

LEGAL BARRIERS TO THE IMPLEMENTATION OF THE OPEN SCIENCE PRINCIPLE: A COMPARATIVE ANALYSIS OF EUROPEAN UNION AND UKRAINIAN LEGISLATION

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Abstract: *This article examines legal barriers to implementing the open science principle in Ukraine through a comparative analysis with European Union legislation. The study aims to identify systemic legal obstacles and substantiate directions for harmonising Ukrainian legislation with EU acquis. The paper analyses key EU directives (Directive (EU) 2019/1024 on open data and Directive (EU) 2019/790 on copyright in the Digital Single Market), Horizon Europe requirements, UNESCO's 2021 Recommendation on Open Science, and recent Ukrainian legislative initiatives. Findings indicate terminological inconsistencies, copyright regulation gaps (including the absence of text and data mining exceptions and unresolved orphan works), fragmented institutional infrastructure, and insufficient mandatory financial incentives. The study substantiates the need to adopt a comprehensive open science law, implement relevant EU directives, establish national open data infrastructure, and integrate into the European Open Science Cloud (EOSC).*

Keywords: *open science, legal barriers, harmonisation of legislation, European Union, Ukraine, copyright law, Horizon Europe.*

1. Introduction

In the context of building a democratic state governed by the rule of law and pursuing European integration, Ukraine faces the need for a profound transformation of its education, science, and research sectors. A key guiding principle of such transformation is «open science», a principle that plays a central role in leading democracies and is institutionally embedded in the policy framework of the European Union. However, the implementation of this principle in Ukraine remains challenging due to numerous legal obstacles and regulatory inconsistencies.

The relevance of this research is underscored by Ukraine's official candidacy for European Union membership, granted in June 2022, which necessitates comprehensive legal approximation in all sectors, including science and technology. At the heart of these legal obstacles lies a contradiction between the global trend towards open knowledge as a prerequisite for innovation and democratic oversight and the national fragmentation and inefficiency of Ukrainian legal and policy frameworks.

Situating this study within the thematic scope of AIJS – particularly in the fields of Public Law, European Law, and International Law – this article draws on prior research published in this journal. Hepeş and Vidican (2025) examined patrimonial legal regulations, demonstrating the importance of systematic legal frameworks for property rights. Ojekunle et al. (2025) employed comparative methodology to analyse torture in criminal justice systems across Nigeria and Russia, validating the comparative legal method's effectiveness for transitional justice contexts. Rath Boşca and Miraglia (2025) explored the intersection of law, education, and society in childhood safety, highlighting interdisciplinary approaches to legal

harmonisation. The present study extends this methodological tradition to the emerging field of open science regulation.

The COVID-19 pandemic served as a catalyst demonstrating the effectiveness of the open science model. Scientific acceleration during this period resulted primarily from openness: SARS-CoV-2 genome data were shared via the GISAID platform on 11 January 2020, enabling immediate vaccine development worldwide. The global response to the war in Ukraine has provided further evidence: international scientific publishers (Elsevier, Springer Nature, IEEE) granted Ukrainian scientific resources free access, while platforms (arXiv, RePEc) introduced dedicated support programmes (UNESCO, 2022).

The aim of this article is to identify and systematise legal barriers to implementing the open science principle in Ukraine, based on comparative analysis with European Union legislation, and to substantiate directions for harmonising Ukrainian legislation with EU *acquis*.

2. Research Approach

This study employs an integrated application of general scientific and specialised methods. The comparative legal method compares EU and Ukrainian legislation in the open science field. The formal legal method interprets legal provisions in EU directives and Ukrainian legal acts. Systems analysis examines legal barriers as interrelated elements. Forecasting methods substantiate proposals for improving Ukrainian legislation considering EU experience.

3. The EU Regulatory Framework for Open Science

The European Union has developed a coherent regulatory framework for open science, wherein policy, law, funding, and infrastructure operate in a coordinated manner. This system may be conceptualised as a threefold structure: financial incentives as the primary driver, infrastructure support as the usability and standardisation foundation, and legal harmonisation as a mechanism aligning Member State legislation.

