

Sustainable Governance of Heterogeneous International Trade Information Sources: A Case Study on Privacy-Preserving Federated Information Repositories

Otabek Khudayberdiev¹, Kamoliddin Sirojiddinov², Komiljon Tajibaev³ and Shuxrat Lutpidinov⁴

¹Associate Professor, Faculty of Economics, Namangan State Technical University, Namangan, Uzbekistan

²Associate Professor, Department of Green Economy and Sustainable Business, Namangan State University, Namangan, Uzbekistan

³Associate Professor, Department of Green Economy and Sustainable Business, Namangan State University, Namangan, Uzbekistan

⁴Associate Professor, Department of Green Economy and Sustainable Business, Namangan State University, Namangan, Uzbekistan

E-mail: ¹khudayberdievotabek@my.swjtu.edu.cn, ²ksi0209178@gmail.com, ³tajibayevkomiljon.7575@gmail.com, ⁴lutpidinovshuxrat8@gmail.com

ORCID: ¹<https://orcid.org/0000-0001-6169-3996>, ²<https://orcid.org/0000-0002-7851-5990>,

³<https://orcid.org/0000-0002-0157-1978>, ⁴<https://orcid.org/0009-0001-7936-4944>

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Abstract - The increasing reliance on international trade is based on the exchange of information that can be obtained from different sources, including customs organizations, logistics companies, banks, regulatory agencies, and multinational firms. Given the heterogeneity of these information sources, there are numerous issues associated with privacy, information sharing, interoperability, regulation, and sustainability of information governance. While traditional trade information governance models have utilized central information storage facilities to manage the information exchange process, certain issues of privacy, organizational autonomy, and cross-jurisdictional regulations have emphasized the necessity to explore other governance alternatives. This research offers a theoretical case study on federated information repositories as a sustainable governance structure for heterogeneous international trade information sources. The research employs a qualitative case study methodology with extensive analysis of the existing literature on information governance, federated information systems, privacy management, and digital repositories. This study explores the governance systems, stakeholders, policies, and sustainability aspects relating to federated repository architectures. From the findings in the study, federated information repositories have been found to facilitate information sharing while ensuring security through control over the information by those involved in federations. The current study identifies a number of knowledge gaps in this field, including the absence of governance frameworks for federated trade information networks, limited interest in addressing the issue of interoperability, scarcity of studies focusing on cross-border privacy laws, and no longitudinal studies on the sustainability of federated information repositories. From this paper, it becomes quite apparent that proper governance for federated repositories involves harmonizing policies, adopting standardized methods of metadata management, accountability, and collaboration, among other aspects. In summary, federated information repositories that ensure the privacy of traders can be considered

a realistic approach towards ensuring information availability, security, and sustainability in global trade systems.

Keywords: International Trade Information Sources, Information Governance, Federated Information Repositories, Privacy Preservation, Sustainable Information Management, Information Sharing, Digital Repositories, Information Interoperability

I. INTRODUCTION

The international trade ecosystem depends on the constant production, exchange, and use of information by customs authorities, logistics operators, financial intermediaries, regulatory bodies, and multinational firms. These parties have different forms of information resource management systems, which vary greatly in terms of their structure, ownership, and management. In view of increasing the role of information in the trade process, effective coordination of these different forms of information resource management has become one of the primary factors in successful international business transactions (Oubrahim & Sefiani, 2023).

There are certain limitations of traditional information management systems because of the growing volume and diversity of information generated by business transactions. There have been certain challenges faced by the traditional system of information management, wherein the information is managed in a centralized database in relation to information ownership, organizational independence, privacy issues, etc. Organizations could find themselves in a situation where they do not want to share information with any outside party because of the potential dangers involved in such a process (Jussen & Möller, 2024).

Recent innovations in digital ecosystems and decentralized information environments have prompted the consideration of the possibilities that exist in federated repository solutions. Federated repository solutions make it possible for different organizations to engage in collaborative information exchange relationships without having to fully centralize the information resources that belong to them. Information is left at the source while controlled access and exchange become possible through federated repositories (Casaletto et al., 2023; Zheng et al., 2025).

