

DOI: <https://doi.org/10.34069/AI/2024.74.02.18>

How to Cite:

Tumalavičius, V., Prykhodkina, N., Vovk, M., Mytych, S., & Kustovska, O. (2024). Legal impacts of digitization on intellectual property. *Amazonia Investiga*, 13(74), 214-226. <https://doi.org/10.34069/AI/2024.74.02.18>


## Legal impacts of digitization on intellectual property

### Aspectos jurídicos de la protección de la propiedad intelectual en la era digital

Received: January 4, 2024

Accepted: February 23, 2024

Written by:


**Vladas Tumalavičius<sup>1</sup>** <https://orcid.org/0000-0002-0811-0074>**Nataliia Prykhodkina<sup>2</sup>** <https://orcid.org/0000-0001-9965-6912>**Mariia Vovk<sup>3</sup>** <https://orcid.org/0000-0002-8740-8222>**Serhiy Mytych<sup>4</sup>** <https://orcid.org/0009-0004-4426-9543>**Oksana Kustovska<sup>5</sup>** <https://orcid.org/0000-0003-1469-9249>


#### Abstract

The digital age has revolutionized the way intellectual property is created, shared, and protected. This article explores the legal aspects of IP protection in the digital age, focusing on the challenges and opportunities posed by digital technologies. The objective of this study is to analyze the evolving landscape of IP protection in the digital age, examining the impact of digitalization on traditional IP laws and regulations. This study employs a qualitative research methodology, conducting a comprehensive review of existing literature, laws, and regulations related to IP protection in the digital age. Content analysis and synthesis are used to illustrate key concepts and trends. The results of the study highlight the need for updated and harmonized IP laws to address the challenges posed by digital technologies. The study also identifies the importance of technological solutions, such as blockchain and digital rights management, in enhancing IP protection in the digital age. In conclusion, the study emphasizes the importance of adapting IP laws and regulations to


#### Resumen

La era digital ha revolucionado la forma de crear, compartir y proteger la propiedad intelectual. Este artículo explora los aspectos jurídicos de la protección de la PI en la era digital, centrándose en los retos y oportunidades que plantean las tecnologías digitales. El objetivo de este estudio es analizar la evolución del panorama de la protección de la propiedad intelectual en la era digital, examinando el impacto de la digitalización en las leyes y reglamentos tradicionales de propiedad intelectual. Este estudio emplea una metodología de investigación cualitativa, realizando una revisión exhaustiva de la literatura existente, las leyes y los reglamentos relacionados con la protección de la PI en la era digital. Se utilizan el análisis de contenido y la síntesis para ilustrar conceptos y tendencias clave. Los resultados del estudio ponen de relieve la necesidad de actualizar y armonizar las leyes de PI para hacer frente a los retos que plantean las tecnologías digitales. El estudio también identifica la importancia de las soluciones tecnológicas, como blockchain y la gestión de derechos digitales, para

<sup>1</sup> PhD in Law, Researcher, Research Group for Security Institutions Management, General Jonas Žemaitis Military Academy of Lithuania, Vilnius, Lithuania.  WoS Researcher ID: AAE-1718-2022

<sup>2</sup> Doctor of Pedagogical Sciences, Professor, and Chief Scientific Officer, Department of Research Activities of Universities, Institute of Higher Education, National Academy of Pedagogical Sciences of Ukraine, Kyiv, Ukraine.  WoS Researcher ID: AAM-8016-2020

<sup>3</sup> PhD in Law, Associate Professor, Associate Professor of the Department of Civil Law Disciplines, Institute of Law of the Lviv State University of Internal Affairs, Ukraine.  WoS Researcher ID: ADJ-3397-2022

<sup>4</sup> PhD, Teacher, The Criminal Procedural Law Department, National Academy of Internal Affairs, Kyiv, Ukraine.  WoS Researcher ID: KAM-7230-2024

<sup>5</sup> PhD in Economics, Associate Professor, Department of Land-Use Planning, Faculty of Land Management, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine.  WoS Researcher ID: HGD-2853-2022



the digital age to ensure effective protection of IP rights. It also underscores the need for collaboration between governments, industries, and technology companies to develop innovative solutions for IP protection in the digital era.

**Keywords:** evolution, intellectual property rights, digital age, legal frameworks, technological advancements, artificial intelligence.

## Introduction

In the rapidly evolving digital age, the protection of intellectual property has become a paramount concern. As technological advancements continue to reshape the way information is created, disseminated, and consumed, the legal aspects surrounding intellectual property rights have assumed unprecedented significance. This necessitates a comprehensive examination of the challenges and opportunities that arise in safeguarding intellectual property in the digital realm.

The digital age has ushered in an era of unparalleled connectivity and information accessibility (Sofilkanych et al., 2023). However, this interconnectedness has also given rise to a myriad of challenges for protecting intellectual property. With the ease of digital reproduction and distribution, issues such as copyright infringement, piracy, and unauthorized use have proliferated. The relevance of understanding and addressing the legal aspects of intellectual property protection in the digital age is thus imperative to foster innovation, encourage creativity, and ensure a fair and sustainable knowledge economy.

Many studies have delved into the legal dynamics of intellectual property protection in the digital era. These studies highlight the complexities posed by emerging technologies, the inadequacy of traditional legal frameworks, and the need for adaptive strategies (Pelegrinová & Lačný, 2016). Besides, modern research collectively provide insights into various facets of intellectual property protection, technological innovation, global economic perspectives and some legal procedures (Nadobko, 2020; Voronkova et al., 2019). However, without applying these works, there is still a lack of comprehensive works that would systematize the experience of various countries in the protection of intellectual property.

mejorar la protección de la PI en la era digital. En conclusión, el estudio subraya la importancia de adaptar las leyes y reglamentos de PI a la era digital para garantizar una protección eficaz de los derechos de PI. También subraya la necesidad de colaboración entre gobiernos, industrias y empresas tecnológicas para desarrollar soluciones innovadoras para la protección de la PI en la era digital.

