Advancing Digital Government: Integrating Open Source Software Enablement Indicators in Maturity Indexes[*]

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ABSTRACT

Context: Open Source Software (OSS) is a vital public good, comprising around 96% of modern software stacks. Its licensing enables free reuse and collaborative development, significantly impacting GDP and national tech growth. European and global frameworks highlight OSS's role in public sector digital transformation, prioritizing interoperability, sovereignty, and transparency. However, systematic awareness and measurement of governmental OSS adoption remain limited. **Research Aim**: This study contributes to digital government maturity indexes by analyzing policies and support actions leveraging OSS for software reuse and collaborative development across 16 digitally mature countries, and proposing potential indicators for said indexes. It examines OSS policy formation, stated goals, key actors, and support mechanisms. **Methodology**: A qualitative approach is used combining desk research of policy documents with semi-structured interviews of government representatives, producing detailed country reports. These are cross-analyzed, focusing on OSS policy promotion, rationale, and implementation support. **Results**: Policies facilitating OSS reuse are widespread, targeting both inbound acquisition and outbound sharing, and are predominantly governed by central public sector organizations. Policy goals include interoperability, digital sovereignty, transparency, and cost efficiency, with security framed both as a risk and strength. Implementation is supported by diverse Open Source Program Offices (OSPOs) at multiple government levels, which foster capacity building, resource pooling, and sustainable project governance. Indicators are synthesized and proposed across 14 areas covering policy incentives and design, and implementation and support. **Conclusions**: OSS is a strategic enabler for public sector digital transformation. Clear policy frameworks, coupled with institutional support such as OSPOs, are essential. International digital maturity frameworks should expand OSS indicators to better guide and assess government adoption and impact. Holistic strategies integrating policy, capacity, and ecosystem engagement are critical to realizing OSS's benefits in transparency, interoperability, sovereignty, and cost efficiency.

1. Introduction

Open Source Software (OSS) makes up a public good estimated to be part 96 percent of todays software stacks (Synopsys, 2025). The OSS licencing regime enables the software to be freely reused, inspected, modified, and redistributed, and by extension enabling a collaborative form for development shown to have substantive impact on both the GDP (Blind, Böhm, Grzegorzewska, Katz, Muto, Pätsch and Schubert, 2021), and increased competitiveness and growth of national tech industries (Nagle, 2019). A study brings light on the value generated both from a supply and demand side perspective, with figures between $1.22-6.22 billion, and $2.59-13.18 trillion respectively (Hoffmann, Nagle and Zhou, 2024). The potential that OSS brings as an instrument for software reuse and collaborative development is accordingly significant, and a pivotal tool to be used in the digital transformation of the public sector.

On a European level, the importance has been stressed through consecutive Ministerial Declarations (European Commission, 2017b, 2020a, 2022), as well as in overarching visions (European Commission, 2021), strategies (European Commission, 2020b), and legislative frameworks (European Commission, 2017a). Interoperability among digital infrastructure and service components, sovereignty in technical in technical sourcing and design decisions, and transparency into data collection and use are some of the more prominent policy goals being reiterated.

Also, in other parts such as the US and China, OSS has gained a prominent role in the long-term strategic programmes for digital transformation, as well as an awareness for the need to keep pace with technology development, attracting a skilled workforce, and proactively managing the increased threats of cyber security attacks. The importance of OSS as a carrier for innovation is additionally stressed in the context of developing countries, and in addressing the Sustainability Development Goals set out to be achieved by 2030. Despite the apparent awareness on the international scale, there is limited attention and awareness in following up on the overall progress, both in the international and national levels of government.

International rankings have shaped government behaviour since the 1970s (Merry, 2011), driving reforms and policy shifts as nations vie for legitimacy and status Kelley and Simmons (2015); Broome, Homolar and Kranke (2018). OSS is acknowledged in some prominent indexes—such as those by DIAL (2024), OECD (2023), and WIPO's Global

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Innovation Index (2024)—highlighting its roles in interoperability and innovation. Yet, OSS indicators remain narrow and offer little actionable guidance for governments, meaning many digital transformation efforts risk missing major opportunities if OSS is overlooked as a strategic policy tool.

In this work, we aim to provide input to these indexes through an exploratory and cross-comparative analysis of the policy, and support actions for the leveraging of OSS as an instrument for software reuse and collaborative development among national governments. We look specifically to a sample of the 16 countries highlighted as digital mature considering a set of four different digital maturity indexes. These countries are surveyed through a multiple-case study in terms of:

- RQ1: How are government policies considering or promoting OSS in terms of software reuse and collaborative development? Who are the actors involved in the policy definition and enforcement?

- RQ2: What are the policy goals and rationale (e.g., interoperability, sovereignty, and transparency) stated in the policies for promoting and enabling software reuse and collaborative development through OSS?

- RQ3: How are subjects for the policies supported and enabled in terms of implementing the policy directives?

Desk research of online material is synthesised, complemented, and validated through semi-structured interviews with government representatives from each country. Country reports are compiled per country, and cross-analysed regarding each research question. The country reports are presented in a recently published report (Linåker and Muto, 2024) commissioned by the Danish Agency for Digital Government (Digitaliseringsstyrelsen) and Local Government Denmark (KL), aimed at providing input on how Danish PSOs can specifically become better at reaping benefits by reusing existing software and creating value by developing software in a way so that it can be reused. This study extends the report with a focus on how the digital maturity indexes may be tailored to care for the specific features observed among the surveyed countries related to the enabled of software reuse through OSS.

Specifically, we find that most countries have implemented policies on software reuse through OSS, covering both inbound acquisition and outbound sharing, with central PSOs typically responsible for their governance. While the primary focus is on public sector use, some policies extend to stimulating OSS uptake in the broader technology sector. Policy goals commonly reference interoperability, digital sovereignty, transparency, and cost efficiency, alongside economic arguments, with varying emphasis across national contexts. Security is framed both as a risk—due to potential exposure of vulnerabilities—and as a strength, thanks to OSS's transparency and collaborative oversight. Policy implementation is supported by a growing ecosystem of initiatives, notably Open Source Program Offices (OSPOs)

at national, institutional, and local levels, which build capacity, enable resource pooling, and sustain joint projects. Success cases often originate from single-entity initiatives that evolve into collaboratively maintained projects, with software catalogues serving as important tools for promoting and enabling reuse.

Based on our findings, we synthesize and propose **XX** qualitative indicators per the two categories policy incentives and design, and policy implementation and support.

The paper is structured as follows: In section 2, we elaborate on the background and related work in the context of OSS policy and implementation. In section 3, we describe the research design and methodology used in the study. Section 4 presents the findings of the study, followed by a discussion and a presentation of a synthesized set of potential indicators to digital government indexes and governments to consider. Section 6 concludes the paper.

2. Background and related work

Below we elaborate on background and related work on OSS policies in general, the motives underpinning the policies, and the challenges and actions relating to their implementation.

2.1. Open Source Software policies

Policies supporting adoption and collaboration of OSS can take many shapes, and have been surveyed on several occasions through the years. Bouras et al. (2014) qualitatively survey several policies in the European context, highlighting policies on the local and regional, national, and European levels of government. Blind et al. (2021) also surveyed the OSS policies among EU countries, while also investigating Brazil, China, India, Japan, South Korea and the USA to contrast results. In more recent works, Thévenet (2024) surveyed EU countries as part of the EU commissions Open Source Observatory project.

From a more quantitative perspective, The Center for Strategic & International Studies (CSIS) presented a mapping over 669 OSS policies globally across various countries, reporting a clear increase its former mapping 2010 (Lostri, E. and Lewis, J, 2023). The policies most commonly come in the form of parliamentary bills, directives and regulations, strategies (general or OSS specific), or more informal expressions of support for OSS. The policies typically focus on Research and Development (R&D), and procurement where the latter is evenly distributed between advisory and mandatory requirements on OSS adoption. The report notes an increasing trend for the former since 2013.

