

AI-Powered Interoperability: Lessons Learned from the European Public Sector Awards



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The European Public Sector Award (EPSA) is a Europe-wide award scheme for public administrations at all levels of government. Since 2009, the European Institute of Public Administration (EIPA) organises EPSA to recognize excellence in public sector innovation across Europe. In doing so, EPSA serves as the platform for sharing best practices to inspire the public sector to develop and implement projects contributing to efficient and effective public administration, and ultimately enhanced service delivery to the benefit of businesses and citizens.

As part of the EPSA 2023-24 knowledge dissemination, policy briefings have been drawn up, providing policy makers, innovators and public sector officials with accessible information about key topics relevant for public sector innovation, and hands-on recommendations for practical applications.

Briefing title

AI-Powered Interoperability: Lessons Learned from the European Public Sector Awards

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EXECUTIVE SUMMARY

In the context of the current EU priorities on digital transformation, Member States are increasingly advancing on key aspects of this transformation, often guided by policy initiatives developed at the EU level. In doing so, the EU facilitates digital innovation across governance levels to enhance, modernise, and create resilience within its public sector. Two central aspects of this process are interoperability and artificial intelligence (AI). By pursuing interoperability through AI applications, public administrations can unlock the full potential of digital public services, going beyond mere technological integration to create a collaborative interconnected environment for service delivery.

This briefing analyses relevant project submissions to EPSA 2023–24 to explore how AI can enable interoperability among EU public administrations. Drawing on selected projects, the briefing aims to share good practices and offer guidance for policy makers and innovators.

EPSA projects highlight the significant efforts public administrations are making in adopting digital transformation and leveraging AI to enhance governance and public service delivery (54 projects in EPSA 2023–24 relate directly to digital transformation; 67% of which occur at the national level, underscoring the role of centralised frameworks at a Member State-level in advancing digital solutions).

Almost 70% of projects relied on AI, demonstrating that public administrations are committed to harnessing the power of AI for improved public services and function; the high level of AI adoption in the EPSA projects analysed demonstrates AI's capabilities to enhance processes and solve challenges of all different layers of interoperability.

Although only a small fraction of projects mention 'interoperability', more than 60% of submitted projects reference interoperable-related terms, suggesting a discrepancy in the reporting of interoperability in project descriptions. In turn, less than 14% of cases addressing both AI and interoperability-related aspects indicates significant room for adoption of AI-support interoperable projects.

To fully utilise the opportunities for innovation at the intersection of AI and interoperability, public administrations need to raise awareness about the different layers of interoperability and to build capacities to enable innovators support interoperability through AI applications.

Policymakers need to create the conditions under which administrations can engage with the challenges and opportunities of AI-driven interoperability, for instance through fit-for-purpose policy frameworks, or cross-border and multilevel collaboration across Europe.

To design and implement projects successfully, innovators require a clear framing of interoperability as a core project objective to utilise such opportunities.

1. Introduction

The emergence of digital technologies and the digital society introduces innovative opportunities for enhancing public goods and services to shape a digital landscape that leaves no one behind and operates under the principles of freedom, protection, and fairness (European Parliament, 2019). However, the process of digital transformation is accompanied by a series of challenges which the EU is aiming to tackle (OECD, 2024).

Digital transformation is one of the most prioritised goals of the European Commission (European Commission, n.d.). Member States are increasingly taking steps through the digital transition. To provide guidance, set targets, and solve complex policy challenges, the European Commission has brought forward its plan of strategic priorities for 2030 with its [Digital Strategy](#). By investing in digital innovation across governance levels, the EU aims to enhance, modernise, and create resilience within its public sector.

The [Digital Decade framework](#) outlines the EU's vision for a human-centred digital transformation by 2030, focusing on four key areas: digital skills, secure infrastructures, digital business, and public services (European Commission, 2021). Additionally, the framework ensures that digital public services are accessible to all citizens (European Commission, 2021). Multi-country projects promote cross-border collaboration, while the Declaration on Digital Rights and Principles ensures that EU values guide this digital transformation¹.

