Exploring Business Models for Public Open Data Resources

Insights and recommendations from the data.europa.eu campaign

2024 Summary paper

data.europa.eu
The official portal for European data

This study has been prepared as part of data.europa.eu, an initiative of the European Commission. The Publications Office of the European Union is responsible for the management of data.europa.eu contracts.
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Last update: 30 September 2024
https://data.europa.eu/

ISBN: 978-92-78-44500-3 doi: 10.2830/6425248 Catalogue number: OA-01-24-170-EN-N

Contents

List of figures

Exploring Business Models for Public Open Data Resources

Executive summary

This summary paper, *Exploring Business Models for Public Open Data Resources*, is the second of two papers aimed at fostering the engagement of the public sector as reusers of open data. It sheds light on the results from the 1-year campaign featuring a first scoping paper on new business models for open data, a data.europa.eu academy webinar and a focus group on how business models are applied to the public sector and open data specifically. It incorporates the insights from the campaign, draws conclusions and provides policy recommendations on how data.europa.eu can enable and stimulate the application of business models for open data by public institutions across Europe.

It explores the transformative potential of open data in fostering innovation, economic growth and a competitive advantage in the modern economy. While the general value of open data – publicly available datasets that can be freely used, modified and shared – is recognised, the specific mechanisms for generating significant economic value remain largely unexplored. The European Union has promoted open data accessibility and reuse through initiatives like the open data directive and the digital Europe programme. However, technical, legal and cultural barriers need to be addressed to fully realise the benefits of open data.

The paper addresses the critical need for business models that transform open data from a resource into a catalyst for economic growth. The research is guided by the following question.

How can sustainable business models for open public sector data resources be established and supported to maximise value creation and reuse across national and local levels in Europe**?**

To foster the development and application of business models for open data, the following policy recommendations are proposed.

1. **Promoting an ecosystem approach.** Encourage public–private partnerships and support intermediary organisations to bridge gaps between data providers and users.

2. **Implementing support mechanisms for public institutions.** Invest in data literacy and analytical skills, provide robust technological infrastructure and establish clear data governance frameworks.

3. **Encouraging user-centric data publication strategies.** Engage with data users to understand their needs, prioritise high-value datasets and ensure data quality and usability.

1. Introduction: business models for services based on open data

In the modern economy, data has undeniably become a key driver for innovation, growth and competitive advantage. Governments and businesses alike have recognised this transformative potential. However, while the general value of data is well understood, the specific mechanisms through which open data – publicly available datasets that can be freely used, modified and shared – can generate significant economic value remain largely unexplored. The transformation of open data into tangible economic benefits is not as straightforward as anticipated, leaving a gap that this paper seeks to address.

Despite the widespread availability of open data, many public and private sector entities struggle to harness its full potential. The challenge lies not in the data itself but in the lack of structured approaches to effectively use it. Open data is non-rivalrous and non-excludable, meaning it can be used by multiple entities simultaneously without depletion. However, this unique characteristic also presents challenges in creating sustainable business models that can capture and generate economic value. The European Union, through initiatives like the open data directive (Directive (EU) 2019/1024) and the digital Europe programme, has made significant efforts to promote the accessibility and reuse of high-value datasets. Yet, the path to fully realising the benefits of open data is fraught with technical, legal and cultural barriers that need to be addressed.

This paper delves into the critical need for business models that can transform open data from a mere resource into a powerful catalyst for economic growth. By examining the insights from the data.europa.eu campaign and leveraging frameworks such as the service-dominant business model design, we propose strategic recommendations to foster a collaborative open data ecosystem. The data.europa.eu campaign consisted of a discussion paper, a webinar, one mini survey and a focus group, which provided valuable insights into the challenges and opportunities in the creation of sustainable business models for services based on open public data. The campaign targeted a wide audience of open data professionals and enthusiasts, and the survey received more than 200 answers, while the webinar was attended by a similar number of people – a testament to the relevance of and interest in the topic.

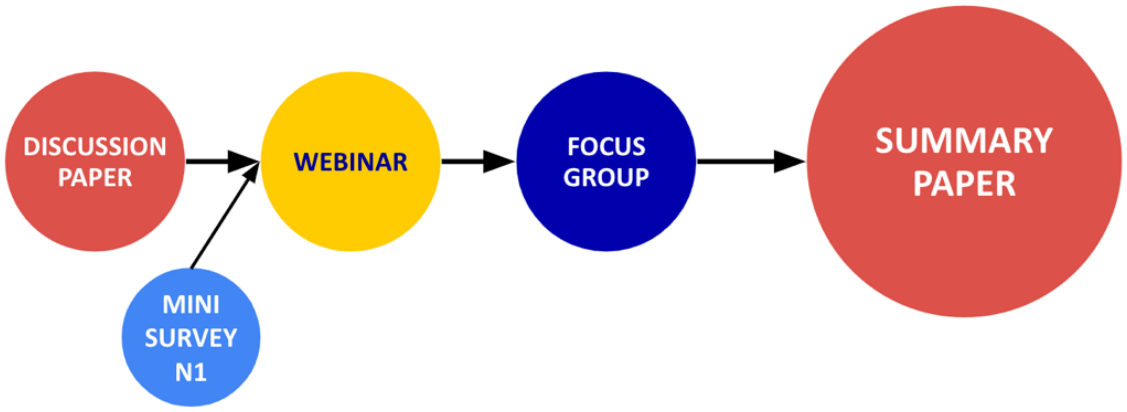


Figure 1: 2024 data.europa.eu campaign

More specifically, this summary paper aims at providing an overview of existing methods and good practices in establishing a sustainable public data resources ecosystem, identifying the key drivers that promote the adoption of business models for open data and the barriers that hinder their implementation.

To guide the research activities carried out during the campaign that led to the publication of this summary paper, the following research question was formulated.

How can sustainable business models for open public sector data resources be established and supported to maximise value creation and reuse across national and local levels in Europe**?**

To answer this main question, the following sub-questions were formulated.

- What are the existing methods and good practices in establishing a sustainable public data resources ecosystem?
- What barriers exist to data-driven value creation in the public sector, and how can they be overcome?
- What are the key political, economic, social, technological, legal and environmental factors impacting the sustainability of open data business models?
- What support mechanisms do public institutions need to successfully create value from open data ecosystems?

These questions are considered from a practice-oriented angle, supported by the data.europa.eu community engagement activities that have taken place throughout the campaign since the publication of the discussion paper *New Business Models for Data-driven Services* in November 2023.

The **introduction** begins by outlining the transformative potential of open data for society and the economy, drawing insights from the initial discussion paper. It highlights the significant economic value that open data can unlock. The various business models that leverage open data identified in the discussion paper are then summarised. In addition to summarising the insights on open data economics from the discussion paper, this section also outlines the benefits of applying business models to the delivery of public services.

The second section, **barriers to the establishment of sustainable business models**, provides an overview of the current state of the use and application of business models for open data, as revealed by the survey and webinar. It discusses the practices and experiences of different public institutions engaging with open data. This section also delves into the aspirations and concerns regarding sustainable business models for open data, capturing the perspectives shared during the focus group discussions.

The final section, **policy recommendations: how to create value from open data public resources**, offers policy recommendations on establishing sustainable business models for open data. It suggests ways to overcome barriers and provides actionable insights for public institutions and stakeholders to maximise the creation of value for and reuse of open data across Europe.

By following this structure, the summary paper aims to present an analysis of the challenges and opportunities that arise when creating sustainable business models for open data, supported by data and expert insights. The recommendations provided will serve as a roadmap for fostering open data reuse and driving innovation in public services.

1.1. The open data opportunity

The transformative potential of open data for society and the economy is immense. Open data has the potential to unlock substantial economic value, estimated to reach between EUR 199.51 billion and EUR 334.2 billion by 2025 (Capgemini Invent et al., 2020).

With the advent of new data-hungry technologies, such as artificial intelligence (AI) and blockchain, open data can create substantial value by making more data available. Increased access to data can foster the creation of start-ups and enable them to scale up, driving significant economic and societal benefits. Large amounts of quality data are

crucial not only as input during the operation of AI systems but also to train them initially. Without access to high-quality data, algorithms cannot learn effectively. Even the most powerful AI techniques with cutting-edge hardware are significantly less useful without high-quality data. In this respect, global data oligopolies are likely to turn into global AI oligopolies if access to data is not managed strategically from both technological and policy perspectives (European Commission et al., 2023). Open data fosters innovation by serving as the raw material in the development of new applications and services. Using open data, start-ups and tech companies can create solutions addressing societal challenges, from smart city applications to personalised healthcare. The open data canvas framework illustrates how data elaboration and customisation can transform raw open data into enterprise-specific assets, driving value creation (Digital Government: Research and Practice, 2022).