As highlighted above, gaining the support and endorsement from policy makers is critical for public sector entities (Cassell, 2008; Silic and Back, 2017). The way, however, in how such support and endorsement is engraved and formulated differs. Van Loon and Toshkov (2015) report how national legislation prescribing a non-mandatory OSS adoption has little effect on the local level if the buy-in from local leadership is limited. An earlier report from the Finnish context showed the opposite, in how there was a

general interest in OSS adoption among the municipalities, while the interest and support from central government was limited (Välimäki, Oksanen and Laine, 2005).

In contrast, Venezuela has adopted more strict approach stating in their Decree 3,390 from 2004 that *"all systems of the government must adopt FLOSS, and that all public offices must begin a progressive and gradual adoption of FLOSS"* (Maldonado, 2010). An exception was provided for cases where an OSS alternative was not present on the market. A similar policy was reported early on in the context of Peru but was later stopped due to intense lobbying from technology incumbents (Chan, 2017). Other countries as France have been reported as more successful in their implementations of similar policies favouring OSS in procurement and adoption processes (Nagle, 2023).

Blind et al. (2021) reports on a distinction between how policies either focus on proposing a preferential treatment to OSS in procurement process, or on growing the skills and capacity for adopting and collaborating on OSS. While the former may be regulated through policies with varying levels of prescriptiveness, the latter is typically embodied through strategy documents *"prescribing or guiding the use of Open Source within the organisation itself or guidelines on the re-use of OSS within the public sector of the jurisdiction"* (Blind et al., 2021).

2.2. Policy motivations

The motivation underpinning OSS policy varies depending on contextual factors and needs. CISA's investigation show modernization of digital infrastructure and service being a main driver in its survey of 669 OSS policies, followed by providing support for the national industry, and potential cost savings (Lostri, E. and Lewis, J, 2023). Increased transparency, security and digital sovereignty was also highlighted. Findings overlap with the case study research by Blind et al. (Blind et al., 2021), highlighting both economical, technical, and political concerns used as motivation in policies. Below, we nuance these areas further.

2.2.1. Economic concerns

Considering economical concerns specifically, these may be nuanced further into the potential cost savings (e.g., related to production, maintenance and lock-in effects) and stimulus of market competition and technology neutrality.

Cost related motives has long been a main driver for OSS policy making but less so in recent years (Blind et al., 2021). Motives for cost savings on the one hand relate to the ability to share and reuse existing OSS across PSOs, where one study have shown that organizations *"would need to spend 3.5 times more on software than they currently do if OSS did not exist"* (Hoffmann et al., 2024). On the other hand, there is the potential for reduced license fees from proprietary software (Deller and Guilloux, 2008; Cassell, 2008; Koloniaris, Kousiouris and Nikolaidou, 2018), in addition to a potentially free or low-cost maintenance of the OSS (Waring and Maddocks, 2005). Such "free" maintenance efforts, however, require an active and sustainable community backing the project, which cannot be taken for granted (Linåker, Papatheocharous and Olsson, 2022), why support contracts may still be needed to enable a stable and secure adoption and use of the OSS alternative (Shaikh, 2016).

Complementary to potential the cost savings, economic concerns focus on market stimulus and economic growth, which has been iterated several studies (Ghosh, Glott, Krieger and Robles, 2002; Ghosh, 2006; Greenstein and Nagle, 2014). Among more recent works, a study of a French national policy favoring OSS in procurements highlights how it led to significant increase in OSS contributions and contributors per year from France, and how the following growth of IT startups and workforce impacted the economic growth of the country (Nagle, 2023). A similar study has also been performed on the EU context, highlighting how the workforce from member countries invested a corresponding amount of €1 billion in OSS, rendering in an impact of between €65 and €95 billion on the European economy (Blind et al., 2021). Korkmaz et al. (Korkmaz, Calderón, Kramer, Guci and Robbins, 2024) further show similar findings also for the US context.

The studies further highlight how increased investment further impacts both GDP and entrepreneurial growth within the concerned countries. The latter has been further elaborated in follow-up studies showing how number of new ventures grow with increasing number of contributions (Wright, Nagle and Greenstein, 2023).

2.2.2. Political concerns

Political concerns highlights both aspects related autonomy and independence, and transparency and democracy. Autonomy and independence have grown in importance in recent years, becoming a central narrative in OSS policy globally (Blind et al., 2021; Lostri, E. and Lewis, J, 2023; Jokonya, 2015).

The topic commonly focus on the management of dependencies and relationships towards single vendors or technologies (Deller and Guilloux, 2008; Lostri, E. and Lewis, J, 2023; Blind et al., 2021). As the source code is available as OSS, PSOs can define the preferred OSS solution in a tender and focus on selecting between service rather than product suppliers. From the opposite perspective, the OSS may provide a tool for opening up otherwise close markets, and enable new players to enter and compete with incumbents (Välimäki and Oksanen, 2005).

Independence may also refer to the ability for PSOs to grow their own internal capacity to develop and tailor services, tools and infrastructure to their own needs and priorities, not being dependent on other PSOs or private actors (Cassell, 2008; Allen, 2010). Vendor independence, and the ability to gain control, e.g., upgrades was the main driver for the LiMux project, the City of Munich's adoption of Linux-based operating systems (Silic and Back, 2017).

Autonomy and independence can also be a significant driver from an ideological perspective as illustrated in the case of Venezuela (Maldonado, 2010). Here, OSS policy was part of a plan *"for endogenous development intended*

to break Venezuelan dependence on foreign software and hardware. The main justification claims that previous governments spent more on licensing fees for proprietary software than on developing domestic technology and strengthening sovereignty, which have become top priorities for the Venezuelan socialist government" (Maldonado, 2010).

Equal rationale can be observed in, e.g., Europe and the European Union in their strive towards achieving an open strategic autonomy, able to make technical and sourcing decision based on European values, norms and laws (Europe, 2022). Favouring of OSS vis-à-vis proprietary solutions is considered a key step towards avoiding vendor-lock-in and by extension strengthening the digital sovereignty (Blind et al., 2021). The referred independence and sovereignty commonly also include promoting and growing a domestic or local ecosystem of vendors and service suppliers, investing in national R&D capabilities, upskilling the digital workforce, and by extension boosting the economic growth of the corresponding region (Bouras et al., 2014; Blind et al., 2021; Maldonado, 2010). Blind et al. (Maldonado, 2010) specifically note how Asian countries surveyed signal a higher focus on promoting OSS in the context of their domestic industries, while European and American countries surveyed have a higher focus on public procurement of OSS-based solutions.

Considering transparency and democracy, OSS may be seen as a means to scrutinize and promote trust of public digital services, what data they collect, and how this is processed (Blind et al., 2021). Citizens and society are by extension enabled to hold PSOs and policy makers accountable, and demand change when needed (Thévenet, 2024).

2.2.3. Technical concerns

Technical concerns are commonly uttered in the form of Quality (or non-functional) requirements (Blind et al., 2021). Interoperability, standardization, flexibility, customisability, reliability and scalability enabled by the openness of the source code are commonly cited (Deller and Guilloux, 2008; Waring and Maddocks, 2005). These factors potentially enable an increased efficiency in PSOs processes as systems may be tailored more closely to internal requirements (Cassell, 2008; Allen, 2010), and enabling further growth of e-government solutions (Lakka, Stamati and Martakos, 2012).

Together with open standards, OSS can further enable systems and public services that are interoperable within and across organizational borders (Almeida, Oliveira and Cruz, 2011). Being able to influence pace of development are other factors highlighted (Koloniaris et al., 2018; Allen, 2010). Times of crisis, exemplified by the COVID-19 pandemic, and the Russian invasion of Ukraine, exemplify how OSS can enable swift digital solutions being developed and deployed from actors across sectors and borders (Thévenet, 2024). Blind et al. (Blind et al., 2021) highlight improved access and maintenance of data stored in OSS using open standards as a main driver in recent years.