Two central aspects of digital transformation are interoperability and artificial intelligence (AI), which can unlock the full potential of digital public services, going beyond mere technological integration to create a collaborative interconnected environment for service delivery (European Commission, 2024a).

As recognised by the [European Commission's Artificial Intelligence Strategy](#) and the [Interoperable Europe Act](#), there are opportunities to harness the benefits of both AI and interoperability to advance its goals towards a European single digital economy.

Recognising the potential AI has in advancing these goals, the European Commission with the goal of making the EU a leader in trustworthy AI published a communication on [Fostering a European Approach to Artificial Intelligence](#). The strategy aims to remove market barriers, foster collaboration between research and industry, and share best practices on retaining talent (European Commission, 2023a). Public administrations play a crucial role in advancing interoperable citizen-centred digital public services, serving as the foundation for enhanced collaboration and integration across the EU.

2. Understanding interoperability in the European public sector

Interoperability refers to the ability of different organisations and public bodies across EU Member States to work together collaboratively and coherently, through digital systems (European Commission, 2024b). An interoperable solution can therefore refer to tools or resources such as guidelines, standards, and software, that help make this cross-border collaboration possible (European Commission, 2023b). Such mechanisms can provide innovative solutions to complex administrative challenges, reducing costs and saving time for citizens, businesses, and the public sector, towards a more integrated single market. As such, an interoperable EU can

¹ Multi-country projects are large-scale projects that no single Member State could develop on its own and include areas such as data infrastructure, low-power processors and 5G communication. The EU Commission wants to accelerate those projects; see European Commission, 2030 Policy Programme "Path to the Digital Decade" (COM(2021) 574 final), 2021, https://www.eumonitor.eu/9353000/1/j4nvhdjdk3hydza_j9vvik7m1c3gyxp/vlm8mpwkd7xo.

support economic growth while fostering increased public trust in public administration service and function (European Commission, 2024c).

The European Commission seeks to endorse principles of interoperability via the [European Interoperability Framework](#) (EIF), which provides guidelines for establishing interoperable digital public services across Europe by establishing various but interconnected layers of interoperability including legal, semantic, technical, and organisational interoperability. This four-layer model of classifying and assessing interoperability became formalised via the [Interoperable Europe Act](#), establishing new obligations for Member States.

Legal interoperability

Legal interoperability is concerned with ensuring that organisations operating under different legal frameworks, policies, and strategies can work together under rules that are consistent with existing EU laws and policies. It ensures EU legislation is designed with digital aspects in mind, leading to more efficient and cost-effective implementation by supporting the creation of digital-ready laws aligned with existing frameworks, serving cross-border collaboration.

More specifically, in environments where Member States have the flexibility to legislate at the national level, interoperability plays a crucial role in ensuring consistency across the single market, providing a legal framework upon which Member States can enact and enforce national legislation. Without interoperability, the risk of inconsistent application of EU law increases, potentially leading to legal uncertainty or fragmentation.

Semantic interoperability

Conversely, semantic interoperability ensures that the exact format and meaning of exchanged data are maintained and correctly interpreted during interactions between parties, ensuring mutual understanding between the sender and receiver (European Commission, 2024d). Semantic interoperability under the [EIF](#) therefore encompasses both semantic and syntactic dimensions, where semantic refers to the *meaning* of data and syntactic refers to the *formatting* of the data exchanged. As such, semantic interpretability ensures that data, information, or language from one system can be accurately interpreted by another, regardless of the development or differing technical infrastructure.

Technical interoperability

Unlike semantic interoperability, technical interoperability refers to the applications and infrastructure enabling the connection between different systems and services (European Commission, 2024e). It encompasses aspects such as interface specifications and interconnection, and data integration services, data exchange, and presentation, as well as security protocols. This typically involves hardware and software components, systems, and platforms designed to facilitate machine-to-machine communication (European Commission, 2016). Without technical interoperability, data exchange could not be effective and fast. However, this could be resolved if there were formal technical specifications and standards which would allow for the facilitated machine-to-machine communication, mentioned above.