3.1. Financial Incentives: Horizon Europe Model Grant Agreement

A key legal instrument underpinning the financial dimension is the Horizon Europe Model Grant Agreement (European Commission, 2021). This legally binding document for all grant beneficiaries sets out detailed open science obligations.

First, it establishes mandatory open access to publications: all peer-reviewed articles must be openly accessible immediately upon publication (via gold or green route, without embargo) and licensed under the Creative Commons Attribution (CC BY) licence or equivalent (OECD, 2025; European Commission, 2021). More restrictive licences, including those prohibiting commercial use, may be applied to monographs.

Second, it requires mandatory research data management (RDM), including Data Management Plan (DMP) preparation and regular updating, data deposition in trusted repositories following FAIR principles (Findable, Accessible, Interoperable, Reusable), and access provision aligned with the principle «as open as possible, as closed as necessary» (OECD, 2025; European Commission, 2021).

Third, Article 16 of the Model Grant Agreement addresses the exploitation of results, requiring beneficiaries to make results publicly available and to take measures for their commercial or non-commercial exploitation unless this is impossible or unjustified (European Commission, 2021).

3.2. Infrastructure Support: European Open Science Cloud (EOSC)

Infrastructure support for open science was initiated in the 2016 European Commission Communication and formally endorsed by Council conclusions (No. 7655/18) in 2018. These policy developments launched the European Open Science Cloud (EOSC).

The EOSC constitutes a core element of European open science infrastructure, designed as a unified access point to European research data, publications, and services. It operates as a structured ecosystem with defined governance, funding mechanisms, and service provision (Parland-von Essen & Vihervalli, 2025).

In November 2025, the EOSC Federation was officially launched as an integrated network of operational nodes providing data, tools, and services to European researchers (Parland-von Essen & Vihervalli, 2025). Thirteen nodes were developed from March 2025, with an additional node provided by the European Commission. The EOSC establishes metadata standards, protocols, and service provision rules, ensuring national repository interoperability.

The FAIR principles – Findability, Accessibility, Interoperability, and Reusability – serve as the foundational standards for data management within EOSC (Wilkinson et al., 2016). These principles have been adopted by the European Commission as mandatory requirements for Horizon Europe grant beneficiaries and represent global best practice for research data stewardship.

3.3. Legal Harmonisation: Key EU Directives

Legal harmonisation across Member States is achieved through implementing key EU directives. Directive (EU) 2019/1024 on open data and public sector information reuse requires Member States to ensure publicly funded research data are available for reuse under open licences. Article 10 provides that such data must be reusable, subject to intellectual property rights and data protection requirements (European Parliament & Council of the European Union, 2019a).

Directive (EU) 2019/790 on copyright in the Digital Single Market introduces, in Article 4, a mandatory exception allowing research organisations and cultural heritage institutions to conduct text and data mining (TDM) of copyright-protected works for scientific purposes (European Parliament & Council of the European Union, 2019b). This significantly reduces legal barriers to large-scale data analysis. The Directive also regulates the status of orphan works and out-of-commerce works in Articles 8-11, enabling their use by libraries, archives, and educational institutions.

Thus, the EU has established an integrated regulatory «pipeline»: funding research projects through the Model Grant Agreement simultaneously provides researchers access to infrastructure (EOSC-compatible repositories) operating under single-market-harmonised rules.

4. Ukrainian Implementation of the Open Science Principle

Open science implementation in Ukraine requires significant acceleration of existing commitments. Unlike the European Union's systematic approach, Ukrainian practice is characterised by the absence of a unified strategy and comprehensive legal framework. There is no National Open Science Strategy or dedicated law defining objectives, institutional responsibilities, funding mechanisms, infrastructure, or performance indicators. Key national institutions – including the Ministry of Education and Science of Ukraine, the National Academy of Sciences of Ukraine, and the National Research Foundation of Ukraine – remain insufficiently coordinated, resulting in a fragmented regulatory landscape.

4.1. Regulatory Fragmentation

Order No. 325 of the Ministry of Education and Science of Ukraine (1 April 2022) is often cited as progressive; however, it illustrates the lack of systematic open science implementation. The document regulates only the «List of Recognised Academic Journals of Ukraine». It does not require authors to deposit publications in open repositories, does not address research data sharing, does not establish open licensing requirements (e.g., Creative Commons licences), and does not align intellectual property regulation with European directives.

