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The Impact of Tagging on Patents in the Digital Age: Opportunities and Challenges

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Abstract:

In recent decades, the world has been undergoing profound and radical transformations in the digital age, affecting fields of innovation, including the patent system, which is a fundamental tool for protecting creativity and an effective driver of the knowledge economy. In this context, the concept of "tagging" technology has emerged as a modern digital tool used to organize, document, and protect digital information. However, integrating tagging into the patent system presents a set of promising opportunities and challenges, such as enhancing transparency, improving the efficiency of scientific research, tag accuracy, protecting rights, and the potential for information manipulation. Accordingly, this research paper aims to shed light on the impact of tagging in the field of patents in the digital age, by analyzing its advantages and highlighting the problems it raises.

Keywords: Tags, Patents, Digital Age, Intellectual Property, Legal Protection, Opportunities and Challenges.

Introduction:

The regulation of patents is undergoing remarkable progress and a qualitative shift in light of the changes brought about by the digital transformation. Legal protection means are no

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longer confined to traditional tools but have expanded to include modern means, among them "tagging." This concept has emerged as a modern technology used to organize digital information. Tagging is understood as indicating that a particular product is protected by a patent, whether by placing the patent number or by referring to an electronic source containing its details. The influence and governance of these technologies have extended to the field of patents, as one of the most important tools for protecting intellectual property in the digital age. Especially with the emergence of virtual tagging, a patent is no longer merely a legal document; it has become part of a complex digital system in which technology, economy, and law intersect. Hence the importance of studying the impact of tagging on patents arises, in terms of the opportunities it offers and the challenges it imposes. As a culmination of what has been presented in this research paper entitled "The Impact of Tagging on Patents in the Digital Age: Opportunities and Challenges," we may raise the following problem:

To what extent does digital tagging contribute to enhancing patent protection in the digital age, without restricting innovation and creating new legal challenges?

To address this research paper, we adopted the descriptive approach to present the reality of using tagging in the digital environment. We also relied on the analytical approach to study digital tagging and its impact on patents. Additionally, we derived from the comparative approach for analytical comparison of legal and regulatory frameworks between different countries in a few instances.

Overall, answering this problem requires dividing the study in this research paper into two axes:

First Axis: The Theoretical and Legal Framework of Digital Tagging and its Relationship to Patents.

Second Axis: The Contributions of Digital Tagging to Patent Protection (Opportunities and Challenges).

First Axis: The Theoretical and Legal Framework of Digital Tagging and its Relationship to Patents

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In this axis, we will attempt to address the appropriate definition of digital tagging (First), as well as highlight its types (Second), while clarifying and enumerating its technical and legal characteristics (Third). We also need to illustrate the provisions governing patent regulation in the digital environment.

First: Definition of Digital Tagging

In order to access the meaning of digital tagging more accurately and clearly, it is necessary first to define it from three perspectives: doctrinal, judicial, and legal.

1. **Doctrinal Definition:**

Any digital mark or signal inserted into electronic content—text, image, or program—aimed at distinguishing it, identifying its source, proving ownership, or tracking its use, employing hidden or visible digital techniques. The doctrinal aspect focuses on the function of the technology, such as distinction, protection, the intangible nature of the tag, and its role in protecting intellectual property rights, especially in the digital environment[1].

2. **Judicial Definition:**

It is a technical means of an electronic nature used to distinguish, track, or document digital content or a legal act, enabling judicial authorities to prove identity, ownership, or data source, in order to enhance the probative value of digital evidence in court. This judicial definition can be summarized as follows:

- A tool of proof
- A means of documentation
- A tracking mechanism

[1] Wahbah Al-Zuhayli, Islamic Jurisprudence and its Evidences, (no edition), Dar Al-Fikr, Damascus, Syria, (Vol.6), (no year), p.42.10.

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- Legal authenticity[2]

3. **Legal Definition:**

From a legal perspective, digital tagging is defined as a set of structured electronic data or codes incorporated within a digital work, either visibly or invisibly, to enable identification of its owner or creator, to specify the terms of its use, or to track its circulation, with the attendant legal effects pertaining to the protection of ownership and legal liability[3].

Second: Types of Digital Tagging

Digital tagging has become one of the most prominent technical mechanisms used in the modern digital environment, relied upon for customizing, protecting, and organizing digital content. Accordingly, it is necessary to present a typology of its forms, which vary according to the factors bearing upon them.

