Legislation on the Use of Artificial Intelligence in European Union Countries

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Abstract: This study analyzes the legislative framework governing the use of artificial intelligence (AI) in the European Union, focusing on patterns of legal convergence and divergence, as well as the governance challenges arising from its implementation. The research aims to examine how the EU constructs a harmonized yet flexible regulatory regime capable of addressing the multifaceted risks of AI while promoting innovation. Methodologically, this study employs a qualitative approach through doctrinal legal analysis and policy review, drawing on primary legal instruments, including the EU AI Act, as well as secondary sources such as policy reports and academic literature. The findings indicate that the EU adopts a risk-based regulatory model that classifies AI systems into low, medium, and high-risk categories. While most AI applications fall into low- or medium-risk categories, high-risk systems—particularly those used in sensitive sectors such as healthcare, justice, employment, and finance—pose significant legal and ethical challenges. The study identifies key risks, including algorithmic bias, data privacy violations, and a lack of transparency, alongside broader concerns about accountability and the protection of fundamental rights. Furthermore, although legal convergence is evident in the establishment of uniform EU standards, divergence persists in national implementation, enforcement practices, and institutional readiness across member states. This study contributes to the existing literature by providing a comprehensive analysis of the interplay between harmonization and fragmentation in EU AI regulation. It also highlights the need for adaptive governance mechanisms that balance regulatory consistency with contextual flexibility. Ultimately, the research underscores that effective AI legislation must strengthen accountability, ensure ethical compliance, and foster

public trust, thereby aligning technological development with the core values of the European Union.

Keywords: Administrative Legal Protection; Civil Legal Protection; Intellectual Property Law; Liability; Object of Legal Relations.

Introduction

The rapid expansion of digital technologies in the twenty-first century has fundamentally transformed the structure of modern society, particularly through the accelerated development and deployment of artificial intelligence (AI).[1] Across diverse sectors—including public administration, healthcare, justice, finance, education, and security—AI systems are increasingly embedded as tools for decision-making, prediction, and automation. These technological advancements offer significant opportunities to enhance efficiency, optimize resource allocation, and improve service delivery. However, the widespread integration of algorithmic systems, machine learning, and big data analytics simultaneously raises complex legal, ethical, and social concerns. At the core of these concerns lies a fundamental tension between fostering technological innovation and safeguarding human rights, democratic values, and the rule of law.[2]

The legal Regulation of AI has therefore emerged as a critical issue in contemporary governance. The risks associated with AI deployment are multifaceted, ranging from immediate threats such as data privacy violations, algorithmic discrimination, and lack of transparency, to broader systemic challenges including accountability deficits, economic disruption, and threats to national and information security.[3] These concerns are amplified by the autonomous and adaptive nature of AI systems, which often operate beyond direct human oversight. In the absence of universally accepted global standards, regulatory approaches have largely developed within regional frameworks, with the European Union (EU) playing a leading role in shaping a comprehensive and rights-based model of AI governance.[4]

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[1] Guangda Liang, 'Governing the Amorphous: AI, Social Justice, and the Challenge of Future-Proof Regulation', *Social Sciences and Humanities Open* 13 (2026), https://doi.org/10.1016/j.ssaho.2026.102467.

[2] Shu Ching Yang, 'Integrating Technology Acceptance, Self-Determination, and Self-Regulation: A Structural Model of Generative AI-Supported Learning and Competence', *Computers in Human Behavior* 179 (2026), https://doi.org/10.1016/j.chb.2026.108933.

[3] Isah Ndakara Abubakar et al., 'Control Strategies and AI-Based Techniques for Blood Glucose Regulation in Artificial Pancreas System Development: A Systematic Literature Review', *Medicine in Novel Technology and Devices* 30 (2026), https://doi.org/10.1016/j.medntd.2026.100438.

[4] Marcos Eduardo Kauffman et al., 'EU AI Act Regulation: A Study of Non-European Union Manufacturers' Compliance Preparedness', *Journal of Manufacturing Technology Management*, 2026, 1–20, https://doi.org/10.1108/JMTM-07-2025-0657.

The EU's regulatory approach is particularly significant due to its ambition to balance innovation with robust legal safeguards. The adoption of the Artificial Intelligence Act (AI Act) represents a milestone in this regard, introducing a risk-based regulatory framework that categorizes AI systems according to their potential impact on individuals and society.[5] This model seeks to ensure that high-risk AI applications—especially those used in sensitive areas such as healthcare, law enforcement, employment, and financial services—are subject to strict compliance requirements, while lower-risk systems are regulated more flexibly. Such an approach reflects the EU's broader commitment to promoting trustworthy AI grounded in transparency, accountability, and the protection of fundamental rights.[6]

Despite these advancements, the regulatory landscape of AI in the EU remains complex and evolving. Variations in national implementation, institutional capacity, and enforcement mechanisms across member states give rise to both legal convergence and divergence. While harmonization efforts aim to establish uniform standards across the Union, practical differences in legal interpretation and administrative readiness create challenges for achieving regulatory coherence.[7] These dynamics highlight the need for a deeper analytical understanding of how EU legislation functions in practice, particularly in navigating the balance between centralized Regulation and national discretion.[8]

Existing scholarship provides valuable insights into the development of AI regulation, yet several gaps remain. First, research by Elio Fam Eli and Enrico Bis Enzi emphasizes comparative legal approaches to AI governance across jurisdictions such as the EU, advocating for unified regulatory frameworks.[9] However, their work primarily focuses on doctrinal and theoretical aspects, with limited attention to the interaction between legal Regulation and technological or economic realities. Second, several studies underscore that current regulatory

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[5] Renato Cuocolo et al., 'AI Medical Device Post-Market Surveillance Regulations: Consensus Recommendations by the European Society of Radiology', *Insights into Imaging* 16, no. 1 (2025), https://doi.org/10.1186/s13244-025-02146-8.

