




## NEW TECHNOLOGIES AND THEIR ADVANCEMENT IN THE FIELD OF INTELLECTUAL PROPERTY LAW

### AS NOVAS TECNOLOGIAS E SEU AVANÇO EM MATÉRIA DE DIREITO DE PROPRIEDADE INTELECTUAL

### LAS NUEVAS TECNOLOGÍAS Y SU AVANCE EN MATERIA DE DERECHO DE PROPIEDAD INTELECTUAL

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**Albert Einstein Lima da Silva<sup>1</sup>**

#### **ABSTRACT**

This study analyzed the adaptation of intellectual property law to the challenges of new technologies. The objective was to understand how legal systems protect creators' rights in a globalized digital environment, exploring the evolution of the concept of property, technological challenges, and existing legal and regulatory strategies. The methodology employed was qualitative bibliographic research, which analyzed articles, books, national and international legislation, and reports from organizations such as WIPO. The critical and comparative approach allowed for a comprehensive view of the topic. The results indicate that intellectual property, essential for innovation and development, faces threats such as online piracy and data breaches. In response, legislation continually adapts, driven by agreements such as TRIPs and by tools such as patents, trademark registrations, and copyrights. New technologies, such as blockchain, emerge as promising solutions for the management and protection of intellectual property. The study concludes that constant legislative updates and the adoption of interdisciplinary strategies are essential to balance the protection of creators with access to information and technological advancement in the digital age.

**Keywords:** Intellectual Property. New Technologies. Legal Systems.

#### **RESUMO**

Este estudo analisou a adaptação do direito de propriedade intelectual aos desafios das novas tecnologias. O objetivo foi compreender como os sistemas jurídicos protegem os direitos dos criadores em um ambiente digital globalizado, explorando a evolução do conceito de propriedade, os desafios tecnológicos e as estratégias jurídicas e regulatórias existentes. A metodologia empregada foi uma pesquisa bibliográfica qualitativa, que analisou artigos, livros, legislações nacionais e internacionais, e relatórios de organizações como a OMPI. A abordagem crítica e comparativa permitiu construir uma visão abrangente sobre a temática. Os resultados apontam que a propriedade intelectual, essencial para a inovação e o desenvolvimento, enfrenta ameaças como a pirataria online e a violação de dados. Em resposta, a legislação se adapta continuamente, impulsionada por acordos como o TRIPs, e por ferramentas como patentes, registros de marcas e direitos autorais. Novas tecnologias, como o blockchain, emergem como soluções promissoras para a gestão e proteção da propriedade

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<sup>1</sup> Doctoral student in Legal Sciences. Universidad del Museo Social Argentino (UMSA).  
E-mail: markyownz@gmail.com



intelectual. O estudo conclui que a constante atualização legislativa e a adoção de estratégias interdisciplinares são essenciais para equilibrar a proteção dos criadores com o acesso à informação e o avanço tecnológico na era digital.

**Palavras-chave:** Propriedade Intelectual. Novas Tecnologias. Sistemas Jurídicos.

## RESUMEN

Este estudio analizó la adaptación del derecho de propiedad intelectual a los desafíos de las nuevas tecnologías. El objetivo fue comprender cómo los sistemas jurídicos protegen los derechos de los creadores en un entorno digital globalizado, explorando la evolución del concepto de propiedad, los desafíos tecnológicos y las estrategias jurídicas y regulatorias existentes. La metodología empleada fue una investigación bibliográfica cualitativa, que analizó artículos, libros, legislaciones nacionales e internacionales, y informes de organizaciones como la OMPI. El enfoque crítico y comparativo permitió construir una visión integral sobre la temática. Los resultados señalan que la propiedad intelectual, esencial para la innovación y el desarrollo, enfrenta amenazas como la piratería en línea y la violación de datos. En respuesta, la legislación se adapta continuamente, impulsada por acuerdos como el TRIPs, y por herramientas como patentes, registros de marcas y derechos de autor. Nuevas tecnologías, como el blockchain, emergen como soluciones prometedoras para la gestión y protección de la propiedad intelectual. El estudio concluye que la constante actualización legislativa y la adopción de estrategias interdisciplinarias son esenciales para equilibrar la protección de los creadores con el acceso a la información y el avance tecnológico en la era digital.

**Palabras clave:** Propiedad Intelectual. Nuevas Tecnologías. Sistemas Jurídicos.



## 1 INTRODUCTION

It is necessary to analyze the private property of material goods from a historical, legal and economic point of view to understand the new concept of property in the information age, this helps to understand the connection between property and society, with the private property of material goods being of essential importance to the Law, being the foundation of legal systems, because the legal protection that the State offers guarantees peaceful coexistence between people, since it is possible to clearly define what belongs to each one. (Ribeiro & Neto, 2016)

The way to protect what the human mind creates is through intellectual property. According to the World Intellectual Property Organization (WIPO), the concept encompasses a wide variety of rights, ranging from the protection of literary and artistic works to inventions, as well as trademarks and design models. (Araújo et al., 2010)

According to Oscar Pérez and Samia Sisa (2023) cited in Zapata (2024), intellectual property is a set of duties and rights, which includes industrial property, the protection of traditional knowledge, in addition to copyright and related rights.

The protection of intellectual property is something that has been sought for a long time when people were looking for ways to mark the authorship of their creations, such as the use of signatures on documents and paintings, however, the more information you have about the identification mark, the more vulnerable it becomes, and the mark should be as discreet as possible. Thus, tagging techniques have functions, such as watermarking songs, in which it is possible to include information such as the name and artist in such a way that the compatible player displays this data without a common player noticing any change in the track. (Zanuy, 2014)

Aviles, Alvarado, & Zapata (2024) explain that intellectual property is an essential concept for the protection of creativity and innovation, having its modern roots around the eighteenth century, when the Statute of Ana (1710) established Great Britain as the first modern copyright law, being the basis for legislation worldwide on intellectual property.

For Dueñas (2021), the regulation of intellectual property encourages investment in research, development, and innovation, ensuring that companies recover their investments and obtain profits through royalties, encompasses copyrights and industrial property: patents, trademarks, etc., allowing companies to explore their ideas to obtain competitive advantages in the market.