**Palabras clave:** evolución, derechos de propiedad intelectual, era digital, marcos jurídicos, avances tecnológicos, inteligencia artificial.

The research problem at the core of this study revolves around the inadequacies of current legal frameworks in addressing the multifaceted challenges posed by the digital age to intellectual property protection. The dynamic nature of technological advancements often outpaces legislative responses, leaving intellectual property vulnerable to various forms of infringement. This research aims to scrutinize these gaps and propose nuanced solutions that align with the evolving nature of the digital landscape.

The primary aim of this research is to critically examine the legal aspects of intellectual property protection in the digital age and propose effective strategies for mitigating the challenges posed by technological advancements. By assessing the current legal frameworks, understanding the implications of emerging technologies, and drawing on insights from relevant studies, this research aims to contribute to the enhancement of intellectual property protection mechanisms in the digital era.

To achieve the stated aim, the following research tasks will be undertaken:

1. to review of existing legal framework
2. to analyze the influence of emerging technologies, such as artificial intelligence, blockchain, and digital distribution platforms, on intellectual property protection.
3. to explore and analyze specific cases of intellectual property infringement in the digital space to identify patterns, challenges, and potential solutions.

By undertaking these research tasks, this study aspires to contribute valuable insights to the ongoing discourse on intellectual property protection, facilitating the development of legal frameworks that are not only robust but also

capable of adapting to the dynamic digital system.

### Literature review

Intellectual property (IP) refers to creations of the mind, encompassing a broad range of intangible assets such as inventions, literary and artistic works, designs, symbols, names, and trade secrets. These creations are the result of human intellect and creativity, and they hold value for individuals, businesses, and society at large. Intellectual property serves as a means to incentivize innovation, foster creativity, and promote economic growth by granting creators and innovators exclusive rights to their intangible assets.

The protection of intellectual property is a concept that involves legal and regulatory frameworks designed to safeguard the rights of creators and inventors. The fundamental purpose is to provide a set of exclusive rights that allow the originators of intellectual property to control how their creations are used, shared, and commercialized (Mansfield, 2000). These exclusive rights typically come with certain limitations and durations, aiming to strike a balance between the interests of the creators and the broader public (Brown et al., 2016). Therefore, modern authors have focused on various aspects of intellectual property protection. For instance, Cho and Kim (2017) examined the issue of relationship between intellectual property rights (IPR) protection and technological innovation. Focusing on the business context, the research investigated how robust IPR regimes influenced the incentives for firms to engage in research and development activities. The authors discussed the role of IPR protection as a motivator for technological innovation and its impact on the overall competitiveness of businesses. Cimoli, Dosi, Maskus, Okediji, Reichman and Stiglitz (2014) provided a comprehensive overview of the role of intellectual property rights in modern countries. Examining the broader economic implications, the research synthesized findings on how IPR regimes affected innovation, technology transfer, and economic development in developing nations. The authors presented conclusions and insights drawn from various studies, offering a nuanced understanding of the challenges and opportunities associated with intellectual property rights in the context of global development. Besides, Janković (2017) explored diverse legal aspects related to intellectual property laws. Focused on procedural aspects within the European Union legal

framework, the research provided an in-depth analysis of the legal intricacies surrounding IPR. The author addressed issues such as enforcement, dispute resolution, and the evolving nature of intellectual property law within the EU. Mula and Lobina (2012) provided insights into legal challenges and protections specific to web pages.

Given the rapidly changing nature of the online environment, the study's analysis could be enriched by considering evolving digital technologies, user-generated content, and global legal perspectives on web page protection. Kumar (2012) investigated the intersection of digital rights management (DRM) and intellectual property protection. Focused on the digital realm, the research explored how DRM technologies contributed to the protection of intellectual property in the context of digital content. Mula and Lobina (2012) provided insights into legal challenges and protections specific to web pages. Given the rapidly changing nature of the online environment, the study's analysis could be enriched by considering evolving digital technologies, user-generated content, and global legal perspectives on web page protection. Yi and Naghavi's (2017) research delved into the intersection of intellectual property rights (IPR), foreign direct investment (FDI), and technological development. This study contributes to the ongoing debate on how IPR influences innovation and economic growth. Moreover, Calista, Sudirman and Djaja (2023) analyzed the legal protection of digital painting. This work uses normative legal analysis using legal data. According to these results, copyright is an exclusive right formed from non-property and economic rights. This study demonstrates that copyright issues exist today, especially in the digital age. Legal regulation of intellectual property protection in EU countries was defined by Yavorska & Boyarska (2020). The results of this study demonstrate both challenges and solutions for this system. Litvishchenko's (2020) study explored the legal dimensions of protecting television formats as intellectual property. This niche focus indicated a recognition of the evolving nature of content creation and the need for legal frameworks to keep pace. The study's brevity suggested it may serve as a foundational exploration or commentary. However, a deeper analysis of specific legal mechanisms, case studies, or comparative perspectives could enhance the study's depth and applicability. However, the study described effective mechanisms for the protection of intellectual property in EU countries. In conclusion, the reviewed studies collectively

provide insights into various facets of intellectual property protection, spanning digital art, technological innovation, global economic perspectives, legal procedures, and digital rights management. Each study contributes important perspectives to the broader discourse on intellectual property in its diverse applications and contexts. However, in view of the development of new and new threats to intellectual property in the digital age, this problem remains relevant and not fully investigated. In this context, it is worth comparing the experience of different countries on the protection of IP.