2.3. Policy implementations

Deciding and communicating a policy is seldom enough for it to be implemented and adopted by its target audience. In the case of OSS several challenges apply as exemplified in literature, but luckily so also examples of how policy implementation can be supported. Below, we elaborate on both topics accordingly.

2.3.1. Challenges and barriers

Adoption and collaboration of OSS in the public sector does not come without friction. Several challenges are re-iterated in literature impacting the implementation of OSS policies, and the realization of their intended effects.

Culture is one area commonly highlighted, including a comfort with status quo and resistance towards change (Persson and Linåker, 2024), and alternatives towards established proprietary solutions (Deller and Guilloux, 2008; Koloniaris et al., 2018). Switching to an OSS-based solution may require multiple tools be integrated, and not all functionalities being present "out-of the box" creating further resistance among end-users (Cassell, 2008; Koloniaris et al., 2018). Risk-aversiveness may also be a factor in the IT departments even though OSS and proprietary solutions may very well co-exist (Rossi, Russo and Succi, 2006). Koloniaris et al. (Koloniaris et al., 2018) reports from a Greek municipal context how the IT departments may be *"sceptical and doubtful about the possibility of a radical change in the way they work and support their departments and the possibility that they would be requested to learn and support something totally new"*. Buy-in is required from all parts of the organization, including political, top-level, organizational, end user, and IT (Silic and Back, 2017).

Leadership support, be it from the local policy-makers or management is especially highlighted as cumbersome. Short-term horizons, and risk aversiveness are commonly impeding characteristics. One reason includes that the adoption of OSS may involve technical risks in terms of tailoring and integrating identified components (Cassell, 2008; Silic and Back, 2017). Existing relationships with established vendors, and lobbying from the same, further complicates matters (Oram, 2011), including the blocking of potential policies in support for OSS adoption (Chan, 2017). Organizational aspects related to hierarchy and communication between leadership and other parts of PSOs is also key factor for success (Cassell, 2008).

Lack of internal competence and resources needed to identify, evaluate and adopt the OSS is also cited as a common challenge (Cassell, 2008; Deller and Guilloux, 2008). This relates both to technical know-how needed in terms of software and requirements engineering (Borg, Olsson, Franke and Assar, 2018), and to knowledge on how to adapt and apply the ridged procurement frameworks that PSOs are bound by (Lundell, Gamalielsson, Butler, Brax, Persson, Mattsson, Gustavsson, Feist and Öberg, 2021). Miss-application of these frameworks can render in lock-in and costly migrations despite potential motives driving

the adoption process, but also in costly overruling by competing vendors. Historical explanations can be found in how PSOs suffer due to a long tradition of outsourcing, and hiring of short-term consultants, inhibiting the growth of internal capabilities (Marco-Simó and Pastor-Collado, 2020; Cinar, Trott and Simms, 2019). Issues are especially apparent among PSOs limited in size and on the local levels of government (Persson and Linåker, 2024).

Ensuring a sustainable availability of maintenance and support of the OSS project is as also highlighted as a critical challenge (Deller and Guilloux, 2008). Here, literature reports on PSOs being sceptic towards the level of trust that can be placed in the communities maintaining the OSS projects (Deller and Guilloux, 2008; Koloniaris et al., 2018). Rather, they seem to express needs for vendors and service suppliers that can support the PSOs in adopting any OSS (Lungo and Kaasbøl, 2007), aligning with the earlier reported resource constraints. Still, there is a scepticism reported towards the availability of professional support at large, which may further inhibit the consideration of OSS in the first place (Cassell, 2008; Koloniaris et al., 2018).

2.3.2. Support actions

Aligning with the referred challenges, growing internal technical expertise within PSOs (Oram, 2011), as well as creating champions that can support OSS adoption and collaboration, and integrate with the OSS communities and wider ecosystems is highlighted as a success factor (Van Loon and Toshkov, 2015). The practice of having experts consulting and supporting entities within government on OSS matters has also been observed on local level of the UK government, and proposed as a policy recommendation in the study (Shaikh, 2016).

The calls for internal experts and champions resonate with the increasing establishment of Open Source Program Offices (OSPOs) in later years, inspired by industry practice (Haddad, 2020). The OSPOs are essentially support functions driving organizational change, supporting its overarching organization to adopt and leverage OSS in alignment with its business or policy goals (Ruff, 2022). They have been proposed in numerous policy recommendations (Blind et al., 2021; Nagle, 2022; Herpig, 2023; CISA, 2023), and can help PSOs develop and apply the necessary knowledge for how to interpret and implement concerned OSS policies. Linåker et al. (Linåker, Lundell, Servant, Gamalielsson, Muto and Robles, 2023) investigates and proposes six different archetypes for public sector OSPOs based on a survey among PSOs in EU countries.

For PSOs limited in size and resources, however, creating their own OSPO may not be a possibility why collaboration between PSOs may be a way forward, both within (Frey, 2023) and across (Marco-Simó and Pastor-Collado, 2020) different levels of government. Persson and Linåker (Persson and Linåker, 2024) describe how PSOs should work towards setting up joint OSS stewards, a form of proxy-organization that facilitates communication, collaboration, procurement, and maintenance of common OSS projects. These stewards would in practice fill the same role as an internal OSPO and support the owners or members of the steward.

Examples of these kind of stewards can be found e.g., Denmark and Belgium with the organizations OS2 and IMIO respectively. OS2, a Danish municipal association of 80+ out 98 municipalities as members, demonstrates how PSOs can collaborate on the development and maintenance of common OSS projects, typically through procured services from their ecosystem of 60+ vendors and service providers (Frey, 2023). Governance models, as well as procurement and development models are standardized and signed off by involved vendors and service suppliers through Memorandums of Understanding. IMIO, on the other hand, is a service provider co-owned by 140+ Wallonian municipalities, where which develops and maintains common OSS projects based on the requirements from its owners (Viseur and Jullien, 2023).

As exemplified by the case of OS2, OSS stewards can further help to ensure the availability of professional support. Shaikh (Shaikh, 2016) highlights that it is essential *"that a healthy ecosystem of small and medium sized firms is stimulated to service public sector open source products"* caring for the *"detailed documentation, quality assurance, certification schemes, training, and support services"* also typically required for proprietary products and services, although already included in product licenses and service contracts. The OSS stewards and OSPOs in general can further ensure that vendors and service providers *"agree [to] the open source approaches, so that source code can be reused across the government"* and performs any development tasks in an open, agile and collaborative manner as expressed by Mergel (Mergel, 2016).

2.4. OSS indicators in Digital Government Indexes

Since the 1970s, international ratings and rankings have become pervasive (Merry, 2011). Research on how governments respond to international rankings suggests that these can cause political and economic change as much as reflect it. Governments often view high rankings as a signal of legitimacy, which can lead to targeted reforms (Broome et al., 2018). Rankings can also heighten status concerns, particularly when compared with peer or rival nations, encouraging compliance to avoid reputational risk and enhance global standing (Kelley and Simmons, 2015). While there is a risk that some states, especially those less economically independent, adapt specific policies to improve their ranking metrics without deep structural changes, these rankings nevertheless can be an important driver for enacting policy change.

OSS indicators are included in some international rankings, like the Principles for Digital Development (Alliance, 2024), developed with input from USAID and other international bodies, emphasizing the use of open standards and collaborative design as best practices across digital project stages. The OECD's Digital Government Policy Framework echoes this by advocating OSS adoption to avoid

vendor lock-in, enhance service interoperability, and foster a competitive digital public sector (OECD, 2024). The OECD's Digital Government Index asks for the *"availability of guidelines to use open source to develop digital government initiatives"* and *"available actions related to the use of open source"* OECD (2023).

The Global Innovation Index (GII), published by the World Intellectual Property Organization (WIPO), now includes metrics that reflect contributions from OSS developers, such as GitHub commits (WIPO, 2024). This update further recognizes OSS development as a significant form of innovation, alongside traditional indicators like patents and academic publications.

