



Legal Responsibility for Patent Infringement in the Contemporary Technological Environment

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Abstract:

The study examines legal liability for patent infringement in the modern technological environment, particularly in the context of digital technologies, artificial intelligence, and advanced manufacturing. Using analytical, comparative, and descriptive approaches, it explores the challenges of proving infringement, identifying responsible parties, and applying existing legal frameworks to digital and cross-border violations.

The study concludes that traditional civil and criminal liability rules are insufficient to address the complexities of modern technological infringements. It therefore recommends updating legal frameworks, adopting more flexible legal mechanisms, and strengthening international cooperation to ensure effective patent protection in the digital age.

Keywords: Patents, Responsibility Liability, Infringement, Technological Environment, Intellectual Property, Artificial Intelligence.

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Introduction :

Technological innovation has become one of the main drivers of economic and scientific development, making the protection of intellectual property, particularly patents, a legal necessity for safeguarding innovations and promoting scientific research. However, the rapid advancement of technology, accompanied by the proliferation of digital technologies, artificial intelligence, three-dimensional printing, and cross-border digital platforms, has given rise to new forms of patent infringement and generated legal challenges concerning the proof of infringement, the identification of the liable party, the applicable law, and the competent jurisdiction. In light of these developments, there is a growing need to examine the extent to which traditional legal rules can accommodate the specific nature of technologically driven infringements and whether existing liability mechanisms and legal sanctions provide effective protection for patent holders.

This study aims to identify the nature of patent infringements in the modern technological environment, analyze the adequacy of traditional civil and criminal liability rules in addressing such infringements, and assess the effectiveness of legal sanctions in ensuring protection and deterrence. It also seeks to highlight the emerging legal issues relating to the proof of infringement, damage, causation, and the determination of liability, with a view to identifying legal mechanisms capable of strengthening patent protection in the context of technological development.

The central research problem is therefore formulated as follows: To what extent are traditional legal liability rules capable of addressing patent infringements in light of the challenges posed by the modern technological environment?

To address this research problem, the study adopts descriptive, analytical, and comparative methodologies by examining and analyzing forms of patent infringement in the modern technological environment and the legal rules governing liability for such infringements. The study also draws upon relevant international conventions, as well as selected comparative legislation and legal practices, in order to assess the adequacy of the existing legal protection in addressing emerging forms of technology-related patent infringement.

The first section examines the manifestations of patent infringement in the modern technological environment, addressing traditional forms of infringement in their digital manifestations, as well as indirect forms of infringement arising from the use of emerging technologies such as digitization, artificial intelligence, and smart manufacturing.

The second section addresses the issue of legal liability arising from such infringements by examining the scope of application of traditional liability rules and assessing their effectiveness in addressing emerging forms of technology-related patent infringement.

THE FIRST TOPIC : Manifestations of Patent Infringement in the Modern Technological Environment



The digital transformation has created a new legal environment in which patents face increasingly complex forms of infringement. Such infringements are no longer limited to traditional physical acts but have extended to the digital sphere through practices such as electronic counterfeiting, piracy, and unauthorized reproduction. The ease of copying and distribution, the absence of geographical boundaries, and the difficulty of identifying infringers have created significant legal challenges and exposed the limitations of traditional protection mechanisms. Accordingly, this section examines traditional patent infringements in their digital forms and emerging infringements resulting from modern technological developments.



FIRST REQUIREMENT: Traditional Patent Infringements in Their Digital Forms

Despite the development of the technological environment, traditional infringements of patents¹ have not disappeared; rather, they have been reproduced in a digital form, thereby increasing their seriousness and expanding their scope. Such infringements primarily consist of the unauthorized exploitation of a patented invention without the consent or authorization of the patent holder. However, the digital medium has given rise to new manifestations of such infringements.

Firstly: Unauthorized Reproduction of Inventions through Digital Media

The unauthorized reproduction or imitation of inventions is considered one of the most prominent forms of traditional patent infringement. However, this conduct is now increasingly carried out through digital means, such as obtaining technical drawings or industrial designs via the Internet and reproducing or manufacturing them without authorization. Electronic databases² have also facilitated access to protected technical information, thereby increasing the risk of its unlawful exploitation.

1- Unauthorized Commercial Exploitation through Digital Platforms

Certain entities offer patented products or technologies through e-commerce websites³ without obtaining the legal authorization of the rights holder. Such conduct constitutes a clear infringement of the exclusive rights conferred by the patent. The seriousness of this infringement is further aggravated by the cross-border nature of the Internet, which makes legal enforcement and prosecution more difficult.

2- Dissemination of Protected Technical Information through Electronic Networks

Patent rights may also be infringed through the dissemination of details or technical secrets relating to an invention on websites, online forums, or social media platforms. Such

¹ Ordinance No. 03-07 of 19 July 2003 on Patents, Official Gazette, 23 July 2003, No. 54, p. 16.

² Law No. 18-07 of 10 June 2018 on the Protection of Natural Persons in the Processing of Personal Data, Official Gazette, 10 June 2018, No. 34.

³ Law No. 18-05 of 10 May 2018 on Electronic Commerce, Official Gazette, 16 May 2018, No. 28.



dissemination makes protected information publicly accessible, thereby diminishing the economic value of the patent and undermining the patent holder's exclusive right of exploitation.

3- Imitation of Software Associated with Patented Inventions

In certain cases, a patented invention may incorporate software or digital systems. The unauthorized imitation, reproduction, or distribution of such software may therefore constitute an infringement of the patent rights associated with the invention, resulting in overlapping forms of intellectual property infringement.