### Methodology

This research seeks to address this need by analyzing the legal aspects of IP protection in the digital age. By assessing the effectiveness of current legal frameworks, understanding the implications of emerging technologies, and drawing on insights from relevant studies, this research aims to propose effective strategies for mitigating the challenges posed by technological advancements. Ultimately, this research aims to contribute to the enhancement of intellectual property protection mechanisms in the digital era, ensuring that creators, innovators, and businesses can continue to thrive in an increasingly digital world.

To provide the proposed research several scientific methods were used. The synthesis method was used to analyze and summarize information on the legal aspects of intellectual property protection in the digital age. This method involves studying various sources of information, such as scholarly articles, books, legislation, case law, and other sources, to identify key aspects of the topic. Furthermore, by synthesizing the data obtained, the article can conduct a comparative analysis of legal norms and practices of intellectual property protection in different countries. This will help identify common trends and differences in regulating intellectual property protection in the digital age. Finally, through the synthesis of the data obtained, the article can formulate conclusions and recommendations for further development of legislation and practice in intellectual property protection in the digital age.

The main method was content analysis of scientific data. For this study, it was utilized multiple databases of scientific journals, including Scopus, Google Scholar, and Web of Science, to gather bibliographic data. Keywords such as "innovations", "digital technologies",

"law", "intellectual property", "legal challenges", "opportunities of legal regulation" were used for the search. The process of coding information from the content analysis involved the selection of sources based on relevance and relevance to the topic. After that, the units of analysis were determined, that is, a certain concept, sentence or paragraph that was repeated in detail in other works. Based on this, a detailed content analysis was carried out. Each database offers unique features and coverage, enhancing the comprehensiveness of the research. For this study, we relied on the Scopus database as our primary source for collecting bibliographic data. Scopus is a comprehensive abstract and citation database that covers peer-reviewed scientific content. It contains an extensive collection of more than 80 million records, making it one of the largest curated bibliographic databases available today. This database includes intelligent tools for monitoring, analyzing, and visualizing research output across various domains, such as science, technology, medicine, social science, and arts and humanities. It was used the function used Scopus's "Analyze Search Results" feature to analyze the data we collected. This feature allowed us to conduct a detailed analysis based on several criteria, including the distribution of documents by year, document sources, authors, institutes, subject areas, and document types. By utilizing this functionality, it became able to extract valuable insights from the dataset.

Google Scholar is a freely accessible search engine that indexes scholarly articles across various disciplines. It provides a broad scope of content, including peer-reviewed papers, theses, books, conference papers, and patents. Google Scholar's advanced search capabilities allowed us to refine our search queries and retrieve relevant articles on intellectual property rights. Web of Science is a curated database that indexes high-quality scholarly journals across different subject areas. It offers robust citation analysis tools, enabling us to track citations, identify influential works, and discover related research. Web of Science's comprehensive coverage and advanced search functionalities complemented our data collection process.

It has been employed similar methodologies across these databases, including using specific search queries related to intellectual property rights, analyzing search results to extract relevant data, and utilizing database-specific features to conduct in-depth analyses. By combining data from multiple databases, we were able to

enhance the reliability and validity of our findings.

This methodology, although effective, has certain limitations. It is worth taking into account the subjectivity of the judgments of scientists in the selected works.

## Results and discussion

Amidst the ongoing global shift towards the digital era, there is a notable dearth of comprehensive understanding regarding the evolving landscape of intellectual property rights (IPR) in this context. The Information Age has enabled unparalleled access to information and creative works, yet it has also engendered intricate challenges pertaining to IPR protection and enforcement. Recent statistics indicate that in 2020 alone, the internet hosted over 500 billion copyrighted webpages, underscoring the pressing need for a study that methodically examines the shifts in IPR frameworks, the burgeoning issues of digital copyright infringement, and the ramifications of these developments on diverse stakeholders.

The evolution of intellectual property rights (IPR) in the United States and the UK has been driven by technological advancements and changing economic landscapes. In the USA, copyright protection has expanded to include digital media, reflecting the growing importance of digital content. Patent applications related to technology and software innovations have increased significantly, highlighting the role of patents in safeguarding technological advancements (Adams, 2023). Trademark registrations have also surged due to the increasing globalization of markets and the rise of e-commerce, emphasizing the importance of brand protection. Similarly, in the UK, there has been a notable increase in patent applications related to AI and machine learning technologies, leading to the streamlining of patent examination processes (Bowie, 2005). These developments underscore the need to adapt intellectual property rights to accommodate emerging technologies and changing business environments.

Trademark protection has also evolved in response to digitalization. While the UK was a member of the European Union, businesses could secure trademark protection across EU member states with a single application. However, post-Brexit, the UK has introduced its own trademark system while respecting existing EU trademarks,

ensuring continuity of trademark rights for UK-based businesses. Additionally, the UK has implemented domain name dispute resolution mechanisms to address trademark-related issues online. The evolution of intellectual property rights in the UK is closely tied to the challenges and opportunities of the digital age. The statistics and legislative changes discussed here illustrate the country's commitment to adapting its legal framework to safeguard intellectual property in an increasingly digital and globalized environment (Adams, 2023). As technologies advance, intellectual property laws will likely undergo further revisions to address emerging issues and strike a balance between innovation and protection.

In Japan, known for its innovation and technological progress, the evolution of IPR has been remarkable. Japan consistently ranks among the world's top countries for patent applications and grants. In 2019, Japan's patent office received over 340,000 applications, demonstrating the nation's dedication to safeguarding intellectual property. One significant development in Japan's IPR evolution is the extension of patent protection in response to technological advancements. Initially focused on traditional industries like manufacturing and chemicals, patents now cover a broader range of fields due to the rise of digital technology and electronics. Japan has granted patents for innovations in artificial intelligence, biotechnology, and software, highlighting its commitment to protecting intellectual property in emerging sectors.