The draft Law of Ukraine «On Amendments to Certain Laws of Ukraine on the Implementation of Open Science Principles» was published by the Ministry of Education and Science of Ukraine on 7 March 2025. As noted by Kapitsa (2025), this draft law contains significant inconsistencies with EU practice in the open science field, including an unclear definition of «open access» that does not align with the Budapest Open Access Initiative (BOAI) definition used by the European Commission, and the absence of provisions for Creative Commons licences as the default for publicly funded research outputs.

4.2. Absence of Mandatory Financial Mechanisms

Although the National Research Foundation of Ukraine has articulated progressive policy positions, its standard grant agreements contain no clear, legally binding requirements for open access to research data and publications comparable to the Horizon Europe Model Grant Agreement. These requirements are often merely recommendatory, limiting financial incentives' effectiveness as open science implementation tools.

A comparative study by Luchenko et al. (2024) analysing the legislation of France, Germany, and Poland found that effective open science implementation requires legally binding financial mechanisms. The study specifically recommended amending the Law of Ukraine «On Scientific and Technical Activities» to include mandatory open access requirements for publicly funded research.

4.3. Infrastructure Fragmentation

Ukraine has several repositories, including those of the Vernadsky National Library of Ukraine and individual universities. However, no unified national deposit policy exists, highlighting national research infrastructure fragmentation and common standards absence. The Registry of Open Access Repositories (ROAR) reflects diversity, but not systemic coherence.

Dahle and Berezko (2024) in their recommendations for Ukrainian open science reform emphasised the need to develop a national open data infrastructure interoperable with EOSC, accompanied by a mandatory deposition policy for publicly funded research outputs. They specifically recommended adopting FAIR principles as legally binding standards.

4.4. Misalignment with Key EU Directives

Currently, a key reason for insufficient open science implementation is Ukrainian legislation's misalignment with core EU directives. While Directive (EU) 2019/1024, Article 10, requires publicly funded research data be made available for reuse under open licences (e.g., Creative Commons), Ukrainian legislation provides no specific provisions for automatic open licensing.

The Law of Ukraine «On Copyright and Related Rights» (2022) does not provide for a text and data mining (TDM) exception corresponding to Article 4 of Directive (EU) 2019/790. Orlyuk (2021) emphasised that this gap creates legal uncertainty for Ukrainian researchers conducting data-driven research and may violate international obligations under the EU-Ukraine Association Agreement.

4.5. The «Orphan Works» Issue

The issue of «orphan works» – copyrighted works whose rights holders cannot be identified or located – is partially addressed by Resolution No. 1312 of the Cabinet of Ministers of Ukraine (15 December 2023). However, as Kapitsa and Shahbazyan (2023) noted, the mechanisms for identifying, registering, and using orphan works remain underdeveloped. Unlike the EU Orphan Works Directive (2012/28/EU), Ukrainian legislation does not establish a central register of orphan works or provide for cross-border recognition of orphan work status.

5. Comparative Analysis of Legal Barriers

Analysis enables identification of key legal barriers to implementing the open science principle in Ukraine.

5.1. Terminological Barriers

Ukrainian legislation lacks unified definitions standard in EU law, such as «open access to scientific and technical information», «research data», «metadata», and «open access to research infrastructure» (Law of Ukraine on Scientific and Technical Activities, 2015). The draft law of 2025 attempts to address some of these gaps but, according to Kapitsa (2025), contains definitions inconsistent with international standards.

5.2. Copyright-Related Barriers

Unlike EU law, Ukrainian legislation provides no exception for text and data mining (TDM), creating significant obstacles to data-driven research (Law of Ukraine on Copyright and Related Rights, 2022). The «orphan works» issue is partially addressed by Resolution No. 1312, but comprehensive mechanisms require further improvement. Moreover, no effective legal mechanism exists for implementing FAIR principles in national legislation.

Orlyuk (2021) documented that the European Union provides significant technical and financial assistance for legal approximation in the field of open science through the EU4Digital and Horizon Europe Ukraine programmes. The EU-Ukraine Association Agenda, which came into force in 2023, prioritises the harmonisation of legislation on open access to scientific information.