In an economy increasingly based on knowledge and innovation, the legal protection of intellectual property is crucial to encourage creation and development, however, the same technologies that facilitate the creation and distribution of works also make piracy and misuse of protected material more accessible, so it is essential to analyze the adaptation of intellectual property law to understand how legal systems offer security and justice to the creators, balancing their rights with access to information and technological progress, and therefore, this study seeks to contribute to the debate on the need for legislative updates and the search for effective solutions that protect innovation in the digital scenario.

In this context, the guiding question is: How does Intellectual Property Law adapt and respond to the challenges imposed by new technologies, ensuring the protection of creators' rights in a globalized digital environment? To this end, the following objectives were projected: To analyze the impact of new technologies on intellectual property law and the legal strategies adopted to protect intellectual creations in the digital age, to understand the historical evolution of the concept of property, from material to intellectual, and its contemporary relevance, to discuss the specific challenges that new technologies impose on the protection of copyright and industrial property, explore the main existing legal tools and regulations for the protection of intellectual property in the digital context and identify future trends and possible solutions to strengthen the intellectual property protection system in the face of technological advances.

The methodology used is bibliographic research, using a qualitative approach, with analysis of scientific articles, books, national and international legislation, reports from organizations such as WIPO, as well as relevant jurisprudence on the subject, integrating all data and theories from various areas to provide a comprehensive analysis, with a critical analysis structure, comparing different perspectives and arguments to build a clear and grounded view of the adaptation of intellectual property law in the digital age.

## **2 CONCEPT OF PROPERTY AND ITS CONTEMPORARY RELEVANCE**

Wealth was once considered a fundamental attribute in the past when the person was seen in an abstract way, however, current legal thinking defends the repersonalization of the law in which the law now considers the person in a concrete way, taking into account their real needs, feelings and desires. Thus, human dignity is the most important principle, guiding the entire legal system and prevailing over any patrimonial



relationship; In this case, civil law, which previously had a more individualistic focus, now has the dignity of the person as the central value, so when interpreting or applying laws, jurists must always prioritize the protection of human dignity.(Gomes, 2006)

Human rights are not fixed, but historical rights, that is, they arise and transform over time, in response to the social, political and legal changes of each era. Property, for example, is one of these rights that has evolved along with the human being and the social structures he has created, and can be seen as a central element that has driven many of these historical transformations.(Soares, 2006)

At the beginning of the twentieth century, Leon Duguit revolutionized the right to property by introducing the concept of the social function of property, which emerged after Duguit reformulated public law, questioning traditional notions such as public power and the responsibility of the State, proposing that property should not be seen only as a subjective and individual right, but rather as a function to be exercised for the benefit of the collectivity.(Jelinek, 2006)

The work of Leon Duguit at the beginning of the twentieth century had great influence, especially among Latin authors, introducing the idea that rights are only justified if they contribute to a social mission, so Duguit argued that the owner should be seen as an employee, managing his assets not only for himself, but for the good of society. His text on the social function of property became a classic of law.(Martins & Guedes, 2020)

Guilhermino (2024) explains that currently, the focus is no longer on the exclusive possession of goods, but on the right to access them. The idea is that these assets become tools so that all people can enjoy their fundamental rights, living fully in their time. This change in perspective promotes inclusion and ensures the realization of other essential rights, such as freedom of expression and the development of personality.

According to Cortiano Junior (2002), cited in Ribeiro & Neto (2016), the concept of property adapts and evolves over time. Liberal codes, by treating property in an abstract and general way, allowed it to be transformed into a flexible principle, capable of adjusting to new realities. The most significant changes in this discourse are those that seek to bring the idea of property closer to concrete reality, reducing its abstraction and generality to meet the social needs of each era.

Property is no longer an absolute individual right and today incorporates the social function. This principle softened the individualism of the nineteenth century, altering the structure and content of the right to property. Currently, property is seen as the right to



use, enjoy and dispose of goods, as long as this is done in a way that promotes human dignity. The social function is not the reason for the existence of property, but rather the condition for it to be exercised, justifying the powers of the owner.(Gomes, 2006)

According to Soares (2006), with the emergence of collective and diffuse rights, and the growing influence of the State in the private sphere, the concept of property has changed, going from an individualistic right to having a social function. This transformation was consolidated with the Weimar Constitution of 1919, a milestone in contemporary law that inaugurated the constitutional system which, in turn, profoundly impacted the way property is understood and regulated.

In this context, the concept of social function transformed the legal interpretation of values such as freedom and property. While the individualist view considered freedom as the ability to do or not do something, social function theory argues that each person has a duty to develop their capacities to fulfill their role in society. By applying this idea to heritage, Duguit argued that property is not an absolute right. The owner, by owning a good, has the obligation to fulfill a social function.(Jelinek, 2006)

Although some authors claim that property has always had a social function, it was in the contemporary State that this concept was formalized in legislation. This happened, for example, in the Constitutions of Mexico in 1917 and Weimar in 1919. These constitutions reflect the characteristics of the modern State, which is defined by being an instrument of society, with the commitment to seek the common good and the collective interest, and by prioritizing the human being, submitting the economy to the force of the social.(Martins & Guedes, 2020)

The Brazilian Constitution of 1988 established that property must fulfill a social function and little by little, society has understood that the possession of a good brings with it a responsibility. Currently, the meaning of ownership is based on a triple structure: the satisfaction of the owner, social solidarity and respect for the environment.(Guilhermino, 2024)

In this context, Gomes (2006) explains that Brazilian civil law, previously based on the Civil Code of 1916 and influenced by the liberal thought of the nineteenth century, was predominantly patrimonialist. This perspective changed with the Federal Constitution of 1988, which elevated the dignity of the human person to a constitutional value. As a result, the protection of the person became the priority of the entire legal system, marking the abandonment of the vision focused only on patrimony.



### 3 THE SOCIAL FUNCTION OF INTELLECTUAL PROPERTY IN THE DIGITAL AGE: A CRITICAL ANALYSIS BASED ON LÉON DUGUIT'S THEORY

According to Peghini & Meyer-Pflug (2018):

When analyzing the study of the concept of the social function of property, it is verified the existence of some implicators, such as the semantics of the words function and social, since both have different meanings in the branches of the science of law, thus, the legal-constitutional system itself listed this principle, however, it failed to support its constitutive elements. For a certain part of the doctrine, the social function deals with a programmatic constitutional norm, which is up to the legislator to systematize this fundamental principle (408).