These kinds of environments rely largely on the implementation of governance processes that enable transparency, accountability, interoperability, and trust between the participating organizations. In prior studies, it is stressed that governance activities regarding information management help create reliable information-sharing environments as well as foster sustainable collaboration between organizations (Mishra et al., 2022). It cannot be denied, however, that interoperability remains a major issue since the heterogeneity of information systems leads to differences in metadata schemas, thus making information exchange problematic (Fenoglio & Treleaven, 2026).

Moreover, modern digital systems now take into account the value of data sovereignty and governance to help enterprises find a way of balancing information access with privacy and independence (Bumiller et al., 2026). Governance structures become necessary for promoting cooperation among relevant entities as well as for making sure that information sharing remains safe and in line with organizational goals (Chukwurah et al., 2024). It becomes especially important in international trading contexts where information sharing occurs across different jurisdictions (Yanney, 2025).

In view of this scenario, the current research is aimed at exploring the theory behind managing the heterogeneous international trade information sources for sustainability purposes using privacy-preserving federated information repositories (Li et al., 2025). The research explores the issues surrounding governance, stakeholders involved, and the sustainability of federated repository systems. Also, the current research attempts to fill some of the gaps in the literature concerning the use of federated information repositories in the creation of trustworthy, sustainable, and collaborative international trade information services.

Research Gap

While previous studies have considered topics such as distributed information systems, privacy preservation, and cooperative data sharing systems, few efforts have addressed the problem of governing diverse international trade information sources from the perspective of information management. The current body of literature has largely concentrated on technologies and security approaches, whereas the aspects of information governance, collaboration among stakeholders, interoperability, policy coordination, and repository sustainability remain under-researched. Moreover, there is a dearth of case studies that investigate the

possibilities for using privacy-enabled federated information repositories to enable secure information exchange without compromising organizational independence or regulatory compliance within international business networks. The lack of governance and sustainability models leads to the inability to fully assess the prospects for federated information repositories being sustainable information service infrastructures.

Objectives of the Study

The objectives of this study are:

- To investigate the governance issues that relate to handling information from diverse international trade sources.
- To evaluate the importance of federated information repositories for the purposes of ensuring effective collaboration on privacy-protected information exchange between trade actors.
- To consider the governance-related issues that affect information availability, privacy protection, interoperability, accountability, and the overall trust between trading parties when using federated information repositories.
- To outline current knowledge gaps concerning sustainable information governance and federated information management in the international trade context.
- To offer a conceptual definition of the role of federated information repositories in international trade.

Key Contributions

The major contributions of this study are summarized as follows:

- The paper looks into the issues surrounding governance when there are heterogeneous sources of international trade information, with specific focus on the problems of privacy, interoperability, accountability, and information sharing.
- A case study that uses theory to analyze federated information repositories that preserve privacy is discussed as an effective and sustainable model of collaboration for information management.
- The study develops an organizational theory framework to explain the relationship among various information sources, federation repositories, governance approaches, and sustainable international trade information systems.
- Knowledge gaps are highlighted in this research, and possible areas for further studies are suggested to facilitate the development of sustainable international trade information systems.

The rest of the paper is structured as follows. Section II provides a literature review on information governance, federated information repositories, privacy protection, and sustainable information governance. Section III provides an overview of the context, methodology, and theoretical perspective employed in the current study. Section IV highlights the main results from the conducted case study and their implications for the governance of privacy-protected federated information repositories. Section V identifies the current research gaps and future directions for further studies. Finally, Section VI concludes the study and summarizes its contributions to sustainable governance of international trade information sources.

II. LITERATURE SURVEY

The management of information sources that differ from one another has gained attention owing to the increasing complexity of data-sharing environments. Recent studies argue that governance frameworks need to provide a balance among information access, privacy, accountability, and regulation in the case of distributed information environments (Alhassan et al., 2018). With the increasing interconnection among organizations, information management has become a major issue in terms of ownership and control over information resources (Abraham et al., 2019).

Federated repositories emerged as another option that could be considered in the development of collaboration-based information exchange systems while not hindering organizational autonomy. As demonstrated through the research, federated systems enable organizations to maintain their control over the resources and contribute to the creation of information systems at the same time (Collins et al., 2024). This is especially true in cases where there are numerous parties involved in the process of working together, as centralized data management can be impossible in such cases (Janssen et al., 2020).