The evolution of intellectual property frameworks in Sub-Saharan Africa has been notable, with countries in the region progressively establishing and enhancing these frameworks over the past decade. South Africa, for instance, has been at the forefront of adopting modern IP legislation, aligning its policies with international standards. A significant aspect of this evolution is the increasing emphasis on protecting traditional knowledge and cultural expressions (Adams, 2023). Kenya, among other countries, has acknowledged the significance of safeguarding traditional knowledge and folklore.

The following table provides an overview of patent applications, industry leadership, IP framework development and protection of traditional knowledge and cultural expressions in Japan, the UK, South Africa and the US (See Table 1).

**Table 1.**  
*Intellectual property landscape in Japan, the United Kingdom, South Africa, and the United States.*

Indicator	Japan	United Kingdom	South Africa	United States
Leadership in	Technological innovations	Digital innovations	Legislative stability	Technological innovations
Development of IP framework	Broad	Adapted	Strengthened	Strengthened
Protection of traditional knowledge	Minimal	Unknown	Active protection	Minimal
Enhanced protection of cultural expressions	Minimal	Unknown	Protection exists	Minimal

Source: Bowie (2005), Adams (2023).

Over the preceding three years, the European Union (EU) has undertaken a series of legislative measures aimed at fortifying copyright and associated rights within the framework of the Digital Single Market. One pivotal development was the adoption of Directive (EU) 2019/789 by the European Parliament on April 17, 2019 (European Parliament & Council, 2019a). This directive lays down regulations governing the use of certain online transmission organizations and the retransmission of television and radio programs. Simultaneously, it addresses the incorporation of Council Directive 93/83/EU (2019), which streamlines cross-border transmission of radio broadcasting via satellite networks (Yavorska & Boyarska, 2020).

Another significant stride was the approval of Directive (EU) 2019/790 by the Parliament and the Council on the same date. This directive is instrumental in delineating copyright and additional rights within the Single Digital Market (European Parliament & Council, 2019b). Furthermore, it introduces amendments to Regulations 96/9/EC and 2001/29/EC (2019), serving to complement and augment existing directives that oversee pertinent matters in the digital landscape (Yavorska & Boyarska, 2020).

The regulatory landscape expanded with the inception of Regulation (EU) 2019/517 by the European Parliament and the Council on March 19, 2019. This regulation focuses on establishing and administering the EU top-level domain name (European Parliament & Council, 2019c). Notably, it modifies and annuls Regulation (EC) No. 733/2002 and repeals Commission Regulation (EC) No. 874/2004 (2019). By doing so, it delineates critical parameters for EU top-level domain names, contributing to the overarching legal framework. Additionally, Regulation (EC) No. 2017/1128, sanctioned by the EU Parliament and Council on June 14, 2017, pertains to the cross-border availability of interactive content services in the internal market

(European Parliament & Council, 2017). This regulation is instrumental in governing the legitimate access to portable e-content by users, ensuring accessibility at any given time and in any country within the boundaries of the European Union. The evolving needs of the digital market, unfolding within the expansive European Union, underscore the necessity for continuous legislative adaptation. The digital market is not only characterized by the free movement of people and services but also by the unimpeded flow of information and the Internet (Yavorska & Boyarska, 2020). This underscores the dynamic nature of EU legislation, responding to the evolving landscape of the digital realm and its multifaceted challenges.

Germany, a stalwart in technological and industrial innovation, possesses a sophisticated framework for the protection of intellectual property (IP). Germany boasts a robust patent system governed by the German Patent and Trademark Office (DPMA) and aligns with the European Patent Convention (EPC). The country's commitment to innovation is evident through the recognition of software as patentable subject matter, a stance that aligns with the European Patent Office (EPO) guidelines. Notably, Germany plays a pivotal role in the establishment of the Unified Patent Court (UPC), a system designed to enhance patent enforcement across participating EU countries. The German Copyright Act (Urheberrechtsgesetz) forms the backbone of copyright protection in the country. It safeguards the rights of authors and creators, covering a spectrum of creative works. Germany, acknowledging the digital age, has adapted its copyright laws to address challenges such as online piracy and the protection of digital content. In addition, Germany participates in the EU Trademark system, allowing businesses to register trademarks with the European Union Intellectual Property Office (EUIPO). Nationally, the German National Institute of Industrial Property (INPI) oversees trademarks.

Germany's approach to trademarks reflects its commitment to fostering a competitive business environment while ensuring fair competition. Besides, design protection in Germany is administered by the German Patent and Trademark Office. The country emphasizes the safeguarding of designs, particularly in the vibrant sectors of fashion and industrial design. Germany's approach aligns with the EU Directive on the Legal Protection of Designs, ensuring harmonization within the European context.

Hence, Germany stands as a paradigm of effective intellectual property protection within the EU. Its legislative frameworks, encompassing patents, copyright, trademarks, and design rights, demonstrate a commitment to fostering innovation and creativity while navigating the challenges posed by the digital age. As Germany continues to play a central role in shaping the European IP landscape, ongoing adaptation and international collaboration remain essential to address emerging complexities in the field.

On the other hand, France boasts a sophisticated and comprehensive legal framework for the protection of intellectual property (IP), aligning with both European Union directives and international standards. The country's commitment to fostering innovation and creativity is evident in its robust laws governing patents, trademarks, copyrights, and geographical indications. Patents in France are administered by the French National Industrial Property Institute, which plays a pivotal role in examining and granting patents. The institute provides a platform for patent registration; ensuring inventors' rights are protected.

France, being a participant in the Unified Patent Court, contributes to a unified system for patent litigation across EU countries. The UPC enhances legal certainty and consistency in patent disputes. Governed by the French Intellectual Property Code, copyright law

protects the rights of authors and creators. The Code encompasses a broad range of creative works, including literary, artistic, and software creations.