[6] Díaz Galán Elena C., 'The legal regulation of Artificial intelligence (AI) in Europe: two decisive (but insufficient) steps of the Council of Europe and the European Union', *Cuadernos de Derecho Transnacional* 17, no. 1 (2025): 366–390, https://doi.org/10.20318/cdt.2025.9334.

[7] Jorge Luis Ordelin Font, 'Copyright and training of generative AI systems: transparency obligations and text and data mining in European regulations', *Revista de Internet, Derecho y Política*, no. 42 (2025), https://doi.org/10.7238/idp.v0i42.431327.

[8] Дар'я Олександрівна Коваленко and Марина Сергіївна Уткіна, 'Проблема Правового Регулювання Інтелектуальної Власності На Об'єкти, Створені Штучним Інтелектом', *Нове українське право*, no. 1 (March 2022): 197–201, https://doi.org/10.51989/NUL.2022.1.30.

[9] Elio Fam Eli and Enrico Bis Enzi, 'The new Artificial Intelligence and the problem of its legal regulation. The european strategy and the long legislative process of the AI Act', *Rivista Italiana di Informatica e Diritto* 7, no. 1 (2025), https://doi.org/10.32091/RIID0224.

efforts are largely confined to ethical guidelines and conceptual frameworks, lacking concrete, enforceable legal mechanisms, particularly in areas such as liability, legal accountability, and the operationalization of AI oversight.[10] Third, other scholars—particularly within the Ukrainian legal context—have explored the legal status of AI, including debates on its potential legal personality and its classification as an object of legal relations.[11] While these contributions are significant, they tend to focus on normative and speculative dimensions rather than on the practical implications of EU regulatory models for governance effectiveness and institutional implementation.

Considering these gaps, this study offers a novel contribution by systematically analyzing the interplay between legal convergence and divergence within the EU's AI regulatory framework, while also addressing the governance challenges that emerge from this interaction. Unlike previous studies that emphasize either theoretical legal constructs or ethical considerations, this research integrates doctrinal legal analysis with a governance-oriented perspective, focusing on how regulatory norms are translated into practice across different jurisdictions. Furthermore, the study extends its relevance by considering the implications of EU AI legislation for legal harmonization processes in countries seeking closer integration with the EU, thereby adding a comparative and forward-looking dimension. Based on this context, the central research question guiding this study is: How does the European Union's legislative framework on artificial intelligence reflect patterns of legal convergence and divergence, and what governance challenges arise in ensuring effective and coherent Regulation across member states? Addressing this question is essential for understanding not only the internal dynamics of EU law but also its broader influence on global AI governance.

The significance of this research lies in both its theoretical and practical contributions. Theoretically, it advances the discourse on AI regulation by bridging the gap between legal harmonization and governance complexity, offering a more nuanced understanding of how regulatory systems function in technologically dynamic environments. Practically, the study provides insights for policymakers, legal practitioners, and scholars by identifying key challenges and opportunities in the design and implementation of AI.

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[10] Hafiz Muhammad Saqib and Hira Amin, 'Comparative Analysis of AI Regulation for Fintech Cybersecurity and Privacy in the European Union and Qatar', *Discover Artificial Intelligence* 6, no. 1 (2026), https://doi.org/10.1007/s44163-025-00736-5.

[11] Sergii Sharov et al., 'Accessibility and Responsibility: Use of Generative AI by Ukrainian Students', *TEM Journal* 14, no. 4 (2025): 3572–3581, https://doi.org/10.18421/TEM144-62.

Method

This study employs a qualitative legal research design grounded in a comparative and doctrinal approach to examine the Regulation of artificial intelligence within the European Union. The research primarily utilizes the comparative legal method to analyze both supranational EU legal instruments—most notably the AI Act—and their implementation across selected member states, including Germany, France, and Spain. This approach enables the identification of patterns of legal convergence at the regulatory level and divergence in national enforcement and institutional practices. Data collection is conducted through comprehensive document analysis, including primary legal sources such as EU regulations, directives, and policy frameworks, as well as secondary sources such as academic literature, institutional reports, and statistical data from official bodies such as Eurostat and the European Commission. This combination of sources ensures a robust understanding of both normative frameworks and practical developments in AI governance.

The data analysis is conducted through qualitative content analysis and systematic legal interpretation, focusing on identifying key regulatory principles, risk classifications, and governance mechanisms embedded in EU law. Comparative analysis is further applied to assess variations in national implementation, particularly regarding oversight institutions, data protection practices, and enforcement mechanisms. To ensure the validity and reliability of the findings, this study adopts a triangulation strategy by cross-referencing legal documents, empirical reports, and scholarly interpretations. Additionally, a systematic-structural approach is employed to map the interrelationships among legal instruments, such as the AI Act and the General Data Protection Regulation (GDPR), to shape a coherent regulatory ecosystem. Through these methods, the study provides a comprehensive and analytically rigorous examination of the European model of AI regulation and its broader implications.