Privacy issues are still an essential element that needs to be addressed when it comes to information governance. Studies carried out recently show that there is more and more pressure put on businesses to follow strict data protection laws as well as ensure proper information transfer between various actors in such organizations (Nadal et al., 2022). Thus, privacy-enabled information systems have become quite a popular research topic for enabling secure collaboration without revealing any sensitive information related to organizations (Van Donge et al., 2022).

Interoperability and standardization of information are another significant theme within the literature. According to research, the main impediments to information integration include metadata disparity, diverse forms of information, and varying governance policies (Di Muri et al., 2024). Lack of standardized methods can hamper information accessibility and affect the performance of collaborative information services. Therefore, for sustainable information management,

there must be a system of governance aimed at fostering compatibility and consistency (Ham et al., 2022).

Another important aspect that the literature mentions is the importance of trust and engagement of stakeholders for the sustainable use of collaborative information resources. It needs to be pointed out that governance is contingent on not only technologies but also on institutional collaboration, policy harmonization, and proper stakeholder roles (Wirtz & Müller, 2023). In the same way, the issue of sustainability should consider non-technical aspects of repository environments (Gill & Germann, 2022).

From the review of the literature, it is clear that issues such as privacy, interoperability, stakeholder trust, and governance accountability play a critical role in the management of heterogeneous information spaces. The current studies have offered important insights about the architecture and implementation of distributed information sharing and repositories. The role of governance in such information repositories that offer privacy has received little attention so far. Moreover, the problems related to policy harmonization, sustainability, and organizational collaboration have not yet received adequate attention. Such an observation indicates the importance of conducting a case study on federated information repositories as a viable governance strategy for international trade information.

III. CASE CONTEXT AND ANALYTICAL FRAMEWORK

3.1 Case Study Context

The ecosystem of international trade information systems is characterized by the constant creation, exchange, and management of information between various parties, such as customs organizations, logistics firms, banks, regulating bodies, and international trade organizations. These organizations have different databases, which differ from each other in their nature, ownership, access conditions, and governance models. This leads to information fragmentation, data protection issues, lack of interoperability, and difficulties complying with regulations.

This research focuses on the governance approach referred to as privacy-preserving federated information repositories, which can be applied to address these issues. The particular case was selected since it illustrates an international trade framework in which several firms have their own information repositories but also take part in an information-sharing environment. This case was selected due to its reflection of the typical characteristics of the governance framework present in current international trade information services.

This case study is concerned with examining the potential for federated repository architectures to facilitate sustainable management of disparate trade information sources while avoiding total centralization of information resources. Key issues of focus include information sharing methods, governance procedures, stakeholder obligations,

interconnectivity needs, and other relevant factors that may impact the success of federated information environments.

3.2 Research Design

This research uses a qualitative approach, through the use of a case study, to examine the governance issues in relation to privacy-preserving federated information repositories. The method of the case study was chosen because it allows for an intensive investigation of the phenomenon under study in its natural setting. This study focuses on the study of governance rather than on technical performance in international trade information services.

This research is founded on documentation analysis and concept synthesis drawn from the scholarly literature, policy documents, and governance and information management research concerning distributed information environments. Such an approach helps in pinpointing recurring themes, issues, and considerations relating to the governance and sustainability of federated information archives.

3.3 Conceptual Framework

The theoretical framework used in this study is depicted in fig. 1. This framework presents the relationship among heterogeneous trade information sources, privacy-preserving federated data repositories, governance models, and sustainable information services results.

