluded subject matter stating that while determining inventive step it is important to look at the invention as a whole full stock it must be ensured that inventive step must be a feature which is not an excluded subject itself.

For CRI inventions particularly those involving AI, ML, or blockchain, the guideline reinforces the disclosure requirements under sec 10 (4) of the patent act.the guideline emphasise is that vague reference to techniques such as object oriented design or black box modernization without specific implementation instruction constitute insufficient disclosure. The specification must enable up persons killed in the art to work the invention without undue experimentation, providing both the what (complete description of invention)and the how (best method of performance).[29]

There are specific provision for emerging technologies like artificial intelligence, machine learning inventions, blockchain and quantum computation.

[27] Supra 22 pg 15-16
[28] Supra 22 pg 18
[29] Supra 22 pg 19-20

the guideline recognise artificial intelligence and machine learning unique characteristics and examination challenges. The guideline acknowledge that artificial intelligence inventions often involve complex algorithm and data processing method that must be evaluated for technical contribution beyond mere mathematical Computation.

For AI related inventions disclosure must be specific and detailed enough to enable reproduction of the invention by a person skilled in the art, ensuring that artificial intelligence model functionality and algorithmic implementation are fully understood and replicable.

For blockchain inventions the guidelines likely focus on distinguishing between technical implementation of distributed Ledger technology and mere business method application. Quantum computation inventions present unique challenges related to their theoretical foundation and practical implementation, requiring examiners to carefully evaluate whether claim represent tangible technical advancement or abstract mathematical concept.[30]

The guidelines represent a balanced attempt to modernize India's patent examination system while respecting the strategy exclusion under Section 3 (k). by providing greater clarity, the guideline aim to foster consistency in examination practice while maintaining flexibility for emerging technologies.

CHAPTER 4

CROSS JURISDICTIONAL COMPARISON OF PATENTABILITY STANDARDS

In the era of technological advancement artificial intelligence and blockchain technology are challenging traditional patent system. Patent offices worldwide are struggling with weather and how to treat algorithmic models and distributed Ledger designs under existing rule for subject matter eligibility, novelty, inventive step and sufficiency of disclosure. Recent year these technologies are pushing international organisations and national official to issue guidance.

Before examining the national practice the forecast important agreement to mention is TRIP'S Agreement which forms important role based international document for protection of intellectual property. Before the TRIPs the status of computer program protection was not

[30] Supra 22 pg 46

defined under Paris convention,which.Despite TRIPs agreement,the most important question was of whether or not computer programs can be patented.

Article 27 of the agreement talks about patentable subject matter, it states that "*patents shall be available for any inventions, whether product or processes in all fields of technology, provided they are new,involve a inventive step and capable of industrial application*."

The second and third paragraphs of the article allow member states to exclude from patentability some categories such as medical treatment, or inventions 5 dangerous to health or environment, it makes no mention of computer programs. Thus the agreement leaves the issue open for the contracting parties to settle. This approach creates scope for different approaches to be adopted by various countries.[31]

UNITED STATES

Section 101 of USPTO guidelines talks about Inventions patentable, its states "*Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title"*[32]

The invention to get patent must slim and fallen to these categories which are mentioned in section 101and also it must qualify the patent eligibility subject matter the test the clean must not be directed toward judicial exception unless the claim as whole includes additional limitations amounting to significantly more than the exceptions. The judicial exceptions are subject Matter that the court have found to be outside of, or exceptions to, the force strategy categories of invention which are mentioned in section 101 and are limited to abstract ideas, law of nature and natural phenomena.

The Supreme Court in *Mayo v. Prometheus* laid out a framework for determining whether an applicant is seeking to patent a judicial exception itself, or a patent-eligible application of the judicial exception. The first part of the Mayo test is to determine whether the claims are directed to an abstract idea, a law of nature or a natural phenomenon (i.e., a judicial exception). If the claims are directed to a judicial exception, the second part of the Mayo test is to determine

[31] Rajnish Kumar Singh, "Patenting Computer Related Inventions: India in Comparison with US and UK", *DELSU Law Review*,2018
[32] United States Patent and Trademark office guideline, s101

whether the claim recites additional elements that amount to significantly more than the judicial exception. The Alice/Mayo two-part test is the only test that should be used to evaluate the eligibility of claims under examination. While the machine-or-transformation test is an important clue to eligibility, it should not be used as a separate test for eligibility, but instead should be considered as part of the "significantly more" determination in the Alice/Mayo test.

In *Alice Corp.,* the Supreme Court identified the claimed systems and methods as describing the concept of intermediated settlement, and then compared this concept to the risk hedging concept identified as an abstract idea. Because this comparison revealed "no meaningful distinction between the concept of risk hedging in Bilski and the concept of intermediated settlement at issue here", the Court concluded 14 that the concept of intermediated settlement was an abstract idea. Although the Supreme Court has not delimited the precise contours of the abstract idea exception, it is clear from the body of judicial precedent that software and business methods are not excluded categories of subject matter.[33]

Therefore abstract idea natural laws in mathematical algorithms as such are not patentable these test are you used to assess whether a claim is "significantly more "than an abstract idea.