1. **Visible Digital Tagging:**

This refers to a tag that appears prominently on digital content, such as logos or text added to images and videos. It is always used to protect intellectual property rights and to prevent unauthorized use and exploitation of content, and it also serves as a means and method of deterrence against digital piracy.[4]

2. **Invisible Digital Tagging:**

This is a tag embedded within digital content in a manner that is hidden and not apparent to

[2] Abdul Karim Zaidan, The Judicial System in Islamic Sharia, (2nd ed.), Al-Basha'ir Library, Amman, Jordan, (no year, no publisher), p.215.
[3] Mohamed Hassan Qassem, Digital Law and Protection of Intellectual Property, New University House, Alexandria, Egypt, 2019, p.45.
[4] Mohamed Hassanien Mansour, International Law of Intellectual Property, New University House, Alexandria, Egypt, 2019, p.112.

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the ordinary user. It relies on data embedding or encryption techniques inside files such as images or audio. This type is used for content tracking and proof of intellectual property[5].

3. **Fragile Digital Tagging:**

This type of tagging is characterized by extreme specificity and sensitivity to any modification of the content. It disappears or changes upon the occurrence of any amendment or alteration, making it an effective and efficient tool for detecting fraud and manipulation[6].

4. **Semi-Fragile Digital Tagging:**

This type represents a conciliatory, middle ground between fragile and robust tagging. It permits certain simple modifications, such as data compression, without being affected, but it reveals fundamental alterations. It often relies on applications requiring a balance between flexibility and protection[7].

5. **Robust Digital Tagging:**

In contrast to fragile tagging, this type is characterized by its ability to resist modifications that may occur to the content. Any alteration or simple change leads to the damage and invalidation of the tag. It is primarily used for verifying data integrity and detecting manipulation in forensic contexts[8].

Third: Technical and Legal Characteristics of Digital Tagging

Digital tagging is distinguished by a set of characteristics. It possesses technical features that make it an effective tool for securing, protecting, and managing digital works, extending to legal

[5] Abd El Razzaq El Sahoury, Al Wasit in Explaining the New Civil Code, (Vol.1), (1st ed.), Dar Al Nahda Al Arabiya, Egypt, 2005, p.78.
[6] Cox, Ingemarj, Etel, Digital Watermarking and Steganography, 2nd ed., Morgan Kaufmann, 2008, p.45.
[7] Khaled Ibrahim, Protection of Digital Evidence between Law and Technology, (no edition), Dar Al Thaqafa wal Nashr, Amman, Jordan, 2022, p.77.
[8] Sami Youssef, Intellectual Property and Modern Technology, (no edition), New University House, Alexandria, Egypt, 2021, p.133.

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characteristics that reinforce its fundamental role in safeguarding and protecting rights. This is what we will address through the following exposition:

1. **Technical Characteristics:**

Digital tagging is marked by a set of features and characteristics that enable it to be an effective tool for securing and protecting digital works and proving intellectual property. These include the property of invisibility, which ensures the tag is embedded within the content without affecting its apparent quality; in addition to robustness, which enables the tag to withstand various types of modification operations such as file compression, allowing the extraction of the tag and proof of the owner's identity; as well as security, linked to the adoption of encryption algorithms that prevent fraud, manipulation, or unlawful removal; alongside capacity, which is determined by the amount of information that can be embedded within the content without affecting it[9].

2. **Legal Characteristics:**

Digital tagging is uniquely endowed with a set of legal characteristics that grant it a distinct and significant value in the field of rights. It serves as a technical tool and means for proving intellectual property and attributing a work to its owner in an invisible or visible manner, thereby strengthening and justifying the legal presumption of attribution in favor of the author. It is also characterized by the property of continuity and permanence, as it remains inherent and attached to the work even after its circulation or modification within certain limits, which supports its protection against infringements such as counterfeiting or piracy[10]. Furthermore, it possesses relative probative value before the judiciary, provided its technical and legal conditions are fulfilled, making it a modern electronic means of proof integrated with traditional rules of evidence. It also aligns with the technical protection measures mandated by modern legislation

[9] Sami Youssef, op. cit., p.145.
[10] World Intellectual Property Organization (WIPO), Guide to the Protection of Digital Works, 2021, p.27.

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and intellectual property agreements, reinforcing the preventive and deterrent aspect of protecting digital rights[11].