4-Unauthorized Importation or Exportation of Counterfeit Products through E-Commerce

The digital environment has facilitated the conclusion of cross-border commercial transactions, contributing to the proliferation of the importation and exportation of products that infringe patent rights without adequate oversight. This constitutes a significant challenge for enforcement and intellectual property protection authorities.

Secondly: Infringement of Technical Information Associated with a Patent

The infringement of technical information associated with a patent constitutes one of the most serious forms of interference with an inventor's rights in the modern technological environment. Infringement is no longer limited to the physical exploitation of the invention but has extended to its underlying intellectual and informational substance, particularly the technical data on which the invention is based. Such information includes engineering plans, technical drawings, operating methods, algorithms, and various forms of data that enable the invention to be understood or reproduced.

The seriousness of this form of infringement is further heightened in the digital environment, where information can be easily stored, transferred, and disseminated, making it vulnerable to unlawful exploitation on a wide scale and through means that are often difficult to trace.

1- Forms of Infringement of Technical Information

Infringement of technical information associated with a patent may take several forms, the most significant of which include:

A- Unauthorized Access to Information Systems: This occurs through the unlawful intrusion into databases belonging to institutions or scientific research centers with the purpose of obtaining confidential technical information, whether before or after the patent is registered⁴.

b- Leakage of Technical Information: Such leakage may occur internally through employees, contractors, or collaborators, or externally through cyberattacks targeting the theft of data.

⁴ Ahmed Mohamed Mahrous Abdel Aal, Electronic Forgery between Traditional Legislation and Modern Mechanisms of Confrontation, Journal of the Academy for Scientific Research and Publication, 2025, p. 233.



c- Unauthorized Electronic Dissemination: This involves publishing technical documents, or parts thereof, through websites or social media platforms, thereby making them publicly accessible without the authorization of the rights holder⁵.

d- Unlawful Digital Trading: This includes the sale or exchange of technical information through digital platforms or illicit networks, thereby turning technical knowledge into an object of unlawful exploitation.

e- Digital Reverse Engineering: This involves analyzing software or digital models associated with an invention in order to extract the technical information embedded therein and reuse it without authorization.

2- Effects of Infringement of Technical Information

Infringement of technical information associated with a patent may result in several adverse consequences, including:

a- Impairment of the Exclusive Right: The disclosure of technical information enables third parties to exploit the invention without authorization.

b- Diminution of the Economic Value of the Invention: This results from enabling competitors to benefit from research outcomes without bearing the costs associated with their development.

c-Harm to the Competitive Position: Particularly in innovation-driven sectors, where the disclosure of technical information may result in the loss of technological advantage⁶.

d- Proliferation of Imitation and Counterfeiting: The availability of technical information makes the reproduction and imitation of the invention considerably easier.

e- Increased Difficulty in Proving Infringement: This is attributable to the digital nature of the information and the ease with which it can be copied, transferred, and disseminated.

It is therefore evident that infringement of technical information associated with a patent constitutes a direct interference with the substance of the protected right, as it may effectively deprive the patent of its practical value by enabling third parties to access and exploit the underlying technical knowledge. Accordingly, the protection of such information constitutes a fundamental element in ensuring the effectiveness of the patent system, particularly in the digital environment, where the risks of infringement are significantly amplified.

⁵ Khadija Boudali, The Legal Framework of Electronic Arbitration Agreements in International Commercial Contracts: A Comparative Study, Kuwait International Law School Journal, No. 3, 2021

⁶ Ahmed Ben Youssef, "Unfair Competition Action in the Protection of Industrial Property, Journal of Legal Studies, 2019, p. 153.



SECOND REQUIREMENT: Indirect Patent Infringements Arising from the Use of Modern Technologies (Digitization, Artificial Intelligence, and Smart Manufacturing)

Modern technologies, particularly digitization, artificial intelligence, and smart manufacturing, have given rise to new forms of patent infringement characterized by their indirect nature. Such infringement does not necessarily take the form of direct imitation or explicit exploitation of the patented invention; rather, it may occur through the use of advanced technological means that ultimately interfere with the exclusive rights of the patent holder.

Firstly: Infringements Associated with Digitization and the Digital Environment

Digitization has brought about a profound transformation in the ways in which technical information is produced, stored, and disseminated, thereby contributing to the emergence of new forms of indirect patent infringement. Digital technologies have made it possible to store, analyze, and transmit vast amounts of technical data, facilitating access to information relating to inventions and its unauthorized exploitation. The most prominent forms of such infringements include:

1- Exploitation of Digital Databases: Technical data available through digital platforms may be used to extract detailed information concerning a particular invention, thereby enabling its unauthorized reproduction or development.

2- Digital Simulation of Patented Inventions: Modern software enables the simulation of patented products or industrial processes, allowing third parties to understand their operating mechanisms without requiring physical access to them⁷.

3- Big Data Analytics: Large volumes of technical data may be analyzed to identify patterns or obtain precise information concerning inventions, potentially facilitating the circumvention of legal protection.

4- Availability of Information through Open Platforms: Open digital platforms may be exploited to access detailed technical information, particularly where such information has been published without adequate safeguards or effective oversight.

The significance of these practices lies in the fact that they do not necessarily constitute direct infringement in the traditional sense; rather, they operate as indirect means that may ultimately produce the same effect, namely, interference with the exclusive rights of the patent holder.