In the context of the functionalization of private law, especially property law, there is a growing national and international tendency to condition the exercise of this private right to a specific social function, an evolution that attenuates the individualistic character that was previously predominant. Among the foundations of this transition, Wieacker and Dresch highlight the Social Law movement, whose main strands go back to Otto von Gierke and Léon Duguit, the latter adopted as a reference for the analysis of this chapter (Scaff, Pinheiro & Sá, 2023).

Pierre Marie Nicolas Léon Duguit (1859-1928) was a French jurist specializing in state theory, constitutional and administrative law. One of the most influential theorists of public law in Europe, he stood out as a precursor of legal sociology. (Siqueira et al., 2015)

Contemporary civil law manuals are unanimous in dealing with property, recognizing the social function as a central element for its understanding in the Brazilian legal system. This perspective stems from the constitutionalization of the branches of law, which presents the social function of property in laudatory contours, as a limitation to the previously unrestricted right (Maldaner & Azevedo, 2015).

Thus,

To legitimize the argument, civilist (and/or constitutionalist) authors resort to history to demonstrate, through an alleged erudition, that the concepts of property and social function have been married. The harmonization of their meanings would cross different legal regimes, to reach the moment of maturity in which they contribute, mandatorily, as it is a provision of the Political Charter, to a less unequal reality.

The social function is responsible, in this union, for the best elaboration of the idea of property, conforming and limiting it. Current legal production recognizes in León Duguit the "father" of this advance, since he is the author of the theory of the social



function of property that inspired Brazilian legislators (Maldaner & Azevedo, 2015, p. 403).

In the French context of the nineteenth and twentieth centuries, anti-individualist doctrines such as Comte's positivism and Duguit's realism gained prominence. In these currents, law focuses on guaranteeing minimum and essential freedom to individuals, allowing them to fulfill their social functions. It starts from society to the individual, and from the social norm to individual rights (Scaff, Pinheiro & Sá, 2023).

In reaction to the absolutism of rights, authors such as Comte and Duguit developed theories that defended the relativity of these rights and the conception of right-function, in which individual rights find their ultimate reason in social order and utility. This implies a shift from commutative justice, typical of the individualistic view, to distributive justice. (Scaff et al., 20223)

According to Siqueira, Wolkmer and Pierdoná (2015), Duguit based himself on the ascendant sociology of his time and sought a positive method for law, distinct from the legal positivism he criticized, but based on observation and the elaboration of concepts based on social reality. His proposal is summarized in three aspects: the objective observation of social facts, the application of deductive reasoning and the total abandonment of a priori, metaphysical or religious concepts, in tune with the scientific environment of his time.

Property has an essentially economic justification. Given that society undergoes constant changes, the legal concept of property must accompany them. For Duguit, property is equivalent to its social function, and this right is not intangible or divine, but adaptable to social changes. It is up to the legislator to supervise the production of wealth and to intervene when individual property does not fulfill its social function. (Onório, 2019)

In 1911, during a lecture in Buenos Aires, Léon Duguit presented his first theorizations on the social function of property. In the centuries before the "age of access", he criticized its individualistic destination. For Duguit, property is only legitimized before the community through a social purpose, from which its protection derives. Thus, in his doctrine, property is not merely endowed with a social function, but is itself a social function. (Conceição & Ganhadeiro, 2023)

According to Siqueira, Wolkmer and Pierdoná (2015),



Professor of Public Law at the University of Bordeaux, Duguit was a colleague of Durkheim, by whom he was deeply influenced, especially by the vision of a functionalized society based on social solidarity, and by the proposal of an experimentalist sociology. On the other hand, the jurist projected Comte's scientific-epistemological proposal onto law, sponsoring a clash with legal conceptions that he considered metaphysical, that is, that were based outside social reality. In this sense, he fought abstractions such as the subjective-natural right of men and the conception of the State as a sovereign entity, distinct from and independent of the collectivity to which he refers (pp. 404-405).

Duguit's theory is often misunderstood, for his thinking on property cannot be isolated from his general conception of law and the influences it received. His defense of a positive science of law, distinct from the legal positivism he criticized, and of social solidarity, as opposed to the rights inherent to the individual, does not weaken private property, but strengthens it. The rights-duties, when observed, promote the collective defense of what enriches society without ceasing to be private. Thus, the fight against natural law and innate rights does not support criticism of proprietary individualism, as was attempted in the Brazilian civil doctrine, nor does it point to an egalitarian society, after all, for Duguit, men are not equal, and the differences are so evident that they are not even worth the effort of searching for their origin. (Peghini & Meyer-Pflug, 2018)

#### **4 THE INTELLECTUAL PROPERTY PROTECTION SYSTEM AND TECHNOLOGICAL ADVANCES**

The TRIPS Agreement, or Agreement on Trade-Related Aspects of Intellectual Property Rights, is a crucial international treaty for Brazil, incorporated by legislation through Decree 1,335/1994 and directly influenced the creation of national laws, such as the Industrial Property Law (9279/96) and the Copyright Law (9,610/98), in addition to those on computer programs (9,609/98) and plant varieties (9,445/97) (Clark & Pimenta, 2010).

The development and approval of this agreement in Brazil were closely monitored by the U.S. ambassador at the time. In addition, researcher Daniela Alves Brandão (2003) studied how TRIPs became part of the World Trade Organization (WTO) system, systematizing the evolution of intellectual property protection at the international level (Clark & Pimenta, 2010).

Before the creation of the WTO, the global intellectual property system was fragmented. It was made up of a variety of components, such as each country's



intellectual property laws, agreements such as the Paris Convention and the Berne Convention, regional treaties, and the work of organizations such as WIPO. In addition, the system was influenced by court decisions and international negotiation practices (Pimentel, 1998).

The issue of intellectual property and its impact on development is a reflection of globalization, affecting both developing countries, especially in Latin America and Africa, and developed countries. Developing countries are in a disadvantaged position, as they do not have the same conditions as rich countries, nor high investment in Research and Development, and face difficulties in implementing and enforcing high protection laws (Adolfo & Tesche, 2011).