Organisational interoperability

Finally, organisational interoperability refers to how public administrations coordinate their business processes, roles, and expectations to achieve shared objectives that are mutually beneficial (European Commission, 2024f). In practice, organisational interoperability involves documenting, integrating, or aligning business processes and the relevant information that is exchanged between them.

While all four layers of interoperability alone can advance interconnectivity between administrations, sectors, and/or jurisdictions, all four are needed to achieve a holistic governance approach that fully realises the objectives of the [EIF](#).

3. From policy to practice: local action for sustainability

Like interoperability, AI has the potential to significantly improve operational efficiency and public services, leading many administrations across the EU to fund, develop, and implement AI solutions from more basic ones (i.e. chatbots) to more advanced (machine learning) options.

In recognising the potential opportunities of AI, many Member States have adopted national AI strategies or policies that set clear objectives and approaches for AI implementation. These strategies outline key priorities and goals for AI adoption in public administration and, in some cases, provide a road map for realising these ambitions. Nevertheless, uncoordinated adoption of AI systems across administrations of different levels and jurisdictions can lead to downstream inefficiencies and fragmentation that can affect deployers, providers, and users of AI systems.

As such, it is imperative that when governments consider interoperability, opportunities for AI adoption be considered – and, equally the reverse – as both can be a positive enabler of the other. By establishing common frameworks the EU can create a strong foundation for success in its AI initiatives, ensuring that the AI development and governance is aligned across Member States, to achieve common goals in AI-driven public sector projects.

3.1. Advancing interoperability with AI: EPSA case studies

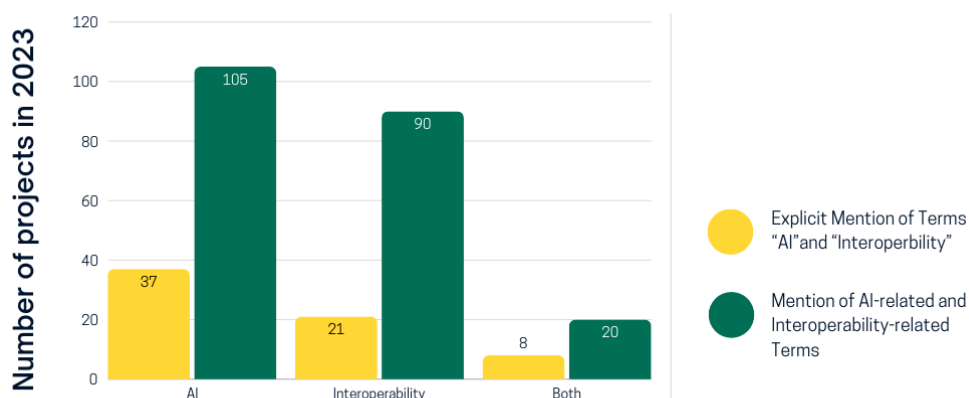
In line with the [Digital Decade](#), and as reflected in the EPSA database, public administrations are making significant progress in their digital transition processes; over 90% of the EPSA projects include initiatives designed to support their digital transformation. Accordingly, the category of *digital transformation* had the second highest number of submissions, with 54 initiatives, whereas 67% of these projects were initiated at the national level, underscoring that national administrations remain critical drivers of the digital transformation across the EU. Conversely, projects falling under the category of *innovation in public administration*, with 79 initiatives that also include digital transformation aspects, reflect a more distributed implementation across local, regional, and national levels, showcasing the scalability of innovative digital solutions for diverse governance needs. However, regardless of the award category (which include *Digital Transformation*, *Innovation in Public Administration*, and *Green Transition and Sustainability*), 71.5% of project submissions include digital aspects, with projects relating to topics such as digital services, e-government, data, signalling the growing efforts in the use of digital technologies for public sector processes, and services.