Secondly: Infringements Arising from Artificial Intelligence and Smart Manufacturing

Advancements in artificial intelligence and the emergence of smart manufacturing technologies have given rise to increasingly complex forms of indirect patent infringement, as

⁷ Badr Eddine Attia, The Digital Environment: The Terminological Issue, Its Origins and Dimensions, *Aalam Journal*, No. 24, 2019, p. 76.



intelligent machines and systems have become capable of analyzing inventions and reproducing or developing them independently or semi-independently.

1- Analysis of Inventions by Artificial Intelligence Systems: Advanced algorithms can examine published patents and extract precise technical information that may be used to develop similar products without resorting to direct imitation.

2- AI-Driven Innovation: Artificial intelligence systems can generate new technological solutions based on existing data, potentially resulting in inventions that closely resemble protected inventions without reproducing them verbatim.

3- Manufacturing through Three-Dimensional Printing: This technology enables the production of models of patented products based on digital designs circulated online, thereby facilitating patent infringement without the need for traditional industrial infrastructure.

4- Smart Manufacturing Systems: These systems rely on the integration of data and machinery, enabling the reproduction of protected industrial processes based on the analysis of available data.

The legal difficulty lies in the fact that such infringements may occur without direct human intervention, or at least with substantial technological involvement, thereby raising important questions concerning legal liability and the limits of traditional patent protection.

It is therefore evident that modern technologies have not merely facilitated innovation but have also contributed to the emergence of new and complex forms of indirect patent infringement. This development calls for a reconsideration of traditional legal mechanisms to ensure their adaptation to contemporary technological transformations.

THE SECOND TOPIC : The Issue of Attributing Legal Liability for Patent Infringement

Against the backdrop of accelerating digital transformation, the digital environment has become an integral part of various spheres of everyday life, particularly in the commercial, social, and legal domains. This rapid technological development has, however, given rise to complex legal challenges, most notably the difficulties associated with legal enforcement and the establishment of rights and facts in the digital environment. Digital evidence, by its very nature, is susceptible to manipulation, alteration, or loss, while the intangible nature of cyberspace and its cross-border character create additional obstacles to tracing cyber offences and enforcing relevant judicial decisions.

FIRST REQUIREMENT: The Difficulty of Legal Enforcement

Cybercrimes and electronic infringements constitute some of the most significant challenges facing modern legal systems, particularly in light of the rapid expansion of digital technologies and the widespread use of the Internet as a primary means of communication and



commercial and social interaction. This reality requires the law to develop effective mechanisms to ensure the enforcement of legal rules in response to such infringements, which may affect the digital rights of individuals and institutions and have implications for the State's cybersecurity.

Under Algerian law, legal enforcement constitutes a fundamental pillar for ensuring the implementation of legal provisions enacted by the legislative and executive authorities. This includes the application of rules governing electronic infringements and the protection of digital rights. Legal enforcement is not limited to the enactment of legislation; rather, it extends to ensuring its effective implementation in practice through a range of measures undertaken by the competent authorities, including law enforcement agencies, the judiciary, and specialized regulatory bodies.

Firstly: Challenges in Enforcing Legal Protection of Patents in the Digital Environment

Legal enforcement in this context may be defined as the process through which written legal provisions are translated into concrete measures aimed at protecting rights, deterring violations, and ensuring digital justice. Effective enforcement requires the existence of advanced legal, administrative, and technical mechanisms capable of keeping pace with the rapid development of technology and addressing the challenges posed by cybercrimes, which are characterized by their complexity and continuous evolution.

Under Algerian law, Article 4(1) of the Algerian Civil Code provides that "the law shall enter into force and be applied immediately upon its publication in the Official Gazette."⁸ This provision underscores the importance of publication as a fundamental condition for the entry into force of legislation, while also ensuring respect for the rights and obligations established therein⁹. Despite this general rule, the enforcement of legislation governing electronic infringements faces numerous challenges due to the complex nature of such offences, which requires the development of specialized and highly effective legal enforcement mechanisms¹⁰.

Legal enforcement in the field of electronic infringements encompasses several dimensions, including the criminal dimension, which provides for sanctions against offences such as hacking, electronic fraud, and digital espionage, as well as the civil dimension, which addresses the harm resulting from such infringements and ensures compensation for injured

⁸Ordinance No. 75-58 of 26 September 1975 containing the Algerian Civil Code, Official Gazette, 30 September 1975, No. 78, p. 990, as amended and supplemented by Law No. 05-10 of 20 June 2005, Official Gazette, No. 44, 26 September 2008.

⁹ Rachid Bemrah and Mohamed Hamli, The Entry into Force of Law as a Guarantee of Rights and Freedoms and the Issues It Raises, *Journal of Legal Studies and Research*, Vol. 10, No. 1, Algeria, 2025, p. 118.

¹⁰ Statements by the Minister of Justice and Keeper of the Seals, Abderrachid Tabi, concerning the strengthening of law enforcement authorities in Algeria, Palermo Conference, 2023, *Akhbar El Youm*, 30 September 2023.



partie¹¹. In addition, regulatory and administrative bodies play a complementary role in monitoring the implementation of legislation and safeguarding the digital environment.

Algerian legislation contains a number of statutory provisions aimed at regulating the prevention of electronic infringements and ensuring the enforcement of the relevant legal rules. Among the most important of these is Law No. 18-05 on Electronic Commerce, which addresses the specific nature of digital transactions and offences associated with them, in addition to Law No. 15-04 on Electronic Signatures, consumer protection legislation, and the amended Criminal Code.

Law No. 18-05 on Electronic Commerce imposes several obligations on electronic suppliers, including the obligation not to offer prohibited or unlawful products, to provide consumers with clear and accurate information, and to protect personal data. The Law also establishes criminal sanctions for violations, including financial penalties and legal measures aimed at suspending unlawful activities.