## **5 THE ROLE OF THE STATE AS A FOSTERER OF INNOVATION: PUBLIC POLICIES AND THE STRATEGIC PERFORMANCE OF THE NATIONAL INSTITUTE OF INDUSTRIAL PROPERTY (INPI)**

The Federal Constitution of Brazil lists continuous national development, in its economic, social and technological dimensions, as a fundamental objective of the Republic (art. 3, II). Thus, it guides the actions of public policy makers, who must prioritize, among other purposes, this development (Monteiro, 2022).

According to Monteiro (2014), when defining its role in the economy, whether as a direct agent or promoter of public policies, the State must balance individual freedom to accumulate wealth and private gains with the need to promote the collective and social good.

The potential for technological innovation in a society does not arise spontaneously or disorderly. Innovations, creations with economic significance, depend on institutional arrangements forged by public policies and well-conceived, structured and continuously improved public-private contracts. This requires an integrated public policy framework, with instruments operated in a concatenated manner for real effectiveness. (Medeiros & Pelaez, 2021)

The economic policy aimed at generating innovations makes sense by positioning innovation as a central variable in economic development. This view has gained strength in recent decades, not only in academic debates, but also in public policies applied in Brazil and around the world. Increasingly, economic policymakers recognize the role of



innovation in economic performance and as a solution to challenges in various sectors.(Adam, 2022)

Science and Technology policies in Brazil emerged from the 1950s onwards, with the creation of development institutions such as CAPES (1951), CNPq (1951), BNDES (1952), FUNTEC (1963) and FINEP (1967). These entities shaped the Brazilian innovation model, still in force, in which the State acts as the main promoter and financier of S&T in the country.(Souza, 2013)

Kaufmann and Tödting (2001), as cited in Brick and Porto (2020), state that the interaction between different actors of social systems exerts a positive influence on innovation systems. This dynamic, especially between scientific sectors, such as universities, and the market, such as companies, increases the chances of more relevant and disruptive innovations. Interactions within the same system, such as between companies, tend to generate incremental innovations, with a smaller scope.

According to Martins (2018), the role of the State as a promoter of innovation transcends the mere correction of "market failures", positioning itself as a proactive, entrepreneurial agent capable of taking risks to create articulated systems that benefit the private sector and the national interest. In the Brazilian context, this strategic action is manifested through public policies and the articulation between development and regulatory institutions, such as EMBRAPA and the INPI.

For Thiebaut, Azevedo, and Rios (2024), the technological and innovative development of the most advanced countries was characterized by the direct or indirect influence of the State, which directed the path to follow. As a result, solid educational foundations, improvements in economic and social indices, and robust research and development models have been established.

Thus,

In order to achieve such effectiveness, public policies for science and technology must become mechanisms to stimulate areas related to innovation, aiming at success in promoting national development. In fact, the mechanisms for stimulating innovative activities become very relevant for understanding the innovation process in an SNI. Such public incentive policies are strategic in the sense of achieving success in actions to impel the productive sectors to make decisions to invest and consequently innovate in an environment of uncertainty about the results to be achieved (Thiebaut, Azevedo & Rios, 2024, p. 164).



In Brazil, the issues of science, technology and innovation have recently come to be treated as State priorities. Public policies in this field are implemented mainly by the Legislative and Executive Branches, through laws and programs (Thiebaut, Azevedo & Rios, 2024).

With the objective of creating an efficient body, focused on the quality of public service and partnerships with companies, the National Institute of Industrial Property (INPI) was established in 1976, by Decree-Law No. 632. This agency aims to support the competitiveness of Brazilian companies through innovative activities (Silva L. C., 2015)

According to Monteiro (2022):

[...] the INPI responsible for granting registrations of the modalities of Industrial Property rights, such as patents (invention and utility models), trademarks, industrial designs, geographical indications, and also for the registration of technology transfer contracts.

As a result of the public policy implemented in the 60s and 70s, in which Brazil made investments aimed at the creation of a technological and scientific structure, it was in 1970, through the enactment of Law No. 5,648, of 12.11.1970, that the National Institute of Industrial Property (INPI) was created (pp.50-51).

Since its creation, the BPTO has been part of the indirect Federal Public Administration as a federal autarchy, linked to the Ministry of Industry and Commerce, with headquarters and jurisdiction in the Federal District (Monteiro, 2022), being the body responsible for all procedures for requesting, granting and administering industrial property rights in the national territory. (Souza, 2013)

The BPTO maintains an interventionist position, imposing prohibitions and restrictions on agreements between private parties, in addition to stipulating prices and terms for technology transfer agreements. Exercising its police power, based on normative power, as in Normative Instruction No. 16/2013, it demonstrates that this power is not exclusive to regulatory agencies. It stems from the administrative activity of the state entity, which encompasses normative, conflict resolution, investigative, fomenting and inspection powers, as assigned by the legislator to various public bodies, regardless of their formal independence (Monteiro, 2014).

Thus,

With regard to the intellectual property policies promoted by the BPTO, it is possible to describe their rationality through the approach of innovation systems – an intellectual property system guarantees legal certainty for investors, allowing



high-risk R&D investments to be made, which often would not be carried out without the mechanism proposed by these policies. (Adam, 2022, p. 58)

It is worth noting that the patent policy and other actions of the BPTO are also based on the correction of market failures. Through the control of intellectual property and the granting of temporary monopolies on innovations, the State mitigates the character of innovation as a public good, allowing its adequate appropriation by private agents. (Adam, 2022)

According to Guimarães (2013), Law No. 10,973/2004, the Innovation Law, boosted the training activities in intellectual property (IP) promoted by the BPTO from that year on. By instituting incentives for innovation and research in the productive environment, regulating the transfer of knowledge from the public to the private sector, and requiring Scientific and Technological Institutions (ICTs) to maintain Technological Innovation Centers (NITs) to manage their IP, it has become essential to train technology managers and technicians from NITs with adequate knowledge.

For Czelusniak & Ribeiro (2016), despite some measures implemented, Brazil still needs additional actions to consolidate an effective National Innovation System. In this context, creating a favorable environment for the development of innovations determines whether the country will position itself as a truly innovative nation.