It was for the mentioned that human inventor ship is mandatory following key rules such as *thaler vs vidal*[34]Therefore AI and blockchain alone cannot be listed as inventor there must be human contribution to that invention The takeaway from these cases are:

1. computer related inventions are evaluated using the same standard as others, the guidance distinguish between claims that merely recite abstract idea like mathematical algorithms and those that integrate such ideas into practical applications that improve technology.

2. human invention remains essential. well AI and Blockchain cannot be listed as invention; inventions created with software assistants can be patented when humans make significant contribution to their conceptions.

[33] Rajnish Kumar Singh, "Patenting Computer Related Inventions: India in Comparison with US and UK", *DELSU Law Review*, pg. 24,2018
[34] Thaler vs vidal, 2022

EUROPEAN UNION

European Union Patent Office has provided specific guidelines for assessing innovations. It focuses on technical effects and contribution, articles 52 -57 of the European Patent Convention collectively define what is considered patentable subject matter at the European Patent Office. article 52 (1) states European patents office shall be *granted for any invention,in all fields of technology*. Article 52 (2) states that *mathematical methods, schemes rules and methods for performing mental act and computer programs etc. are not regarded as invention* [35].Article 54 states that *an invention must be novel*[36] article 56 states that *an invention must be non-obvious for the skilled person over the prior art and must involve an inventive step*.[37] Article 57 states that *inventions are susceptible to industrial application.*[38] Basically European Patent Office uses a dual threshold approach for a computer implemented inventions, including artificial intelligence and blockchain. According to this approach, the invention must solve a technical problem with a technical solution, and if a technical effect is established, the invention must then meet the standard requirement of novelty and inventive step, not just automate a human activity or perform a business method.

JAPAN

Artificial intelligence related inventions are generally treated as sub type of software related inventions and examined under the examination guideline for computer software related inventions. patent application must meet eligibility that is novelty inventive step disclosure requirement.

AI data alone is not patentable unless it is implemented using hardware or specific technical feature merely systematizing task performed by humans with AI there's not satisfied inventive step and patentable claims involving blockchain or artificial intelligence innovations are assessed based on technical contributions such as improvement in data processing, security and network protocol.

Japanese intellectual property High Court in 2025, January 30 rule that artificial intelligence generated inventions cannot be presented because Japanese patent law only recognises natural

[35] European patent office guideline, art.52
[36] Supra35, art.54
[37] Supra35, art.56
[38] Supra35, art. 57

person[39]. As inventor this decision is aligned with international trends in jurisdictions like USA,EU and UK the ruling clarifies act patent act grants patent right only if a natural person is credited as inventor they have excluding as system alone from inventorship.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Artificial intelligence and blockchain are fastest growing technologies in today's world. Field of artificial intelligence and patent law is rapidly evolving in India, USA, European Union and Japan. Each country has its own set of patentability criteria for computer related inventions and the examination process for such patent application also varies from jurisdictions to jurisdictions. The rules and laws that work for traditional inventions does not always fit well for new digital advancements leading to confusion and uncertainty. Many countries still required a real person to be named as the artificial intelligence inventor which is quite picky when the artificial intelligence itself help create a new invention. For blockchain, it can be hard to prove that an Invention half non obviousness and newness because many blockchain ideas are shared openly or it's seems like an abstract concept.

Recently there have been many efforts in several countries to update their patent law and guidelines and provide clearer guidelines on how to evaluate and check weather a new invention fulfill all the patentability criteria or standards which are mentioned. courts also have been playing a significant role by explaining what qualifies as a real technical improvement rather have tracked idea. But despite these efforts, many challenges remain open, especially in different countries, to agree on common rules.

to solve these problem it is important that countries work together to develop a clearer and more effective guidelines and rules which are more consistent patent law for artificial intelligence and blockchain.These laws should reflect how these technologies actually work and allow new ideas to be protected fairly.inventor should be able to clearly describe how their invention functions, solve practical problems, and provide Full disclosure about their invention.

[39] Hajime Matsumura, Fumio Takahashi, “IP High Court Case regarding Patent Inventorship: Patent Inventor must be human”, *Shiga International Patent Office*, 2025

RECOMMENDATIONS

Following are the recommendations :

1. International patent bodies and national offices should collaborate to develop a unified standard clarifying and defining the patent eligibility standards that are novelty, inventive step, and technical effect in context of artificial intelligence and blockchain innovation. Harmonized criteria and a proper definition will reduce uncertainty and confusion and facilitate international patent protection.

2. Patent offices should engage in continuous conversation, and share best practices and possibly established mutual recognition or Fastrack system for artificial intelligence and blockchain patents to streamline cross border examination and reduce duplication of efforts.

3. This is the impact of foundational patents in artificial intelligence on competition policy, proposing framework to balance innovation incentives with prevention of monopolistic practice.

4. Investigate alternative inventorship models that accommodate AI's autonomous contributions without undermining legal certainty and human accountability.

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