Other recognized digital government indexes show no to limited attention to OSS, including the Digital Economy and Society Index (DESI), tracks EU countries' digital performance across themes such as connectivity, digital skills, the digital transformation of businesses, and public services (Commission, 2024a), and the eGovernment Benchmark[1], used to measure user centricity, transparency, key enablers, and cross-border services across Europe (Commission, 2024b). UN E-Government Survey mentions OSS in the context of Digital Public Goods as a means of achieving the global Sustainability Development Goals (SDGs), and as a means to promote interoperability, but has no explicit indicator provided (of Economic and Affairs, 2024).

Although some indicators are present, these are limited and provide little guidance for governments and public sector entities on how to consider and leverage OSS in the planning, implementation, and follow-up of their digital transformation programs. As many governments look to digital maturity indexes, neglecting markers related to the adoption of OSS as a policy instrument may have serious negative implications and render in lost opportunities.

2.5. Summary

OSS policies have been widely adopted globally focusing on research, development, and procurement (Lostri, E. and Lewis, J, 2023). These policies vary in formality and scope, ranging from parliamentary bills to informal support expressions (Blind et al., 2021; Thévenet, 2024). Countries like Venezuela have mandated OSS adoption (Maldonado, 2010), while others, such as France, have successfully integrated OSS into procurement processes (Nagle, 2023). Motivations for these policies include economic benefits like cost savings (Deller and Guilloux, 2008; Cassell, 2008) and market growth (Blind et al., 2021; Nagle, 2023), political goals such as autonomy and transparency (Deller and Guilloux, 2008; Lostri, E. and Lewis, J, 2023), and technical advantages like interoperability and flexibility (Thévenet, 2024; Bouras et al., 2014).

Challenges in OSS adoption include cultural resistance (Persson and Linåker, 2024), leadership support (Van Loon and Toshkov, 2015), competence gaps (Cassell, 2008), and ensuring sustainable maintenance (Deller and Guilloux,

2008). Strategies to overcome these challenges include establishing Open Source Program Offices (OSPOs) (Linåker, Nummelin-Carlberg and O'Riordan, 2023) and collaborative stewardship models like Denmark's OS2 (Frey, 2023), which aim to enhance internal expertise, foster collaboration, and ensure professional support for OSS projects.

Despite the wide availability of reported practice, there is limited systematic overview of policy design and support initiatives. Availability of OSS enablement indicators in established digital government indexes providing guidance and benchmarking is also limited to non-existent. These are the gaps we aim to address through present study.

3. Research design

We adopted multiple-case study design to explore the phenomena in its real-world context (Runeson, Host, Rainer and Regnell, 2012). The methodology offers the possibility to gather in-depth knowledge and create an understanding of its occurrence, and specifically suitable when contextual factors may not be removed or isolated. We adopt lens of pragmatism in the research where we leverage multiple sources of knowledge to generate knowledge, and qualitatively synthesize a common understanding across the investigated cases.

3.1. Case sampling

The goal for our sampling was to identify the most mature in terms of digital maturity, and investigate their policy and related support actions related to the use of OSS as an instrument for software reuse and collaborative development, which we consider our units of analysis. To support our sampling, we identified four international indexes for digital maturity.

- The Digital Economy and Society Index (DESI)(2024a)

- eGovernment Benchmark (2024b)

- UN E-Government Survey (2024)

- OECD Digital Government Index(2023)

Taking maturity, geographical representation, and resource constraints into account, 16 countries were sampled, as presented in Table 1. Fourteen of these were selected with the rationale that they were among the top ten in at least two listings. Four were chosen because they were among the top five in at least one list. One additional country was sampled to improve geographical representation of the south pacific (New Zealand), and one additional country to ensure the representation of an earlier reported mature adopter of OSS (France).

3.2. Theoretical framework

A theoretical framework was developed covering the two dimensions of policy, and policy support actions. The framework draws from earlier reports investigating best practices of OSS in the public sector (Blind et al., 2021; Linåker et al., 2023).

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[1] https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-egovernment-benchmark

Table 1

Country	Rationale
Denmark	Top 10 in at least two lists.
Estonia	Top 10 in at least two lists.
Finland	Top 10 in at least two lists.
Iceland	Top 10 in at least two lists.
Korea	Top 10 in at least two lists.
Luxembourg	Top 10 in at least two lists.
Malta	Top 10 in at least two lists.
Spain	Top 10 in at least two lists.
Sweden	Top 10 in at least two lists.
The Netherlands	Top 10 in at least two lists.
United Kingdom	Top 5 at least in one list
Colombia	Top 5 at least in one list
Japan	Top 5 at least in one list
Ireland	Top 5 at least in one list
France	Top 10 in at least one list, mature user of OSS
New Zeeland	Top 10 in at least one list, geographical representation of the South Pacific

3.3. Data collection and analysis

Data per country was initially collected through desk research and consulting online resources. The country intelligence reports established through the Open Source Observatory (Open Source Observatory, 2025) provided a starting point for many of the countries within Europe. The policy analysis of individual countries presented in Blind et al. (Blind et al., 2021) also provided essential input and starting points for the research.

Each author conducted one case study each in parallel, with a total of eight each. For each case, the investigation switched between the two dimensions of policy, and policy support actions addressing questions defined by the theoretical framework in Table 2, and as new documentation was identified. Investigations were typically initiated with the identification of legislative and regulatory frameworks through aforementioned starting points. These were structured based on their chronological introduction into their respective national contexts, along with any guidelines, recommendations, and public documentation reporting on any policy actions implemented. Online searches via Google and the Joinup Open Source Observatory news archive was used to complement our investigations per country.

Texts were extracted and summarized for each policy entity, and policy support action. After the desk research was considered to have reached a level of saturation, texts were synthesized with a narrative structure as a country report consumable for a practitioner. The country report was sent to at least one current or former government official with in-depth knowledge about the state of OSS policy, and related support actions in the concerned country. This was followed up with semi-structured interviews, guided by the theoretical framework as defined in Table 2, and related to the communicated country report to discuss its

validity, and to add, change or retract any details as needed. Each interview lasted about 60 minutes, were performed via online video conferencing platforms. Thorough note taking was performed during the interview, and summarized afterwards. The country reports were revised accordingly and communicated with the interviewees to validate interview take-aways and finalized country reports. Country reports are available in the report underpinning this study (Linåker and Muto, 2024).

A thematic synthesis (Cruzes, Dybå, Runeson and Höst, 2015) was reiterated for each case where high-level codes were identified, merged and synthesized into higher level themes, e.g., the different dimensions of policy documents (inbound vs. outbound direction, and internal vs. external focus). Finally, a narrative synthesis (Cruzes et al., 2015) was performed across the cases per each of the higher-level themes identified through the thematic coding.

Finally, a set of indicators were derived from the higher level themes, and narrative synthesis, that may provide guidance in terms of planning, implementation, and follow-up on the development of policy, and related support actions of OSS as an instrument for software reuse and collaborative development. The indicators are formulated with the goal of being measurable and compared annually. Formulation and definition is done with inspiration of language and structure from established digital government indexes (Commission, 2024a,b; of Economic and Affairs, 2024; OECD, 2023).

3.4. Limitations and threats to validity

We have not considered support and complementary initiatives from outside of the public sector, e.g., coming from vendors, business associations, civil society, and the larger OSS ecosystem. We acknowledge that these often provide much value in maturing the public sector, in different ways. Yet, due to limitations in scope and resources within the overarching assignment for this report, these parts are excluded. We refer the reader to complementary sources of information such as the Joinup Country Intelligence reports on OSS (Open Source Observatory, 2025), which have provided valuable input to the compilation of this report.