Additionally, open data is potentially a key factor in developing and scaling up a European GovTech ecosystem. GovTech, or government technology, refers to the deployment of digital solutions to improve public service delivery, enhance administrative efficiency and foster greater citizen engagement. The importance of GovTech lies in its ability to transform how governments operate, making them more agile, responsive and capable of meeting the evolving needs of their citizens. By integrating technology into their core functions, governments can streamline processes, reduce costs and deliver higher-quality services. As for AI, the effective use of open data is crucial for the growth and scalability of GovTech in Europe. Open data provides the essential information required for developing innovative digital solutions. By making large datasets accessible and reusable, open data initiatives enable the creation of applications that analyse and interpret this data to offer actionable insights, driving smarter decision-making and enhancing service delivery. For instance, open data can be employed to create tools that manage urban infrastructure, optimise traffic or improve public health responses. Furthermore, the availability of open data attracts tech start-ups and small and medium-sized enterprises, fostering an environment of innovation and competition. This leads to the development of advanced solutions that address public sector challenges, amplifying the impact of GovTech initiatives across Europe. By enabling public sector innovation and collaboration with technology start-ups and adopting service-dominant business models, public institutions can leverage open data to co-create value with private sector partners, facilitating the development of innovative digital solutions tailored to public needs. The resulting ecosystem not only stimulates economic growth and competitiveness but also drives the delivery of more responsive and effective public services, ultimately creating a more dynamic and collaborative landscape for digital governance in Europe.

Despite this immense potential, both research and practice on the creation of business models for services based on open data are still in their infancy, with many public institutions and private enterprises yet to fully embrace open data initiatives (Capgemini Invent et al., 2020). This lag represents an untapped opportunity for Europe to leverage open data to drive innovation, enhance public services and stimulate economic growth.

Scattered around Europe, some national and local governments, together with businesses and often with the support of the European Union, have developed very effective programmes to stimulate open data use and value creation. However, such programmes are relatively not well known and seldom scale up. Oftentimes, open data (re)use in the public sector results in the creation of services for citizens and businesses. As Turetken et al. (2019) note, when what is being sold is not a good but a service, a shift in mindset and culture is needed. This shift entails moving away from focusing solely on individual products or services towards providing integrated solutions that deliver value-in-use to customers within a collaborative ecosystem involving multiple stakeholders. Adopting an ecosystem approach in the design of business models for digital public services is key.

As will be explored in more detail in the following sections, open data is a force for good but requires a collaborative effort between the public and private sectors to realise its potential. A concerted effort should address existing barriers, promote data literacy and implement supportive policies and frameworks.

Open data and artificial intelligence

AI's transformative impact on various sectors, including the public sector and the data ecosystem, is profound. For instance, AI mobility services can improve the passenger experience through automated vehicles and advanced traffic management. In healthcare, AI can identify new drug solutions, enhance clinical trials and improve patient care.

A concrete example can be found in the United Kingdom, where the National Health Service has successfully implemented AI software that has had a tangible impact on reducing missed appointments. This AI system has reduced missed appointments by 30 %, and significantly, it has helped reallocate the remaining 70 % of missed slots to other patients, thus improving the utilisation of healthcare resources. This not only enhances the efficiency of healthcare delivery but also ensures that more patients receive timely care ([1]).

The relationship between open data and AI is mutually reinforcing. Open data can enhance AI systems by exposing them to larger and more diverse datasets, increasing the likelihood of accurate and useful predictions. Conversely, AI can extract additional value from open data by analysing large datasets and identifying trends and patterns that might not be apparent through traditional analysis techniques. For instance, an AI system trained to predict forest fires can analyse weather data, satellite images and historical trends to identify patterns that standard statistical methods might miss.

The broad range of subjects covered by open data expands the potential use cases for AI systems, enabling the development of new AI-driven products and services. These innovations require relevant data that is accessible and easy to use. The availability of diverse datasets through open data is essential for driving innovation and creating new economic opportunities. AI systems can leverage this variety to tackle societal challenges, in turn generating socioeconomic value.

For example, in applications such as urban planning and smart city development, open data on traffic patterns, public transportation usage, energy consumption and population density can be integrated and analysed by AI systems to improve urban infrastructure and services. An AI system can analyse this diverse dataset to identify bottlenecks in traffic flow, optimise public transportation routes and recommend energy-efficient building designs. This comprehensive analysis can help city planners make data-driven decisions to enhance urban mobility, reduce energy consumption and improve the overall quality of life for residents. By leveraging open data, AI systems can provide actionable insights that lead to smarter, more sustainable cities, demonstrating the powerful synergy between open data and AI.

Additionally, integrating open data into AI development can lead to more transparent and accountable AI systems. By using open data, AI developers can ensure their systems are built on diverse and representative datasets, reducing the risk of bias and increasing the reliability of AI predictions. This transparency is crucial for building public trust in AI systems and ensuring they are used ethically and responsibly.

In a nutshell, open data provides the necessary foundation for training and refining AI systems, while AI can unlock additional value from open data by identifying insights and patterns not apparent through traditional analysis techniques. This synergistic relationship underscores the importance of open data in the continued development and application of AI, highlighting its role in shaping a more innovative and equitable future.

Because of the immense potential of AI, AI-driven business models, such as **AI application-as-a-service (AIaaS)** and **AI infrastructure-as-a-service (AI-IaaS)**, are already emerging. The former involves developing AI applications for specific

([1]) For more details, see https://www.england.nhs.uk/2024/03/nhs-ai-expansion-to-help-tackle-missed-appointments-and-improve-waiting-times/.

use cases defined by customers, while the latter provides computational services and pre-trained algorithms. These models highlight the importance of data collaboration, with AI companies often partnering with data providers to enhance their solutions. AI systems rely heavily on large amounts of quality data for training and operation (Open Data Institute et al., 2018). The emergence of AI-AaaS and AI-IaaS models is driven by several key factors, reflecting broader trends in technology and business needs.

A primary driver is the increasing demand for AI capabilities across various industries. Companies today are eager to integrate AI into their operations to improve efficiency, decision-making and the customer experience. However, developing in-house AI solutions requires significant resources – both financial and human. Building AI systems from scratch requires substantial investment in data infrastructure, computing power and highly specialised talent – making it prohibitive for many businesses, especially small and medium-sized enterprises. AIaaS and AI-IaaS models democratise access to advanced AI technologies by providing scalable AI tools and services on a subscription basis, making them accessible even to companies with limited resources.

Another key factor is the complexity of AI development. AI systems are inherently complex, involving sophisticated algorithms, large datasets and ongoing maintenance to ensure models remain effective over time. By leveraging AIaaS, businesses can bypass much of this complexity. These services offer pre-built AI models and tools that have been refined by experts, allowing businesses to focus on applying AI to their specific needs rather than the intricacies of developing AI from the ground up. This not only speeds up the implementation of AI solutions but also reduces the risks associated with AI development.

Scalability and flexibility are also crucial factors contributing to the rise of AIaaS and AI-IaaS. As businesses scale up, their AI needs often expand in complexity and scope. AI-IaaS platforms provide the ability to scale resources up or down based on demand, without the need for significant capital investment in infrastructure. This flexibility is particularly beneficial for industries that experience fluctuating workloads or those that need to manage large volumes of data. Cloud computing advancements have further facilitated this trend by providing the necessary infrastructure to support large-scale AI operations across multiple geographies, with minimal latency.

Furthermore, cloud computing has been instrumental in the proliferation of AIaaS and AI-IaaS models. Cloud platforms now offer robust and secure environments where AI services can be deployed, managed and scaled globally. This integration of AI with cloud services has not only reduced the costs associated with AI adoption but has also enabled hybrid models through which businesses can combine on-premises systems with cloud-based AI solutions.

Lastly, the growing ecosystem of AI tools and platforms offered by major technology companies is reinforcing the shift towards AIaaS and AI-IaaS. Companies like Google, Microsoft and Amazon are heavily investing in their AI platforms, providing a wide range of AI services – from machine learning and natural language processing to predictive analytics. These platforms come with extensive support and integration options, which simplify the process of adopting AI technologies for businesses, further accelerating the trend towards AIaaS and AI-IaaS.

