



المعهد القومي للملكية الفكرية

The National Institute of Intellectual Property
Helwan University, Egypt

المجلة العلمية للملكية الفكرية وإدارة الابتكار

دورية نصف سنوية محكمة يصدرها

المعهد القومي للملكية الفكرية

جامعة حلوان

العدد الخامس

ديسمبر ٢٠٢٢

الهدف من المجلة:

تهدف المجلة العلمية للملكية الفكرية وإدارة الابتكار إلى نشر البحوث والدراسات النظرية والتطبيقية في مجال الملكية الفكرية بشقيها الصناعي والأدبي والفني وعلاقتها بإدارة الابتكار والتنمية المستدامة من كافة النواحي القانونية والاقتصادية والإدارية والعلمية والأدبية والفنية.

ضوابط عامة:

- تعبر كافة الدراسات والبحوث والمقالات عن رأى مؤلفيها ويأتي ترتيبها بالمجلة وفقاً لإعتبارات فنية لا علاقة لها بالقيمة العلمية لأى منها.
- تنشر المقالات غير المحكمة (أوراق العمل) فى زاوية خاصة في المجلة.
- تنشر المجلة مراجعات وعروض الكتب الجديدة والدوريات.
- تنشر المجلة التقارير والبحوث والدراسات الملقاه في مؤتمرات ومنتديات علمية والنشاطات الأكاديمية في مجال تخصصها دونما تحكيم في أعداد خاصة من المجلة.
- يمكن الاقتباس من بعض مواد المجلة بشرط الاشارة إلى المصدر.
- تنشر المجلة الأوراق البحثية للطلاب المسجلين لدرجتى الماجستير والدكتوراه.
- تصدر المجلة محكمة ودورية نصف سنوية.

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- تقبل البحوث باللغات (العربية والانجليزية والفرنسية).
- تنشر المجلة ملخصات الرسائل العلمية الجديدة، وتعامل معاملة أوراق العمل.
- يجب أن يلتزم الباحث بعدم إرسال بحثه إلى جهة أخرى حتى يأتيه رد المجلة.
- يجب أن يلتزم الباحث باتباع الأسس العلمية السليمة في بحثه.
- يجب أن يرسل الباحث بحثه إلى المجلة من ثلاثة نسخ مطبوعة، وملخص باللغة العربية أو الانجليزية أو الفرنسية، فى حدود ٨ - ١٢ سطر، ويجب أن تكون الرسوم البيانية والإيضاحية مطبوعة وواضحة، بالإضافة إلى نسخة إلكترونية Soft Copy، ونوع الخط Romanes Times New ١٤ للعربى، و١٢ للانجليزي على B5 (ورق نصف ثمانيات) على البريد الإلكتروني: ymgad@niip.edi.eg
- ترسل البحوث إلى محكمين متخصصين وتحكم بسرية تامة.
- في حالة قبول البحث للنشر، يلتزم الباحث بتعديله ليتناسب مع مقترحات المحكمين، وأسلوب النشر بالمجلة.

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Digitalization of Patent Prosecution, using
Blockchain & AI
Sarah Sayed Ahmed Mohamed Elshamy

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Abstract

Throughout the history of patent law, the way an invention is represented has influenced the process of the patent office in its prosecution. This article traces how changes in the representation of an invention—from material to text to digital—transformed into patent prosecution. Early inventions were represented by working models, an incarnated invention that needed little or no examination by the patent office, as the inventions themselves were. Substantive examination became necessary when the depiction of the invention shifted from material to text, the point in history at which the invention became harmonized and represented by the patent specification, the written document that includes the invention. Aside from bringing crucial changes in patent prosecution, coordinated invention has centralized patent office operations. With the adoption of new technologies such as blockchain and artificial intelligence (AI), the way invention is represented will undergo another change that will lead to the further development of patent pursuit. Like digital photography that changed the representation of images by radically changing the background process, digital invention will change the back-process of the patent office, i.e. patent prosecution. The most important methodological consequence of invention digitization will be the decentralization of the patent system.

Digitalization of Patent Prosecution, using Blockchain & AI

Intellectual property is becoming one of the most valuable asset classes on the planet, with the *pace of innovation* being the ultimate competitive advantage across global technology sectors. Patents are one of the least understood and least effectively deployed asset classes. Intangible assets — which according to US research firms now represent more than 84 percent of the S&P 500's market value — are notoriously difficult to manage, value and transact. Leading think tanks estimate that in the US alone more than USD 1 trillion in IP assets are going to waste because they are mismanaged and underutilized.