With regard to the enforcement of laws governing electronic infringements, judicial police authorities and the National Security services are entrusted with the task of detecting and investigating cybercrimes. They are vested with broad powers to conduct investigations and collect digital evidence, in cooperation with information technology experts¹².

The Algerian judiciary also plays a central role in legal enforcement by adjudicating cases involving electronic infringements, while taking into account the specific nature of digital evidence, which requires specialized technical knowledge. In recent years, significant efforts have been undertaken to train judges and investigative authorities so as to keep pace with technological developments¹³.

Accordingly, regulatory and administrative bodies, such as the authorities responsible for regulating electronic procurement and consumer protection, play a complementary role in monitoring the implementation of legislation, ensuring that electronic suppliers comply with the requirements governing electronic contracts, and imposing administrative sanctions in cases of non-compliance.

Despite these legal and regulatory efforts, enforcement continues to face several challenges, including the difficulty of identifying offenders due to the complexities of technology, the need for effective international cooperation to combat cross-border offences, and the shortage of technical resources and specialized expertise within certain enforcement

¹¹ Article 124 of the Algerian Civil Code; Yassine Daoudi, Research on Algerian Law – The Various Meanings of Law, *Dispute Resolution Course*, Institute of Legal and Administrative Sciences, Djelfa, p. 4.

¹² See the report of the Office of the United Nations High Commissioner for Human Rights, Law Enforcement and Human Rights, on the official United Nations Human Rights website, as well as the functions of the judicial police published on the official website of the Algerian Police.

¹³ Algerian Press Service, Study Day at the Algiers Court of Justice: Cybercrime and Electronic Evidence, 4 March 2024.



authorities. Additional challenges arise from the difficulties faced by Algerian society, particularly with regard to access to and knowledge of the applicable law¹⁴.

Accordingly, ensuring effective legal enforcement requires the development of an integrated framework encompassing the modernization of legislation, the strengthening of cooperation among the competent authorities, and the enhancement of technical and human capacities, alongside raising public awareness of the importance of complying with digital laws and respecting their requirements.

Legal enforcement mechanisms in the field of electronic infringements operate at several levels of liability, including civil liability, criminal sanctions, and administrative measures, all of which seek to achieve deterrence, provide compensation, and protect society.

1- Civil Liability for Electronic Infringements

Civil liability for electronic infringements is based on the principle of compensation for damage resulting from non-performance of obligations or interference with the rights of others through electronic violations. This includes compensation for both material and moral damage suffered by consumers or injured parties¹⁵.

Under Algerian legislation, civil liability is based on two forms:

Contractual liability, which arises from the breach by one of the parties of its contractual obligations, such as failure to deliver digital goods or the provision of electronic services that do not conform to the agreed specifications; and tortious liability, which arises from harmful acts not arising from a contractual relationship, such as causing a data breach or disclosing personal information without authorization¹⁶.

Compensation constitutes one of the principal instruments of civil enforcement. An injured party may bring a civil action seeking monetary compensation or an order restoring the situation to its previous state, subject to the available evidence and the requirements governing electronic signatures and data preservation.

2.-Criminal Liability for Electronic Infringements

Criminal liability occupies an important position within the enforcement system, as it seeks to deter offenders and prevent the recurrence of violations by imposing punitive sanctions on persons who violate laws governing electronic activities.

The aforementioned Law No. 18-05 on Electronic Commerce provides for a range of sanctions, including financial penalties for violators, such as suppliers who offer prohibited

¹⁴ Rachid Bemrah and Mohamed Hamli, op. cit., p. 133.

¹⁵ Al-Taher Ben Jelloul, *Civil Liability for Cybercrimes: A Comparative Study*, Dar Al-Nahda Al-Arabiya, Lebanon, 2019, p. 142.

¹⁶ Samaher Abdel Karim Abu Shmeis, *Electronic Civil Liability – Applicable Law: A Comparative Study*, Dar Al-Thaqafa for Publishing and Distribution, Jordan, 2020, pp. 41–43.



electronic goods or provide fraudulent services, as well as the suspension or revocation of the electronic authorization of non-compliant suppliers, thereby preventing them from continuing their electronic commercial activities. It also provides for custodial sanctions in cases involving electronic fraud, hacking, and forgery in electronic transactions¹⁷.

In addition, the Algerian judiciary plays an integral role in imposing these sanctions through the competent courts, which rely on the collection of digital evidence and technical investigations to ensure the reliability of convictions and the effectiveness of legal enforcement.

3- Administrative Procedures and Preventive Measures

These measures include monitoring electronic devices and systems, establishing technical and regulatory controls to prevent infringements, strengthening network security, monitoring data traffic, and imposing requirements on Internet service providers and digital platforms to ensure compliance with applicable legislation. They also include conducting awareness campaigns to educate users about the risks of electronic infringements and the appropriate means of addressing them¹⁸.

These various legal frameworks demonstrate that the enforcement of law in relation to electronic infringements in Algeria relies on an integrated system combining civil liability, criminal sanctions, and administrative measures to protect individuals and institutions against cybercrimes.

With the rapid development of digital technologies and the widespread use of electronic transactions, the Algerian legal enforcement system faces several challenges that affect its effectiveness in combating electronic infringements. These challenges require the development of legislation, investigative techniques, and international cooperation in order to adapt the legal system to the evolving digital environment.

a-Technological Challenges and Capacity Building

Cybercrimes are characterized by technical complexity and rapid execution, requiring enforcement authorities to adopt advanced technologies for detection and investigation. However, the shortage of technical and human resources, together with insufficient specialization and training among security and judicial authorities, constitutes a major obstacle to the effective enforcement of the law.