The latest surge in AI interest and investment highlights a trend towards business models that focus on collecting and isolating data into separate silos. Companies adopting this strategy view data access as crucial for gaining a competitive edge in developing, deploying and running AI systems. As a result, these companies often limit access to this type of resource. This set-up is defined as ‘open algorithm + closed data’, and it has led to disparities in data access, creating a gap between data-rich corporations and data-poor start-ups. Open data can help solve this issue as opening up datasets has the effect of democratising access to data, in turn enabling the development of many other data-fuelled AI services (Open Data Institute et al., 2018).

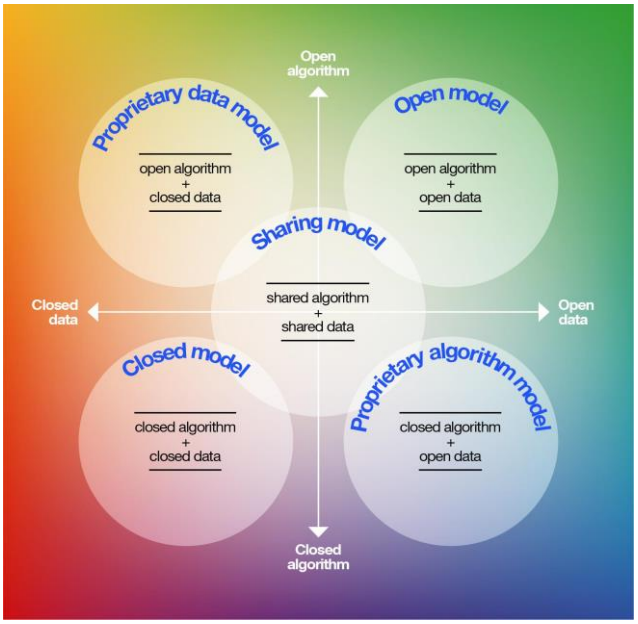


Figure 2: AI business models (Open Data Institute et al., 2018)

Challenges in integrating open data into AI systems

Integrating open data into AI systems presents several complex challenges, which can be broadly classified into technical, legal and ethical domains. One of the primary technical challenges is related to the quality and consistency of the data. AI systems rely on high-quality, structured data to function effectively, yet open data often originates from a variety of sources with differing standards and practices. This variability can lead to issues such as incomplete datasets, inconsistent formats and potential biases. When data quality is compromised, the AI models trained on such data are likely to produce inaccurate predictions and unreliable outcomes, which can have serious implications for decision-making processes. The importance of addressing these issues is highlighted in research by Zhang and Dafoe (2019), who discuss the risks posed by low-quality data in AI applications.

Another significant challenge is data interoperability. Open data is typically generated by different organisations, often using a wide range of platforms, formats and standards. This diversity can create substantial difficulties when attempting to integrate these datasets into a cohesive AI system. The lack of standardisation across data sources complicates the data preprocessing phase, as AI systems may struggle to reconcile discrepancies in data structures, terminologies or models. This lack of interoperability can limit the ability of AI systems to effectively analyse and learn from open data, thereby reducing the potential benefits of combining diverse datasets. The need for improved interoperability standards in AI and data integration has been emphasised in the work of Janssen et al. (2012).

Legal and ethical challenges further complicate the integration of open data into AI systems. Open data is often subject to varying degrees of regulation concerning privacy, security and intellectual property rights. Organisations must navigate these legal frameworks carefully to ensure compliance while integrating open data into AI systems. Moreover, ethical considerations, such as the potential for biased AI outcomes or the misuse of data, require careful management. Organisations must establish robust governance frameworks that address these concerns, ensuring that the integration of open data into AI systems is conducted in a manner that is both legally compliant and ethically sound. This aspect of the challenge is discussed by Floridi et al. (2018), who argue for a more ethical approach to data-driven AI, emphasising the need for transparency, accountability and fairness in AI development and deployment.

In summary, the integration of open data into AI systems is fraught with challenges that span technical, legal and ethical dimensions. Addressing these challenges requires a concerted effort to improve data quality and interoperability, alongside developing governance frameworks that can manage the complex legal and ethical issues involved.

1.2. Open data economics: insights from the discussion paper

Business models are essential for transforming the potential of open data into tangible economic and societal benefits. The unique characteristics of open data, such as its non-rivalrous and non-excludable nature, present both opportunities and challenges for creating sustainable business models. The discussion paper *New Business Models for Data-driven Services* (European Commission et al., 2023) identifies several archetypes of business models that can be employed to generate revenue and deliver value from open data.

Understanding data-driven business models

The concept of a business model, central to economic and trading activities, has evolved significantly with the advent of the internet and the rise of digital economies. A business model defines how an organisation creates, delivers and captures value. For open data, the challenge lies in leveraging a public resource to generate financial sustainability. The business model canvas proposed by Osterwalder and Pigneur (2005) is widely used to represent the architecture of value generation and capture. While multiple versions of the canvas exist, the model remains a standard tool for designing open data business models.

Before discussing business models, it is important to examine the economic aspects of information goods and the value chain of open data. Shapiro and Varian's work in *Information Rules: A strategic guide to the network economy* (1998) offers a comprehensive account of the cost structure of information goods. The fundamental features of information goods include high first-copy costs, low reproduction costs and economies of scale. Applying this conceptualisation to take into account the specificities of open data, the following elements can be identified.

1. **The cost structure of open data, much like information goods, is primarily dominated by initial production costs.** Once public sector data is generated and made available in an open format, the costs associated with reproducing and distributing additional copies become minimal. This characteristic leads to significant **economies of scale**, where the average cost per unit decreases as the volume of data copies increases. Such economies of scale enable the broad dissemination and reuse of data at relatively low costs, thereby enhancing accessibility and use across various sectors.

2. **The reuse of open data is often a second-order effect rather than the main goal behind the generation of data.** Public sector organisations primarily collect data for specific operational purposes such as regulatory compliance, service provision or internal reporting. Since the publication of data is not the primary goal of the data generation process, this leads to datasets not being curated or user-friendly, often resulting in non-negligible maintenance and upgrading costs. This adds layers of complexity to the cost dynamics of open data initiatives. Continuous data generation, storage and curation processes incur ongoing expenses, which must be managed effectively to sustain the value of open data. Further, while economies of scale allow for data to be widely disseminated at minimal additional costs, the **lack of direct, clear and quantifiable returns on investment can be a disincentive to information sharing**. Public institutions may be hesitant to invest in open data initiatives without clear evidence of the benefits and returns. This hesitation highlights the need for structured frameworks and business models that can quantify the impact of open data reuse, providing the necessary incentives for sustained information sharing. It is crucial to consider these economic specificities of open data when looking into business models that integrate open data into the value proposition.

3. **The process that spans from the generation of a data asset to its consumption is far from being linear and is subject to diverse interpretations.** The discussion paper identifies three relevant aspects pertaining to the open data value chain: the activities conducted, the relevant stakeholders and the outputs generated in each step of the value chain. The main added-value activities carried out along the chain are data generation, dissemination, retrieval, storage, categorisation, exposure, reuse and consumption, while the outputs of the

different steps are raw data, refined data and fit-for-purpose products and services. Finally, a number of archetypal stakeholders operating along the value chain have been presented to highlight the concurrent presence of government agencies and for-profit and not-for-profit entities with no expectation of exhaustivity (Figure 3).