## **6 NEW TECHNOLOGIES AND CHALLENGES TO THE PROTECTION OF COPYRIGHT AND INDUSTRIAL PROPERTY**

With the advancement of technology, the management of intellectual property has been transformed. In a digital world, the need for more effective systems to protect authors' rights and ensure the ethical use of their creations is increasing. Innovative tools emerge as promising solutions, with a significant impact on the protection and use of intellectual property. (Falangola & Santos, 2025)

Intellectual property is seen as an engine for innovation, as it stimulates human creativity. Despite being a controversial topic, it is a fundamental pillar in modern society, as it determines the ownership of assets that are essential for the economy and development of a country (Buainain, 2018).

Intellectual property is often violated when innovative products are launched on the market. This can lead to misuse of the trademark, harming the *Branding* and product



growth. To protect their creation, the owner must use tools such as patents and trademark registrations. (Oliveira & Azevedo, 2024)

In the digital age, the instant sharing of content has driven online piracy, which harms the creative industry and authors' rights. The difficulty of monitoring the distribution of works on the internet challenges the effectiveness of traditional copyright laws. Despite this, the digital environment also presents new opportunities. Strategies are being used to protect and monetize content, such as partnerships with digital platforms, the use of digital rights management technologies, and educating the population about the importance of copyright. (Guimarães & Disconzi, 2024)

Copyright is a legal tool that protects content creators and the way their works are reproduced and distributed. It is considered a form of property right, ensuring that the author has his own thing. The term *Copyright* It is a type of copyright protection legislation, while intellectual property is a broader concept, which includes copyright and industrial property rights. (Gonçalves, 2020)

Hardware and software are the fundamental terms of computing, the former being the physical part of the machine and the latter being the codes that instruct it. At the international level, there is an effort to standardize legislation on the subject, but the protection of foreign creations often depends on reciprocity. This principle, the basis of international law, means that one country only protects the creations of another if the second does the same. This reciprocity is addressed in agreements such as the Berne Convention, the Paris Convention and TRIP's, which involve the member countries of the World Trade Organization (Bail & Wechinewsky, 2021).

The registration of the source code serves to formalize the authorship of a software, preventing other people from using its algorithmic solutions. The source code is the functional structure of the program, a sequence of symbols and words that the hardware interprets. Patents, on the other hand, are a type of monopoly granted by the State to the inventor for a limited time. In exchange for publicly revealing the technology, the inventor is given the exclusive right to exploit it. Unlike registration, a patent is granted because it is considered that the invention is truly innovative in its field (Bail & Wechinewsky, 2021).

O *Blockchain*, a decentralized registry technology, has been explored as a tool to modernize intellectual property management, although it is better known and used in the financial and healthcare sectors, its potential in the industrial context is still little explored.



Technology offers the opportunity to create safer and more effective systems, and its applications can bring great benefits to the protection and use of intellectual property.(Falangola & Santos, 2025)

In this context, as previously stated, the concept of intellectual property is based on the idea that creative and intellectual effort must be protected by law and this protection allows creators to be financially rewarded and socially recognized for their works. Within this area, copyright is fundamental, as it guarantees specific protection for literary, artistic, and scientific creations (Guimarães & Disconzi, 2024).

The State protects the producer of knowledge through specific legal instruments, granted by the BPTO when they meet patentability or registrability requirements. The scope of intellectual property encompasses strategic aspects such as technological innovation, reputational capital, tacit and codified knowledge, strategic alliances, open innovation, internationalization, research, technological prospecting and technology transfer, culminating in the production, expansion and diffusion of intellectual capital.(Santos, 2024)

According to Calvo Caravaca and Carrascosa González (2001) cited in Sáenz de Jubera Higuero (2001), legal conflicts in the virtual environment do not represent entirely new problems, but rather classic issues presented in a new technological guise; point out complex challenges that the digital space imposes on Private International Law, focusing on the definition of judicial competences and applicable legislation. They argue that disputes on the network should be resolved by adapting traditional norms rather than creating entirely new laws, prioritizing more flexible and less territorial criteria.

We can observe international electronic commerce, recently regulated by Directive 2000/31/EC, of June 8, of the European Parliament and the Council, whose incorporation into the legal system is the objective of the draft law on information society services and electronic commerce of April 30, 2001. In the field of international jurisdiction, there is Regulation (EC) 44/2001 of 22 December 2000 on jurisdiction and the recognition and enforcement of judicial resolutions in civil and commercial matters and, to a lesser extent, the Brussels Convention of 27 September 1968, the Lugano Convention of 16 September 1988 and the Spanish LOPJ (Sáenz de Jubera Higuero, 2001).

According to the Inter-American Juridical Committee (2022), the Budapest Convention represents a milestone in the fight against cybercrime, but its application is restricted, as it does not regulate state cyberoperations. This limitation demonstrates that



existing international norms, while fundamental, were not designed for the complexities of government-led offensive or defensive operations in cyberspace.

## 7 OVERVIEW OF NEW TECHNOLOGIES IN LATIN AMERICA

Before informational modernity, with visual technologies, industrial modernity transformed everyday life and diversified museums as representative cultural spaces. Today, megaprojects such as Guggenheim Bilbao, Museum of Tomorrow and Centre Pompidou seek tourism and economic regeneration via impactful architecture and public/private investments. (Guimarães S. , 2021)

Despite this,

[...] technology and the revolution achieved, from the last decades of the twentieth century, in the field of information, through the Internet and the social networks generated by it, can already be considered certain stimuli of the growing demand for expression of the most diverse sociocultural groups, and for reflection and action on themes and issues that are sometimes intertwined, such as: the political-economic crisis (with alternatives to the global financial crisis), the environmental issue (with the need to save energy and reuse natural resources through the idea of sustainability), human rights (with the maintenance of the guarantee of protection of human life without distinction in times of growing intolerance), sociocultural diversity (with the recognition and appreciation of the most distinct groups and ethnicities), freedom of expression (with awareness regarding equal rights for gender and age differences, sexual and religious diversity), universal accessibility (with attention to people with special needs), preservation of historical representations (with the valorization of expressions and fragments legacies from the past and subject to safeguarding as aids in the recognition of identities and great human expressiveness), the sharing of ideas and actions (with the entanglement allowed by new communication technologies above all), among other emergencies. Obviously, there are already many spaces built or under construction linked to such themes and issues that are quite representative of contemporaneity at the beginning of the twenty-first century (Guimarães, 2021, p. 22).