The patent prosecution — the art and science of claiming and verifying patents — has evolved over the years with the advancement in technology. The manner of representation of the invention before the patent office has influenced the standards of patent prosecution. The changes in the representation of the invention before the patent office can be mapped to three periods in which the invention came to be materialised, textualised and digitalised. The earliest accounts of patent history show that the material representation of the invention presented to the patent office in the form of miniature working models formed the subject matter of patent prosecution, as models were seen as more authentic embodiments of the invention than written description and drawings¹. It is possible to say, from the viewpoint of patent prosecution,

¹ Kendall J Dood, 'Patent Models and the Patent Law: 1790-1880 (Part I)' (1983) 65 *J Pat Off Soc'y* 187, 210.

that the invention became materialised during this period. The development of the patent specification into a full-fledged written representation of the invention happened over a period of time, which shifted the focus of patent prosecution to how the invention was expressed in words and figures, i.e., the textual representation of the invention¹. The invention became textualised during this period. The advancements in digital technology now allow for a digital representation of the invention, which is achieved by new technologies such as blockchain and artificial intelligence (AI). The invention will become digitalised in this period. The manner in which the advancements in technology influenced the representation of the invention impacts how patents are prosecuted. The standards of novelty, inventive step, fair basis², enabling disclosure, written description and other requirements changed when the representation of the invention shifted³. The chapter covers the impact of new technologies such as blockchain and AI on the representation of the invention before the patent office and its consequential effect on the decentralisation of the functions of the patent office.

¹ Brad Sherman and Lionel Bently, *The Making of Modern Intellectual Property Law: The British Experience, 1760-1911* (1999) 192.

² The doctrine of fair basis requires that for a patent to be valid the claims have to be fairly based on the matter disclosed in the specification. The lack of fair basis can be a ground for invalidating the patent. David J Brennan, 'Does a Requirement that the Description Fully Supports a Product Claim Raise Australia from Mechanistic and Impoverished Patent Rules' (2012) 38 *Monash U L Rev* 78.

³ Feroz Ali, *The Access Regime: Patent Law Reforms for Affordable Medicines* (2016) 29–36.

Transformation of patent Office

Through the ages, the transformation of the patent office can be explained through the metaphor of what it became. Early inventors had to submit working models to the patent office. In the 19th century, the ability to make miniature working models that could be presented as verifiable proofs of invention led to the patent office becoming a “museum” of the prior art. Later, the textualization of the invention, the patent specification, and the manner in which it could be recorded, stored and accessed made the patent office a “library” of records. With the digitalization of patent office records and the prospect of empowering them with AI, the patent office of the future could become a “machine”.

The historical evolution of the patent office from a museum to a library and then to an AI machine has profound implications on the manner in which patents are searched and drafted.

Digitalization of Patent

The digitalization of the invention refers to the process of converting the patent specification into a digital form. The digitalized invention, or more precisely, the digital representation of the invention before the patent office, when stored as a transparent, trustworthy, and secure record by means of technology like the blockchain would make it easier for establishing disclosure, priority, and ownership of inventions.

The digitalized invention will not be a mere digital version of the textualized invention, i.e., an algorithmic version of the printed document.

Patent systems that recognize and attribute priority based on blockchain disclosure would make disclosures public, immutable, and trustworthy, thereby reducing the need to make the first disclosure to the patent office to preserve priority.

A patent system that would recognize a blockchain disclosure of an invention would shift the focus of disclosure made to the patent office to disclosure made to the world at large. The digitalized invention would facilitate simultaneous filing in different jurisdictions and will not require the 18-month secrecy period for publication. We have seen the patent system move away from the first-to-invent system to the first-to file system, a move necessitated by the changes in technology that facilitates record keeping and efficient filing. The digitalized invention would take the patent system to the next phase of patent filing: a first-to-disclose system and

the first disclosure need not be a disclosure made to the patent office¹. The digitalized invention would also make the digital representation of the invention amenable to analysis by AI systems. When the digitalized invention can be subject to AI system, machine analysis of the invention description would be possible. Machine prosecution — AI-enabled prosecution of the digital representation of the invention — would change the manner in which the traditional tests of patent law are applied: the analysis of novelty, inventive step, fair basis, antecedent basis, succinctness, enabling disclosure etc. would change. Some of the changes to the traditional tests will occur be due to the change in the concept of the person skilled in the art². When AI-enabled systems are accessible to the person skilled in the art, the manner in which we understand the standards of novelty, inventive step and enablement are bound to change. Some of the tests, such as the inventive step test, will become a two-fold analysis: the machine inventive step analysis followed by, where necessary, the human inventive step analysis. Such a bifurcation of the analysis will be necessitated by the tasks that can be efficiently and completely performed by machines and those that would require a further human intervention.