¹⁷ Articles 37–43 of Law No. 18-05 of 10 May 2018 on Electronic Commerce, Official Gazette, 15 May 2018, No. 16.

¹⁸ Algerian Ministry of Justice, Generalization of Digitalization in Civil Litigation Procedures, Media Department, official website, 24 May 2021.



There is therefore an urgent need to train judges, investigators, and public officials in digital forensic analysis, the handling of digital evidence, and lawful methods of data collection¹⁹.

b-Legislative Deficiencies and Lack of Legal Harmonization

Although the existing legislation in Algeria constitutes an important foundation, it lacks comprehensive updates addressing emerging forms of cybercrime, such as sophisticated hacking, cyberattacks targeting critical infrastructure, and cross-border cyber offences²⁰.

Addressing these challenges requires the adoption of advanced legislation that strengthens enforcement mechanisms, broadens the definitions of electronic infringements, and incorporates provisions consistent with international conventions, such as the Budapest Convention on Cybercrime.

c-Challenges of International Cooperation and Combating Cross-Border Cybercrime

Cybercrimes are inherently transnational in nature, requiring strong international cooperation between Algeria and other States in areas such as information sharing, mutual legal assistance, and coordinated monitoring.

However, the limited scope of bilateral and regional agreements may hinder the prompt exchange of digital evidence and the speed of legal responses, thereby undermining the effectiveness of enforcement measures and creating opportunities for offenders to evade accountability²¹.

In light of continuing digital development, legal enforcement in the field of electronic infringements remains a fundamental pillar for safeguarding the rights of individuals and institutions and protecting the national economy. Achieving effective enforcement requires coordinated legal and technical efforts, together with strengthened international cooperation, in order to establish an integrated and effective legal enforcement framework in Algeria.

Secondly: Evidence in the Digital Environment

Evidence constitutes one of the fundamental pillars of the judicial system, as it represents the means through which parties seek to convince the court of the validity of their claims. With the development of technological means and the emergence of the digital environment, it has become necessary to reconsider traditional methods of proof,[1] particularly in light of electronic contracting and the increasing number of digital infringements that threaten legal rights and positions. Paper documents are no longer the sole means of establishing rights and obligations;

¹⁹ Higher School for Magistracy, Training Course for Trainers on Cybercrime and Electronic Evidence, News Department, official website of the Higher School for Magistracy, 3 May 2024.

²⁰ Djamel Bouazdia, The Algerian Strategy for Combating Cybercrime: Challenges and Future Prospects, *Journal of Legal and Political Sciences*, Vol. 10, No. 1, 2019, p. 1262.

²¹ Djamel Bouazdia, *op. cit.*, pp. 1277–1288.



rather, digital means such as electronic signatures, digital records, and electronic information have emerged. This development has required legislators and courts to recognize their legal evidentiary value subject to precise and stringent conditions that strike a balance between technological flexibility and the requirements of legal certainty²².

Evidence may be defined as the means employed by parties to establish the truth of facts and legal disputes before the courts. In digital contracts, proof becomes more complex due to the nature of electronic transactions, which rely not on traditional paper documents but on digital data and electronic signatures.[3] Establishing the validity of a digital contract is therefore essential to safeguarding the rights of the parties and ensuring legal certainty in digital transactions²³. The significance of evidence in electronic contracts lies in its ability to verify the parties' intention, ensure the integrity of data, and protect the contract against manipulation and fraud, thereby strengthening users' confidence in such transactions.

Evidence in digital contracts is characterized by several features that distinguish it from traditional forms of evidence. These include temporal and geographical flexibility, meaning that digital evidence may be produced at any time and from any location²⁴, thereby facilitating litigation in cross-border electronic transactions. Digital evidence also relies on technical means, such as electronic signatures, digital records, and electronically stored documents, whose authenticity may require specialized tools and technical expertise. Furthermore, the integrity of data must be ensured through encryption and authentication technologies in order to prevent the alteration of information after its creation. Verification may also be particularly complex because digital evidence is susceptible to forgery and technical manipulation, making the involvement of technical experts necessary to establish its integrity²⁵. These characteristics make digital evidence both a legal and technical challenge, while at the same time rendering it indispensable to the development of digital transactions.

Digital means of evidence in electronic contracts encompass a range of technical and legal tools capable of establishing the validity of contracts and related transactions. The most significant include:

1-Electronic Signature: The electronic signature constitutes a primary means of establishing the identity of the parties and confirming their intention to enter into a digital contract. It may take different forms, including a simple electronic signature and an advanced digital signature based on encryption technologies designed to ensure security and prevent tampering. According to the

²² Ahmed Fathi Sorour, *Means of Evidence in Civil and Commercial Matters*, Dar Al-Nahda Al-Arabiya, Cairo, 2012, p. 41.

²³ Abdullah Ouchen, "Electronic Evidence between Legal Reality and Technological Development, *International Journal of Law and Business*, No. 14, 2021, p. 22.

²⁴ Sameh Abdel Wahid Al-Tahami, *Electronic Signatures in Algerian Law and Comparative Legislation*, *Journal of Legal Sciences*, No. 36, 2019, p. 56.

²⁵ Article 7 of the Electronic Transactions Law of the United Arab Emirates.