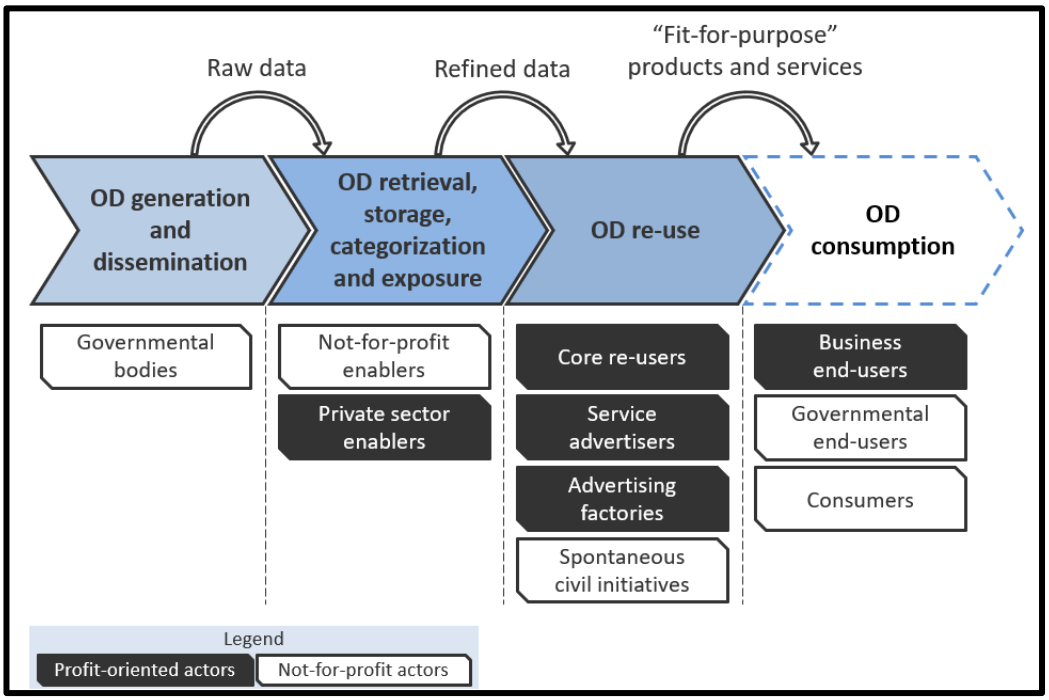
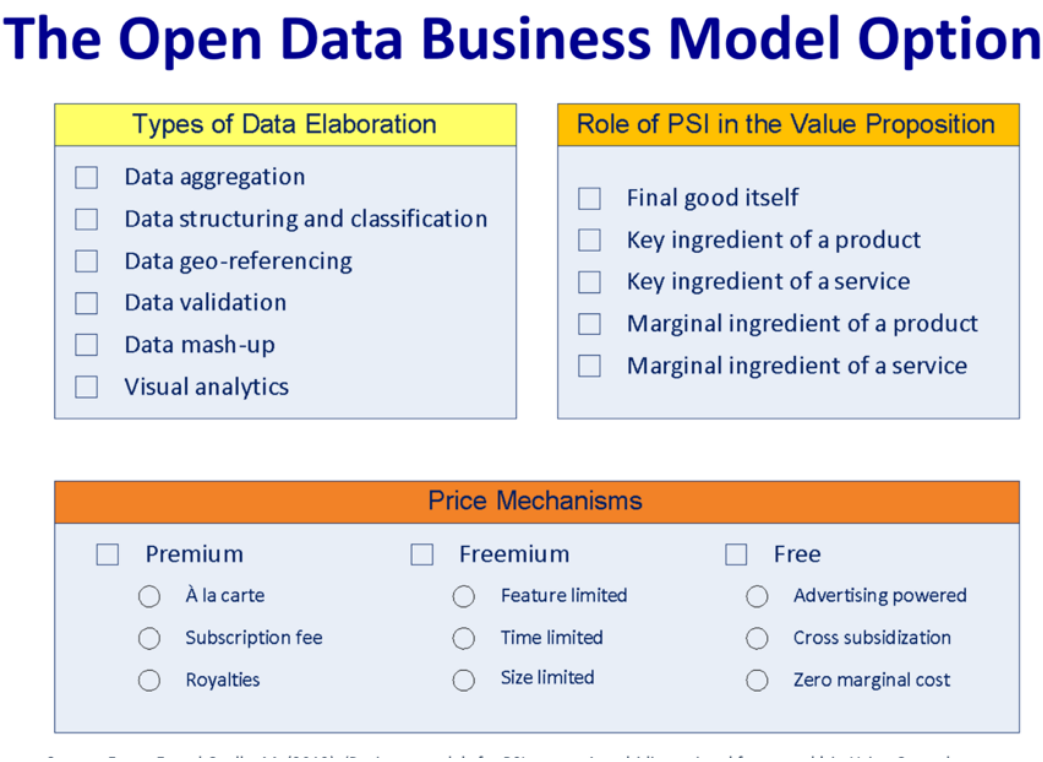


Figure 3: Open data value chain

In the context of open data, three strategic decisions are pivotal when determining which business model to choose: the type of data elaboration, the role of open data in the value proposition and the pricing mechanism. Data elaboration may include aggregation, structuring, classification, geo-referencing, validation, data mash-ups and visual analytics. **The role of open data can range from being the final product itself to a key ingredient or a marginal component of the value proposition.** Pricing mechanisms vary from premium models (paid services) to freemium (free basic services with paid premium features) and free models (supported by advertising or other means).



(*) PSI = public sector information.

Figure 4: Open data business model options (Ferro and Osella, 2012)

The discussion paper and the review of the literature identify 14 different types of business models for integrating open data into one's value proposition (European Commission et al., 2023). These models have a number of common traits and, based on the categorisation by Zeleti et al. (2014), can be condensed into five main categories: freemium, premium, open source, infrastructure and demand/supply-oriented platforms.

- The **freemium** model offers a basic product or service for free while charging for premium features. In the context of open data, this might involve providing access to basic datasets for free while offering advanced analytics, customisation or additional data services for a fee.
- The **premium** model involves providing high-end services and products at a premium price, targeting a niche market with a high profit margin. For open data, this could mean offering highly specialised datasets or data services that cater to specific industries or research needs.
- The **open-source** model involves making source code or data publicly accessible, with revenue generated from added-value services and dual licensing. Organisations can monetise their code or data by offering professional support, bespoke services or enhanced versions under a different licence.
- The **infrastructure** model provides an initial product at a low price or for free, with subsequent products or services generating revenue, akin to razors and blades. For open data, this could involve offering free access to basic infrastructure, such as data storage or processing platforms, while charging for advanced features, additional storage or premium processing capabilities.
- The **demand/supply-oriented platform** model customises datasets based on client needs, with revenue derived from the added value of data aggregation, curation and enrichment.

When discussing business models and open data, it is important to stress that the benefits of open data extend far beyond 'open data start-ups'. While some businesses are specifically established to exploit open data opportunities, many others are leveraging open data to enhance their existing products and services or to develop new ones. This demonstrates that a wide range of businesses can benefit from open data, highlighting its broad applicability and potential. Also, open data is not only about consumption – its publication also creates substantial value for small

businesses. By accessing open data, businesses can innovate, attract new customers, improve customer experiences and capture new markets. And lastly, but perhaps most importantly, the most significant value of open data often emerges when it is combined with other data sources. Businesses can address complex problems by integrating diverse data types from open, shared and closed sources, resulting in stronger value propositions and more effective solutions. This approach enhances the overall utility and impact of open data (European Commission et al., 2023).

Business models for public services

Open data represents an opportunity for businesses and public institutions alike. While businesses are acquainted with the concept of a business model, the same cannot always be said of public institutions. However, adopting business models can help public institutions understand the broader ecosystem in which they operate. **They provide a structured framework for identifying the various stakeholders, resources and processes involved in service delivery, enabling a more holistic approach to managing public services.**

Innovative business models for public services can enable public institutions to leverage open data effectively, fostering the development of new services and improving existing ones. Further, incorporating a business model perspective shifts the discussion from mere cost efficiency to a more comprehensive evaluation of organisational productivity and effectiveness. Traditionally, public sector productivity has been viewed through the lens of cost efficiency, focusing on reducing expenditure and optimising resource use (Jörden et al., 2024). However, this narrow focus can obscure the broader benefits that structured business models bring. Business models facilitate a better understanding of value creation, delivery and capture, ensuring that public services are not only efficient but also impactful and sustainable (Wirtz et al., 2021). This shift is essential for recognising the full spectrum of public value generated through open data initiatives, including enhanced service quality, increased transparency and improved citizen engagement.

The concept of public service provision models, adapted from traditional business models, emphasises the need to orchestrate and finance public services effectively. This perspective allows public entities to manage how they create, deliver and capture value, ensuring that public services are both sustainable and responsive to citizens' needs (Lorenz et al., 2024). **Public service provision models differ from conventional business models primarily in their focus on public value rather than profit.** These models centre around addressing public needs and delivering value that enhances the quality of life for citizens. This often involves intangible benefits such as increased trust in public institutions and greater transparency, alongside tangible outcomes like improved service efficiency. For instance, the use of AI and data analytics in public services can streamline processes and provide more personalised services to citizens. Such technological advancements require robust business models that support ongoing innovation and adaptability within public institutions.