Results and Discussion
The European Union's Regulatory Architecture for Artificial Intelligence

The findings of this study demonstrate that the European Union has developed one of the most comprehensive and structured legal frameworks for governing artificial intelligence (AI) globally. This regulatory architecture is primarily driven by the need to reconcile two often competing objectives: promoting technological innovation and protecting fundamental rights. The increasing integration of AI systems into public administration, healthcare,

finance, law enforcement, and digital services has heightened the urgency of establishing clear legal norms to address both opportunities and risks.[12]

At the core of this framework lies Regulation (EU) 2024/1689, widely known as the AI Act, which introduces a harmonized legal regime across member states. The study finds that the EU's approach is fundamentally risk-based, categorizing AI systems into prohibited, high-risk, limited-risk, and minimal-risk categories. This classification reflects a proportional regulatory logic, ensuring that stricter obligations are imposed on systems with greater potential to harm individuals or society.[13] For example, prohibited practices include manipulative AI systems and social scoring mechanisms that undermine human autonomy and dignity. Meanwhile, high-risk systems—such as those used in employment decisions, biometric identification, and judicial processes—are subject to rigorous compliance requirements, including data governance standards, transparency obligations, and human oversight mechanisms.

The results indicate that this model represents a form of legal convergence at the supranational level. Through directly applicable regulations, the EU ensures a unified baseline of rules governing AI across all member states. This harmonization reduces legal fragmentation, facilitates cross-border digital markets, and enhances legal certainty for developers and users of AI technologies. Additionally, the integration of complementary instruments such as the General Data Protection Regulation (GDPR), the Digital Services Act (DSA), and the Digital Markets Act (DMA) creates a multi-layered regulatory ecosystem that addresses various dimensions of digital governance. However, the study also reveals that this convergence is not absolute. While the regulatory framework is uniform in principle, its interpretation and practical application may vary across jurisdictions. This indicates that the EU model is characterized not only by harmonization but also by embedded flexibility, allowing member states to adapt implementation strategies according to their institutional capacities and socio-economic contexts.[14] Ultimately, the EU's regulatory architecture reflects a normative commitment to "trustworthy AI," emphasizing transparency, accountability, fairness, and human-centric design. This positions the EU as a

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[12] Iryna Izarova et al., 'Advancing Sustainable Justice Through Ai-Based Case Law Analysis: Ukrainian Experience', *Access to Justice in Eastern Europe* 7, no. 1 (2024): 127–148, https://doi.org/10.33327/AJEE-18-7.1-a000123.

[13] Klemens Katterbauer et al., 'The Challenges of AI Regulation for the Gig Economy in the European Union', in *Regulating the Gig Economy in the European Union: Challenges, Innovations, and Global Impacts*, ed. Rui Alexandre Castanho et al. (IGI Global, 2025), 125–145, https://doi.org/10.4018/979-8-3373-6082-9.ch005.

[14] Michele Corazza et al., 'Hybrid AI Enhancing European Drafting Legislation for a Better Regulation', *Int. Conf. eDemocracy and eGovernment, ICEDEG*, no. 2025 (2025): 106–113, https://doi.org/10.1109/ICEDEG65568.2025.11081650.

global standard-setter in AI governance, like its earlier influence through the GDPR.

Legal Convergence and Divergence in National Implementation

A central finding of this research is that the European Union's AI governance framework exhibits a dual dynamic of convergence and divergence.[15] Legal convergence is evident in the adoption of common regulatory standards, particularly through the AI Act and GDPR, which establish uniform principles for risk classification, data protection, and accountability.[16] These instruments create a shared legal foundation that applies across all member states, ensuring consistency in core regulatory objectives. Nevertheless, divergence emerges in the practical implementation and enforcement of these norms. The comparative analysis of selected member states—Germany, France, Spain, Italy, and Nordic countries—demonstrates significant variation in institutional arrangements, regulatory priorities, and levels of technological readiness. Germany, for instance, emphasizes industrial applications and technical standardization, supported by strong institutional frameworks and active involvement of data protection authorities. France adopts a more centralized, ethics-oriented approach, with regulatory oversight reinforced by specialized bodies such as the CNIL, which plays a crucial role in ensuring compliance with data protection and algorithmic transparency standards.[17]

Spain represents a distinct model characterized by the institutionalization of AI governance through the establishment of a dedicated supervisory authority (AESIA). This reflects an emerging trend toward specialized regulatory bodies capable of addressing the complexities of AI oversight. In contrast, Italy focuses more on data protection and ethical considerations, while countries such as Finland and Denmark lead in AI adoption due to advanced digital infrastructure and high levels of human capital.[18] These differences highlight the persistence of regulatory diversity within a unified legal system. The findings suggest that divergence is not necessarily a weakness but rather a reflection of contextual adaptation. Member states tailor their implementation strategies to align with

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[15] Martin Mach, 'DeepSeek as a Precedent – A Test of the Resilience of European AI Regulation', *Pravnik* 164, no. 11 (2025): 1068–1111.

[16] Lukasz Górski and Shashishekar Ramakrishna, 'Right to Explanation in Large Language Models: Lessons from the European Union AI Act and General Data Protection Regulation', *IT Professional* 27, no. 1 (2025): 34–40, https://doi.org/10.1109/MITP.2024.3518917.

[17] Corazza et al., 'Hybrid AI Enhancing European Drafting Legislation for a Better Regulation'.

[18] Fam Eli and Bis Enzi, 'La nuova Intelligenza artificiale e il problema della sua regolazione giuridica. La strategia europea e il lungo iter legislativo dell'AI Act'.

national priorities, economic structures, and technological capabilities.[19] However, excessive divergence may lead to inconsistencies in enforcement, potentially undermining the effectiveness of the overall regulatory framework.