By analysing the database of *digital transformation* projects, AI is present in 70% of all submitted projects under this category. It appears that governments are not only aware that AI can advance the digital transformation in the EU, but that they are already testing AI's applications within their administrations for a variety of purposes. However, awareness of how AI can enable common goals in both the digital transformation and interoperability appears to be less well known. While the presence of AI is prominent in the EPSA database, both directly (37 projects) and indirectly (105 projects), the same cannot be said for interoperability, where the term 'interoperability' is only directly mentioned in 21 out of 151 projects.

Interestingly, a closer examination of the project descriptions reveals that many projects indirectly mention interoperability through related terms and concepts, such as ‘transferability’, ‘common database’, ‘collaboration between organisations’, ‘data exchange’, ‘APIs’, ‘standardisation’, ‘policy alignment’, and others (see Graph 1). Possible explanations for discrepancy in reporting interoperability as an aspect of submitted projects may include applicants not recognising the relevance of interoperability for the three EPSA categories; or that some administrations might be initiating projects that are unknowingly advancing the interoperability objectives outlined by the [EIF](#) and the [Interoperable Europe Act](#). In such cases, greater awareness is needed to ensure that projects with interoperable elements are designed with the relevant policies in mind.

Among the 21 projects mentioning ‘interoperability’, only eight referenced ‘AI’ or ‘Artificial Intelligence’, revealing that many of the projects submitted to EPSA aiming to achieve interoperability did not leverage AI techniques to do so. This suggests that while administrations are advancing both on interoperability and AI adoption, such efforts are not occurring with consideration of their compatibility. This is possibly resulting in missed opportunities to capture the benefits of both interoperability and AI-supported solutions in the early stages of problem identification and project design². Nevertheless, expanding the search criteria to include both explicit and implicit mention of interoperability and AI revealed that many projects contain both elements, without direct mention of either. The number of projects combining AI and interoperability-related concepts is 20, even though only eight projects explicitly mention both ‘AI’ and ‘interoperability’ as core elements (see Graph 1). More research is needed to understand why applicants did not include core terms such as ‘interoperability’ and ‘artificial intelligence’ or ‘AI’. With this in mind, the following section highlights some of the projects whereby AI is used to support interoperability, according to the four layers of interoperability of the [EIF](#).

Graph 1: Distribution of Projects by mention of AI and Interoperability-related Concepts.



Source: This graph was created by the author for the purpose of this brief.

² This discrepancy can be attributed to scenarios in which applicants did use AI techniques, but chose not to disclose this in their project descriptions.

3.2. Example: AI for semantic interoperability

Semantic interoperability is often achieved by implementing standardised vocabularies, taxonomies, and data classifications, ensuring that all actors involved interpret and process terms coming from a variety of organisations consistently. Some examples of AI being able to leverage semantic interoperability include the following.

1. **Natural language processing (NLP) capabilities:** Machine learning techniques can extract meaningful information from unstructured text and convert it into standardised formats, reducing costs and time allocation for manual data entry.
2. **Improving data quality:** AI algorithms can analyse and interpret datasets to identify inconsistencies and inaccuracies allowing for improved outcomes.
3. **Enhancing communication among systems:** AI-powered solutions capable of recognising different coding systems facilitate a unified approach to data sharing, improving information sharing and availability across diverse entities.

Governments in Europe have already begun incorporating the layer of semantic interoperability, leveraging AI applications to do so. For instance, the Data-Driven Justice Project in Spain places a strong emphasis on semantic interoperability as a foundation for creating a unified and efficient data system across various judicial and administrative bodies.³

Box 1 EPSA Project: The Data-Driven Justice Project

The Data-Driven Justice Project aims to develop an inter-administrative data platform with open access, integrating different kinds of information systems. These systems include data from justice service administrations as well as from other relevant public bodies, whose information supports informed decision-making in management processes. The project utilised AI techniques to achieve semantic interoperability through the design of the platform and the aspects of data collection and standardisation. Both processes were automated to ensure common data structures even when the data varied in format and source.