United Nations Commission on International Trade Law (UNCITRAL), an electronic signature consists of electronic data contained in, attached to, or logically associated with a data message, which may be used to identify the signatory in relation to the data message and to indicate the signatory's approval of the information contained therein.²⁶

The European Directive 1999/93 on electronic signatures required the signature to be linked to the signatory and capable of identifying its holder, created by means maintained under the exclusive control of the signatory, and linked to the data to which it relates, in addition to relying on certification services²⁷. The electronic signature generally serves as a supporting mechanism for electronic writing and contributes to establishing its evidentiary value. The Directive also distinguished, in Article 2(2), between advanced and simple electronic signatures²⁸.

It should be noted that the Algerian legislature amended the evidentiary provisions of the Civil Code in order to accommodate modern communication technologies and electronic signatures. This is reflected in Ordinance No. 05-10 of 20 June 2005 amending and supplementing the aforementioned Civil Code. Although the legislature did not expressly define the electronic signature, it did not exclude its use. Article 327 recognizes electronic writing as evidence provided that the conditions set out in Article 323 bis 1 of the same Code are satisfied. The latter provides, in substance, that electronic writing has the same evidentiary value as writing on paper, provided that the identity of the person from whom it originates can be established and that it is created and preserved under conditions ensuring its integrity²⁹.

An examination of the European Directive and the provisions of the Civil Code demonstrates that both establish certain requirements designed to enhance the reliability and trustworthiness of electronic signatures. These requirements may ultimately be linked to the principal functions of a signature, namely identifying the signatory and establishing the signatory's commitment to the content of the signed document.

2-Digital Records: According to Microsoft, a record is an electronic or physical document or entity that serves as evidence of an activity or transaction carried out by an organization and that must be retained for a specified period. Records management refers to the process governing the classification, retention, and disposal of such records in accordance with legal and regulatory

²⁶ Abdelhamid Belabbas, *Electronic Certification as a Means of Protecting Electronic Signatures under Algerian Law*, *Journal of Law and Technology*, 2021, pp. 102–103.

²⁷ French Executive Decree No. 2010-4110/474 of 21 December 2010.

²⁸ Sameh Abdel Wahid Al-Tahami, *Electronic Signatures in Algerian Law and Comparative Legislation*, *Dar Al-Fikr Al-Qanuni*, 2020, pp. 45–60.

²⁹ Article 2 of the UNCITRAL Model Law on Electronic Signatures, 2001.



requirements³⁰. Examples include email messages, modification logs, and timestamps establishing the date and time at which a contract was created, thereby supporting the stability and reliability of the information.

3-Digital Documents: A digital document is generally a document created or converted into digital form using computer technology, whether through word-processing software or by converting a paper document into digital format through digital imaging devices³¹. Examples include electronically signed and authenticated contracts and invoices, which may constitute strong evidence when preserved in a manner that prevents alteration or forgery.

4-Digital Certification Certificates: These are issued by trusted certification authorities, whether public or private, independent and impartial entities that act as intermediaries between parties to authenticate their electronic transactions³². They ensure the validity of the electronic signature and its connection to the signatory and therefore constitute an important legal safeguard against manipulation.

5-Secure Systems and Databases: These systems ensure the secure storage of data while safeguarding it against unauthorized alteration or deletion.

All these challenges necessitate the development of integrated legal and technical frameworks, together with continuous training for judicial and technical authorities, in order to ensure the recognition of the evidentiary value of digital evidence and strengthen its probative force.

SECOND REQUIREMENT: The Limits of Applying Traditional Legal Liability Rule

The modern technological environment, particularly with the advancement of digitization and intelligent systems, has given rise to profound issues concerning the adequacy of traditional legal liability rules in addressing emerging forms of patent infringement. These rules were primarily developed to regulate direct human conduct, whereas contemporary infringements may occur through complex digital systems or by indirect means, thereby limiting the effectiveness of their application.

Firstly: The Inadequacy of the Elements of Traditional Legal Liability in the Technological Environment

³⁰Article 2 of European Directive 1999/93/EC of 13 December 1999 of the European Parliament and of the Council on a Community framework for electronic signatures.

³¹V. Sedalla, *Proof and Electronic Signature*, Paris, available online.

³²Lazhar Ben Said, *The Legal Framework of Electronic Commerce Contracts*, Dar Houma, Algeria, 2012, pp. 154–155.



Traditional legal liability, whether civil or criminal, is based on three fundamental elements, namely fault, damage, and a causal link. However, the application of these elements in the digital environment presents several difficulties³³.

1-Civil

Protection:

An action for unfair competition constitutes an effective legal means of protecting industrial property rights, whether registered or unregistered. Such an action is based on the principles of tortious civil liability and seeks to put an end to acts constituting unfair competition, such as imitation, counterfeiting, or misappropriation of industrial property rights, while providing compensation to the injured party for the damage suffered³⁴.

Unfair competition is defined as any competitive act that is contrary to the standards of honesty and fair dealing in the industrial or commercial sphere and that causes harm to the right holder. An action for unfair competition is therefore based on the existence of an act of unfair competition and the occurrence of damage to the right holder. In cases of unfair competition, the courts presume the occurrence of damage without requiring it to be established separately³⁵.

An action for unfair competition is characterized by providing broader protection in terms of the scope of rights protected, as it does not require the existence of a registered right. Rather, it is based on the principles of honesty, integrity, and fair dealing in competition, making it a general action that may be brought against any conduct that violates the principles of fair competition³⁶.