Poland has taken significant steps to enhance intellectual property protection by establishing specialized IP courts. These courts play a crucial role in efficiently handling IP-related disputes, contributing to a more streamlined legal process. Poland's commitment to creating a specialized judiciary reflects its dedication to the effective enforcement of intellectual property rights. Moreover, Poland has made substantial efforts to harmonize its intellectual property laws with EU directives (Sapiński & Szydłowski, 2022). This commitment ensures that Poland's legal framework aligns with European standards, promoting consistency in IP protection across the EU. The harmonization process reflects Poland's dedication to fostering a unified and effective intellectual property regime (Pelegrinová & Lačný, 2016). Although not an EU member, Switzerland collaborates closely with the European Patent Organization and the EUIPO. The Swiss Federal Institute of Intellectual Property oversees patents, trademarks, and designs, contributing to a comprehensive and harmonized intellectual property landscape (GGBA, (n.d.)). Switzerland's legal framework aligns with international standards, ensuring a robust protection system. Recognized as a hub for pharmaceutical innovation, Switzerland places a strong emphasis on the protection of pharmaceutical patents (GGBA, (n.d.)). The country's intellectual property laws strike a balance between incentivizing innovation in the pharmaceutical sector and addressing public health considerations. Rigorous patent protection measures contribute to fostering a conducive environment for research and development. This table highlights each country's approach to intellectual property protection and innovation, showcasing their efforts to support and protect creativity, innovation, and traditional knowledge (See Table 2)

**Table 2.**  
*Approach to intellectual property protection and innovation*

	Germany	France	Poland	Switzerland
Patents	Germany boasts a robust patent system managed by the German Patent and Trademark Office (DPMA). It actively contributes to technological protection and innovation.	France places emphasis on technological protection, recognizing the importance of patents in fostering innovation.	Poland actively supports innovation through specialized IP courts that efficiently handle patent-related disputes.	Switzerland, a hub for pharmaceutical innovation, places a strong emphasis on protecting pharmaceutical patents. The legal framework balances innovation incentives with public health considerations.
Copyright	Germany's copyright framework, governed by the <i>Urheberrechtsgesetz</i> , provides comprehensive protection for authors. The legal landscape addresses challenges posed by the digital environment, emphasizing the rights of content creators.	France has strong copyright protection, recognizing moral rights. The legal framework ensures the integrity and reputation of creators.	Poland actively harmonizes its copyright laws with EU directives, adapting to the digital landscape and addressing challenges in online content distribution.	Switzerland addresses challenges in the digital landscape, adapting copyright laws to protect the rights of content creators and foster creativity.
Trademarks	Germany adheres to the EU Trademark system, allowing businesses to register trademarks with the European Union Intellectual Property Office (EUIPO). The country emphasizes brand protection within the European framework.	France places a strong emphasis on protecting trademarks through both national and EU systems. Rigorous trademark protection is essential for preserving brand integrity.	Poland, through specialized IP courts, enhances enforcement of trademark rights, contributing to a streamlined legal process.	Switzerland collaborates closely with international organizations, contributing to a comprehensive and harmonized intellectual property landscape, including trademark protection.
Geographical Indications (GIs)	Protected and regulated according to the European system. Examples are regional varieties of wine, cheese, etc.	France is renowned for stringent protection of Geographical Indications (GIs). Examples include Champagne, Roquefort cheese, and Bordeaux wine. Protects the authenticity and quality of regional products.	Poland takes an active role in international discussions and forums focused on the protection of traditional knowledge and Geographical Indications (GIs). This proactive engagement demonstrates Poland's commitment to contributing to global conversations surrounding the preservation of traditional practices, cultural heritage, and the distinctive qualities of products	Switzerland, though not an EU member, has its system to recognize and protect Geographical Indications (GIs). The comprehensive framework covers diverse products like agricultural produce, food items, and traditional crafts with unique qualities tied to specific regions. Following PDO and PGI schemes similar to the EU, Switzerland ensures products from specific areas maintain distinct qualities linked to



			Germany is recognized for creating an innovation-friendly environment, with various mechanisms supporting research and development.	France actively supports innovation through various mechanisms, including tax incentives, contributing to a culture of research and development.	Poland actively supports innovation through initiatives such as tax incentives, fostering a culture of research and development.	Switzerland actively fosters innovation, particularly in the pharmaceutical sector, providing a conducive environment for research and development.
--	--	--	---	--	--	---

Source: Romanyuk (2017), Pasechnyk (2022).

However, practical experience shows that the digital space presents a myriad of challenges for protecting intellectual property, encompassing issues such as digital piracy, counterfeiting, plagiarism, and cybersecurity threats. Many modern authors emphasize this (Bowie, 2005). Unauthorized distribution of copyrighted content, the sale of counterfeit goods, and the unauthorized use of creative works are pervasive problems. Additionally, increasing cybersecurity threats jeopardize the integrity of digital IP. To address these challenges, potential solutions include enhanced digital rights management technologies, stricter legal enforcement, and public awareness campaigns to mitigate digital piracy. Strengthening e-commerce platform monitoring, implementing blockchain for supply chain transparency, and fostering a culture of respect for IP rights can combat counterfeiting and trademark infringement. Solutions for plagiarism involve content recognition technologies, a legal

framework supporting content creators, and initiatives promoting awareness. Protecting against cybersecurity threats to IP necessitates robust cybersecurity measures, encryption technologies, and regular audits of digital infrastructure. A comprehensive strategy involves global cooperation among governments, law enforcement, and industry stakeholders. Legal reforms to update and harmonize IP laws, integrating advanced technologies for proactive monitoring, and promoting awareness are crucial components. Blockchain technology offers transparent and tamper-proof records of IP rights, while collaboration between IP owners and technology companies is essential for innovative solutions. Strategic litigation against major infringers can set precedents and deter others, contributing to a more secure and respectful digital environment for intellectual property. The Table 3 outlines the main challenges and potential solutions that should be implemented.