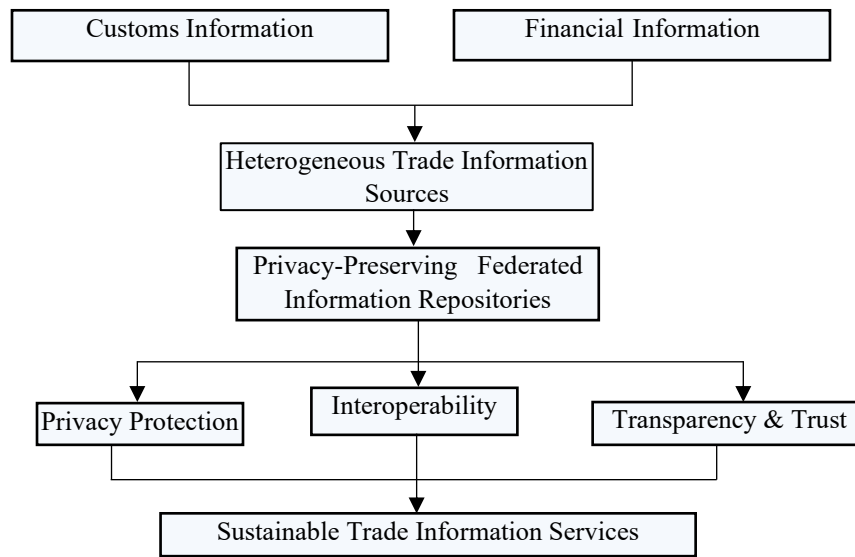


Fig. 1 Sustainable Trade Information Governance Framework

The model is based on the notion that heterogeneous sources of information give rise to problems associated with privacy, interoperability, access to information, and coordination between organizations. Privacy-preserving federated information repositories provide an intermediary form of governance that facilitates managed information exchange and, at the same time, retains ownership of the information resources for institutions. Good governance practices of transparency, accountability, trust, and compliance lead to the establishment of sustainable trade information services.

3.4 Analytical Dimensions

To facilitate systematic analysis of the case, four governance dimensions were examined.

Privacy Protection: It measures whether federated repository frameworks enable secure information sharing without compromising sensitive information belonging to the organization and related to trade activities.

Interoperability: This dimension addresses the issue of effective use of information across participating repositories,

even when there are variances in information formats among the organizations.

Governance and Accountability: This dimension explores the frameworks and policies that influence decision-making and accountability concerning information management operations by the participating organizations.

Sustainability and Trust: This aspect revolves around the sustainability of information systems, which includes concerns like stakeholder trust, collaboration between institutions, compliance with regulations, and sustainability of information management services.

These dimensions of analysis form the framework that could be used to assess the governance challenges associated with federated information repositories in international trade information ecosystems.

3.5 Data Sources and Analysis Procedure

The research is built around a structured sample of 15 peer-reviewed academic journal articles, 3 reports on global governance and regulation, as well as 2 international digital ecosystem frameworks, sourced from academic databases

such as Scopus, Web of Science, and ScienceDirect. These secondary sources of data include information from academic journals, governance reports, information management reports, and international trade information system reports, which were chosen under stringent criteria for inclusion involving cross-border data ecosystems, data sovereignty, and organizational policies. The sources on the topic of the study have been critically reviewed with an objective of exploring any governance challenges, repository management issues, privacy challenges, and sustainability issues.

Technical works that were concerned solely with hardware architectural aspects of cryptography without any discussion of related governance were excluded from the database. The collected data was analyzed through a strict thematic analysis process. The results related to governance that emerged from this limited database of previous works were categorized using the analytical categories formulated for the present research. The results concerning information sharing, coordination of stakeholders, interoperability, accountability, and sustainability were then analyzed in terms of federated information repository systems. In this way, the researcher

established a transparent method of data collection and formulated a comprehensive understanding of the role of federated governance in sustainable international trade information management.

IV. FINDINGS AND DISCUSSION

4.1 Governance Challenges in Heterogeneous Trade Information Sources

According to the findings from the case study, information ecosystems of international trade are distinguished by having various types of information storage facilities, which are administered by customs authorities, logistics firms, banks, and government departments. While the use of all these information storage facilities is important for the management of international trade, their heterogeneity is one of the factors that cause challenges in information flow and service delivery. Specifically, the differences between various standards, corporate policies, privacy laws, and information management procedures tend to lead to fragmentation in the information environment.

TABLE I MAJOR GOVERNANCE CHALLENGES IDENTIFIED IN TRADE INFORMATION ECOSYSTEMS

Governance Challenge	Description	Potential Impact
Information Fragmentation	Information stored across independent repositories	Reduced accessibility and coordination
Privacy Concerns	Restrictions on sharing sensitive trade information	Limited stakeholder collaboration
Interoperability Issues	Differences in formats, standards, and metadata	Difficulties in information exchange
Regulatory Diversity	Varying legal and policy requirements across jurisdictions	Compliance complexities
Accountability Gaps	Unclear responsibilities among participating organizations	Reduced transparency and trust

According to table I above, information fragmentation, privacy issues, interoperability problems, regulatory differences, and lack of accountability are some of the major governance challenges identified. Together, these challenges impact the effectiveness and sustainability of international trade information services by hindering the smooth flow of information between relevant parties.