Table 1. Comparative Overview of AI Regulation in Selected EU Jurisdictions

Country / Level	Key Regulatory Frameworks	Regulatory Characteristics	Institutional Support	AI Adoption Trends
EU (Supranational)	AI Act; GDPR; DSA; DMA	Risk-based, harmonized approach	European Commission; AI Board	Moderate but growing
Germany	National AI Strategy; EU laws	Industrial focus: standardization	Federal Ministries; Data Authorities	High adoption
France	National AI Strategy; CNIL	Ethical governance; state-driven	CNIL; Advisory Committees	Moderate-high
Spain	AI Act + AESIA	Institutional supervision model	AESIA	Growing adoption
Italy	GDPR; digital strategies	Data protection emphasis	National Data Authority	Moderate
Finland/Denmark	National strategies; EU laws	High digital readiness	Digital Agencies	Very high adoption

Source: Author's interpretation

The table illustrates the diversity of artificial intelligence (AI) regulatory approaches at both the supranational level of the European Union (EU) and across its member states. At the EU level, key regulatory frameworks such as the AI Act, GDPR, DSA, and DMA reflect an integrated, risk-based approach aimed at achieving legal harmonization across member countries. Strong institutional support from the European Commission and the AI Board plays a crucial role in ensuring consistent policy implementation. Although the level of AI adoption at this level remains moderate, it continues to grow steadily, driven by increasing legal certainty and sustained innovation incentives.

At the national level, each country demonstrates distinct regulatory characteristics shaped by its domestic context. Germany stands out with its industrial focus and emphasis on standardization, contributing to a high level of AI adoption. France prioritizes ethical governance through institutions such as

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[19] Yu Peng Zhu et al., 'Regulation and Innovation: Unveiling the Quadruple-Helix-Innovation Ecosystem of Generative AI', *Information Processing and Management* 63, no. 3 (2026), https://doi.org/10.1016/j.ipm.2025.104549.

CNIL and advisory committees, resulting in moderate to high adoption levels. Spain reinforces institutional oversight through AESIA, while Italy places greater emphasis on data protection. Meanwhile, Nordic countries such as Finland and Denmark exhibit very high digital readiness, supported by advanced digital agencies, which translates into very high levels of AI adoption. Overall, the table highlights that despite a shared EU regulatory framework, implementation is significantly influenced by institutional capacity, policy priorities, and each country's level of digital readiness. The table illustrates that while the EU ensures a unified legal structure, national systems retain distinctive features in governance and implementation. This confirms that the EU model is best understood as a hybrid system combining regulatory harmonization with decentralized execution.

Governance Challenges in the EU AI Regulatory Model

The governance of artificial intelligence within the European Union represents one of the most ambitious regulatory experiments in the contemporary digital era. Anchored in a comprehensive legal architecture led by the AI Act and supported by complementary instruments such as the General Data Protection Regulation (GDPR), the EU seeks to balance innovation with the protection of fundamental rights. However, despite its normative sophistication, this study identifies a range of governance challenges that complicate the effective regulation and implementation of AI policies across the Union.[20]

One of the most prominent challenges lies in the complexity and regulatory burden associated with compliance. The EU's risk-based approach, while conceptually robust, imposes significant procedural obligations on developers and deployers of high-risk AI systems. These obligations include rigorous conformity assessments, detailed technical documentation, risk management systems, and continuous post-market monitoring. While such requirements are essential for ensuring safety and accountability, they also generate substantial compliance costs. For large corporations with extensive resources, these obligations may be manageable; however, for small and medium-sized enterprises (SMEs), they can represent a considerable barrier to entry. This imbalance risks creating an uneven innovation landscape in which only well-resourced actors can fully participate, potentially stifling competition and limiting the diversity of AI solutions within the European market.[21]

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[20] Regine Paul, 'European Artificial Intelligence "Trusted throughout the World": Risk-Based Regulation and the Fashioning of a Competitive Common AI Market', *Regulation and Governance* 18, no. 4 (2024): 1065–1082, https://doi.org/10.1111/rego.12563.

[21] Jonas Tallberg, Magnus Lundgren, and Johannes Geith, 'AI Regulation in the European Union: Examining Non-State Actor Preferences', *Business and Politics* 26, no. 2 (2024): 218–239, https://doi.org/10.1017/bap.2023.36.

Closely related to this issue is the challenge of legal ambiguity within the regulatory framework. Key concepts embedded in the AI Act, such as "high-risk AI" and "general-purpose AI," are inherently flexible and context dependent. While this flexibility allows the regulation to remain adaptable to technological developments, it also opens the door to divergent interpretations among member states. For instance, what qualifies as a high-risk application in one jurisdiction may be classified differently in another, depending on national priorities, institutional interpretations, or sectoral contexts. This lack of definitional precision can lead to legal uncertainty for developers and users alike, undermining predictability and potentially discouraging investment. Moreover, inconsistent interpretations may weaken the EU's broader objective of regulatory harmonization, as uneven enforcement practices emerge across national boundaries.[22]

Institutional capacity further complicates the governance landscape. The effectiveness of any regulatory framework ultimately depends on the ability of institutions to implement and enforce it. Within the EU, there is significant variation in the technical expertise, administrative infrastructure, and regulatory experience of national authorities. Some member states, particularly those with advanced digital ecosystems, possess well-established data protection agencies and specialized AI oversight bodies. Others, however, face resource constraints and limited technical capabilities, which can hinder their ability to evaluate complex AI systems effectively. This disparity creates a risk of fragmented supervision, where regulatory rigor varies significantly across jurisdictions. As a result, companies may engage in regulatory arbitrage, strategically operating in countries with less stringent oversight, thereby weakening the overall coherence of the EU regulatory model.[23]

The cross-border nature of AI technologies introduces an additional layer of complexity. Unlike traditional industries, AI systems are not confined by geographical boundaries; they often operate across multiple jurisdictions simultaneously, processing data and delivering outputs in real time. This transnational character challenges conventional enforcement mechanisms, which are typically organized along national lines. Coordinating regulatory actions among multiple authorities becomes a demanding task, requiring not only legal alignment but also effective communication and data-sharing mechanisms. Although the EU has established supranational bodies such as the European

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[22] Rob van den Hoven van Genderen and Rosa Ballardini, 'AI and Emotional Data Between the Scylla and Charybdis of European Regulation', *Jusletter IT*, 2024, 57–66, https://doi.org/10.38023/aa115617-978f-4d5a-93a7-5b9f16005cf0.