**Table 3.**  
*The main challenges and potential solutions of protection IP*

Aspects of IP Protection	Challenges	Potential Solutions
Digital Piracy	Unauthorized distribution of copyrighted content	Enhanced digital rights management (DRM) technologies - Stricter legal enforcement - Public awareness campaigns
Counterfeiting and Trademark Infringement	Illicit reproduction and sale of counterfeit goods	Strengthen e-commerce platform monitoring - Implement blockchain for supply chain transparency - International cooperation
Plagiarism and Content Theft	Unauthorized use and reproduction of creative works	Content recognition technologies - Legal recourse for content creators - Educational campaigns
Cybersecurity Threats to IP	Increasing cybersecurity threats	Robust cybersecurity measures - Encryption technologies - Regular audits of digital infrastructure
Global Cooperation	Cross-border challenges in enforcement	Strengthen international collaboration and information sharing - Harmonize legal frameworks for international IP protection
Legal Reforms	Outdated or inconsistent IP laws	Update and harmonize intellectual property laws - Clarify jurisdiction in cases of international infringement

Technology Integration	Emerging challenges in digital landscapes	Embrace advanced technologies (AI, ML) for proactive monitoring - Implement automated takedown systems for infringing content
Education and Awareness	Lack of understanding about IP importance	Promote awareness campaigns - Foster a culture of respect for intellectual property
Blockchain for IP Protection	Lack of transparent and tamper-proof records	Leverage blockchain technology for transparent IP records - Enhance traceability of ownership
Collaboration with Tech Industry	Technology facilitating infringement challenges	Encourage collaboration between IP owners and tech companies - Develop innovative solutions and best practices for protection
Strategic Litigation	Insufficient deterrents for major infringers	Pursue strategic legal actions against major infringers - Set legal precedents to deter others

Source: Malinovska (2018), Svitlak (2023).

Therefore, the multifaceted nature of intellectual property protection in the digital age requires a strategic and holistic approach. Legislative reforms, technological integration, global collaboration, and awareness initiatives are crucial components of an effective strategy to safeguard intellectual property rights in the ever-evolving digital landscape.

In the context of the legal aspects of intellectual property protection in the digital age, the research undertaken has yielded significant insights. The results indicate that the evolving landscape of digital technology has posed intricate challenges to the traditional framework of intellectual property rights. The findings align with Janković's (2017) exploration of diverse legal aspects related to intellectual property rights, emphasizing the need for procedural considerations in the EU law context. Furthermore, Pelegrinová and Lačný (2016) shed light on the economic dimensions of intellectual property protection, highlighting its critical role in fostering economic development. The obtained results resonate with Vindele and Cane's (2022) exploration, emphasizing the evolving role of intellectual property rights in the technological age. However, in this dynamic discourse, Cimoli, Dosi, Maskus, Okediji, Reichman and Stiglitz (2014) conclusions on the role of intellectual property rights in developing countries present a contrasting perspective, pointing towards the need for nuanced considerations in diverse global contexts. The results show that the multifaceted nature of intellectual property rights requires a comprehensive understanding of legal intricacies, economic implications, and technological advancements.

The obtained results indicate that legal frameworks must adapt to the evolving digital landscape, balancing the interests of creators and the broader public. In comparing these findings with existing literature, Janković's insights align with the need for procedural advancements in EU

law, contributing to a nuanced legal framework. Pelegrinová and Lačný's (2016) emphasis on economic aspects resonates with the growing recognition of intellectual property's crucial role in driving economic prosperity. Vindele and Cane's (2022) exploration of intellectual property rights in the technological age aligns with the broader discourse on the dynamic relationship between innovation and legal protection. However, Cimoli, Dosi, Maskus, Okediji and Reichman (2014) conclusions provide a divergent viewpoint, suggesting that the implications of intellectual property rights vary significantly in developing countries. Instead, this study demonstrated that modern countries are actively trying to develop their legal framework in accordance with the challenges of digitalization. This is especially noticeable from the analysis of the legislative framework. Also, this study demonstrated that the general legislative frameworks of the EU countries are adopted by the member countries and are actively adapted and developed in different national base.

However, it is crucial to extend the discussion to include Pick's (2022) work to provide a more comprehensive understanding. The results demonstrate that the legal protection of Geographical Indications (GIs) is a vital component in the broader discourse on intellectual property. Pick's (2022) exploration of the legal framework for GIs in France provides an enriching perspective. The obtained results indicate that the legal protection of GIs is intricately linked to the overall intellectual property landscape, reflecting the need for specialized considerations in protecting regional and traditional products. Comparing these findings with the existing literature, Pick's (2022) work aligns with the growing recognition of the unique challenges and opportunities associated with GIs. The emphasis on GIs in France, as presented by Pick (2022), corresponds with the broader global discourse on the protection of regional identities and traditional knowledge. Integrating this perspective into our discussion

enriches our understanding of the legal intricacies surrounding intellectual property, showcasing the need for specialized legal frameworks to safeguard geographical indications.