Technology presents an essential duality: on the one hand, the operator; on the other, the object, both, however, are human beings. Technical action, therefore, is configured as an exercise of power. Society is organized around this technology, whose power becomes the main source of social domination. This is evident in the designs of technological equipment, which restrict the range of interests and concerns that can be represented in the "normal" functioning of technology and the institutions that depend on it. (Feenberg, 2010)



In this sense, the Science, Technology and Society (CTS or CTSA) approach adopts innovative strategies in Science Education, aiming to improve citizenship education and offer a more balanced view of science and technology. Its pillars: the development of critical thinking and training for decision-making, seek to foster a more democratic society. In it, citizens can position themselves in an informed way in the face of scientific-technological advances, especially those who directly bear the consequences of uncontrolled techno-scientific development.(Rodríguez & Pino, 2017)

To conquer the competitive international market, European transnational corporations expanded to several countries, spreading the linear model of innovation. International institutions such as the OECD and UNESCO assisted in the implementation of this European model in nations such as those in Latin America (Silva, 2015).

However,

[...] during the 60s and 70s, a Latin American STS thought emerged (nicknamed by Dagnino, Thomas and David as PLACTS) that questioned the relations between science, technology and society. It would have developed from the criticism of the linear model of innovation, from the assumptions involving science and technology policy in Latin American countries at the time and from the model of society that was intended to be built (Silva, 2015, p. 21).

Guimarães (2021) points out that initially, the progressive belief in the beneficial effects of "machinic ascension" prevailed throughout society. After decades, however, skepticism arose about its connection with wars and the market. In the meantime, expository cultural spatialities promoted expression and representation as tools for reflection and dialogue with a more open daily life, marked by the visible coexistence of human cultural diversity, finally recognized by the intelligentsia in search of modern renewal.

The relevance of the activity in science and technology in national employment is reflected in the proportion of scientists and technologists in the economically active population. The disparity between Latin America and the U.S. is striking: more than 7 per thousand in the U.S., compared to 0.7 per thousand (ten times less) in the Latin American region.(Vaccarezza, 2011)

Vaccarezza (2011) explains that:

A characteristic feature of scientific research in Latin America is its great dependence on the State. In fact, both for what refers to funding and for those who



carry out research, the State contributes more than 70% of the effort. This is contrary to what is observed in developed countries: for example, in the USA, the origin of funding and the management of scientific and technological activities is the responsibility of private companies in more than third parties. If the government finances a third term, it is estimated to have less than 10% of R+D. Similar values —although somewhat lower— are observed in Canada and even in Spain, which in many respects share with Latin America a weak tradition in scientific and technological policy (p. 43).

For Vaccarezza (2011), in the strictly technological sphere, patent statistics reveal North-South disparities similar to those of R&D: the USA registers about 200 thousand annual applications, while Spain and Canada add up to more than 50 thousand and 40 thousand, respectively. In Latin America, only Brazil and Mexico have expressive numbers (6 to 10 thousand per year, with strong annual variations), even though they are markedly lower.

## **8 JURISDICTION AND CONFLICT OF LAWS IN CYBERSPACE: THE INEFFECTIVENESS OF NATIONAL BORDERS IN RESOLVING TRANSNATIONAL DISPUTES**

With the emergence of cyberculture, marked by disruption, convergence and digitalization, new social patterns of values and behaviors have expanded. From this process, cyberspace was emancipated: a dynamic forum for individual interaction that, due to its technological richness, impacted almost all aspects of social life in an unprecedented way.(Sombra, 2019)

Digital constitutionalism seeks to respond to the growing interaction between fundamental rights and technological advances, and may be restricted to the regulation of cyberspace or expand to promote institutional missions linked to national scientific-technological development. However, when trying to adapt traditional legal concepts to the digital context, inconsistencies emerge that question the effectiveness of classical paradigms, requiring the formulation of new ones (Silva, 2025).

For Squadri (2022):

Although there is still no consensus regarding the form of organization of cyberspace, whether it would be public or private, it is not possible to say that the notions of territoriality and State have been completely relegated. Instead, the element of territory still prevails for the notion of State, and there is no space appropriated by humanity that does not belong to an organized nation, with very rare exceptions. However, it cannot be ignored that new types of relationship in



the digital globalized era are being formed, and that classic theories no longer respond to the current reality (p. 7).

In cyberspace law, the norms to regulate interpersonal conflicts would emerge from the convergence of wills of national states. Thus, an international body, with state participation, similar to the UN and the OAS, would approve declarations, treaties, pacts and conventions through the traditional mechanisms of these bodies.(Fachin, 2021)

Cyberspace can be considered as a global environment that transcends real-life territorial boundaries. It is not a physical territory, but a constant flow of information via networks, where virtual location creates the idea of territory. Their crimes have a transnational character, reaching multiple countries simultaneously, requiring a new analysis of the application of criminal law in cyberspace.(Teixeira, 2024)

The liberal conception argues that the cyberspace law is superior to the state law, as it prioritizes individual freedom and offers solutions that are more pertinent to the digital environment. Therefore, it is argued that the State limits its own sovereignty and the application of internal laws in cyberspace (Carvalho, 2018).

According to Guerreiro (1999), in cyberspace, self-regulation must prevail, anchored in the autonomy of the will in international contracts. By autonomy in private international law, the parties choose the applicable law, respecting coercive and police rules. Material autonomy excludes imperative norms, without violating public order.

The Inter-American Convention (1994, art. 7) legitimizes express or evident choices. Alternative solutions include arbitration and mediation via WIPO, with neutrality and linguistic flexibility (art. 40). The UNCITRAL Model Law (arts. 6-7) equates data messages with reliable writings and signatures, complementing agreements (Guerreiro, 1999).

## **9 LEGAL STRATEGIES AND REGULATIONS IN THE DIGITAL CONTEXT**

The digital age democratizes access to information and culture, however, it creates challenges for copyright protection, with online piracy as a major concern, weakening the creative industry and the effectiveness of traditional copyright laws. However, this new reality also opens up opportunities, and thus strategies are created to protect and monetize content on the internet through partnerships with digital platforms, the use of rights management technologies, and public education (Guimarães & Disconzi, 2024).



Since the Berne Convention, the protection of intellectual rights has been framed by the economic development interests of nations. The current system seeks to avoid conflicts, with the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights) strengthening and complementing the work of the World Intellectual Property Organization (WIPO), ensuring an interpretation that evolves over time (Pineiro, 2018).