Fourth: Provisions Governing Patent Regulation in the Digital Environment

The digital revolution has produced profound transformations across various fields, particularly in the domain of intellectual property in general, and patents in particular. Innovation has become necessarily dependent on digital technologies, software, and artificial intelligence. Consequently, it has become imperative to reconsider the provisions governing patent regulation to align with and adapt to the specificities of the digital environment, which is characterized by speed, intangibility, and the ease of information circulation. Accordingly, this subject raises multiple legal problems, which we shall address in further detail:

1. Definition of a Patent in the Digital Environment

A patent certificate is a legal document granted to an inventor, conferring an exclusive right to exploit their invention for a limited period. In the digital environment, this concept extends to include innovations related to software, algorithms, and information systems. However, this extension raises debate regarding the extent to which such innovations can be considered inventions in the traditional sense, given that many legislations exclude computer programs as such from patent protection—unless they are intrinsically linked to a technical application[12]. It is worth noting that research and studies on inventions often mention "creations" simultaneously. Is there a distinction between the two terms or not? One doctrinal view holds that "invention" and "creation" share the same meaning from a linguistic perspective, the origin tracing back to the Latin expression meaning "found," and "creation" signifies anything new.

[11] Abdelkader Ben Dammash, "Legal Protection of Digital Works", Journal of Law, University of Rabat, Morocco, (Issue 3), 2010, p.45.
[12] Zaidi Amal, "The Impact of Digitization on the Legal System of Patents", Tabna Journal of Academic Scientific Studies, University Center of Barika, Batna, Algeria, No. (Issue 3), 2021, p.15 et seq..

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From an economic standpoint, however, they differ, as efforts distinguish between creative inventions, in the sense of genius, and those that do not possess this quality[13].

2. Conditions for Patentability in the Digital Environment

Digital patents are subject to the same traditional conditions for grant, namely: novelty, inventive step, and industrial applicability. However, the field of applying these conditions in the digital realm raises particular difficulties, especially with respect to proving novelty in light of the ease and fluidity of information and its circulation via the Internet[14].

3. Scope of Application of the Legal Provisions Regulating Digital Patents

Patent protection relies on a set of international conventions and national legislations, the most important of which are:

- The Paris Convention for the Protection of Industrial Property
- The TRIPS Agreement
- National laws relating to intellectual property
  These legal systems have endeavoured to accommodate digital innovations by interpreting the patentability conditions (novelty, inventive step, industrial applicability)[15].

4. Patent Filing Procedures in the Digital Environment

The digital environment has introduced fundamental changes to patent registration procedures, most notably:

[13] Farha Zarawi Saleh, The Complete in Algerian Commercial Law (Intellectual Rights), (no edition), Ibn Khaldun for Publishing and Distribution, Oran, Algeria, 2016, from p.12.
[14] Mohamed Hussein Mansour, op. cit., p.89.
[15] Sami Youssef, op. cit., p.112.

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- The adoption of electronic filing for patent applications.
- The acceleration of examination and publication procedures.
- The use of digitized databases for prior art searches[16].

5. Legal Obstacles to Patent Regulation in the Digital Environment

a. The Problem of the Protectability of Digital Inventions:

The issue of the protectability of software and algorithms by patent is among the most prominent legal problems. Legislation conflicts as to whether they are considered inventions or mere abstract ideas. Furthermore, artificial intelligence raises new issues concerning the determination of the status of the inventor, especially if the innovation is generated by an intelligent system without human mental intervention[17].

b. Difficulties of Protection in the Digital Environment:

Digital patents face significant impediments in the field of protection, most notably:

- The ease of rights infringement via the Internet.
- The difficulty of proving infringement.
    - The multiplicity of jurisdictions due to the global nature of the digital space, coupled with the ineffectiveness of traditional protection mechanisms in the areas of proof and tracking[18].

[16] Eman Ibrahim Ali, "The Impact of Artificial Intelligence on Patent Provisions in Sharia and Law", Journal of Sharia and Law, (Vol.44), November 2024, p.36.
[17] ohamed Hassanien, op. cit., p.145..
[18] Ahmed Abou El Wafa, Intellectual Property in the Digital Environment, (no edition), Dar Al Nahda Al Arabiya, Egypt, 2021, p.66.

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Second Axis: The Contributions of Digital Tagging to Patent Protection (Opportunities and Challenges)

Digital tagging constitutes a modern technical mechanism for enhancing the security of patents by enabling the tracking of use and proof of ownership in the digital environment. Its most significant contributions appear in limiting infringement and accelerating the detection of violations, in line with the evolution of innovation and its dissemination across digital platforms. This will be clarified and illustrated in the element of opportunities (First). However, this technology, in turn, raises legal and technical challenges, particularly with regard to its probative value, the possibility of its circumvention, and the balance between protection and the freedom of circulation and knowledge. This is what we will address analytically in the element of challenges (Second).