[23] Uroš Ćemalović, 'Prohibited Artificial Intelligence Practices According to Article 5 of the European Union's Regulation on AI—between the "Too Late" and the "Not Enough"', *International Journal of Law and Information Technology* 32 (2024), https://doi.org/10.1093/ijlit/eaae023.

Commission and the AI Board to facilitate coordination, practical challenges remain in ensuring timely and consistent enforcement across all member states.[24]

Transparency and accountability represent another critical dimension of governance challenges. The AI Act emphasizes the importance of explainability, human oversight, and accountability mechanisms to safeguard fundamental rights. However, the technical complexity of many AI systems—particularly those based on advanced machine learning and deep learning techniques—poses significant obstacles to achieving these goals. Many high-performing AI models function as "black boxes," where the internal decision-making processes are not easily interpretable, even by their developers. This lack of transparency complicates efforts to audit AI systems, identify biases, and assign responsibility in cases of harm or error. Consequently, ensuring meaningful accountability becomes a difficult task, especially in high-stakes contexts such as healthcare, finance, or law enforcement, where AI decisions can have profound societal implications.[25]

In addition to technical opacity, there are broader concerns related to trust and public legitimacy. Effective governance of AI is not solely a matter of legal compliance; it also depends on the extent to which citizens trust that these technologies are being used responsibly. If individuals perceive AI systems as opaque, unaccountable, or biased, public resistance may grow, undermining the adoption of otherwise beneficial innovations. The EU's emphasis on ethical AI and fundamental rights reflects an awareness of this issue, yet translating these principles into practice remains an ongoing challenge.[26]

Another structural challenge arises from the rapid pace of technological development. AI technologies evolve at a speed that often outpaces the legislative process, creating a persistent regulatory lag.[27] By the time a regulatory framework is fully implemented, new technological paradigms may have already emerged, rendering certain provisions outdated or insufficient.[28] This dynamic is

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[24] Francesca Mollo, 'The processing of biometric data in the AI Act: intersections between data protection legislation and the new European regulation of artificial intelligence', *Federalismi.it* 2024, no. 28 (2024): 91–129.

[25] Oskar J. Gstrein, Noman Haleem, and Andrej Zwitter, 'General-Purpose AI Regulation and the European Union AI Act', *Internet Policy Review* 13, no. 3 (2024), https://doi.org/10.14763/2024.3.1790.

[26] Francesco De Micco et al., 'Robotics and AI into Healthcare from the Perspective of European Regulation: Who Is Responsible for Medical Malpractice?', *Frontiers in Medicine* 11 (2024), https://doi.org/10.3389/fmed.2024.1428504.

[27] Mohammad Khabbab Taki, 'Artificial Intelligence in Bangladesh's Legal System: Pathways to Smart and Efficient Justice', *Nusantara: Journal of Law Studies* 5, no. 1 (March 2026): 252–268, https://doi.org/10.66325/nusantaralaw.v5i1.158.

[28] Sukindar et al., 'Legal Innovation in Religious Courts: The Potential Utilization of Artificial Intelligence (AI) in Resolving Contemporary Cases', *MILRev: Metro Islamic Law Review* 3, no. 2 (December 2024): 388–410, https://doi.org/10.32332/milrev.v3i2.8199.

particularly evident in the rise of generative AI and large-scale foundation models, which introduce novel risks not fully anticipated by earlier regulatory discussions.[29] These include the spread of misinformation, the unauthorized use of copyrighted materials, and the potential for large-scale societal manipulation through automated content generation. Addressing these emerging risks requires not only adaptive regulatory mechanisms but also continuous dialogue between policymakers, researchers, and industry stakeholders.[30]

Furthermore, the global nature of AI development raises questions about the external effectiveness of the EU regulatory model. While the EU aspires to set a global standard for trustworthy AI—often referred to as the "Brussels Effect"—its influence depends on the willingness of non-EU actors to align with its rules. In a competitive international environment, where other major economies may adopt more flexible or innovation-driven approaches, there is a risk that overly stringent regulations could place European firms at a disadvantage. Balancing global competitiveness with ethical leadership thus becomes a delicate task for EU policymakers.[31]

In conclusion, while the EU AI regulatory model represents a pioneering effort to govern emerging technologies in a comprehensive and rights-based manner, it faces a complex array of governance challenges. These include regulatory complexity and compliance burdens, legal ambiguity, disparities in institutional capacity, cross-border enforcement difficulties, issues of transparency and accountability, and the accelerating pace of technological change. Addressing these challenges requires a dynamic and adaptive governance approach—one that not only refines legal frameworks but also strengthens institutional capacities, fosters collaboration across jurisdictions, and maintains an ongoing engagement with technological developments. Only through such a holistic strategy can the EU ensure that its vision of trustworthy and human-centric AI becomes a practical reality rather than merely a normative aspiration.

Toward Adaptive and Coherent AI Governance

In response to these challenges, the study identifies several pathways for enhancing the effectiveness and coherence of AI governance in the European Union. First, there is a need for greater regulatory clarity through the development of detailed guidelines and interpretative frameworks at the EU

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[29] Muh Fadli Faisal Rasyid et al., 'Cybercrime Threats and Responsibilities: The Utilization of Artificial Intelligence in Online Crime', *Jurnal Ilmiah Mizani: Wacana Hukum, Ekonomi Dan Keagamaan* 11, no. 1 (April 2024): 49–63, https://doi.org/10.29300/mzn.v11i1.3318.