4.2 Role of Privacy-Preserving Federated Information Repositories

From this analysis, it is clear that federated information repositories for protecting privacy offer an alternative governance-based framework for the management of distributed information resources. Unlike centralized frameworks, which require total centralization, federated repositories offer institutions the option of retaining control of their information resources while collaborating on sharing such information through collaboration-based platforms.

TABLE II GOVERNANCE BENEFITS OF FEDERATED INFORMATION REPOSITORIES

Governance Aspect	Contribution of Federated Repositories
Privacy Protection	Enables controlled access to sensitive information
Information Accessibility	Facilitates information discovery across repositories
Institutional Autonomy	Allows organizations to maintain ownership of information resources
Collaboration	Supports information exchange among stakeholders
Compliance Support	Assists adherence to organizational and regulatory requirements

The results shown in table II indicate that federated repositories help achieve several governance goals at once. Through the provision of privacy protection, autonomy, and cooperation for information exchange, federated repositories

provide conditions for organizations to engage in information networks while retaining management over information resources they manage themselves.

4.3 Governance Dimensions Supporting Sustainability

The concept of sustainability in trade information ecosystems goes beyond technology and relies significantly on the

effectiveness of governance. The case study highlights a number of governance aspects that have an impact on the sustainability of federated repository systems. These aspects help ensure the sustainability of the repository system.

TABLE III GOVERNANCE DIMENSIONS AND SUSTAINABILITY OUTCOMES

Governance Dimension	Sustainability Outcome
Transparency	Improved visibility of information-sharing practices
Accountability	Clear responsibilities and governance structures
Trust	Stronger stakeholder participation and cooperation
Interoperability	Enhanced integration of heterogeneous information sources
Policy Compliance	Reduced legal and regulatory risks

Based on table III above, it is clear that transparency, accountability, trust, interoperability, and compliance are very critical for the sustenance of information governance. There is a high possibility that organizations will be willing to engage in a collaborative information environment provided there are clear-cut governance mechanisms.

V. DISCUSSION

The results indicate that privacy-protected federated information repositories have considerable prospects as solutions to governance problems regarding heterogeneous sources of international trade information. The case analysis shows that for proper governance to take place; there needs to be an equilibrium between information availability and privacy. Federated repository platforms afford such means by which different actors may interact without losing ownership of their information.

It is evident that for effective governance to occur, apart from the creation of repositories, the adoption of transparent

policies, interoperability standards, and effective governance procedures must occur. Information services will be sustainable in situations where there is a shared set of governance practices among all parties involved in establishing trust relationships among themselves, allowing them to cooperate effectively into the future. As such, federated information repositories cannot be seen simply as information-sharing infrastructures, but rather as effective governance systems.

VI. RESEARCH GAPS AND FUTURE DIRECTIONS

The analysis of the literature and the case study demonstrates that there are still many aspects that need further consideration regarding the governance of heterogeneous sources of information related to international business. Although much effort was made to examine distributed information systems, issues of privacy, and collaboration in terms of exchanging information, some significant gaps still exist.

5.1 Identified Research Gaps

TABLE IV RESEARCH GAPS IN FEDERATED TRADE INFORMATION GOVERNANCE

Research Area	Identified Gap	Implication
Governance Frameworks	Limited availability of comprehensive governance models for federated trade information repositories	Inconsistent governance practices across organizations
Interoperability Standards	Lack of universally accepted metadata and information-sharing standards	Difficulties in cross-organizational information integration
Privacy Governance	Insufficient understanding of privacy governance across multiple jurisdictions	Challenges in regulatory compliance and information sharing
Stakeholder Coordination	Limited studies examining collaborative governance mechanisms among trade stakeholders	Reduced effectiveness of repository participation
Sustainability Assessment	Lack of frameworks for evaluating the long-term sustainability of federated repositories	Uncertainty regarding long-term operational viability
Trust Management	Limited investigation of trust-building mechanisms in distributed information ecosystems	Potential barriers to stakeholder engagement

Table IV highlights that although existing research has provided many useful insights related to information sharing and privacy protection, there is still not much literature available on governance models that may foster sustainable federated repositories. Technology is often the main focus of such studies, while policy and governance receive relatively little coverage.