To effectively implement and scale public services, public institutions must adopt a comprehensive approach that includes understanding their value propositions, value creation and delivery mechanisms, and value capture strategies. This involves recognising the unique challenges of public service provision, such as regulatory constraints, the need for inclusivity and the importance of public accountability. **By integrating business model thinking into their strategic planning, public institutions can develop frameworks that not only meet immediate service delivery needs but also anticipate future demands and opportunities for innovation.**

For instance, Finland has embraced the circular economy model in its national strategy, aiming to transition from a linear economy to one that is regenerative by design. The Finnish Innovation Fund Sitra has been instrumental in this shift, using business models to analyse how different sectors of the economy can operate more sustainably. By

adopting the circular economy model, Finland has been able to reduce waste, promote the sustainable use of resources and create new business opportunities in areas such as recycling and renewable energy ([2]).

Another great example of how public institutions can use the ecosystem business model to foster innovation is Germany's 'industry 4.0' initiative in the manufacturing sector. Industry 4.0 integrates cyber-physical systems, the internet of things and cloud computing to create smart factories. The German government has supported this initiative by bringing together various stakeholders, including manufacturers, technology providers and research institutions, to create a robust innovation ecosystem. This model has allowed Germany to maintain its competitive edge in manufacturing by leveraging the strengths of different stakeholders within the ecosystem ([3]).

And last but certainly not least, Barcelona has implemented a smart city strategy that applies a business model approach to urban planning and public services. By leveraging data and technology, the city has created an ecosystem that connects various public services, such as transportation, energy and waste management, to improve efficiency and sustainability. The smart city model allows Barcelona to address urban challenges by integrating technology into the fabric of the city, leading to more responsive and efficient public services ([4]).

Public sector reuse of open data frequently leads to the creation of services aimed at citizens and businesses. According to Turetken et al. (2019), **when the focus shifts from offering tangible goods to providing services, it necessitates a substantial change in both mindset and organisational culture**. This change involves transitioning from an emphasis on stand-alone products or services to offering integrated solutions that generate value for customers within a collaborative network of multiple stakeholders. This approach is defined as the **service-dominant business model**. This relatively new conceptualisation offers a transformative approach to business model design, particularly relevant for digital services. Unlike the traditional goods-dominant logic, which focuses on the production and exchange of tangible products, the service-dominant logic emphasises **the co-creation of value through interactions and relationships between service providers and consumers**. This approach is particularly suited to the digital age, where services are often dynamic, customisable and highly dependent on user engagement and feedback.

In the context of public services and the reuse of open data, adopting a service-dominant business model can significantly enhance the way public institutions deliver value. This model encourages public entities to view citizens not just as passive recipients of services but as active participants in the value-creation process. For example, digital platforms that allow citizens to contribute data, provide feedback or co-design services can lead to more effective and user-centric public services. The focus on co-creation also helps public institutions build stronger relationships with their stakeholders, fostering a sense of ownership and engagement among citizens.

Implementing a service-dominant business model requires public institutions to rethink their operational strategies and service delivery mechanisms. It involves integrating digital tools and technologies that facilitate real-time interaction and collaboration with citizens. Additionally, it necessitates a cultural shift towards viewing public services as dynamic and evolving processes, rather than static offerings. By embracing the principles of the service-dominant business model, public institutions can create more responsive, efficient and innovative services that better meet the needs of their communities.

Lastly, business models can provide a structured framework to address the lack of impact measurement for open data. By adopting business models, public institutions can better replicate successful projects across different regions or services, thereby increasing the impact of positive innovations and enabling widespread benefits. Lorenz et al.

([2]) For more information, see https://www.sitra.fi/en/topics/a-circular-economy/.
([3]) For more information, see https://www.gtai.de/en/invest/industries/industrial-production/industrie-4-0.
([4]) For more details, see https://www.beesmart.city/en/smart-city-blog/smart-city-portrait-barcelona.

(2024) argue that adopting business models can help public institutions scale up their initiatives more effectively, ensuring that successful projects have a broader reach and impact. But, concretely, in what ways can the public sector create value from open data? The campaign following the discussion identified five adaptations of the business model categories listed in the previous section.

- **Through data brokerage.** Public sector organisations can act as intermediaries between data providers and data users, facilitating the exchange of data and generating revenue through transaction fees or commissions.
- **Through data analytics.** Public sector organisations can use open data to develop data analytics services, providing insights and recommendations to other organisations or to the public.
- **Through data-driven products and services.** Public sector organisations can develop new products and services based on open data, such as mobile apps, dashboards or data visualisations.
- **Through data licensing.** Public sector organisations can license their data to other organisations for commercial or non-commercial use, generating revenue through licensing fees.
- **Through data sharing partnerships.** Public sector organisations can partner with other organisations to share data and jointly develop new products and services.

2. Barriers to the establishment of sustainable business models

This section aims at providing an overview of the current state of the adoption of business models for public services based on open data, as revealed by the survey, focus group and webinar. It goes over the practices and experiences of different public institutions in engaging with open data business models, analysing the barriers that arise when establishing processes to generate value through a purposeful and effective use of data released in an open format.

2.1. Current state of open data in Europe's public institutions

The limited existing literature explores different business models and canvases for open data, providing templates to apply to business processes and service development. But what are public institutions doing in practice?

The survey carried out as part of the present campaign provides new data points that provide a useful snapshot of the perception of the community. The purpose of the survey was to better understand the level of interest in and degree of knowledge about business models for open data among public administrations in Europe, and which approaches have already been explored. We surveyed a diverse range of public administrations across Europe, including national, regional and local governments, along with public institutions and agencies, for a total of 209 respondents (Figure 3) that, due to multiple-choice questions, translated into a total of 335 answers.

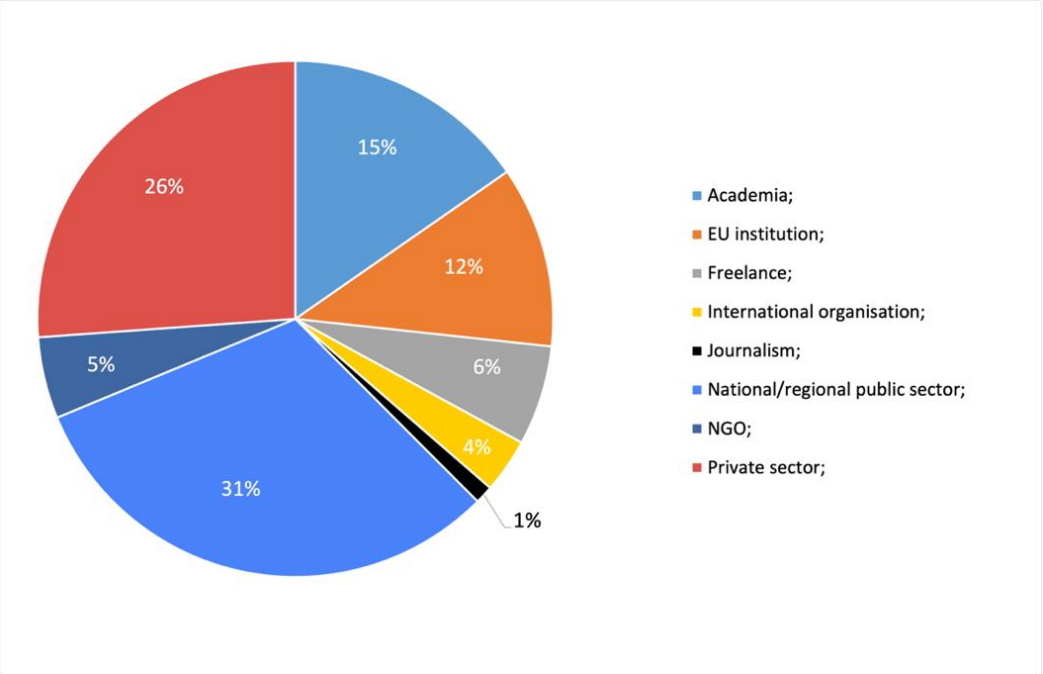


Figure 5: Respondents to the survey

Figure 6 illustrates whether organisations have employed business models that effectively integrate open data into their value propositions. A large majority, 72 % of respondents, indicated that their organisations have not yet integrated open data into their business models. Only 28 % of respondents reported successful integration of open data.