The digitalized invention would facilitate simultaneous filing in different jurisdictions and will not require an 18-month secrecy period for publication. We have seen the patent system move away from the first-to-

¹ Jurisdictions such as United States, Japan and India that recognise grace period do not require the first disclosures to be made to the patent office. Chiara Franzoni and Giuseppe Scellato, 'The Grace Period in International Patent Law and Its Effect on the Timing of Disclosure' (2010) 39 **Research Policy** 200.

² Ryan Abbott, 'Everything is Obvious' (2019) 66 **UCLA L Rev** 2.

invent system to the first-to-file system, a move necessitated by the changes in technology that facilitates record-keeping and efficient filing.

The digitalized invention would take the patent system to the next phase of patent filing: a first-to-disclose system and the first disclosure need not be a disclosure made to the patent office.

The digitized invention would also make the digital representation of the invention amenable to analysis by AI systems. When the digitized invention can be subject to an AI system, machine analysis of the invention description would be possible. Machine prosecution — AI-enabled prosecution of the digital representation of the invention — would change the manner in which the traditional tests of patent law are applied: the analysis of novelty, inventive step, fair basis, antecedent basis, succinctness, enabling disclosure, etc. would change. Some of the changes to the traditional tests will occur due to the change in the concept of the person skilled in the art. When AI-enabled systems are accessible to the person skilled in the art, the manner in which we understand the standards of novelty, inventive step, and enablement are bound to change.

The tasks that can be efficiently and completely performed by machines and those that would require further human intervention will necessitate such a bifurcation of the analysis.

A decentralized patent office of the future will specialize in the functions that have to be done solely by humans, once the machine analysis is done, thereby

making patent prosecution quicker, efficient, and less susceptible to errors.

The Way to Represent the Invention

The digitized invention is a digital representation of the invention with the use of new technologies. While it is hard to predict the future acceptance of the new technologies, any technology that can have an impact on the following three aspects can impact digitized invention.

For the present, emerging technologies will influence the digitalized invention in three aspects:

- (1) The manner in which it is created,
- (2) The manner in which the invention is presented in the digital medium
- (3) The manner in which the representation of the invention is verified.

Universal, User-centric, Authenticated Disclosure of patent

This system allows the user to create the first version of the representation of the invention and to present the first version of the invention to the world, at his or her discretion. For the world to verify and check the authenticity of the invention without the need for a third-party verifier, the technology used should be tamper-proof, should enable verification, and should be capable of creating an unalterable timestamp.

More importantly, the source on which the first disclosure is made should be dynamic enough to form the ground for every other action, be it prosecution actions, licensing, revocation, etc.

So that every transaction relating to a patent can be found in one place. By implementing this technological change, the entire public information on priority documents, prosecution history, amendments, licensing, and termination, can be kept in one source.

Blockchain & AI

The digitalised invention will result from the convergence of technologies. Blockchain and AI show promise for becoming the foundational technologies on which the digitalised invention will be built. Blockchain technology shares the traits that would allow for a universal, user-centric, and user-authenticated disclosure. A blockchain is defined as a time-stamped series of immutable records of data that is managed by a cluster of computers not owned by any single entity¹. Since each of these blocks of data (i.e. block) is secured and bound to each other using cryptographic principles (i.e. chain), it is embedded with an uncharacteristic trait not found in digital records, i.e., the trait of immutability. The fundamental characteristics of blockchain are decentralisation, pseudonymity/anonymity, immutability and automation can fundamentally change the way in which patent office

¹ 'What is Blockchain Technology? A Step-by-Step Guide For Beginners' (Blockgeeks, 18 September 2016) 89 The European Union Blockchain Observatory and Forum, 'Legal and Regulatory Framework of Blockchains and Smart Contracts' (2019) 5.

operates.⁸⁹ Blockchain allows digital information to be distributed but not copied¹. The use of blockchain goes beyond cryptocurrency, the use for which it was initially meant for.

Since blockchain network is distributed, there is no need for a centralized authority. Patents specifications disclosed on blockchain will reduce the function of the patent office, we will see a more decentralised patent system where disclosure and patentability analysis are done at the user's end. Transparency will be enhanced since the shared and immutable ledger is open for verification by anyone. Blockchain does not have any transaction cost, though there is a cost for setting up the system, the infrastructure cost. Information shared on a blockchain network exists as a shared and continually updated database, allowing amendments and changes to be done with detailed record of every transaction. Every patent will come along with its prosecution history. Blockchain uses cryptographic hash function to maintain immutability of its records. Hashing is the process of taking an input string of any length and giving out an output of a fixed length. This allows any amount of information to be stored as an input string, whereas the output string will be of the same size, i.e., fixed 256-bits length². Blockchain is also characterized by the "avalanche effect", the property of a small change in the input string leading to a substantial change in the output string. Blockchain contains the data and a hash pointer.