First: Opportunities Provided by Digital Tagging

In this element, we commence by identifying and clarifying the opportunities provided by digital tagging, which we will address through the following exposition:

1. **Enhancing Intellectual Property Protection:**

Digital tagging is one of the most prominent modern technological tools that has proven its merit in strengthening, safeguarding, and securing intellectual property rights in the digital environment. It enables the embedding of hidden information within digital works for the purpose of proving ownership and also allows for the detection of unauthorized use, serving as both a legal and a deterrent means simultaneously. It contributes to reducing piracy and infringement by enabling rights holders to effectively prove their ownership before the judiciary. Moreover, it enhances the confidence of creators in disseminating their works across the digital

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space[19]. It is also worth noting that digital tagging provides advanced mechanisms for tracking and monitoring the circulation of works, allowing for the early and preliminary detection of any violation and the taking of appropriate proactive legal measures[20]. This system also seeks integration with other technologies such as Digital Rights Management (DRM), leading to the creation of an integrated and harmonious system for the protection and safeguarding of innovations and works in the intellectual field, in light of the increasing challenges and difficulties imposed by the digital revolution[21].

2. **Facilitating the Proof of Infringements:**

The intent of this heading is to highlight the significant role played by digital tagging in strengthening the protection of intellectual property rights by facilitating the process of proving the occurrence of assaults or infringements upon digital works. In the digital environment, it has become easy to copy and circulate content without license or permission, which raises the issue of proving ownership and priority. Here, digital tagging emerges as an effective technical and legal tool simultaneously. The importance of digital tagging lies in its being a strong technical piece of evidence that can be relied upon before judicial authorities, as it assists in:

- Proving the attribution of the work to its true owner.
- Determining the date of publication or circulation.
- Detecting any modification or distortion that has occurred to the work.
- Tracing the path of unauthorized copying[22].

3. **Supporting Innovation and Encouraging Investment:**

[19] Sami Youssef, op. cit., p.112.
[20] Mohamed Hassanien Mansour, op. cit., p.87.
[21] World Intellectual Property Organization (WIPO), op. cit., 2020, p. 45.
[22] Reza, M., et al., "Digital Image Copyright Protection Using Watermarking," arXiv, 2012, p. 35.

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Tagging is one of the modern technological tools that effectively contribute to supporting innovation and encouraging investment in the field of patent protection in the digital environment. This is what we will analyze as follows:

a. **Supporting Innovation:**

Digital tagging provides a technical framework that strengthens the confidence of inventors in protecting their intellectual products. It allows the inclusion of invisible information within the digital content related to the invention, ensuring the possibility of tracking it and proving its attribution in the event of a dispute. This technical protection reduces theft or imitation, and develops and encourages investment in the creative intellectual field[23].

b. **Encouraging Investment:**

It is an effective factor for protecting patents. Digital tagging serves to attract investors by providing a legal and technical climate and environment that guarantees them protection, as tagging contributes to reducing the risks associated with piracy or unlawful exploitation[24].

4. **The Role of Blockchain Technology in Enhancing Digital Tagging:**

Blockchain plays a pivotal role in enhancing the effectiveness of digital tagging by providing a secure and transparent environment for recording. This system documents digital tagging in an immutable manner, which strengthens and enhances its credibility as legal evidence for proving ownership and flagrant infringements, especially in the field of patents. It also contributes to the process of tracing the use of works over time and limits piracy. Furthermore, it facilitates smart digital licensing through smart contracts. Blockchain

[23] Digital Watermarking and Steganography, Ingemar Cox et al., Digital Watermarking and Steganography, Morgan Kaufmann, 2008, p.45.
[24] Eman Ibrahim, op. cit., p.54.

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enhances the trust and security of the transacting parties by offering a decentralized distributed ledger that is difficult to manipulate and defraud[25].

Second: Challenges Associated with Digital Tagging

It is worth noting at this juncture that digital tagging is one of the most prominent modern technologies that has contributed to the protection of digital content and the enhancement of proof of intellectual property in the digital environment. Despite the significant advantages it offers, it nonetheless faces difficulties and challenges, which we confine to the following:

1. Technical Challenges

Digital tagging faces a set of technical difficulties and challenges that restrict and limit its value and effectiveness in protecting patents. Foremost among these is the susceptibility of certain tagging techniques to removal and distortion as a result of digital attacks or compression and conversion processes, thereby affecting the proof of ownership. The issue of balancing the robustness of the tag with its non-impact on the quality of the content also arises. Furthermore, there is the difficulty of harmonizing technical standards between different systems, which impedes interoperability. The challenges and difficulties related to data capacity are also classified as such, alongside the risks of hacking and the use of artificial intelligence techniques

[25] WIPO, Blockchain and Intellectual Property, WIPO Publication, 2022, p.41.