The remedies resulting from such an action include orders to cease the acts constituting unfair competition, in addition to monetary compensation for the resulting damage. Such cases are generally heard by commercial courts. It should also be noted that the action is subject to a limitation period of three years³⁷ from the date on which the injured party becomes aware of the damage and the identity of the person responsible for it, and in any event, no later than fifteen years from the occurrence of the unlawful act.

Under Algerian law, an action for unfair competition is based on three conditions: fault, damage, and a causal relationship between them³⁸. Accordingly, it is governed by the general principles applicable to civil liability arising from wrongful acts. Any person whose right has

³³Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement), dated 15 April 1994, which entered into force in 1995.

³⁴Ahmed Ben Youssef, *The Action for Unfair Competition in the Protection of Industrial Property*, Journal of Legal Studies, 2019, pp. 112–130.

³⁵Slim Al-Atrache, *Unfair Competition between Civil and Commercial Law*, Dar Al-Fikr Al-Qanuni, 2017, pp.78-85.

³⁶Fatima Saadi, *Industrial Property and Means of Civil Protection*, Arab Law Journal, 2020, pp. 95–110.

³⁷Article 44 of Ordinance No. 03-03 of 19 June 2003, as amended and supplemented by Law No. 08-12 of 25 June 2008, relating to competition; see also Supreme Court Decision No. 1130389, issued on 16 June 2016.

³⁸Article 124 of the Algerian Civil Code.



been infringed is therefore entitled to bring an action for compensation on the basis of unfair competition in order to obtain compensation for the damage suffered as a result of an act of infringement.

The right holder may seek civil compensation for the damage resulting from the infringement, whether material, such as loss of profits, or moral, such as damage to reputation or loss of customers' confidence³⁹. Compensation is governed by the general rules of civil liability, subject to proof of damage and the causal relationship between the wrongful act and the damage. Such protection is not limited to registered rights; rather, it extends to all cases in which an act of unfair competition causes damage to the right holder, thereby strengthening the civil-law protection afforded to industrial property rights⁴⁰.

The Algerian legislature⁴¹, through the provisions relating to protection, provides that an action for unfair competition may arise from an act characterized as counterfeiting or an attempt to counterfeit. The same applies under French law,⁴² which, in contrast, allows an action for unfair competition to provide broader protection extending to unregistered rights as well. Such an action is based on establishing the existence of competitive practices that are contrary to accepted standards of commercial honesty and that cause harm to the right holder, without requiring the existence of a registered right⁴³.

2-Criminal

Protection:

Criminal protection of industrial property rights constitutes one of the principal legal mechanisms adopted by the Algerian legislature to address serious infringements affecting the fundamental elements of patent rights.

Counterfeiting constitutes one of the most serious forms of interference with the exclusive right granted to the proprietor of a trademark or industrial design, as it directly undermines public confidence in the market, adversely affects the reputation of the original product, misleads consumers, and distorts their free and informed choice.

The legislature's concern with this offence is reflected in the specific provisions contained in industrial property legislation. With regard to patents, the Algerian legislature provided, in Ordinance No. 03-07 on Patents, referred to above, in Article 56, that patent infringement by way of counterfeiting constitutes a criminal offence punishable under Algerian law. The same principle also applies to industrial designs and models.

This offence consists of three elements: the legal element, consisting of the existence of a statutory provision criminalizing counterfeiting and prescribing the applicable penalty; the

³⁹Sami Ben Younes, Civil Compensation in Industrial Property Litigation, *Journal of Civil Law*, 2020, pp. 85–87.

⁴⁰Nour El-Dine Hossam, Civil Liability in Unfair Competition Actions, *Journal of Law and Commerce*, 2021, p.95.

⁴¹Article 28 of Ordinance No. 03-06, referred to above.

⁴²Article L. 716-1 of the French Intellectual Property Code.

⁴³ Mohamed Youssef, Counterfeiting and the Action for Unfair Competition: A Comparative Study, *Journal of Economic Law*, 2020, pp. 60–75.



material element, consisting of a physical act involving the reproduction, imitation, or unauthorized use of the trademark, together with the existence of a degree of similarity capable of causing confusion; and the mental element, which requires the existence of criminal intent and bad faith, as inferred, *inter alia*, from the offender's knowledge of the registration of the trademark and of the rights of third parties therein⁴⁴.

The applicable penalties include principal criminal sanctions consisting of imprisonment for a period ranging from six (6) months to two (2) years and a fine ranging from two million five hundred thousand (DZD 2,500,000) to ten million (DZD 10,000,000). The Algerian legislature⁴⁵ provides that the criminal penalties consist of imprisonment and a fine, or either of these penalties alone.

Through these punitive measures, the legislature seeks, on the one hand, to protect the interests of industrial property right holders and, on the other hand, to ensure transparency in economic transactions and prevent the market from being flooded with counterfeit products that undermine the principle of fair competition.

An action for infringement in Algeria is characterized by specific rules concerning the parties entitled to initiate proceedings. The right holder or licensee is entitled to bring an action before the competent judicial authorities, provided that the licensing agreement does not expressly prohibit the licensee from doing so. The Public Prosecutor may also initiate criminal proceedings *ex officio* where it is established that acts of counterfeiting have occurred and affect the economic public order, particularly in cases involving public health or industrial safety.

Legal protection is not confined to the criminal sphere. It is complemented by civil protection through the possibility of bringing an action for unfair competition or an action for damages. This creates an integrated legal framework for the protection of industrial property in Algeria.

Nevertheless, there remains a pressing need for legislative reforms aimed at enhancing the effectiveness of such protection, particularly by strengthening inspection and monitoring mechanisms, providing specialized training for judges in this field, and updating the legal framework to keep pace with digital developments.