In addition to supporting semantic interoperability, the Data-Driven Justice project also indicates how AI could be applied to support legal interoperability via a document ratified by all entities involved in the project. [This formalises policies and standards for data governance that prioritise semantic consistency.](#) AI in this project could be used to verify that a vast amount of data is in accordance with the standards set in the document mentioned above. In this way, lack of regulatory fragmentation on a national level supported by AI can enhance semantic interoperability.

Box 2 EPSA Project: The Once-Only Project, Germany

The Once-Only Project aims to achieve interoperable solutions for the efficient digitalisation of their public services through semantic interoperability by establishing a common understanding of administrative terms such as "income" across all administrations and agencies. Although seemingly insignificant, establishing semantic consistency on commonly used terms, like "income", means both citizens and civil servants can

³ For more information about the Data-driven Justice Project, see the project entry in the EPSA Database; <https://www.eipa.eu/epsa/the-virtual-digital-interaction-desk-vid-2-2/> (see also Box 1).

avoid unnecessary complications or confusion when providing or reporting income-related information for administrative purposes.

Both the **Data-Driven Justice Project** and the **Once-Only Project**⁴ demonstrate how semantic interoperability can enhance public administration, but they approach the concept through distinct methodologies tailored to their specific contexts. Similarly, both projects incorporate the notion of a common understanding of terms and concepts across multiple organisations, putting an emphasis on data standardisation and governance.⁵

Beyond the semantic layer, both projects also infuse elements of technical, organisational, and legal interoperability. The creation of centralised data platforms with structured and classified data incorporates technical interoperability and at the same time reduces varied/fragmented interpretation of information, ensuring a uniform legal understanding and fair administration of justice. Additionally, in the case of Germany, establishing frameworks for the common application of administrative terms and concepts can foster organisational interoperability through alignment between different administrations. The projects' AI-driven interoperability layers create strong foundations that support the use of data across the entire national governance. This further reinforces the notion that interoperability cannot be achieved solely through one layer, but rather with a holistic and systematic approach to implementing interoperable-by-design principles and practices.

3.3. Example: AI for technical interoperability

Technical interoperability can be strengthened by AI by using advanced automation technologies, such as NLP and machine learning algorithms, since the ability of different systems, platforms, and technologies to communicate, exchange data, and operate together becomes more approachable and less burdensome. AI can assist and automate the creation of reference architectures and assist in the creation of common technical standards.

Box 3 EPSA Project: The Robotic Process Automation (RPA)

The Spanish Ministry developed the RPA initiative to ensure that various systems across the judicial administration can efficiently exchange information, automating repetitive and labour-intensive processes, while integrating different formats of data between different platforms.

The digitalisation of criminal record cancellations with the use of algorithms demonstrates technical interoperability through the integration of different systems within the Ministry's digital infrastructure. The project incorporated hyperautomation, which is the use of advanced technologies such as AI and RPA in the management of monitoring procedures to speed up their processing. For example, in the automation of payment orders procedures, AI and more specifically machine learning was used to optimize the process. Additionally, by automating the process of criminal record cancellations for example, RPA technologies enable automated data retrieval and processing without manual intervention. This not only speeds up the process of judicial services but also ensures that information is transmitted accurately across different systems, such as the criminal record databases and procedural management platforms.

⁴ For more information on the Once-only marketplace and data matching, which exemplifies different types of interoperability, see the project entry in the EPSA Database; <https://www.eipa.eu/epsa/once-only-marketplace-and-data-matching-the-data-should-run-not-the-citizens/> (see also Box 2).