5.2 Future Research Directions

In future research efforts, the focus needs to be on creating an effective governance structure for federated repositories of information for use in international trade. Research should consider areas such as policy harmonization, interoperability standards, privacy governance, and coordination among stakeholders. Further research is needed to be done in order

to assess the sustainability of federated repositories based on aspects that influence topics like trust, transparency, and cooperation. Case studies from different fields and areas of the world may provide lessons for the governance of federated repositories for international trade information services.

5.3 Implications for Information Services

The implications that come out of these gaps have serious implications for the future of information services in the international trade sector. It is through the application of appropriate governance mechanisms that it will be possible to improve information provision, enable decision-making, and facilitate collaboration among the actors within the international trade systems. Future research on information systems could contribute towards creating a sustainable information infrastructure within complex international trade systems.

The findings demonstrate that federated privacy-aware information repositories could potentially become a good starting point for creating future information services. However, for successful deployment, it is important to establish effective governance structures, guaranteeing transparency, accountability, trust, and sustainability.

VII. CONCLUSION

As a result of the increased complexity of international trading relationships, it becomes more necessary than ever to have effective systems of governance in order to facilitate the management of disparate information sources without sacrificing concerns like privacy and sustainability. The current paper analyzed the use of federated information repositories with privacy assurance as a governance framework for enabling collaborative information environments within international trade ecosystems. The above was done through a theoretical case study, whereby the major governance challenges have been considered. It has been found that federated information repositories can be used as an appropriate solution in enabling secure information exchange without the need for complete centralization of the information resources. The fact that federated information repositories make it possible for control over information resources to be maintained while sharing a common information resource pool makes it a solution that fosters cooperation, enhances access to information, and ensures adherence to relevant regulations. This study has also emphasized the importance of transparency, trustworthiness, interoperability, and accountability in trade information services.

Additionally, the research discovered some deficiencies in the literature available in relation to the governance model, interoperability model, cross-border privacy management, stakeholder coordination, and sustainability assessment model. Fulfilling these research gaps is highly necessary to improve the performance of the federated information

systems in the future. Conclusion In summary, the case study is a good addition to the discussion concerning the concept of information governance within the context of sustainability and privacy protection in federated information repositories. The insights gained from the present case study will enable researchers, policy makers, and information specialists to create sustainable models of information governance, which take into account information sharing and privacy protection principles.