⁴⁴ Saleh Saidi, *The Offence of Trademark Counterfeiting under Algerian Law*, Master's Dissertation in Law, Faculty of Law and Political Science, University of Algiers, 2022, p. 15.

⁴⁵ Article 32 of Ordinance No. 03-06, referred to above: "Subject to the transitional provisions of this Ordinance and without prejudice to the provisions of Ordinance No. 66-156 of 8 June 1966, containing the Penal Code, as amended and supplemented, any person who commits the offence of counterfeiting shall be punished by imprisonment for a period of six (6) months to two (2) years and a fine ranging from two million five hundred thousand Algerian dinars (DZD 2,500,000) to ten million Algerian dinars (DZD 10,000,000), or by either of these penalties alone, together with: temporary or permanent closure of the establishment; confiscation of the objects, means, and tools used in the offence; and destruction of the objects constituting the subject matter of the offence." This may be compared with Article 28 of repealed Ordinance No. 66-57, referred to above.



The purpose of imposing stricter penalties is to protect the public interest and safeguard the economic order by deterring anyone who may seek to infringe upon the rights of others, particularly in sectors that rely heavily on innovation and creativity, such as the pharmaceutical and technology industries⁴⁶.

Secondly: The Inadequacy of Legal Sanctions in Addressing Modern Technological Infringement

Legal sanctions constitute one of the fundamental pillars of legal liability, as they seek to achieve both general and specific deterrence and to provide redress for the harm suffered by the right holder. However, the rapid pace of technological development and the emergence of digital and indirect infringements of patents have revealed the limited effectiveness of traditional sanctions in achieving these objectives, both in their civil and criminal dimensions, as explained above.

In the traditional environment, legal sanctions are based on a clear rationale, namely monetary compensation or direct criminal punishment. However, this rationale encounters significant difficulties when applied to infringements associated with modern technologies, owing to their complex and intangible nature.

1- The Limited Effectiveness of Civil Compensation in Redressing Technological Harm

Civil compensation constitutes the principal means of redressing harm within the framework of civil liability. However, in the context of technological infringements of patents, it raises several difficulties, most notably the difficulty of assessing indirect damage, such as the loss of competitive advantage, the leakage of technical information, or the decline in the economic value of an invention⁴⁷. Furthermore, damage in the digital environment may be continuous and recurrent, making monetary compensation insufficient to restore the situation to its original state.

2- The Limitations of Traditional Criminal Penalties in Achieving Deterrence

Although criminal laws, including Algerian legislation, criminalize certain forms of infringement of intellectual property rights and information systems, traditional penalties, such as fines and imprisonment, may fail to provide sufficient deterrence against offenders operating in the digital environment. This is particularly the case where it is difficult to identify the perpetrator or where multiple parties are involved in the harmful conduct.

3- The Inadequacy of Traditional Sanctions for the Cross-Border Nature of Technological Infringements

⁴⁶ Leila Hamdi, *Punitive Sanctions in the Protection of Industrial Property*, Journal of Criminal Sciences, 2018, pp. 60–78.

⁴⁷ Ordinance No. 66-48 of 25 February 1966 concerning Algeria's accession to the Paris Convention for the Protection of Industrial Property, concluded on 20 March 1883 and subsequently amended, Official Gazette, No. 16, 25 February 1966.



Technological infringements are characterized by an international and cross-border nature, whereby the infringing act may be committed in one State while its effects materialize in another. This situation limits the effectiveness of national sanctions and makes the enforcement of judicial decisions and criminal penalties more complex, particularly in light of differences between national legal systems and conflicts of jurisdiction.

4- The Insufficiency of Preventive Sanctions in Light of the Nature of the Infringement

Traditional legal systems tend to focus on sanctions imposed after the occurrence of an infringement, such as compensation or punishment. However, digital infringements of patents are often characterized by their speed and immediate dissemination, making subsequent intervention insufficient to effectively prevent or mitigate the resulting harm.

It is therefore apparent that, despite the importance of traditional legal sanctions in protecting rights, they suffer from significant shortcomings when applied to modern technological infringements, particularly in terms of their ability to redress harm, achieve deterrence, and respond to the cross-border nature of such infringements. This calls for reconsideration of existing mechanisms and the development of more flexible and effective measures capable of addressing the specific characteristics of the digital environment.

Conclusion:

In light of the rapid pace of technological development, patents are facing unprecedented challenges arising from the proliferation of infringements in the digital environment and the difficulty of determining the legal liability arising therefrom. The study has demonstrated that, although traditional legal rules remain important, they are no longer sufficient to address these challenges, thereby necessitating the development of national legislation and the strengthening of international cooperation in the field of intellectual property protection.

Furthermore, striking a balance between protecting inventors' rights and fostering technological innovation constitutes one of the most important objectives that modern legal systems should pursue, particularly in light of the transition towards a global digital economy.

Findings :

- The rapid pace of technological development, particularly in the digital environment, has resulted in the emergence of new forms of patent infringement that are difficult to address through traditional legal mechanisms.
- The legal rules governing civil and criminal liability continue to constitute the fundamental framework for patent protection; however, their application in the digital environment presents several practical and legal difficulties.
- The cross-border nature of patent infringements in the modern technological environment gives rise to issues relating to jurisdiction and the applicable law.
- The involvement of multiple parties in the digital environment, including users, digital platforms, and technology service providers, complicates the determination of legal liability for infringements.



- Modern technologies, such as three-dimensional (3D) printing and artificial intelligence, have facilitated the reproduction and exploitation of innovations without the authorization of their owners.

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