We further note that, while the synthesized findings and recommendations in this study are based on case studies of 16 countries, readers should be aware that these do not necessarily generalize or are suitable for all contexts. The study has used a qualitative approach, providing detailed information for the reader to draw anecdotal generalizations, comparing, e.g., organizational, cultural, and political factors between case studies and the real-world context. Thorough investigations should be performed before any recommendations are implemented, where the reports and findings from this study may provide a starting point.

The data collected per country are also limited to online resources and complementary interviews to expand, enrich, and validate findings. These interviews were typically limited to one or two interviews per country due to the study's resource constraints. Hence, the completeness and correctness of reports are threats readers should consider. Each

Table 2

Area	Question
	Dimension: Policies
Type of policy	* Are there any national policies or strategies prescribing the (re)use, sharing and collaboration of software and OSS specifically? Consider: - General strategies for e-government services and internal use - Specific domain, e.g., Science, Employment Service, Digital Infrastructure, Public procurement. - Digital sovereignty, i.e., avoidance of lock-in to any specific format, platform, technology, or vendor, and being able to make technological decisions based on national laws, values, and needs? - Cybersecurity aspects related to of OSS used with the public sector or society at large?
Scope and purpose of policy	* What is the scope and purpose of these policies or strategies? * Is it internally on the focal administration, and/or externally focused on directing and supporting external organizations? * Where is it executed and enforced? E.g., level of government?
Stakeholders	* In which ministries or PSOs are the strategies anchored? * How is it enforced and realized? * Which stakeholders are involved?
Prescriptions	* What policies, recommendations, or guidelines are given related to software (re)use, sharing and collaboration of software and OSS specifically? * Are the policies, recommendations, or guidelines advisory (recommended), preference (preferred but not mandatory), or mandatory (required)? * Consider both acquisition of solutions (no procurement), procurement of products or services, and internal or collaborative development perspectives.
	Dimension: Policy support actions
Current state and use of OSS Organizational Support	* What role does software reuse through OSS play in the country? * Are there any formal or informal centers of competency (similar to an Open Source Program Office (OSPO)) supporting the adoption of OSS and reuse of software? * On what mandate and policy are they acting? Compare and align with policies listed earlier. * What is their scope and purpose? * Is it internally on the focal administration, and/or externally focused on directing and supporting external organizations? * Where is it executed and enforced? E.g., level of government? * How are these they organized and structured? * Consider OSPO archetypes described in the EC OSPO study: National Government, Local Government, Association-based, Institution-centric, Academic, and Independent OSPOs.
Funding	* Is there any funding or state aid provided for promoting or enabling the (re)use, sharing and collaboration of software and OSS specifically? * Are there any additional types of support provided?
Development and release	* How is development, governance, and ownership of intellectual property related to software released as OSS managed? * Are there any policies, recommendations, guidelines, or best practice in place? * How is long-term maintenance, quality, and sustainability of OSS considered and ensured?
Software inventory	* How are solutions inventoried and promoted for reuse, and collaboration? * Consider any public software catalogs or use of external social coding platforms such as GitHub and GitLab.
Promotion	* Are there any organized or informal activities promoting or enabling the (re)use, sharing, and collaboration on software and OSS specifically?
Reuse	* How is the (re)use, sharing, and collaboration of OSS perceived across public sector organizations, and levels of government? * What actions are being made to improve the (re)use, sharing, and collaboration of software, and OSS specifically?

case study has, however, been validated through member-checking with interviewees after being synthesized, and references are provided as far as possible to enable readers to trace sources.

4. Findings

4.1. Policy and stakeholders

As approached in this study, government policies refer to a set of principles, objectives, and guidelines that have been explicitly formulated by a government or other authoritative bodies at the national level and that are designed to influence or determine decisions and actions or offer guidance. The policies included in the analysis of this report are aimed at improving the conditions for the use and reuse of software, with OSS viewed as a mechanism for furthering such practices. While adopted policies do not always reflect the actual practice and impact of software reuse through OSS in the country, they serve as evidence of an awareness at the political level of the value that such practice can have for furthering desired outcomes in the public interest.

Across a diverse sample of 16 countries, we observed notable variations in policies concerning scope, objectives, and levels of prescription. Despite this diversity, which at least in part can be attributable to different institutional frameworks, distinct groupings emerged based on a number of discernible criteria. In the following section, we compare and contrast the policies according to these criteria to provide insights into both commonalities and divergences. The resulting categorization as summarized in Table 3 allows for a more nuanced understanding and a basis for drawing conclusions and offering recommendations in subsequent sections.

4.1.1. Focus of policies

A first distinction can be made between government policies that focus on the PSO's own use of or contribution to OSS (internal focus) and those policies that are aimed at encouraging OSS uptake in the private sector (external focus). The overall emphasis in this study is on the former category, and most of the countries in the sample have policies of that nature. Yet the two Asian countries included in the analysis, South Korea and Japan, are notable exceptions where the governments have adopted several policy measures since the early 2000s to actively encourage and support OSS uptake in their domestic tech industry (Korean Government, 2020; Ministry of Economy, Trade and Industry, 2022). Such activities can also be observed to a lesser extent in Colombia, where there is a national program in place to promote OSS use by SMEs (World Economic Forum, 2021).

The policies that are internally focused can be further divided into those focused on the use (or consumption) of OSS and those that center processes of its development and release. The former concerns acquisition and procurement of OSS for internal purposes, while the latter pertains to the release of software developed through public funds. Policies addressing the use and adoption of OSS are here referred to as inbound OSS policies, while those concerning

the development and release of OSS are termed outbound OSS policies. The inbound and outbound context may be addressed by distinct policies or joint policies addressing the two use cases together.

In France (Secretariat General du Gouvernement Direction des Systèmes d'Information et de Communication, 2012; French government, 2016), and the Netherlands (Dutch Government, 2013; Procee, R. and Al-Saqaf, M.and Spanninga, H.and Vos, F.and and van der Meer, H, 2022), these aspects are considered in separate policies, whereas in Malta (Malta Information Technology Agency, 2019) and Iceland (Digital Iceland, 2021) they are addressed jointly. It should be noted that the borders between these policy domains are not always clear-cut, and the distinction appears linked to the evolution of policies and to the maturity of OSS use. Policies adopted in the early 2000s, such as in the UK (Office of Government Commerce, 2002), focused on inbound consumption (procurement), while more recent policies, such as in Estonia (Office of Government Commerce, 2021), have shifted to include the outbound aspect. In some countries, such as Colombia (Office of Government Commerce, 2019), the focus is almost exclusively on promoting increased use of OSS, with no outbound direction or guidance.

Where these policies are considered separately, they may also be owned by different parts of the government, and the intervention may be based on distinct arguments or justifications. For instance, inbound policies may reside in procurement rules under a ministry of finance to ensure responsible use of government funds, while separate outbound policies may be housed in a department responsible for digital transformation, driven by principles of open innovation (more examples of how these factors interact with each other are provided below).

4.1.2. Type of intervention

The policies examined in this report also vary in terms of the type of policy measure and the degree to which software reuse through OSS is prescribed. In a first group of countries, government intervention pertaining to OSS mainly takes the form of high-level endorsements within policy documents of a more general nature. Examples include Colombia, which in its 2018-2022 and 2022-2026 National Development Plans (Departamento Nacional de Planeación, 2018, 2022) mentions the promotion of OSS. Similarly, recent government programs in Finland (Finnish Government, 2019) and Luxembourg (Luxembourg Government, 2018) have outlined the intention of the administration to encourage OSS uptake, but these commitments have not, to a significant degree, been translated into concrete guidance documents or specific policies at the national level.

A second distinct group comprises countries where explicit OSS advisory policies have been adopted. These policies recommend considering, comparing, and evaluating OSS on an equal footing with proprietary alternatives in acquisition and procurement policies (inbound context) and

Table 3: Overview of policy dimensions and types, along with definitions and references to examples derived through thematic synthesis of the case studies.