[30] Allessia Chiappetta, 'Navigating the AI Frontier: European Parliamentary Insights on Bias and Regulation, Preceding the AI Act', *Internet Policy Review* 12, no. 4 (2023), https://doi.org/10.14763/2023.4.1733.

[31] Hans Steege, 'Impact of the European draft AI regulation on tomorrow's mobility', *VDI Berichte* 2023, no. 2413 (2023): 19–30, https://doi.org/10.51202/9783181024133-19.

level. The European Commission and related bodies should play a more active role in issuing standardized methodologies to ensure consistent application of legal norms across member states. Second, the adoption of adaptive regulatory mechanisms is essential. Tools such as regulatory sandboxes can provide a controlled environment for testing innovative AI solutions while ensuring compliance with legal requirements. These mechanisms enable a more flexible approach to Regulation, allowing policymakers to respond dynamically to technological developments.[32]

Third, strengthening institutional coordination is crucial. Enhanced cooperation between national regulators, along with the establishment of centralized oversight structures, can help mitigate fragmentation and improve enforcement consistency. Information-sharing mechanisms and joint supervisory initiatives should be expanded to address the cross-border nature of AI systems.[33] Fourth, the study emphasizes the importance of balancing Regulation with support for innovation. Financial incentives, research funding, and capacity-building programs can help offset the compliance costs associated with strict regulatory requirements. Initiatives such as Horizon Europe and Digital Europe demonstrate the EU's commitment to fostering innovation alongside Regulation, but further efforts are needed to ensure inclusivity and competitiveness.[34]

Finally, the findings underscore the importance of a human-centric approach to AI governance. Legal frameworks must continue to prioritize the protection of fundamental rights, ethical principles, and societal well-being. Building public trust in AI systems requires not only robust legal safeguards but also transparency, inclusivity, and stakeholder engagement. In conclusion, the research answers the central question by demonstrating that the European Union's AI legislation embodies a complex interplay between legal convergence and divergence, shaped by a risk-based regulatory model and influenced by diverse national contexts. While the EU has made significant progress in establishing a comprehensive governance framework, ongoing challenges related to implementation, clarity, and adaptability highlight the need for continuous refinement. The European model thus represents both a benchmark and an evolving experiment in global AI regulation.

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[32] Jakob Mökander et al., 'Conformity Assessments and Post-Market Monitoring: A Guide to the Role of Auditing in the Proposed European AI Regulation', *Minds and Machines* 32, no. 2 (2022): 241–268, https://doi.org/10.1007/s11023-021-09577-4.

[33] Valentyna I. Bobrytska et al., 'Artificial Intelligence (AI) in Ukrainian Higher Education: A Comprehensive Study of Stakeholder Attitudes, Expectations and Concerns', *International Journal of Learning, Teaching and Educational Research* 23, no. 1 (2024): 400–426, https://doi.org/10.26803/ijlter.23.1.20.

[34] Tommaso Di Noia et al., 'Recommender Systems under European AI Regulations', *Communications of the ACM* 65, no. 4 (2022): 69–73, https://doi.org/10.1145/3512728.

Conclusion

This study demonstrates that the European Union has developed a comprehensive and multi-level regulatory model for artificial intelligence, characterized by a dynamic interplay between legal convergence and divergence. At the supranational level, instruments such as the AI Act and the GDPR establish a harmonized legal framework based on a risk-oriented approach, enabling differentiated Regulation according to the potential impact of AI systems. This model successfully balances the protection of fundamental rights, ethical considerations, and the promotion of innovation. At the same time, the findings reveal that national implementation across member states varies widely in terms of institutional capacities, policy priorities, and levels of technological development. Countries such as Germany, France, and Spain illustrate varying regulatory emphases, while statistical disparities in AI adoption highlight the persistence of a digital divide within the EU. Despite these differences, integrating regulatory measures with financial and institutional support—particularly through programs such as Horizon Europe and Digital Europe—strengthened the overall effectiveness of the European AI governance framework. Nevertheless, the study also identifies several challenges, including regulatory complexity, uneven enforcement, and the need for clearer legal definitions and adaptive governance mechanisms. In this regard, future research should focus on evaluating the long-term effectiveness of the AI Act in practice, particularly in relation to emerging technologies such as generative AI and general-purpose systems. Further studies are also needed to explore comparative models beyond the EU, assess the impact of regulatory frameworks on innovation ecosystems, and examine mechanisms for enhancing international cooperation in AI governance. Additionally, expanding empirical research on institutional capacity and enforcement practices across member states would provide deeper insights into the practical implementation of AI regulation. Such directions will contribute to the ongoing refinement of legal frameworks that are both responsive to technological change and aligned with fundamental human values.

Author Contributions Statement

Tetiana Kolomoiets conceived and developed the overall structure of the study, formulated the main arguments, and guided the preparation and writing of the manuscript. Maryna Velykanova and Marina Kravets made significant contributions to the theoretical analysis and interpretation of the results, offering critical conclusions that strengthened the legal and methodological aspects of the study. Meanwhile, Hanna Blinova and Oleh Posykaliuk played a key role in conducting the literature review, collecting relevant data, and refining the discussion to ensure coherence between the regulatory framework and the current realities of legislative development. All authors actively participated in the review and final approval of the manuscript, ensuring its academic accuracy and integrity.