¹ 'What is Blockchain Technology? A Step-by-Step Guide For Beginners' (Blockgeeks, 18 September 2016) 89 The European Union Blockchain Observatory and Forum, 'Legal and Regulatory Framework of Blockchains and Smart Contracts' (2019) 5.

² Bitcoin uses the hashing algorithm SHA-256.

The hash pointer instead of just containing the address of the previous block, it also contains the hash of the data inside the previous block.¹ For the representation of an invention that is as dynamic as the one described above, the manner in which the invention is drafted and prosecuted will have to change. A technology that helps the user to create an immutable disclosure, that allows the user to check whether the disclosure is unique and complies with the principles of patent law (novelty, inventive step and utility), that allows the user to check and fine-tune her invention, before she discloses it to the world, will require employing blockchain at the systemic level. While blockchain would form the basic substrate for the representation of the invention, AI will make machine prosecution a reality. As a branch of computer science, AI is concerned with the automation of intelligent behavior². AI refers to the ability of digital computers and computer systems to perform tasks commonly associated with intelligent beings such as the ability to reason, discover meaning, generalize, or learn from past experience³. AI systems are prediction machines that make decisions based on data.⁴ The bigger the data set, better the predictions. Problem-solving is a defining trait of AI, which can be characterized as a systematic search through a range of

¹ 'What is Blockchain Technology? A Step-by-Step Guide For Beginners' (Blockgeeks, 18 September 2016) 89 The European Union Blockchain Observatory and Forum, 'Legal and Regulatory Framework of Blockchains and Smart Contracts' (2019) 5.

² George F Luger, *Artificial Intelligence: Structures and Strategies for Complex Problem Solving* (6th ed, Pearson Addison-Wesley 2009) 1.

³ 'Artificial Intelligence | Definition, Examples, and Applications' (Encyclopedia Britannica, no date)

⁴ Ajay Agrawal and others, *Prediction Machines: The Simple Economics of Artificial Intelligence* (Harvard Business Review Press 2018).

possible actions in order to reach some predefined goal or solution. For problem-solving, one of the general-purpose techniques that AI uses is the means-end analysis—a step-by-step, or incremental, reduction of the difference between the current state and the final goal. In prosecuting patents, the means-end analysis will be critical in applying the tests of novelty and inventive step.

Impact of BlockChain & AI

The impact of new technology on patent prosecution can be studied in the manner in which two leading technologies of our times, namely blockchain and AI affect the development of prosecution. The new technologies will affect patent prosecution in two significant ways. First, it will enable machine prosecution, i.e. prosecution of patents using AI and machine learning without human intervention. Second, the wide use of these technologies and the limited role played by humans will result in the decentralization of the functions of the patent office.

Both machine prosecution and decentralization of the patent office functions will have a bearing on how the traditional concepts of novelty, inventive step, disclosure, and enablement are understood.

The patent system, which uses blockchain and AI, will be a decentralized, user-centric system. Just as blockchain is expected to fundamentally change the banking system by eliminating the banks as the intermediaries who handle money, a similar change can be expected in the patent office with the advent of machine-assisted prosecution of patents. However, unlike banks,

patent offices are not just repositories of intellectual property; they are also the arbiters and assessors of inventions. Though we can expect the final discretionary functions of granting and rejecting patents to be done by humans, the structure of the patent system would be a decentralized one. As publicly accessible distributed ledgers, blockchain can make record-keeping more efficient and AI and machine learning can constantly evolve and improve with the systemic needs. *The digitalized invention will revolutionize the patent system by eliminating its human frailties: time-delays, fraud, and judgmental errors, all of which have plagued the existing patent system.*

Thus, the patent system which uses blockchain and AI will be a decentralized, user-centric system. Just as blockchain is expected to fundamentally change the banking system by eliminating the banks as the middlemen who handle money, a similar change can be expected in the patent office with the advent of machine assisted prosecution of patents. But unlike banks, patent offices are not just repositories of intellectual property, they are also the arbiters and assessors of inventions. Though we can expect the final discretionary functions of granting and rejecting patents to be done by humans, the structure of the patent system would be a decentralized one. As publicly accessible distributed ledgers, blockchain can make record keeping more efficient and AI and machine learning can constantly evolve and improve with the systemic needs. The digitalized invention will revolutionise the patent system by eliminating its human frailties: time-delays,

fraud and judgmental errors, all of which have plagued the existing patent system.