For Santiago (2021), the growing violation of privacy in modern society requires the State to regulate technology to protect individual rights, however, this regulation must consider that technological advances are crucial for social and economic development.

In this context, the globalized and technological market requires "global lawyers", that is, professionals with skills that go beyond traditional law, legal professionals who need to master computer science, digital marketing, strategic planning and other languages, need to have a global and local market vision, be entrepreneurs, act digitally and be able to manage risks, acting in the prevention and resolution of conflicts through mediation, conciliation and arbitration (Viana, 2021).

Thus, in order to produce knowledge about property, it is necessary to recognize that law is a temporal and local phenomenon, and its history cannot be used only to justify current legislation, because law is directly linked to the social and economic contexts of each era and, therefore, needs to be in constant adaptation to remain relevant and connected to the reality of society (Ribeiro & Neto, 2016).

It is known that companies, more precisely small and medium-sized enterprises, often prefer to use technical methods rather than legal means to protect their intellectual property, such as software protection, which can include digital authentication, encryption, access control, systems auditing, and segregation of duties. Companies that create products to order control access and use encryption, but regardless of legal protection, these technical methods have become crucial to competitive strategy in the software industry, for example (Tigre & Marques, 2009).

The protection of intellectual property aims to balance the incentive and innovation with social, cultural and technological development, finding a balance between copyright protection and freedom of expression and access to knowledge, in the digital age, so it is essential that legislation continuously adapts to reflect new ways of creating and consuming content, meeting the interests of all those involved (Guimarães & Disconzi, Copyright in the Digital Age, 2024).



Pinheiro (2018) recalls that the development of comparative law in Latin America was complex and unique, framed by its history of exploration, with the lack of pre-existing legal structures, adapted to local needs, creating significant challenges, as well as as consequently, the legislative development of the region was strongly influenced by French Enlightenment thought and the ideals of the North American independence movement. Despite the discussions, intellectual property defines the ownership of goods that are becoming increasingly essential in the modern economy, strategic assets for the production of wealth and for the development of society in general (Buainain & Souza, 2018).

## **10 TECHNOLOGY AS A TOOL FOR PROTECTION: AN IN-DEPTH LOOK AT BLOCKCHAIN, DIGITAL WATERMARKS, AND RIGHTS MANAGEMENT SYSTEMS (DRM)**

With the rapid growth of the Internet, networked systems are playing a vital role in modern society, bringing enormous benefits but also significant risks to users. On a daily basis, individuals and organizations create new threats that attack and compromise computer systems. As reported by the Center for the Study, Response and Treatment of Security Incidents in Brazil.(Silva et al., 2018)

According to Santos & Urrutigaray (2012), innovation has occupied a growing space in the Brazilian national agenda since the 1990s, with effective state policies in the academic development of science and technology. In public security, the 1988 Constitution broke with the repressive police model of the military dictatorship, promoting agents focused on human rights. New technologies play a crucial role in the construction of this renewed contemporary reality.

Seleiro (2020) explains that the application of *blockchain* in digital identities is already consolidated: giants such as IBM, Microsoft, and Deloitte, as well as governments in Estonia and India, invest in and use this technology. In Brazil, private technology and information security institutions offer the service, while discussions on the standardization of self-sovereign digital identity advance.

Rodotá (2008), as cited in Costa and Kremer (2022), points out that:

[...] Digital technologies have reshaped the senses of privacy in contemporary society. The expressive use of ICT is accompanied by market justifications of increased safety, practicality and comfort for consumers and also of public interest,



due to the possibility of improvements in the provision of public services, even as an attempt to increase and maintain public safety. The events that occurred on September 11, 2001 in the United States are a recent historical moment that marked the need for increased surveillance at a global level, leading to the massive control of personal data and the implementation of accurate facial recognition technologies in cameras on public roads and airport systems, for example. Thus, constant surveillance through digital technologies has been shown to be a trend worldwide (p. 148).

Vieira (2021) says that technology does not determine society, nor does it dictate the course of technological transformations. Many factors intervene in this process, such as creativity and entrepreneurial initiative, influencing scientific discovery, technological innovation, and their social applications.

In modern organizations, where information circulates quickly and is invaluable, numerous security attacks are common. External and internal actors often seek to capture data to which they do not have legitimate access. (Silva et al., 2018)

The protection of the fundamental rights of the human person begins, essentially, with the safeguarding of life. The new technologies put at the service of human dignity in the field of public security offer, in conflict situations, the possibility of opting for instruments that are less harmful than firearms. (Santos & Urrutigaray, 2012)

With the arrangement of technologies, it has become feasible to collect, record, process, cross-check and transmit information intensively and unlimitedly. This dynamic, in which the combination of data generates new informational elements, makes it possible to obtain privileged information about individuals, capable of guiding political, economic and social decisions of both public agencies and private entities. (Seleiro, 2020)

## **11 BEYOND THE COURTS: MEDIATION AND ARBITRATION AS MECHANISMS FOR RESOLVING INTELLECTUAL PROPERTY CONFLICTS IN THE DIGITAL SPHERE**

With the growing influence of technology, digital platforms face several legal challenges, so issues such as privacy, copyright, unfair competition, and liability for user content are at the center of legal disputes, as well as freedom of expression and consumer protection also become topics of debate as these platforms become more present. (Maciel, 2023)

The internet is a data network that transcends borders, being an environment where the confidentiality, integrity, and authenticity of data can be violated. The virtual environment also facilitates the violation of intellectual property, such as copyright and



industrial secrecy. Online threats, which often enhance those in the physical world, include the ease of storing and multiplying intellectual works such as music, text, and videos with the use of a personal computer.(Álvares, 2015)

Trademark registration allows you to protect names, symbols, and logos of products or companies, avoiding misuse and unfair competition. This protection also extends to the shape of the product, its packaging and ergonomics. These intellectual property protection mechanisms are crucial and need to be more widely disseminated and used. By doing so, it is possible to combat plagiarism, misuse, and unfair competition, valuing innovations that benefit society as a whole.(Oliveira & Azevedo, 2024)

Organizations are constantly facing the risk of data breaches and cyberattacks, and it is necessary to have a well-structured and repeatable incident response plan for protection. Technology, despite facilitating the processing of information, brings with it risks such as hacking and confidentiality issues with online systems particularly exposed to threats (Machado, et al., 2022).