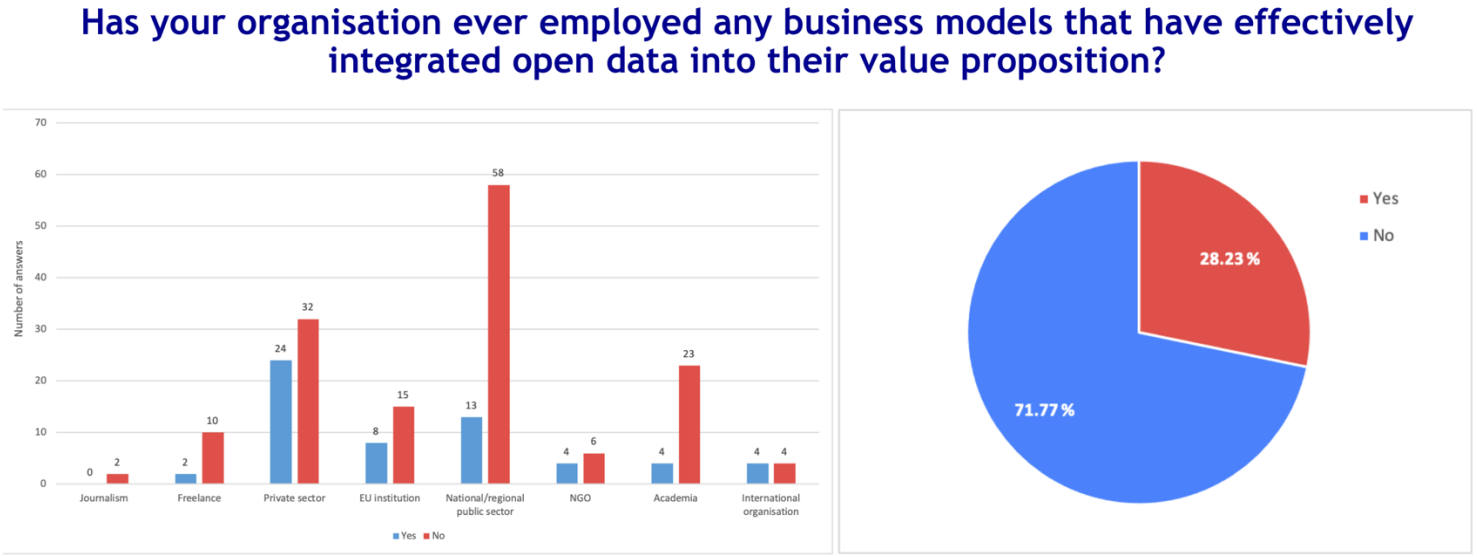


Figure 6: Visualisation of survey answers

Zooming in on the results, the difference between sectors is striking, with a significant difference between the public and private sectors. Put simply, business models integrating open data are largely unknown in the public sector, with only 22.3 % adopting them versus 42.9 % in the private sector.

Barriers to data-driven value creation in the public sector have been extensively identified in the literature and usually fall into two categories: (1) technical or (2) institutional. Last year's summary paper, *Creating public sector value through the use of open data* (European Commission et al., 2023), provides a clear and data-informed overview.

The most common technical barriers are:

- data silos, and the related lack of data harmonisation and interoperability;
- poor data quality (and management);
- licensing issues.

Meanwhile, the most common institutional barriers to the reuse of open data by public institutions are namely:

- the need to consider public institutions as data reusers from the outset of the data publication process;
- the lack of 'self-awareness' of public institutions that they are open data reusers;
- the lack of contact between the person or body responsible for the open data portal(s) and the ecosystem of users.

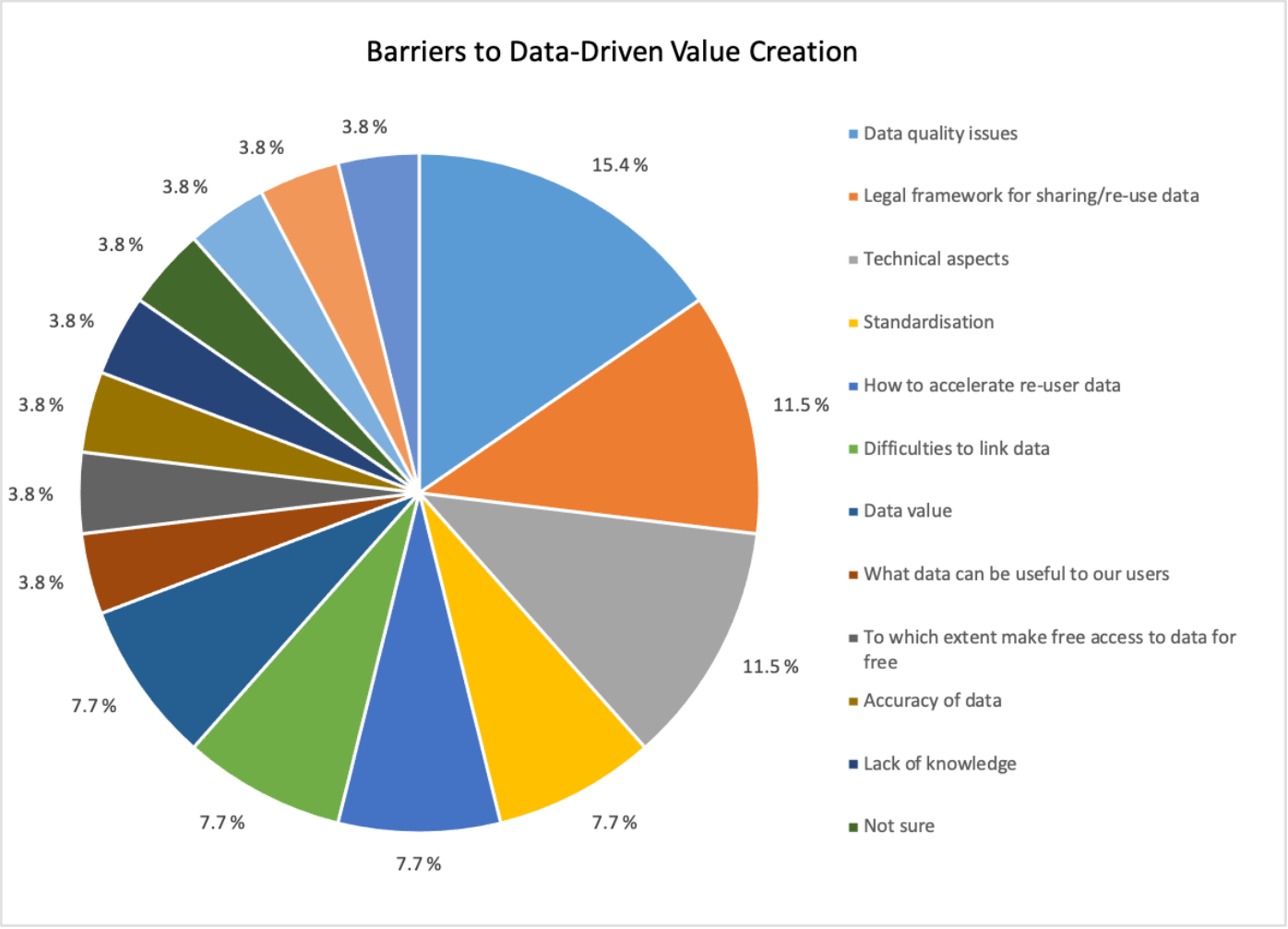


Figure 7: Barriers to data-driven value creation

Integrating findings from last year's campaign with insights from this year's campaign offers further food for thought and analysis. In addition to the usual challenges of technological, policy and legal barriers, the main issue with creating business models for public services based on open data remains cultural.

The low level of experimentation with business models in the public sector can indeed be traced back to the prevailing view that public services should primarily create value for the public and do not require a business model in the same way private sector services do. Throughout the campaign, this issue arose multiple times, with participants from the

webinar often underlining that for public bodies, the reason behind the publication and opening of data is making it available to citizens and third parties for them to use and develop innovative solutions and services.

However, this is a flawed perception for two main reasons.

(1) **It is important for the public sector to be able to develop their own digital solutions.** Long-term trends such as ageing populations, increasing inequality and climate change, along with unpredictable challenges like migration and security, impact citizens' well-being and resilience. To be prepared for these changes and challenges, long-term visions, evidence-based investments and coordinated actions from governments are needed. To realise this, a data-driven public sector is needed, as the effective integration of data revolutionises the design, delivery and monitoring of public policies and services through data management, sharing and usage. Leveraging data as a strategic asset is essential for governments to enhance public sector intelligence, thereby improving their capacity to develop policies and services that are sustainable, inclusive and trusted in the long run (van Ooijen et al., 2019).