AI Usage Statement

The authors state that artificial intelligence (AI) applications were used on a small scale to assist with language correction, grammar correction, and rephrasing in academic writing. There was no use of AI when generating research data, conducting analysis, interpreting legal materials, or developing arguments and conclusions in the study. All the substantive work, including intellectual contributions such as conceptualisation, legal analysis, comparative assessment, and findings interpretation, was done entirely by the authors. The authors assume complete responsibility for the contents, correctness, and originality of this work.

Conflict of Interest

The author declares that there is no potential conflict of interest, whether financial, professional, or personal, that could have influenced the research findings, data interpretation, or conclusions presented in this article. The research was conducted independently and objectively to ensure academic integrity and transparency.

References

Abubakar, Isah Ndakara, Oluwadamilare Harazeem Abdulganiyu, Moad Essabbar, Hajar Saikouk, and El Hilali Alaoui Ahmed. 'Control Strategies and AI-Based Techniques for Blood Glucose Regulation in Artificial Pancreas System Development: A Systematic Literature Review'. *Medicine in Novel Technology and Devices* 30 (2026). https://doi.org/10.1016/j.medntd.2026.100438.

Bobrytska, Valentyna I., Hanna V. Krasylnykova, Nataliia A. Beseda, Sergii R. Krasylnykov, and Tetiana S. Skyrda. 'Artificial Intelligence (AI) in Ukrainian Higher Education: A Comprehensive Study of Stakeholder Attitudes, Expectations and Concerns'. *International Journal of Learning,*

Teaching and Educational Research 23, no. 1 (2024): 400–426. https://doi.org/10.26803/ijlter.23.1.20.

Ćemalović, Uroš. 'Prohibited Artificial Intelligence Practices According to Article 5 of the European Union's Regulation on AI—between the "Too Late" and the "Not Enough"'. *International Journal of Law and Information Technology* 32 (2024). https://doi.org/10.1093/ijlit/eaae023.

Chiappetta, Allessia. 'Navigating the AI Frontier: European Parliamentary Insights on Bias and Regulation, Preceding the AI Act'. *Internet Policy Review* 12, no. 4 (2023). https://doi.org/10.14763/2023.4.1733.

Corazza, Michele, Generoso Longo, Leonardo Zilli, Emanuele Di Sante, Salvatore Sapienza, and Monica Palmirani. 'Hybrid AI Enhancing European Drafting Legislation for a Better Regulation'. *Int. Conf. eDemocracy and eGovernment, ICEDEG*, no. 2025 (2025): 106–113. https://doi.org/10.1109/ICEDEG65568.2025.11081650.

Cuocolo, Renato, Diana Bernardini, Daniel Pinto dos Santos, Michail E. Klontzas, Tugba Akinci D'Antonoli, Luís Curvo Semedo, Robin Decoster, et al. 'AI Medical Device Post-Market Surveillance Regulations: Consensus Recommendations by the European Society of Radiology'. *Insights into Imaging* 16, no. 1 (2025). https://doi.org/10.1186/s13244-025-02146-8.

De Micco, Francesco, Simone Grassi, Luca Tomassini, Gianmarco Di Palma, Giulia Ricchezze, and Roberto Scendoni. 'Robotics and AI into Healthcare from the Perspective of European Regulation: Who Is Responsible for Medical Malpractice?' *Frontiers in Medicine* 11 (2024). https://doi.org/10.3389/fmed.2024.1428504.

Di Noia, Tommaso, Nava Tintarev, Panagiota Fatourou, and Markus Schedl. 'Recommender Systems under European AI Regulations'. *Communications of the ACM* 65, no. 4 (2022): 69–73. https://doi.org/10.1145/3512728.

Elena C., Díaz Galán. 'The legal regulation of Artificial intelligence (AI) in Europe: two decisive (but insufficient) steps of the Council of Europe and the European Union'. *Cuadernos de Derecho Transnacional* 17, no. 1 (2025): 366–390. https://doi.org/10.20318/cdt.2025.9334.

Fam Eli, Elio, and Enrico Bis Enzi. 'The new Artificial Intelligence and the problem of its legal regulation. The european strategy and the long legislative process of the AI Act'. *Rivista Italiana di Informatica e Diritto* 7, no. 1 (2025). https://doi.org/10.32091/RIID0224.

Font, Jorge Luis Ordelin. 'Copyright and training of generative AI systems: transparency obligations and text and data mining in European

regulations'. *Revista de Internet, Derecho y Politica*, no. 42 (2025). https://doi.org/10.7238/idp.v0i42.431327.

Górski, Lukasz, and Shashishekar Ramakrishna. 'Right to Explanation in Large Language Models: Lessons from the European Union AI Act and General Data Protection Regulation'. *IT Professional* 27, no. 1 (2025): 34–40. https://doi.org/10.1109/MITP.2024.3518917.

Gstrein, Oskar J., Noman Haleem, and Andrej Zwitter. 'General-Purpose AI Regulation and the European Union AI Act'. *Internet Policy Review* 13, no. 3 (2024). https://doi.org/10.14763/2024.3.1790.

Hoven van Genderen, Rob van den, and Rosa Ballardini. 'AI and Emotional Data Between the Scylla and Charybdis of European Regulation'. *Jusletter IT*, 2024, 57–66. https://doi.org/10.38023/aa115617-978f-4d5a-93a7-5b9f16005cf0.

Izarova, Iryna, Oksana Uhrynovska, Oksana Khotynska-Nor, Yuriy Prytyka, Oleksandr Bedyukh, and Yuliia Alendar. 'Advancing Sustainable Justice Through Ai-Based Case Law Analysis: Ukrainian Experience'. *Access to Justice in Eastern Europe* 7, no. 1 (2024): 127–148. https://doi.org/10.33327/AJEE-18-7.1-a000123.