⁵ See for instance also the EPSA MITOS project: <https://www.eipa.eu/epsa/mitos-national-registry-of-administrative-procedures/>

The possibilities of using AI to facilitating technical interoperability are abundant, particularly in complex and data-intensive environments. For example, NLP and machine learning algorithms can foster data gathering, standardisation, and sharing regimes which can then allow interaction between multiple systems, even when dealing with diverse formats and structures. In the case of the robotic process automation initiatives by the Spanish Ministry of Justice, AI ensures that documents and information are verified across multiple external systems, and transmitted rapidly and accurately. By processing large datasets from various platforms, AI ensures consistent interpretation and effective use of information across entities, reducing errors and manual intervention.⁶

3.4. Example: AI supporting all four layers of interoperability

The integration of AI in public cross-cutting governance demonstrates a comprehensive approach to interoperability, closely aligning with the goals of the [Interoperable Europe Act](#) for fostering digitalised services and innovation. For instance, consider the Dutch Government's Hansken project.⁷

Box 4 EPSA Project: Hansken, the open digital forensic platform

Hansken is an open digital forensic platform with the purpose to serve the Dutch criminal justice system and several other European countries, providing law enforcement agencies with advanced tools to investigate digital data. The platform adheres to legal and forensic standards, and its API-driven (API entails the connection between different applications) design allow developers to sync data between multiple platforms and can facilitate communication among the various judicial authorities. The platform's transparency allows public prosecutors, judges, and lawyers to access the same data, ensuring a fair trial process. This alignment with the Interoperable Europe Act and other EU legal principles, therefore, helps build trust and facilitates the mutual acceptance of digital evidence across member states.

The platform's success in handling large volumes of digital evidence is underpinned by its advanced AI techniques, like NLP, which can support speech-to-text, text recognition, translation, and semantic search. These tools enable investigators to analyse complex and text-based data with greater speed and precision, supporting the Interoperable Europe Act's vision of scalable, cutting-edge technologies.

AI's added value from a technical perspective is that it offers digitisation options (i.e. via speech-to-text) for data formats, which would normally be difficult to transfer across systems and which are especially prominent when it comes to evidence. By creating those common data formats efficiently, AI is vital in the communication of different systems. The AI features also allow for a structured dataset with transformative aspects between languages, overcoming terminology-related barriers and varied formats of datasets. Platforms such as Hansken promote an open and collaborative framework, which allows for the incorporation of all four layers of interoperability.

⁶ For more information about the award-winning project Robotic process automation (RPA) in justice see the project entry in the EPSA Database: <https://www.eipa.eu/epsa/robotic-process-automation-rpa-in-justice/> (see also Box 3).

⁷ For more information about the award-winning Hansken Project see the project entry in the EPSA Database: <https://www.eipa.eu/epsa/hansken-the-open-digital-forensic-platform/> (see also Box 4).

4. Conclusions

Overall, the high level of AI adoption in the EPSA projects analysed, but also across the 2023 database, demonstrates AI's capabilities to enhance processes and solve challenges of all different layers of interoperability. Member States looking to align with the [Interoperable Europe Act](#) need to achieve cross-cutting governance that will incorporate semantic, technical, legal, and organisational aspects successfully; AI remains a promising, yet underutilised path towards interoperability.

The EPSA database highlights the significant efforts public administrations are making in adopting digital transformation and leveraging AI to enhance governance and public service delivery. While AI is increasingly seen as a strategic tool for addressing key challenges faced by public administrations, its integration within initiatives advancing interoperability, both directly and indirectly, remains fairly limited. This indicates a critical gap in fully recognising AI's potential to advance interoperable systems across public administrations in Europe.

There is considerable room for further exploration at the intersection of AI and interoperability. As the results suggest, a lack of awareness or clear framing of interoperability as a core project objective could be contributing to this gap. There is therefore need for detailed research, on how AI can be systematically applied to enhance the four layers of interoperability, while addressing underlying barriers currently present among stakeholders. It is imperative to highlight how AI-driven interoperability can contribute to building the pathway for achieving the goals of the [Interoperable Europe Act](#), in not only creating efficient systems that support public governance but also strengthening cross-border and multilevel collaboration in the EU.

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