Policy dimension	Policy type	Description	Examples
Policy focus	Internal	Focus on the PSO's own use of or contribution to OSS.	Estonia, France, the Netherlands
	External	Aimed at encouraging OSS uptake in the private sector.	Japan, South Korea, Colombia
Policy direction	Inbound	Concerns acquisition and procurement of OSS for internal purposes.	Malta, France, Spain
	Outbound	Pertains to the release of software developed through public funds.	Iceland, New Zealand, Denmark
Type of intervention	High-level endorsement	High-level endorsements within policy documents of a more general nature encouraging the use or release of OSS.	Columbia, Finland, Luxembourg
	Advisory	Recommend considering, comparing, and evaluating OSS on an equal footing with proprietary alternatives in acquisition and procurement policies (inbound context) and as a mechanism for releasing and reusing software developed with public funds (outbound context).	Denmark, Iceland, Malta
	Prescriptive	Explicitly expresses a preference for OSS before other alternatives unless special circumstances apply in the acquisition and procurement process (inbound context), or a preference is for releasing public sector software as OSS by default, unless specific considerations, such as security or confidentiality, dictate otherwise (outbound context).	France, the Netherlands, Spain
	Legislative	Defined in rule of law adopted by the national legislative body.	France, the Netherlands
Form for definition	Government instruction	Defined in formal instructions from the national government.	France, UK
	Strategy documents	Defined in national or agency-specific strategies, e.g., related to digital government, transformation, or procurement.	Iceland, New Zealand
	National government	Regards PSOs on the national level of government.	France, Spain, Iceland
Scope of policy	Regional and local government	Regards PSOs regional and/or local levels of government.	Denmark, Spain
	Institution-specific	Concerns specific PSOs.	Sweden

as a mechanism for releasing and reusing software developed with public funds (outbound context). Notable examples include Denmark (Digitaliseringsstyrelsen, 2022b) and Iceland (Digital Iceland, 2021) where advisory policies encourage the adoption of OSS for both (re)use and release of public software.

Lastly, a distinct group of policies explicitly expresses a preference for OSS. In the inbound context, these policies prescribe that OSS should be chosen before other alternatives unless special circumstances apply in the acquisition and procurement process. In the outbound context, the preference is for releasing public sector software as OSS by default, unless specific considerations, such as security or confidentiality, dictate otherwise.

In the UK, while rules have evolved separately, some policy documents integrate both aspects, creating an expectation that OSS is the default option without specific mandatory legislation for inbound or outbound (Cabinet Office, 2022, 2023). France (French government, 2016) and the Netherlands (Dutch Government, 2013) have outbound policies mandating that public sector software be released as OSS unless special circumstances apply, e.g., in relation to security, confidentiality, or integrity aspects, while both have advisory policies for the inbound context. In Spain, all PSOs are required to release any public sector software for internal reuse inside the government, and if deemed appropriate use OSS as a means for enabling such reuse (Spanish Government, 2015). All PSOs are correspondingly obliged to consider any public software, OSS or not, in the initiation of any acquisition and procurement process. Estonia has no general inbound policy but has recently adopted a law stipulating that all software developed with taxpayers' money should be published with an OSS license unless doing so would harm national security (Office of Government Commerce, 2021).

4.1.3. Scope

The policies further differ in terms of who they apply to or address. The French inbound policy, coming in the form of a government instruction, addresses PSOs on the national level of government, while the outbound policy as defined by the law applies to all PSOs (Secretariat General du Gouvernement Direction des Systèmes d'Information et de Communication, 2012). In Denmark, national policies are defined in guiding architectural documents (Digitaliseringsstyrelsen, 2022b), on the one hand, by the Agency for Digital Government addressing all PSOs on the national level of government, while on the other hand, a corresponding policy is provided by the Association of Regions and Municipalities applying to PSOs on the regional and local levels of government (Digitaliseringsstyrelsen, 2022a). In contrast, policies and guidelines found in Sweden are typically limited to single PSOs (DIGG, 2022; Försäkringskassan, 2019). In the UK, the inbound policy "playbook" applies directly to central government agencies on a 'comply or explain' basis and is to be considered 'good practice' by the wider public sector (Cabinet Office, 2022, 2023).

Summary: Most surveyed countries have established policies addressing software reuse through OSS, encompassing both inbound (acquiring new software) and outbound (sharing acquired solutions). While policies differ in scope and level of prescriptiveness, they are, in most cases, owned by central PSOs with responsibility for areas such as digital government, transformation, and procurement. The main emphasis in this study is on policies concerned with the public sector's own use of OSS, yet in a notable subset of countries, such policies had an external focus aimed at increasing the uptake of OSS in the domestic technology sector.

4.2. Policy goals
4.2.1. Economic factors – OSS to avoid double spend, lock-in, and promote a competitive market

Present in all initiatives is some notion of encouraging responsible public spending and reducing lock-in to specific vendors. The potential for cost savings and efficiencies were particularly prominent in earlier policies and are seldom provided as the only reason for promoting OSS in more recent policy documents.

Within the general focus on economics, there are distinct arguments made. For example, the principle that the public sector should not pay for the same solution twice is explicit in some policies that insist on individual contracting authorities acquiring the rights to allow for reuse within the public sector. Examples include Colombia (Office of Government Commerce, 2019), Spain (Spanish Government, 2015), and the UK (Cabinet Office, 2023).

The (re)use of OSS is also seen as a means to increase competition among suppliers in a procurement process. As the source code, and ideally all necessary knowledge and infrastructure are openly available, suppliers unfamiliar with OSS can enter a market, although a knowledge barrier may still exist. Studies in the context of France, as of Europe, both show the potential increase in competitiveness, growth in small- and medium-sized companies, and a positive impact on GDP (Nagle, 2019; Blind et al., 2021).

4.2.2. Interoperability – OSS as a mechanism for interoperable infrastructure and public services

The European Interoperability Framework (EIF) and National Interoperability Frameworks (NIFs) have also proved to be important impetuses for several of the policies. The motivation is often combined with other value drivers such as cost efficiencies and innovation, but technical interoperability is, in some cases, seen as an overarching driver for reuse and the adoption of OSS.

In Estonia, the decision to use OSS appears to have been driven by technological pragmatism and the need to make rapid progress on its digital transformation, building on existing components while ensuring interoperability between different parts of the government. Recently, the Estonian government has recognized the value of tapping into

a global community of developers (Office of Government Commerce, 2021).

In Spain, the National Interoperability Framework underpins the legislation requiring PSOs to share and reuse public sector software as far as possible, where OSS is seen as a mechanism for the reuse to be used if such release contributes to greater transparency for the PSO's operations (Spanish Government, 2015). Although not as explicit, other countries, such as New Zealand (New Zealand Government, 2016), Sweden (eSam, 2022), and Iceland (Digital Iceland, 2021), also explicate the value in promoting interoperability and harmonization across public services and the national digital infrastructure.

4.2.3. *Digital sovereignty – OSS as a means empower sovereign decisions on use of technology*

Digital (or technical) sovereignty highlights the importance and means of being able to make technical sourcing and design decisions based on local law, norms, and values. In France, digital sovereignty is implicitly highlighted as a policy goal through the Digital Republic law, which states that administrations shall ensure that their information systems remain under control, sustainable, and independent (French government, 2016).

In Sweden, digital sovereignty is also implicitly mentioned in several PSO-specific policies (DIGG, 2022; Försäkringskassan, 2019). The general discourse on the topic, however, has received much attention in general debates regarding cloud and data management. eSam, a national collaboration between 30+ PSOs, is, for example, driving an investigation into possible communication and collaboration tools allowing for hosting and data management in line with European legislation in the area (eSam, 2022). Private vendors have now initiated packaging of services based on different OSS-based solutions such as Nextcloud for document management, Element for chat, and Jitsi for video conferencing. The Swedish Insurance Agency and Tax Agency are also investigating a public sector alternative for the corresponding solutions. Looking beyond the surveyed countries, Germany also provides a similar example through the development of their OpenDesk solution, a compilation of OSS-based solutions aiming to provide a sovereign option to the desk suite for civil servants, including the collaboration and communication tools surveyed and implemented in Sweden.