Katterbauer, Klemens, Sema Yilmaz, Hassan Syed, and Rahmi Deniz Özbay. 'The Challenges of AI Regulation for the Gig Economy in the European Union'. In *Regulating the Gig Economy in the European Union: Challenges, Innovations, and Global Impacts*, edited by Rui Alexandre Castanho, Fabricio Pelloso Piurcosky, Andrey Kinyakin, Mario De Martino, and Rodrigo Franklin Frogeri, 125–45. IGI Global, 2025. https://doi.org/10.4018/979-8-3373-6082-9.ch005.

Kauffman, Marcos Eduardo, Marcelo Negri Soares, Kuo-Ming Chao, Tengfei Long, and Welington Junior Jorge Manzato. 'EU AI Act Regulation: A Study of Non-European Union Manufacturers' Compliance Preparedness'. *Journal of Manufacturing Technology Management*, 2026, 1–20. https://doi.org/10.1108/JMTM-07-2025-0657.

Liang, Guangda. 'Governing the Amorphous: AI, Social Justice, and the Challenge of Future-Proof Regulation'. *Social Sciences and Humanities Open* 13 (2026). https://doi.org/10.1016/j.ssaho.2026.102467.

Mach, Martin. 'DeepSeek as a Precedent – A Test of the Resilience of European AI Regulation'. *Pravnik* 164, no. 11 (2025): 1068–1111.

Mökander, Jakob, Maria Axente, Federico Casolari, and Luciano Floridi. 'Conformity Assessments and Post-Market Monitoring: A Guide to the Role of Auditing in the Proposed European AI Regulation'. *Minds and*

Machines 32, no. 2 (2022): 241–268. https://doi.org/10.1007/s11023-021-09577-4.

Mollo, Francesca. 'The processing of biometric data in the AI Act: intersections between data protection legislation and the new European regulation of artificial intelligence'. *Federalismi.it* 2024, no. 28 (2024): 91–129.

Paul, Regine. 'European Artificial Intelligence "Trusted throughout the World": Risk-Based Regulation and the Fashioning of a Competitive Common AI Market'. *Regulation and Governance* 18, no. 4 (2024): 1065–1082. https://doi.org/10.1111/rego.12563.

Rasyid, Muh Fadli Faisal, Muh Akhdharisa Sj, Karlin Z. Mamu, Saptaning Ruju Paminto, Wahab Aznul Hidaya, and Abdennour Hamadi. 'Cybercrime Threats and Responsibilities: The Utilization of Artificial Intelligence in Online Crime'. *Jurnal Ilmiah Mizani: Wacana Hukum, Ekonomi Dan Keagamaan* 11, no. 1 (April 2024): 49–63. https://doi.org/10.29300/mzn.v11i1.3318.

Saqib, Hafiz Muhammad, and Hira Amin. 'Comparative Analysis of AI Regulation for Fintech Cybersecurity and Privacy in the European Union and Qatar'. *Discover Artificial Intelligence* 6, no. 1 (2026). https://doi.org/10.1007/s44163-025-00736-5.

Sharov, Sergii, Serhii Tereshchuk, Liudmyla Romas, Alina Zemlianska, Olga Derkachova, and Antomi Saregar. 'Accessibility and Responsibility: Use of Generative AI by Ukrainian Students'. *TEM Journal* 14, no. 4 (2025): 3572–3581. https://doi.org/10.18421/TEM144-62.

Steege, Hans. 'Impact of the European draft AI regulation on tomorrow's mobility'. *VDI Berichte* 2023, no. 2413 (2023): 19–30. https://doi.org/10.51202/9783181024133-19.

Sukindar, Hendrik Kusnianto, Sarikun, Benhard Kurniawan Pasaribu, and Muhd Syahazizamir bin Sahmat. 'Legal Innovation in Religious Courts: The Potential Utilization of Artificial Intelligence (AI) in Resolving Contemporary Cases'. *MILRev: Metro Islamic Law Review* 3, no. 2 (December 2024): 388–410. https://doi.org/10.32332/milrev.v3i2.8199.

Taki, Mohammad Khabbab. 'Artificial Intelligence in Bangladesh's Legal System: Pathways to Smart and Efficient Justice'. *Nusantara: Journal of Law Studies* 5, no. 1 (March 2026): 252–268. https://doi.org/10.66325/nusantaralaw.v5i1.158.

Tallberg, Jonas, Magnus Lundgren, and Johannes Geith. 'AI Regulation in the European Union: Examining Non-State Actor Preferences'. *Business and Politics* 26, no. 2 (2024): 218–239. https://doi.org/10.1017/bap.2023.36.

Yang, Shu Ching. 'Integrating Technology Acceptance, Self-Determination, and Self-Regulation: A Structural Model of Generative AI-Supported Learning and Competence'. *Computers in Human Behavior* 179 (2026). https://doi.org/10.1016/j.chb.2026.108933.

Zhu, Yu Peng, Si Qi Liang, Ya Fang Zou, and Han Woo Park. 'Regulation and Innovation: Unveiling the Quadruple-Helix-Innovation Ecosystem of Generative AI'. *Information Processing and Management* 63, no. 3 (2026). https://doi.org/10.1016/j.ipm.2025.104549.

Коваленко, Дар'я Олександрівна, and Марина Сергіївна Уткіна. 'Проблема Правового Регулювання Інтелектуальної Власності На Об'єкти, Створені Штучним Інтелектом'. *Нове українське право*, no. 1 (March 2022): 197–201. https://doi.org/10.51989/NUL.2022.1.30.