In conclusion, incorporating Pick's insights into the discussion enhances the comprehensiveness of this exploration. The legal protection of GIs in France serves as a valuable case study, illustrating the nuanced considerations required for specific categories within the broader spectrum of intellectual property. This further reinforces the notion that a one-size-fits-all approach is inadequate in addressing the diverse challenges posed by the digital age. The experiences of various countries, as explored in Janković (2017), Pelegrinová, Lačný (2016) and Pick (2022) work collectively underscore the importance of a nuanced and adaptive legal framework to effectively protect intellectual property in a rapidly evolving digital landscape. The obtained results underscore the importance of continuous analysis and adaptation of legal frameworks to address emerging challenges. They indicate the need for a balanced approach that considers technological advancements, economic implications, and global diversity. In conclusion, while supporting our theory, Janković (2017) contributes valuable perspectives, Adams's (2023) work highlights the necessity for context-specific considerations in the evolving discourse on intellectual property rights. This comprehensive analysis reinforces the notion that intellectual property protection in the digital age demands a nuanced, globally aware, and adaptive legal framework. Therefore, this work has a significant and significant contribution to the study of the experience of countries in the context of the protection of intellectual property in the digital age. Emphasis on various aspects, such as legal tricks, economic dimensions, and the impact of technology on intellectual property, gives this study a wide scope and depth. Therefore, this study makes a significant contribution to solving intellectual property issues, considering them in an international context.

## Conclusions

The evolution of intellectual property rights in the digital age is a complex and dynamic process, with various countries adapting their legal frameworks to accommodate technological advancements and changing economic landscapes. In the United States, for example, copyright, patenting, and trademark registration have all seen significant growth, reflecting the

importance of IPR in fostering innovation and creativity. Similarly, the UK and Japan have witnessed notable developments in patent and trademark protection, highlighting the global nature of IPR evolution. Moreover, in Sub-Saharan Africa, there is a growing emphasis on protecting traditional knowledge and cultural expressions, indicating a broader recognition of the importance of intellectual property in diverse cultural contexts. Overall, these trends underscore the need for ongoing legal and policy adjustments to address emerging challenges and ensure a balance between protection and accessibility in the digital era.

The European Union has implemented several legislative measures to strengthen copyright and associated rights in the Digital Single Market. Germany's intellectual property protection framework is sophisticated, with robust patent, copyright, trademark, and design protection systems. The country plays a central role in the Unified Patent Court and emphasizes the protection of digital content in its copyright laws. France also has a comprehensive legal framework for IP protection, aligning with EU directives and international standards. The country's laws governing patents, trademarks, copyrights, and geographical indications reflect its commitment to fostering innovation and creativity. Poland has made significant efforts to enhance IP protection, including establishing specialized IP courts and harmonizing its laws with EU directives. Switzerland, although not an EU member, collaborates closely with EU organizations and has a robust IP protection system, particularly in pharmaceutical patents. These countries' approaches to IP protection demonstrate a commitment to fostering innovation while addressing the challenges of the digital age.

The digital space presents significant challenges for protecting intellectual property, including digital piracy, counterfeiting, plagiarism, and cybersecurity threats. Unauthorized distribution of copyrighted content, sale of counterfeit goods, and unauthorized use of creative works are widespread issues. Cybersecurity threats also pose risks to digital IP integrity. Potential solutions include enhancing digital rights management technologies, enforcing stricter legal measures, and raising public awareness to combat digital piracy. Monitoring e-commerce platforms, implementing blockchain for transparency, and fostering respect for IP rights can address counterfeiting and trademark infringement. Solutions for plagiarism include content recognition technologies and legal

frameworks supporting content creators. Protecting against cybersecurity threats requires robust measures, encryption technologies, and regular infrastructure audits. A comprehensive strategy involves global cooperation, legal reforms, integration of advanced technologies, and promoting awareness. Blockchain technology can provide transparent records of IP rights, and collaboration between IP owners and technology companies is crucial. Strategic litigation against major infringers can set precedents and deter others, contributing to a more secure digital environment for intellectual property. So, this work has a significant contribution to the study of the experience of countries in the context of the protection of intellectual property in the digital age. Hence, this research makes an important contribution to solving intellectual property issues, considering them in an international context. Although the used methodology provides a systematic approach to the analysis of the problem of intellectual property protection, it is worth paying attention to certain limitations. First, the methodology includes content analysis of digital sources, while it may ignore non-traditional sources such as industry reports or expert opinions. At the same time, it is worth noting that the study took into account the experience of EU crises, while ignoring the experience of other countries. Important directions for further research are the analysis of concrete cases of violations of intellectual property rights based on practical legal consideration.