Communication is also an important area in Luxembourg, where digital sovereignty has been invoked as a rationale for specific initiatives such as the development of LuxChat, an OSS instant messaging service developed for the public sector in partnership with an ecosystem of several providers to safeguard the proper use of data (Luxembourg Government, 2018). In France, a corresponding alternative is developed through the Tchapp project.

The Basque country, a region in Spain, provides an example where the transition to OSS-based tools and infrastructure has matured to a state where all the public sector uses OSS-based operating systems and productivity suites (Ajuntament de Barcelona, 2018). A partial motive

has also been to localize the software to the regional language, further increasing the sense of independence in the region.

Policies in Japan and Korea, the two Asian countries included in the sample, have been formulated with the clear aim of supporting technological independence (Ministry of Economy, Trade and Industry, 2022; Korean Government, 2020). In contrast with the rest of the countries in the sample, OSS promotion is aimed at the private sector as part of an industrial strategy. Korea, in particular, has invested significant resources and built institutional competence, not to guide public sector users but to support uptake in its tech sector.

4.2.4. *Security – OSS as a (potentially) robust building block in need maintenance*

Security in terms of OSS is commonly highlighted with both positive and negative perspectives. One discourse emphasizes the risks associated with having source code openly available, potentially exposing vulnerabilities to identification, introduction, and exploitation. Another perspective views OSS as robust and secure, leveraging transparency for multiple eyes to review the source code, thereby identifying and addressing issues early on, reducing the risk of vulnerabilities. The security of OSS depends on its sustainability—how well-maintained the OSS is over time without disruptions or quality weakening.

While many policies stress the importance of a functioning and interoperable digital infrastructure without vendor lock-in, there's often limited attention to the sustainability of the OSS building blocks that underpin it. France is an exception, where the government instruction Circulaire 5608 recommends dedicating 5-10 percent of any funds saved through an OSS-related acquisition to contribute back to the concerned OSS projects and their dependencies (Secretariat General du Gouvernement Direction des Systèmes d'Information et de Communication, 2012).

The emphasis on sustainability is often found in guidelines that help implement and realize defined policies. In Sweden, many PSO-specific policies and guidelines highlight the value of contributing any changes or additions back to OSS projects (DIGG, 2022; Försäkringskassan, 2019). The Netherlands also emphasizes this through reports commissioned by the government (Procee, R. and Al-Saqaf, M.and Spanninga, H.and Vos, F.and and van der Meer, H, 2022). In France, the guidelines and support from the National government OSPO focus on encouraging contributions back to OSS projects used and developed further (Direction Interministérielle du Numérique, 2023).

The level of security and trust in OSS is further highlighted through its adoption and use among cybersecurity agencies, such as the House of Cybersecurity in Luxembourg (Luxembourg House of Cybersecurity, 2023) and the National Agency for the Security of Information Systems (Agence nationale de la sécurité des systèmes d'information – ANSSI) in France (Agence nationale de la sécurité des systèmes d'information, 2023). Both actively (re)use OSS

and participate in the collaborative development of several tools. ANSSI also has an explicit and diverse approach to promoting and contributing to the sustainability of several core OSS projects of both internal and national interest.

In Japan, the government has established a software security task force, assuming private sector use of OSS (Ministry of Economy, Trade and Industry, 2022). It has published guidelines for appropriate software management methods and responses to vulnerabilities and license issues.

4.2.5. Transparency – OSS as an enabler for trust, control, and innovation

Transparency is a recurring theme in many policies. In France and the Netherlands, transparency is a driving factor in their outbound policies, enacted in the legislation of their respective countries (French government, 2016; Dutch Government, 2013). This effectively considers source code as public data and administrative documents that should be released openly upon request from the public. In the Netherlands, this approach is a response to earlier incidents where algorithms used in public services resulted in discriminatory recommendations.

Similarly, in Colombia (Office of Government Commerce, 2019), Sweden (DIGG, 2022), and New Zealand (New Zealand Government, 2016), the use of open technologies is expressed as a way to enhance trust between the government and other stakeholders, including citizens. In Spain, the potential for creating transparency in government services is explicitly mentioned as a factor to consider in deciding whether a public sector software should be released as OSS or not (Spanish Government, 2015).

In some cases, these policies are part of a broader push for open government and open innovation. Luxembourg, for example, views OSS as a means to enable the co-creation of government services by involving both public and private actors (Luxembourg Government, 2018). This reflects a broader trend toward openness and collaboration in the development and provision of government services.

Summary: The rationale for introducing government policies promoting software reuse through OSS in the public sector stems from a variety of factors. Policy documents typically draw on several such factors to make the case for encouraging OSS. Economic factors are a driver in almost all cases, aiming to avoid double-spending, vendor lock-in, and foster market competition. Digital sovereignty is highlighted in some countries and is a driver for specific initiatives. Security considerations emphasize the dual perspectives of risk and opportunities provided through transparency, and in some cases, highlight the need for supporting and contributing to the maintenance of critical OSS components used in the digital infrastructure. Benefits of transparency are further mentioned, e.g., in terms of collecting and managing data, making algorithm-based

decisions, or defining interfaces that third-party actors may interact with.

4.3. Implementation and support
4.3.1. Institutionalised support functions on different levels of government

In industry, the use of support functions and centers of competency is a well-established practice for implementing a company's OSS strategy in line with the overarching business goals. These functions are commonly referred to as Open Source Program Offices (OSPOs), a construct and practice that has also transitioned to the public sector and can be found at various levels of government, providing support for the use and release of OSS, and promoting software reuse within government, in line with any overarching government policy (Linåker et al., 2023). The different types of OSPOs complement each other in supporting different parts of the government, and by providing interfaces to each other, sharing resources and knowledge, and more effectively implementing their specific, and any overarching policy.

The responsibility for supporting the implementation of any national policy for OSS and software reuse typically resides with the PSO(s) responsible for digital government and transformation in a country. These PSOs, or the units within responsible for the support, may be referred to as national-government OSPOs. In France, this is constituted specifically by the Free Software Unit within DINUM (Linåker et al., 2023), while in other countries the role is more blurred on the organizational level, as with Digital Iceland in Iceland (Digital Iceland, 2021) and Red.es in Spain (Secretaría de Estado de Administraciones Públicas, 2022).

In the Netherlands, an Institution-centric OSPO (Linåker et al., 2023) has been set up in the Ministry for the Interior and Kingdom Relations, with an internal focus on the ministry and its related national-level PSOs. The OSPO is, however, a main driver for implementing the country's "Open, unless" policy and an implicit support for other parts of the government as well (Procee, R. and Al-Saqaf, M.and Spanninga, H.and Vos, F.and and van der Meer, H, 2022). They are, however, also in the process of supporting the establishment of a national-government OSPO under the Office of the Government CIO, which would have a wider responsibility for supporting the implementation of the policy. In Sweden, there was no national government OSPO either, although what may be referred to as a series of institution-centric OSPOs exist among primarily the national-level PSOs such as the Agency for Digital Government, Swedish National Insurance Agency, and Statistics Sweden.

The lower levels of government also showed to have OSPOs in place in various cases. In Spain, regional OSPOs were exemplified, among others by the regional government of Galicia. Larger municipalities were also referred to in the study, including the cities of Barcelona, Amsterdam, Paris, and Aarhus. Local governments, however, seldom alone have the resources or capabilities to provide the necessary

Table 4
Types of support actions related to the implementation of OSS policies.