In the current scenario, digital threats to intellectual property are a significant concern for the economy and growth of countries, so the search for methods to mitigate these risks has become a key research area for experts around the world. For Buainain & Souza (2018), intellectual property defines the ownership of assets that assume increasing importance as a form of wealth in today's society, and that are strategic for the organization and control of social production and for development in general.(Machado et al., 2022)

Intellectual property is linked to human creativity and can be compared to civil property law. A creation can be used for the individual benefit of the owner, who has the right to exploit its economic value. In a competitive market where innovation is highly valued, industrial property law stands out for offering the essential tools to protect innovations, knowledge and distinctive signs. Digital security will always be necessary, and institutions must increasingly invest in science, technology, and innovation to keep institutional intellectual property safe and secure.(Oliveira & Azevedo, 2024) (Machado et al., 2022)

The protection of intellectual property is in constant conflict between legislation and technology. While technological advances make it easier to copy works, the law adapts to try to keep up with this reality. To balance the interests of authors and society, the legislation establishes exceptions and restrictions, such as the concept of fair use and



the temporal limitation of exclusive rights. An example of this is the American tradition of restricting rights to the first sale only. (Simon, 2000)

Borges (2008) explains that the protection of intellectual property is guaranteed by international conventions, such as the Paris Convention, the protection of industrial property, the Bern Convention on the protection of literary and artistic works; protection of performers, phonogram producers and broadcasters and the TRIPS agreement. In the European Union, specific directives regulate software, databases, and copyright. Despite this, the application and incorporation of these rules into the laws of each country still present significant differences.

In today's economy, intellectual property has become a way to generate capital from knowledge and its application. As Smith and Parr (2019) cited in Oliveira & Azevedo (2024) observe, intangible assets such as trademarks, patents, and copyrights have a higher value than the physical equity of companies, reflecting a change in the nature of the economy, where valuation is more centered on knowledge, experience, and learning capacity than on physical capital. (Oliveira & Azevedo, 2024)

## 12 FINAL THOUGHTS

The present study aimed to analyze the complex and dynamic relationship between intellectual property law and the challenges posed by new technologies in a globalized digital environment.

The bibliographic research, with a qualitative approach, deepened the understanding of the historical evolution of the concept of property, the contemporary relevance of intellectual property and the legal and technological strategies adopted for its protection. The integrated analysis of scientific articles, books, legislation and jurisprudence provided a comprehensive and critical view on the subject, revealing the need for constant legislative adaptations to ensure safety and justice for creators in the digital age.

The concept of property, previously focused on the possession of material goods and the abstract figure of the individual, has undergone a profound transformation; as pointed out, from the twentieth century onwards, with the influence of thinkers such as Leon Duguit and the emergence of constitutions such as the Weimar constitution (1919), property incorporated the idea of social function.



This principle was consolidated in the Federal Constitution of 1988, in Brazil, shifting the focus from patrimonialist individualism to the dignity of the human person, with property no longer as an absolute right, but a responsibility, exercised in

benefit of the community, social solidarity and respect for the environment. This evolution is essential to understand the new concept of ownership in the information age, where value is concentrated in intangible assets such as knowledge, experience, and innovation.

Intellectual property, in this new context, emerges as a way to generate capital from creations of the human mind. According to WIPO, it covers a wide range of rights, ranging from literary and artistic works to inventions, trademarks and designs. Its protection, which dates back to historical practices such as the use of signatures and watermarks, has gained more formal and complex contours.

The Statute of Anne (1710) in Great Britain is considered a milestone in copyright law, serving as the basis for the modern system of protection. Intellectual property regulation is vital to encourage investment in research and development, allowing creators and businesses to recoup their investments and make profits. Legal protection, therefore, is not only a matter of justice, but an engine for economic and social progress.

However, the digital age has brought unprecedented challenges. The same technologies that facilitate the creation and distribution of works also enhance piracy and the misuse of protected material. Online piracy, in particular, weakens the creative industry and challenges the effectiveness of traditional copyright laws. The instant sharing of content and the difficulty of monitoring the distribution of works on the internet require new approaches. In this scenario, the study highlighted strategies such as partnerships with digital platforms, the use of digital rights management (DRM) technologies, and public education as essential tools.

The legal protection of intellectual property, in turn, has adapted to this new reality. The TRIPs agreement is one of the main examples of international regulation that seeks to harmonize national laws and strengthen the global system.

This agreement outlined the basis for important laws in Brazil, such as the Industrial Property Law (9279/96) and the Copyright Law (9.610/98), in addition to international treaties, legal tools such as patents, which guarantee a monopoly for a limited time to an innovative invention, and software registration, which formalizes the



authorship of the source code, are essential for the protection of innovations and creations.

In addition to traditional legal tools, new technologies also offer solutions, such as blockchain technology, for example, which has been explored as a promising tool to modernize intellectual property management, offering more secure and decentralized registration systems.

However, it is critical for institutions to invest in science, technology, and innovation to protect intellectual property effectively. Cybersecurity and privacy protection are extremely relevant principles, especially when dealing with the collection and indiscriminate use of personal data by digital platforms; Creating clear rules to protect personal information and ensure control over it is an urgent need.

The development of intellectual property protection in developing countries, such as those in Latin America and Africa, faces additional challenges. The lack of investment in R&D and the difficulty of implementing and enforcing high-protection laws put these countries in a position of fragility. The history of exploitation and the absence of legal structures adapted to local needs have complicated legislative development in the region.

The study reinforces that law is not a static phenomenon, but a temporal and local phenomenon, which needs to adapt to social and economic contexts. To produce relevant knowledge about intellectual property, it is necessary to recognize its evolution and its connection with the realities of each era.

The protection of intellectual property must seek a balance between encouraging innovation and social, cultural and technological development. Legislation must continuously adapt to reflect new ways of creating and consuming content, ensuring the protection of creators' rights in a globalized digital environment, without, however, restricting access to information and technological progress.

The search for effective solutions and the need for legislative updates continue to be a crucial debate for the future of society. The training of legal professionals with interdisciplinary skills in technology and management is increasingly necessary to face the complex challenges of this new scenario.

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