### Bibliographic references

- Adams, R. (2023). The Evolution of Intellectual Property Rights in the Digital Age. *Journal of Modern Law and Policy*, 3(2), 52-63. <https://doi.org/10.47941/jmlp.1554>
- Brown, A., Yampolskiy, M., Gatlin, J., & Andel, T. (2016). Legal aspects of protecting intellectual property in additive manufacturing. In *Critical infrastructure protection X* (pp. 63–79). Springer International Publishing. [https://doi.org/10.1007/978-3-319-48737-3\\_4](https://doi.org/10.1007/978-3-319-48737-3_4)
- Bowie, N. E. (2005). Digital rights and wrongs: Intellectual property in the information age. *Business and Society Review*, 110(1), 77-96. <https://doi.org/10.1111/j.0045-3609.2005.00005.x>
- Calista, J., Sudirman, M., & Djaja, B. (2023). Legal Protection of Digital Painting Works as Intellectual Property Right. *Al-Hakim Journal: Student Scientific Journal, Sharia Studies, Law and Philanthropy*, 5(2), 159-172. <https://doi.org/10.22515/jurnalalhakim.v5i2.7656>
- Cho, S. H., & Kim, H. G. (2017). Intellectual property rights protection and technological innovation: The moderating effect of internationalization. *Multinational Business Review*, 25(4), 350-368. <https://doi.org/10.1108/mbr-04-2017-0019>
- Cimoli, M., Dosi, G., Maskus, K. E., Okediji, R. L., Reichman, J. H., & Stiglitz, J. E. (2014). 17 The Role of Intellectual Property Rights in Developing Countries: Some Conclusions. In *Intellectual Property Rights* (pp. 503–513). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199660759.003.0017>
- European Parliament & Council. (2019a). *Directive (EU) 2019/789 of the European Parliament and of the Council of April 17, 2019, on regulations governing the use of certain online transmission organizations and the retransmission of television and radio programs*. Retrieved from: <https://acortar.link/mLiB9q>
- European Parliament & Council. (2019b). *Directive (EU) 2019/790 of the European Parliament and of the Council of April 17, 2019, on copyright and additional rights within the Single Digital Market. Amending Regulations 96/9/EC and 2001/29/EC (2019)*. Retrieved from: <https://eur-lex.europa.eu/eli/dir/2019/790/oj>
- European Parliament & Council. (2019c). *Regulation (EU) 2019/517 of the European Parliament and of the Council of March 19, 2019, on the establishment and administration of the EU top-level domain name. Modifying and annulling Regulation (EC) No. 733/2002 and repealing Commission Regulation (EC) No. 874/2004 (2019)*. Retrieved from: <https://eur-lex.europa.eu/eli/reg/2019/517/oj>
- European Parliament & Council. (2017). *Regulation (EC) No. 2017/1128 of the European Parliament and of the Council of June 14, 2017, on the cross-border availability of interactive content services in the internal market*. Retrieved from: <https://acortar.link/z1r5mp>
- GGBA. (n.d). *Intellectual property protection in Switzerland*. Retrieved from: <https://ggba.swiss/en/intellectual-property-protection-in-switzerland/>
- Janković, D. (2017). Different legal aspects of the intellectual property rights. In *Procedural aspects of eu law*. Faculty of Law, Josip Juraj

- Strossmayer University of Osijek, Vol 1. <https://doi.org/10.25234/eclic/6526>
- Kumar, N. V. (2012). Digital rights management and intellectual property protection. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2030762>
- Litvishchenko, H. O. (2020). Legal protection of tv format as intellectual property. *Juridical Scientific and Electronic Journal*, (4), 457-459. <https://doi.org/10.32782/2524-0374/2020-4/108>
- Malinovska, I. M. (2018). Modern trends of legal protection intellectual property. *Law and Innovations*, 3(23), 110-116. <https://doi.org/10.31359/2311-4894-2018-23-3-110>
- Mansfield, E. (2000). Intellectual property protection, direct investment and technology transfer: Germany, Japan and the USA. *International Journal of Technology Management*, 19(1/2), 3. <https://doi.org/10.1504/ijtm.2000.002805>
- Mula, D., & Lobina, M. L. (2012). Legal protection of the web page. In *Information technology for intellectual property protection* (pp. 213–236). IGI Global. <https://doi.org/10.4018/978-1-61350-135-1.ch008>
- Nadobko, S. V. (2020). Intellectual property as object of administrative legal protection. *Expert: Paradigm of Law and Public Administration*, 3(9), 141-149. [https://doi.org/10.32689/2617-9660-2020-3\(9\)-141-149](https://doi.org/10.32689/2617-9660-2020-3(9)-141-149)
- Pasechnyk, O. (2022). International aspects of intellectual property rights protection. *Baltic Journal of Economic Studies*, 8(5), 146-157. <https://doi.org/10.30525/2256-0742/2022-8-5-146-157>
- Pelegrinová, L., & Lačný, M. (2016). Protection of intellectual property and its economic aspects. *Journal of Economic Development, Environment and People*, 5(3), 5-20. <https://doi.org/10.26458/jedep.v5i3.507>
- Pick, B. (2022). The legal protection of GIs in France. In *Intellectual property and development* (pp. 23-51). Routledge. <https://doi.org/10.4324/9781003352105-3>
- Romanyuk, I. (2017). Intellectual property: Criminal and legal aspects of research. *Visnyk of the National University "Lviv Polytechnic"*, 876(1), 284-289. <https://doi.org/10.23939/law2017.876.284>
- Sapiński, A., & Szydłowski, D. (2022). Paradigm of philosophy of security in Poland through the prism of pandemic and socio-political changes: analysis of problem origin and risks of spreading attention focus. *Futurity Philosophy*, 1(3), 4-27. <https://doi.org/10.57125/FP.2022.09.30.01>
- Sofilkanych, N., Vesova, O., Kaminsky, V., & Kryvosheieva, A. (2023). The impact of artificial intelligence on Ukrainian medicine: benefits and challenges for the future. *Futurity Medicine*, 2(4), 28-39. <https://doi.org/10.57125/FEM.2023.12.30.04>
- Svitlak, I. (2023). Cyber Military Threat and International Law: Assessing the Response to Cyber Attacks in the Military Context. *Futurity of Social Sciences*, 1(1), 35-50. <https://doi.org/10.57125/FS.2023.03.20.03>
- Vindele, L., & Cane, R. (2022). The role of intellectual property rights in the technological age. *Acta prosperitatis*, 13, 182-197. <https://doi.org/10.37804/1691-6077-2022-13-182-197>
- Voronkova, V., Kapitanenko, N., & Nikitenko, V. (2019). Legal principles of intellectual property protection in the digital society. *ScienceRise: Juridical Science*, 4(10), 32-37. <https://doi.org/10.15587/2523-4153.2019.188163>
- Yavorska, I., & Boyarska, S. (2020). Legal regulation of the protection of intellectual property rights within the EU digital market. *Visnyk of the Lviv University. Series International Relations*, (48). <https://doi.org/10.30970/vir.2020.48.0.11043>
- Yi, X., & Naghavi, A. (2017). Intellectual property rights, FDI, and technological development. *The Journal of International Trade & Economic Development*, 26(4), 410-424. <https://doi.org/10.1080/09638199.2016.1266380>