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to remove and forge digital tags. This decisively imposes the necessity of developing algorithms as a defense against attacks[26].

2. Legal Challenges

Digital tagging raises a set of minute and precise legal difficulties, most notably:

- The ambiguity of the legislative framework regulating it in many systems, creating difficulty in determining its legal characterization and nature.
- The problem of its probative value before the judiciary and the possibility of challenging it.
- Challenges relating to the protection of personal data when the tag embeds traceable information.
- The complexities of jurisdiction in the cross-border digital environment.
- The difficulty of proving infringement or accurately attributing it in the event of manipulation, circumvention, or removal of the tag.
- The problem concerning the balance between intellectual property rights and ensuring the circulation of information, which necessitates the updating of legal rules and their adaptation to rapid technological developments[27].

3. Economic and Ethical Challenges

Digital tagging constitutes an advanced tool for strengthening and enhancing the protection of intellectual rights and content tracking. Conversely, it poses several economic and ethical difficulties that require precise and balanced treatment. Therefore, we must clarify this as follows.

a. **The Economic Aspect:**

[26] Cox, I.J., Miller, M.L., Bloom, J.A., Fridrich, J., & Kalker, T. (2007). Digital Watermarking and Steganography, Morgan Kaufmann, p.53.
[27] See: Mohamed Hassanien Mansour, op. cit., p.178, and Sami Youssef, op. cit., p.215.

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The use of digital tagging technologies faces high burdens related to technological infrastructure, software development, and human resource training. This may constitute a cost burden on small and large institutions alike and lead to a clear disparity in the ability to benefit from these technologies among economic actors[28]. There is also the problem of technological monopoly by large corporations that own major technologies, which may affect free competition[29].

b. **The Ethical Aspect:**

From this perspective, difficulties and problems emerge relating to the protection of privacy, as digital tagging may be used to track user behavior without their knowledge or explicit consent, thereby infringing upon their fundamental rights[30].

Conclusion:

The conclusion comprises a set of findings reached by this research paper, and the proposals it deems appropriate, given that digital tagging has become profoundly impactful on patents as a fertile field of study, entailing promising opportunities for enhanced protection against challenges that call for precise legal regulation balancing innovation with the guarantee of rights. They are as follows:

First: Findings

- Digital tagging is an effective tool for strengthening and enhancing patent protection, as it contributes significantly and accurately to proving intellectual property and identifying the source of innovation, thereby supporting the position of the patent holder in the event of a dispute.

[28] Ahmed Abdullah, Protection of Intellectual Property in the Digital Environment, (no edition), Dar Al Nahda Al Arabiya, Cairo, Egypt, 2021, p.112.
[29] Mohamed Hassanien Mansour, op. cit., p.87.
[30] Sami Youssef, op. cit., p.156.

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- Digital tagging offers the capability of tracing in monitoring the use of inventions and infringements in a rapid and more effective manner compared to traditional means, which strengthens the mechanisms for enforcing rights.
- It contributes to innovation and encourages investment, as it grants innovators greater confidence in securing their intellectual production in the digital environment.
- Despite these opportunities, digital tagging faces technical difficulties, such as its circumvention or removal, which necessitates the development of more secure and hack-resistant systems.
- There are also manifest legal difficulties, especially in light of the absence and gaps in the organized and harmonized legislation governing the use of digital tagging.
- We also find economic and ethical challenges, including the high costs and burdens of implementing tagging technologies, misuse, or the impact on privacy.

Second: Proposals

- Updating national intellectual property laws to include digital tagging technologies and recognize them as a legal tool of proof.
- Harmonizing international standards related to digital tagging to facilitate the securing and protection of patents across borders.
- Enacting explicit legal provisions criminalizing the manipulation or removal of digital tags from protected innovations.
- Developing digital tagging technologies to become more secure and resistant to hacking and counterfeiting.
- Integrating digital tagging with modern technologies such as blockchain to strengthen traceability and transparency.
- Establishing secure digital databases that permanently link patents with their digital tags.
- Enhancing cooperation between patent offices and technology companies to adopt digital tagging solutions.
- Training judges and experts on the use of digital tagging as a means of proof, while establishing specialized bodies to monitor the use of digital tagging among researchers and innovators.

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- Including the topic of digital tagging within legal and technical academic curricula in the field.

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