(2) **Public services, despite their focus on public value, still need to be orchestrated efficiently to maximise public value.** To put it simply, concept of public value may be described as the analogue of the desire to maximize shareholder value in the private sector (Coats and Passmore, 2018).

A significant part of the barrier is the difference in terminology between the public and private sectors. Stemming from a flawed interpretation of 'value', public sector entities often do not see themselves as needing 'business models', a term that connotes profit-driven motives are inconsistent with their mission of public service (Timeus et al., 2017). This terminological difference contributes to a misunderstanding of how business model frameworks can be adapted to enhance public value creation without compromising their core objectives.

Additionally, public services need to be orchestrated and financed efficiently. Without a business model perspective, public institutions may struggle to manage resources effectively, leading to inefficiencies and wasted opportunities. The structured approach provided by business models helps in understanding the costs associated with delivering services and identifying potential revenue streams, even if not profit-oriented. This is crucial for ensuring the sustainability of public services, especially in times of budget constraints (Wirtz et al., 2021). The disparity between the public and private sectors in adopting business models suggests that public institutions may lag behind in terms of service quality and efficiency. The private sector's higher degree of experimentation with business models allows for continuous improvement and adaptation to changing needs and technologies. Public institutions, on the other hand, risk becoming stagnant and less responsive to the needs of their citizens if they do not adopt similar approaches. This gap has significant implications, as it can lead to public dissatisfaction and reduced trust in public services (Timeus et al., 2017).

A significant barrier to the uptake of open data in the public sector is the lack of clear ways to measure the use, impact and success of such data. This issue was analysed in the discussion paper *Measuring Data Demand Within the Public Sector* (van Ooijen et al., 2022), also produced within the data.europa.eu context. The paper highlights that without robust metrics and evaluation frameworks, it is difficult for public institutions to demonstrate the value generated from open data initiatives. This measurement challenge further hinders scaling up successful initiatives and ensuring their sustainability. While society has developed markets to facilitate the buying and selling of goods and services through the exchange of currency, we have not yet cultivated a comprehensive method to quantify the value that is generated through the open sharing of information products. For example, new information may have a significant

effect on people's health, their ability to choose a suitable education and the way they interact with their natural environment and with other people. Whereas such effects have inevitable personal and social value, they are unlikely to be reflected in any performance indicator that is designed to measure the contribution of the public sector to economic value or public value (Jetzek et al., 2019). The non-application of business models to public services based on open data further exacerbates this issue.

By addressing this cultural resistance and promoting the adoption of business models, public institutions can unlock the full potential of open data, driving innovation, efficiency and improved public services. This shift requires a change in mindset, recognising that business models are not just tools for profit-making but essential frameworks for creating sustainable and impactful public services.

Similar conclusions can be drawn from the analysis of the answers from another survey question. To assess the relevance of the different approaches, the survey circulated among the data.europa.eu open data community included a question on what type of approaches have been explored by the surveyed institutions. And, as shown in Figure 8, most organisations at the time of the survey (February 2024) had not yet engaged in activities to assess business models. This confirms that the integration of business models for open data remains in its infancy for many organisations.

Has your organisation undertaken activities to assess possible business models for data-driven services?

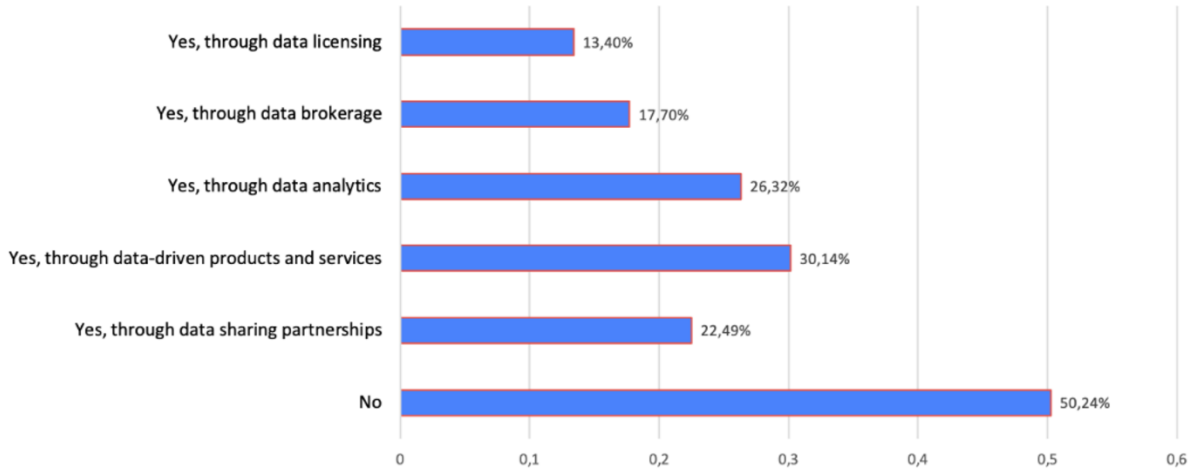


Figure 8: Visualisation of survey answers (multiple choices allowed)

Moreover, the visualisation of the survey answers provided in Figure 8 also shows that, when organisations assess possible business models that integrate open data in their value proposition, the preferred options are data analytics or data-driven products and services. What does this tell us?

One of the key reasons data analytics is so highly preferred could be that the reuse of open data is often a second-order effect rather than the primary goal behind the generation of data. Many public sector organisations collect data primarily for specific operational purposes, such as regulatory compliance, service provision or internal reporting. The potential for reuse, while recognised, is not the driving factor in the data generation process. Consequently, data analytics becomes a natural choice for these organisations, as it allows them to derive additional value from data that was initially collected for other purposes. This approach enables organisations to uncover new insights and applications from existing datasets, making data analytics a practical and attractive option.

Moreover, the high preference for data-driven products and services, such as mobile apps, dashboards and visualisations, suggests a strong demand for tools that make data accessible and actionable for users. These products can enhance user engagement, provide real-time information and support interactive data exploration, making it easier for organisations to demonstrate the value of open data to stakeholders. Despite being highly beneficial, the preference for this type of reuse also creates key challenges, mainly of a cultural nature. These challenges are faced not only by public sector institutions but also by businesses.

The focus group discussion provided valuable insights into why adopting an ecosystem perspective in service design and delivery can be challenging for both the public sector and businesses.

Firstly, **organisational silos and resistance to change** pose significant barriers. Public sector institutions and businesses are often structured in a way that promotes siloed thinking, where departments and units operate independently rather than collaboratively. This structure can hinder the flow of information and resources needed to develop integrated solutions. Additionally, resistance to change is common, as shifting to an ecosystem perspective requires altering established processes and mindsets, which can be met with reluctance from employees and management alike.

Secondly, **a lack of interoperability and standardisation** can impede the development of collaborative ecosystems. For an ecosystem to function effectively, the various stakeholders involved must be able to seamlessly share data and resources. This requires interoperable systems and standardised protocols, which are often lacking, especially in the public sector. Without these, it becomes challenging to integrate services and deliver cohesive solutions that span multiple organisations or departments.

Thirdly, **differing goals and priorities** among stakeholders can complicate collaboration. Public sector entities and businesses often have different objectives, performance metrics and regulatory constraints. Aligning these diverse goals to work towards a common purpose within an ecosystem requires significant effort and negotiation. Lastly, establishing trust among stakeholders, which is crucial for effective collaboration, can be difficult when there are varying interests and expectations.

However, not all is negative. While highlighting a lack of adoption and exploration of business models, the survey results at the same time show a relatively high level of awareness of their importance. The data reveals that 55 % of respondents had given prior thought to such business models, while 45 % had not. This indicates a moderate level of awareness and consideration of data-driven business models across the surveyed organisations. Sector-specific insights reveal unsurprisingly that the private sector has a higher level of engagement, with more respondents indicating prior consideration of business models. In contrast, European Union institutions, national and regional public sector organisations and non-governmental organisations display mixed levels of prior consideration, suggesting varying degrees of readiness and awareness.