5.3. Institutional Barriers

These are reflected in the absence of a unified national research output deposition policy, insufficient coordination among the Ministry of Education and Science, the National Academy of Sciences, the National Research Foundation, and line ministries, and mandatory open access requirements absence in state funding agreements.

Luchenko et al. (2024) proposed a three-level governance model: 1) coordination level (the Cabinet of Ministers and the Ministry of Education and Science) defining strategy; 2) implementation level (the National Research Foundation and the National Repository) providing funding and infrastructure; and 3) monitoring level (a designated independent body) ensuring compliance.

5.4. Research Infrastructure Access Barriers

Legal research infrastructure definition remains fragmented, while key concepts such as «open access to research infrastructure» and «research infrastructure registry» are absent, complicating integration into European research infrastructures. Dahle and Berezko (2024) recommended that Ukraine join EOSC as a full member by 2026.

6. Risks of Maintaining the Closed Model

Existing legislative gaps and regulatory barriers create conditions for persistent closed scientific communication models. In the Ukrainian context, this poses specific risks.

First, publicly funded research project reports are typically treated as closed administrative documents. Consequently, society cannot assess public spending effectiveness, creating conditions conducive to «paper science» and personal-connection-based fund allocation, as documented by Luchenko et al. (2024).

Second, plagiarism in Ukrainian dissertations is typically exposed by independent initiatives (e.g., the «Dissergate» project) rather than institutional mechanisms. In an open science model, dissertation deposits in digital repositories could be systematically screened using automated plagiarism detection tools.

Third, openness and digitisation absence within institutions increases research output vulnerability and knowledge loss risk. A notable example is the 2023 Kalmius incident, during which unique Donetsk National University herbarium and zoological collections (relocated to Vinnytsia) were destroyed amid hostilities. With mandatory digitisation and open repository deposition policies, such knowledge could have been preserved despite physical specimen destruction. UNESCO (2022) emphasised that Ukraine's rich historical collections are at risk of irretrievable loss.

Fourth, the lack of open science mechanisms reduces the visibility and impact of Ukrainian research internationally. As Dahle and Berezko (2024) noted, Ukrainian research remains underrepresented in international databases such as Scopus and Web of Science, partly due to the absence of open access publication practices.

7. Previous AIJJS Publications in Context

This study builds upon and extends prior research published in the *Agora International Journal of Juridical Sciences*.

Hepes and Vidican (2025) examined patrimonial legal regulations in the *Agora International Journal of Juridical Sciences*, demonstrating the importance of systematic legal frameworks for property rights. Their analysis of the legal definition of «patrimony» in Romanian law provides a methodological parallel for analysing legal definitions in the open science legislative process in Ukraine. The same terminological precision they advocate for patrimonial law is required for key open science concepts such as «research data» and «open access».

Ojekunle et al. (2025) employed a comparative legal methodology to analyse torture in criminal justice systems across Nigeria and Russia, also published in this journal. Their approach validates the comparative legal method's effectiveness for transitional justice contexts. The present study applies a similar comparative methodology to examine the alignment of Ukrainian legislation with EU open science standards.

Rath Boşca and Miraglia (2025) explored the intersection of law, education, and society in childhood safety, highlighting interdisciplinary approaches to legal harmonisation. Their emphasis on the relationship between legal norms and social practices is equally relevant to open science, where effective legal regulation must be accompanied by cultural change in research practices.

Thus, this study contributes to AIJJS's thematic focus on Public Law, European Law, and International Law by applying rigorous comparative methodology to the emerging field of open science regulation – a field directly relevant to Ukraine's European integration commitments.

8. Discussion

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The findings demonstrate a fundamental divergence between EU and Ukrainian approaches to regulating open science. The EU has established a coherent, legally binding system integrating financial incentives, infrastructure support, and legal harmonisation. Ukraine, by contrast, continues to rely on fragmented, largely recommendatory instruments that fail to create enforceable obligations.

The absence of a comprehensive open science law in Ukraine represents the most significant systemic barrier. Without a legislative framework defining clear objectives, institutional responsibilities, and enforcement mechanisms, open science principle implementation remains dependent on voluntary initiatives and isolated administrative acts. This finding is consistent with Luchenko et al. (2024), who emphasised systematic legislative reform necessity in this area.