REFERENCES

- [1] Abraham, R., Schneider, J., & Vom Brocke, J. (2019). Data governance: A conceptual framework, structured review, and research agenda. *International journal of information management*, 49, 424-438. <https://doi.org/10.1016/j.ijinfomgt.2019.07.008>
- [2] Alhassan, I., Sammon, D., & Daly, M. (2018). Data governance activities: A comparison between scientific and practice-oriented literature. *Journal of enterprise information management*, 31(2), 300-316. <https://doi.org/10.1108/jeim-01-2017-0007>
- [3] Bumiller, A., Kozyri, E., & Dagenborg, H. (2026). Privacy preserving identity federation: A literature study. *ACM Computing Surveys*, 58(9), 1-34. <https://doi.org/10.1145/3745018>
- [4] Casaletto, J., Bernier, A., McDougall, R., & Cline, M. S. (2023). Federated analysis for privacy-preserving data sharing: a technical and legal primer. *Annual review of genomics and human genetics*, 24(1), 347-368. <https://doi.org/10.1146/annurev-genom-110122-084756>
- [5] Chukwurah, N., Ige, A. B., Idemudia, C., & Adebayo, V. I. (2024). Strategies for engaging stakeholders in data governance: Building effective communication and collaboration. *Open Access Research Journal of Multidisciplinary Studies*, 8(1), 57-67. <https://doi.org/10.53022/oarjms.2024.8.1.0045>
- [6] Collins, A., Hamza, O., Eweje, A., & Babatunde, G. O. (2024). Challenges and solutions in data governance and privacy: A conceptual model for telecom and business intelligence systems. *Telecom and Business Intelligence Journal*, 9(3), 110-125. <https://doi.org/10.54660/IJMRGE.2024.5.1.1064-1081>
- [7] Di Muri, C., Pulieri, M., Raho, D., Muresan, A. N., Tarallo, A., Titocci, J., ... & Rosati, I. (2024). Assessing semantic interoperability in environmental sciences: variety of approaches and semantic artefacts. *Scientific Data*, 11(1), 1055. <https://doi.org/10.1038/s41597-024-03669-3>
- [8] Fenoglio, E., & Treleaven, P. (2026). Federated computing: information integration under sovereignty constraints. *Royal Society Open Science*, 13(2), 1-20. <https://doi.org/10.1098/rsos.251318>
- [9] Gill, A. S., & Germann, S. (2022). Conceptual and normative approaches to AI governance for a global digital ecosystem supportive of the UN Sustainable Development Goals (SDGs). *AI and Ethics*, 2(2), 293-301. <https://doi.org/10.1007/s43681-021-00058-z>
- [10] Ham, J., Koo, Y., & Lee, J. N. (2022). Government data openness and knowledge management: configurational patterns for national competitiveness. *Industrial Management & Data Systems*, 122(12), 2710-2736. <https://doi.org/10.1108/imds-03-2022-0188>
- [11] Janssen, M., Brous, P., Estevez, E., Barbosa, L. S., & Janowski, T. (2020). Data governance: Organizing data for trustworthy Artificial Intelligence. *Government information quarterly*, 37(3), 101493. <https://doi.org/10.1016/j.giq.2020.101493>
- [12] Jussen, I., Möller, F., Schweihoff, J., Gieß, A., Giussani, G., & Otto, B. (2024). Issues in inter-organizational data sharing: Findings from practice and research challenges. *Data & Knowledge Engineering*, 150, 102280. <https://doi.org/10.1016/j.datak.2024.102280>
- [13] Li, N., Lewin, A., Ning, S., Waito, M., Zeller, M. P., Tinnmouth, A., ... & Canadian Transfusion Trials Group. (2025). Privacy-preserving federated data access and federated learning: Improved data sharing and AI model development in transfusion medicine. *Transfusion*, 65(1), 22-28. <https://doi.org/10.1111/trf.18077>

- [14] Mishra, S., Komandla, V., Bandi, S., Konidala, S., & Manda, J. (2022). A domain driven data architecture for data governance strategies in the Enterprise. *International Journal of Emerging Trends in Computer Science and Information Technology*, 3(2), 75-86. <https://doi.org/10.63282/3050-9246.ijetsit-v3i2p108>
- [15] Nadal, S., Jovanovic, P., Bilalli, B., & Romero, O. (2022). Operationalizing and automating data governance. *Journal of big data*, 9(1), 117. <https://doi.org/10.1186/s40537-022-00673-5>
- [16] Oubrahim, I., & Sefiani, N. (2023). Exploring the drivers and barriers to digital transformation adoption for sustainable supply chains: a comprehensive overview. *Acta Logistica*, 10(2), 305-317. <https://doi.org/10.22306/al.v10i2.396>
- [17] Van Donge, W., Bharosa, N., & Janssen, M. F. W. H. A. (2022). Data-driven government: Cross-case comparison of data stewardship in data ecosystems. *Government Information Quarterly*, 39(2), 101642. <https://doi.org/10.1016/j.giq.2021.101642>
- [18] Wirtz, B. W., & Müller, W. M. (2023). An integrative collaborative ecosystem for smart cities—a framework for organizational governance. *International journal of public administration*, 46(7), 499-518. <https://doi.org/10.1080/01900692.2021.2001014>
- [19] Yanney, A. A. S. (2025). Cross-border financial regulation and its influence on multinational business operations, tax structures and investment flows. *World Journal of Advanced Research and Reviews*, 26(3), 597-620. <https://doi.org/10.30574/wjarr.2025.26.3.2225>
- [20] Zheng, G., Ivanov, D., & Brintrup, A. (2025). An adaptive federated learning system for information sharing in supply chains. *International Journal of Production Research*, 63(11), 3938-3960. <https://doi.org/10.1080/00207543.2024.2432469>