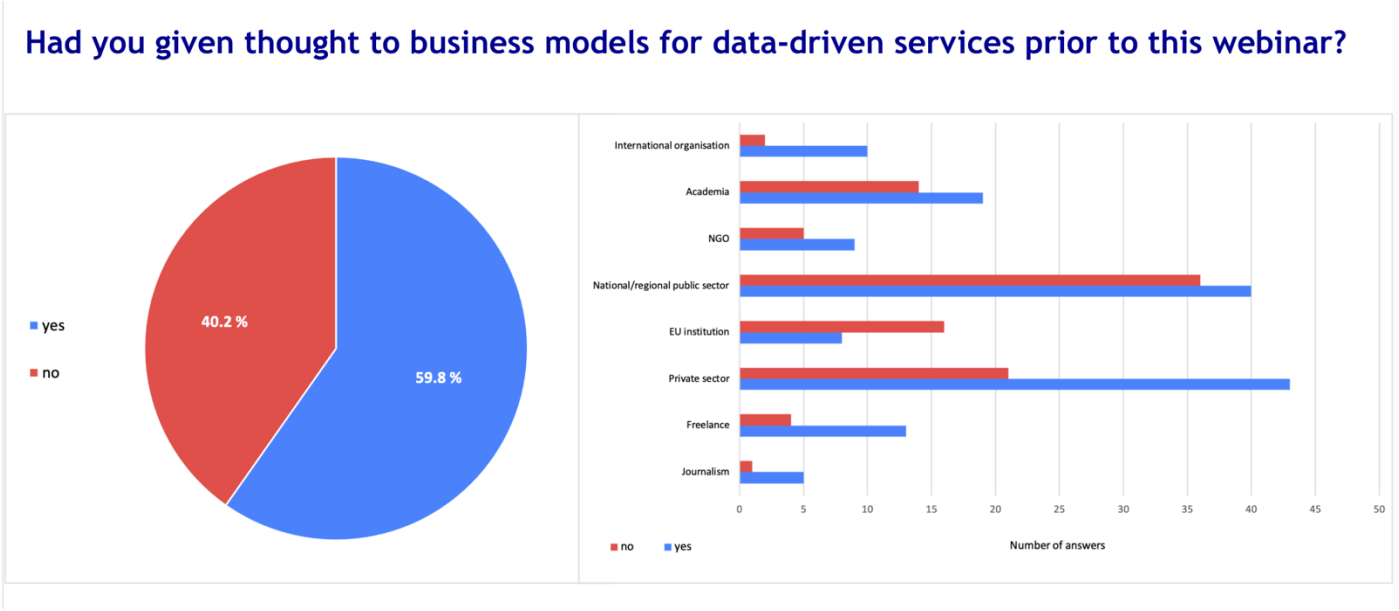


Figure 9: Visualisation of survey answers

The implications here are twofold. First, there is a growing awareness of the importance of business models for data-driven services, although this awareness is not yet universal. Second, the data underscores the need for continued education and support to help organisations across all sectors understand and develop viable business models for open data.

3. Policy recommendations: how to foster the development and application of business models for open data public resources

The European Union has long recognised the transformative potential of open data in driving innovation, transparency and economic growth. Over the past two decades, a series of legislative measures have been introduced to foster an open data ecosystem. The open data directive (Directive (EU) 2019/1024), which replaced the public sector information directive, marks a significant milestone in this journey. By mandating the accessibility and reuse of high-value datasets, the open data directive aims to unleash the power of data for the benefit of citizens, businesses and public administrations across Europe. The European Commission's commitment to this vision is confirmed by the digital Europe programme, which supports projects that enable the widespread use and reuse of public sector data. However, the path to fully realising the benefits of open data is fraught with challenges. These include technical, legal and cultural barriers that must be overcome to create a thriving data economy.

In this context, it is essential to adopt a holistic approach that not only ensures the availability of open data but also promotes its effective use and reuse. This involves fostering an ecosystem where public institutions, private enterprises and civil society collaborate to co-create value from open data.

Furthermore, the Interoperable Europe Act and other legislative initiatives highlight the need for a cohesive framework that supports data interoperability and standardisation across EU Member States. By addressing these and other challenges, we can build a robust infrastructure that supports the seamless flow of data, encourages innovation and drives economic growth.

The following policy recommendations are designed to support the establishment of sustainable business models for open data, foster a collaborative ecosystem and unlock the full potential of data-driven innovation in Europe. By implementing these recommendations, we can ensure that open data becomes a cornerstone of Europe's digital transformation, driving progress and prosperity for all.

The insights from the data.europa.eu campaign highlight the transformative potential of open data and underscore the necessity of robust business models to unlock this potential. The policy recommendations proposed are of two types: (1) recommendations to foster the (re)use of open public data (despite the focus of this policy paper being on business models, it is impossible to talk about business models harnessing open public data's potential without its widespread use) and (2) recommendations on how to use business models to unlock the power of open data.

3.1. Promoting an ecosystem approach

Discussions about the importance and potential of open data have been going on for decades, and despite that, we haven't seen much progress. It is important to recognise that top-down pressure from policy alone is unlikely to improve the state of ecological data availability and accessibility. A collaborative effort is thus required to harness the entrepreneurial spirit of new generations of innovators and the strength of established corporations.

A successful open data ecosystem indeed requires a collaborative approach that involves multiple stakeholders, including public institutions, private enterprises, academia and civil society. The service-dominant business model design framework provides a useful lens for this approach, emphasising the creation of value through collaborative and integrated processes. Key recommendations include the following.

Encouraging public–private partnerships. Facilitate partnerships between public and private sectors to co-create value from open data. Public–private partnerships can leverage the strengths of both sectors to develop innovative solutions and services.

Fostering a culture of collaboration. Promote a mindset shift from a goods-centred logic to a service-dominant one. This involves viewing open data as a resource for co-creating value with stakeholders rather than merely a product to be consumed.

Supporting intermediary organisations. Establish and support intermediary organisations that can bridge gaps between data providers and users, fostering collaboration and facilitating data sharing.

3.2. Implementing support mechanisms for public institutions

To maximise the value creation from open data, public institutions require specific support mechanisms. These mechanisms should address both the technical and organisational challenges identified in the campaign. Recommendations include the following.

Building data literacy and skills. Invest in training programmes to enhance data literacy and analytical skills within public institutions. This will enable public servants to better understand and utilise open data.

Providing technological infrastructure. Develop and maintain robust technological infrastructure that supports data sharing, processing and reuse. This includes cloud services, application programming interfaces and platforms for data integration.

Establishing clear data governance frameworks. Implement comprehensive data governance frameworks that define roles, responsibilities and processes for data management and reuse. These frameworks should ensure data quality, security and compliance with legal standards.

3.3. Encouraging user-centric data publication strategies

Effective reuse of open data requires that data be published in ways that meet user needs. This involves tailoring data publication strategies to ensure data is accessible, relevant and usable. Recommendations include the following.

Engaging with data users. Regularly engage with data users to understand their needs and preferences. This can be done through surveys, focus groups and user feedback mechanisms.

Prioritising high-value datasets. Focus on publishing high-value datasets identified by the Commission, such as geospatial, environmental and mobility data. These datasets have significant potential for economic and societal impact.

Ensuring data quality and usability. Adopt standards and best practices for data quality and usability. This includes providing metadata, ensuring data is machine-readable and using common formats and standards.

4. *Conclusion*

The exploration of open data as a driver of innovation and economic growth underscores the transformative potential embedded in publicly available datasets. However, realising this potential requires more than just data accessibility; it demands robust business models and supportive ecosystems that can translate data into tangible value. The European Union's initiatives, including the open data directive and the digital Europe programme, provide a solid foundation, yet significant barriers remain – technical, legal and cultural – that must be addressed.

This paper has highlighted the critical need for sustainable business models that can catalyse the economic value of open data across various sectors. By adopting an ecosystem approach, fostering public–private partnerships and emphasising user-centric data publication strategies, public institutions can better harness the power of open data. Furthermore, the integration of AI and open data represents a significant opportunity for innovation, particularly in creating smarter, more efficient public services. However, the path forward requires overcoming challenges related to data quality, interoperability and legal frameworks.

The recommendations outlined in this paper provide a roadmap for policymakers and public institutions to maximise the value of open data. By addressing the identified barriers and embracing collaborative, service-dominant business models, Europe can foster a vibrant data economy that not only drives innovation but also delivers substantial societal benefits.

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ISBN 978-92-78-44500-3

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of the European Union