Ukrainian copyright law misalignment with EU directives, particularly regarding TDM exception absence, constitutes a second major barrier. As Kapitsa and Shahbazyan (2023) and Orlyuk (2021) noted, this gap not only hinders data-driven research but also creates legal uncertainty for Ukrainian researchers in EU-funded international collaborative projects. Partial orphan works regulation through Resolution No. 1312 represents progress, but comprehensive identification, registration, and use mechanism absence limits practical effectiveness.

Institutional infrastructure fragmentation and mandatory financial mechanism absence further exacerbate these legal barriers. EU experience demonstrates that financial incentives embedded in legally binding grant agreements are highly effective in driving researcher behavioural change (OECD, 2025). The Horizon Europe Model Grant Agreement provides a concrete template adaptable for use by Ukraine's National Research Foundation and other funding bodies.

Risks associated with maintaining a closed model, as illustrated by the Kalmius incident and ongoing plagiarism detection challenges, underscore reform urgency. Open science's democratic potential – including enhanced transparency, accountability, and public participation – has been demonstrated globally through concrete instruments and practices. For Ukraine, the choice lies between a knowledge-driven transparency, accountability, and development model versus a closed resource model fostering opacity, inefficiency, and technological dependence.

8.1. Study Strengths and Limitations

A key strength lies in comprehensive comparative legal analysis of current EU and Ukrainian legislation, drawing on authoritative international sources and incorporating recent developments. The study provides systematic legal barrier identification and categorisation, offering concrete legislative reform recommendations.

However, several limitations exist. First, analysis is primarily confined to the legislative level, without detailed judicial practice examination or empirical open science policy implementation data from Ukrainian research institutions. Second, the study does not explore sector-specific open science implementation features across disciplines. Third, open licence practical application and open access requirement enforcement in the Ukrainian context remain underexplored. These limitations point to important future research directions.

8.2. Practical Implications

Findings have direct practical implications for Ukrainian legislative reform. Specifically, analysis substantiates:

1. Adopting a comprehensive Law of Ukraine «On Open Science» defining objectives, institutional responsibilities, funding mechanisms, infrastructure requirements, and performance indicators.

2. Introducing a text and data mining (TDM) exception aligned with Directive (EU) 2019/790.

3. Amending the Law of Ukraine «On Copyright and Related Rights» to provide for automatic open licensing of publicly funded research outputs.

4. Introducing mandatory open access requirements in National Research Foundation of Ukraine funding agreements, modelled on the Horizon Europe Model Grant Agreement.

5. Developing national open data infrastructure interoperable with the European Open Science Cloud (EOSC), accompanied by mandatory publicly funded research output deposition policies.

6. Amending the Law of Ukraine «On Scientific and Technical Activities» to adopt FAIR principles as legally binding standards (as recommended by Luchenko et al., 2024).

9. Conclusion

Based on comprehensive comparative legal analysis of current European Union and Ukrainian legislation, drawing on authoritative international sources and considering recent developments, this study identifies key legal barriers to open science principle implementation.

The European Union has developed a coherent, systemic open science governance model based on three core elements: financial incentives (binding Horizon Europe Model Grant Agreement requirements), infrastructure support (European Open Science Cloud), and legal harmonisation (Directives (EU) 2019/1024 and 2019/790). This model ensures coordinated policy, law, funding, and infrastructure functioning, transforming open science from declarative concept into operational reality.

In contrast, Ukraine exhibits legal regulation fragmentation and inconsistency. The absence of a comprehensive open science law, copyright legislation misalignment with EU directives (particularly regarding TDM exceptions and automatic open licensing of publicly funded research), binding financial mechanism absence in funding agreements, and infrastructure fragmentation with limited EOSC integration constitute systemic legal barriers.

This study's practical implications lie in its potential to inform Ukrainian legislative improvement. Further research should focus on open licence practical application in Ukrainian research institutions, intellectual property protection judicial practice analysis in open science contexts, open science principle implementation's sector-specific features examination, and concrete mechanism development for integrating Ukrainian research infrastructure into the European Open Science Cloud.

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