Support action	Description	Example
Open Source Program Offices (OSPOs)		
National government	Supporting the implementation of any national policy for OSS and software reuse. Typically resides with the PSO(s) responsible for digital government and transformation in a country.	France, Iceland
Regional or local government	Supporting the implementation of any regional or local policy for OSS and software reuse. Typically resides office for IT and/or digitization efforts.	Denmark, Netherlands
Associations of PSOs	Associations with PSOs as members or owners, enabling these to initiate and collaborate on OSS projects addressing common needs	Denmark, France
Institution-centric	Internal departments responsible for IT service provisioning to the overarching institution. Primary goal to build and scale capacity inside institution in adopting and collaborating on OSS.	Netherlands, Sweden
Guidelines and support documents		
Inbound-focused	Guidelines to consider or follow when acquiring and reusing OSS.	France
Outbound-focused	Guidelines to consider or follow when releasing public sector software as OSS.	New Zeeland
Communities of practice		
Public sector	Networks focused within the public sector within or across various levels of government.	Sweden, Netherlands
External	External networks including representative, e.g., from industry, civil society, and the broader OSS ecosystem.	France
Software catalogues		
Prescriptiveness	Legally mandated vs. voluntary sharing of OSS via catalogues.	Spain vs. Sweden
Accessibility	Software shared via catalogue only accessible to PSOs vs. public.	Spain vs. Sweden
Software scope	Sharing of public sector software in general vs. OSS only via catalogues.	Spain vs. Sweden
Maintenance	Maintenance of the software catalogue by an OSPO or through crowdsourcing.	France vs. Sweden
Code repository	Provisioning of code repositories for active development of OSS shared.	Germany
Meta-data	Use of meta data files to describe the software shared enabling decentralized search.	France

support. Instead, a common approach is to pool their resources and set up association-based OSPOs (Linåker et al., 2023) where they can share knowledge and initiate, develop, and collaborate on OSS, examples include ADDULACT in France, OS2 in Denmark, and the Dutch Association of Municipalities (VNG).

4.3.2. Guidelines for how to interpret and act according to policies

Several countries maintain guidelines and recommendations on how to practically implement their overarching policies. Outbound policies generally have the most detailed guidelines in terms of aspects and steps to consider or follow when releasing public sector software as OSS. These guidelines typically have two main parts: one clarifying the legal context and supporting the decision on whether a piece of software should be released as OSS or not. The second

part typically focuses more on how to go about releasing the software as OSS and building a community if that is a desired goal for the software.

The former part relates to whether the related policy is advisory or provides a preference for releasing public sector software as OSS. In the Netherlands, the Ministry of the Interior and Kingdom Relations have developed process charts, and detailed guidance has been developed to support their "Open, unless" policy (Procee, R. and Al-Saqaf, M.and Spanninga, H.and Vos, F.and and van der Meer, H, 2022). In France, the Free Software Unit provides three criteria related to the usability of the software for other OSS projects, the general need for it, and the technical profile of the end-users (Direction Interministérielle du Numérique, 2023). Based on the criteria, they propose four levels of openness for how the software may or should be shared.

In the UK, the Government Digital Service maintains a Service Standard that specifies the requirement for public authorities to *"[m]ake new source code open"* in order *"for people to reuse and build on"* the code, notably by publishing the code in an open repository and retaining ownership of the associated intellectual property rights, making it available for re-use under an open license (Government Digital Servicet, 2022). It provides more detailed guidance on how to implement this requirement in the Service Manual (Government Digital Servicet, 2017).

4.3.3. *Leveraging an external community for knowledge sharing and support provision*

Concerning the practical process for releasing OSS, many guidelines provide rich advice both in itself, such as in New Zealand New Zealand Government (2016) and France Direction Interministérielle du Numérique (2023), but also by highlighting external sources of best practice, as done by Digitaliseringsstyrelsen in Denmark Digitaliseringsstyrelsen (2022b). In the former cases, the external ecosystem has further been actively involved in the development of the guidelines. In New Zealand, the guidelines stem from a crowdsourcing process facilitated by an external OSS expert who was brought in for the task. In France, the corresponding guidelines have been iteratively developed and validated through different actors inside and outside the government.

An important source of knowledge in the process has been the BlueHats network, a cross-sector community of individuals and organizations focused on the adoption and development of OSS in the public sector Direction Interministérielle du Numérique (2021a). Related to BlueHats, the Free Software Unit at DINUM also facilitates a Free Software council, with experts and actors from across the public sector and larger OSS ecosystem. The board's role is to provide advice on topics of concern within the intersection of OSS and digital transformation of the public sector Direction Interministérielle du Numérique (2021b).

The case of Blue Hats exemplifies the importance and value of leveraging an external community to help support the implementation of OSS policies. The NOSAD network in Sweden provides another example of how public servants can interact and share knowledge amongst each other and together with the larger OSS ecosystem. The network facilitates regular meetups, operates communication channels, and an online knowledge base with resources to enable reuse and collaboration of OSS and open data. The Netherlands has adopted another network structure for knowledge sharing through their OSPO network which brings PSOs with internal OSPOs.

Another example of enabling reuse and collective knowledge sharing is represented through the association-based OSPOs. OS2 in Denmark, for example, has created standardized processes and structures for governance and collaboration on the development of OSS projects. These help both the members (of which most are municipalities) to initiate and come together on projects addressing common needs and engage with suppliers on terms and conditions understood and recognized by both sides in a procurement process. The Dutch Association of Municipalities is on track to establish similar processes and structures based on lessons learned from a pilot project.

Despite the many initiatives and means for supporting policies on the reuse of software, the cases further show that the sustainability of these varies along with their funding. Malta and Iceland, for example, both had projects initiated in the early 2010s with the ambition to grow and enable the adoption of OSS, and as a mechanism for reuse, while both dissipated a few years later. In Iceland, support was continued and picked up by Digital Iceland, while in Malta, there is no active support being provided by MITA.

4.3.4. *Software catalogues as means for promoting reuse*

Several countries maintain software catalogues covering software developed and/or used by Public Sector Organizations (PSOs). In Spain, the use of the national catalogue is mandated by law, requiring all PSOs to publish acquired applications to enable reuse by other PSOs[2]. Source code, documentation, license conditions, and associated costs should be shared and declared. The national catalogue is maintained by the Technology Transfer Center, a state-level PSO. PSOs can also maintain their own versions and integrate with the national catalogue. Several catalogues are also maintained by regional governments, which also integrate into the national catalogue.

While the Spanish catalogue is closed for PSOs only and not limited to OSS, the French counterpart code.gouve.fr[3] is publicly open and explicitly focuses on OSS used and/or developed by French PSOs. The catalogue is maintained by the national government OSPO constituted by the Free Software Unit inside DINUM. All OSS listed in the catalogue have adopted the public-code.yml metadata standard[4] for public sector OSS projects, which facilitates findability and

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[2]https://administracionelectronica.gob.es/ctt/CTTprincipalEs.htm?urlMagnolia=/pae_Home/pae_SolucionesCTT.html

[3]https://code.gouve.fr

[4]https://yml.publiccode.tools/

adoption. By including the metadata file in the catalogue of an OSS project, it can be queried and included in other catalogues, enabling interoperability between regional, national, and international catalogues, further promoting reuse. Other countries, such as Italy and the Netherlands, have also adopted the standard, improving cross-border reuse and adoption of OSS projects.

In Estonia, OSS solutions developed for the government are made public and freely available at koodivaramu.eesti.ee[5]. The Estonian government recognizes the value of open principles, allowing these solutions to be adapted more easily by businesses and potentially increasing the export of digital government solutions. Similarly, in the Netherlands, the Developer Overheid[6] platform provides a library of both APIs and OSS catalogues from various PSOs across the Dutch public sector. There is a long-term goal to evolve the platform into a common source code storage and collaboration platform, possibly based on the OSS social coding platform GitLab. The German government, through their Centre for Digital Sovereignty, has adopted a similar approach with their OpenCode platform[7]. The European Commission has also created their own environment[8]. Currently, however, most public sector OSS projects are hosted on GitHub, as in most cases investigated in this study, although some exceptions use public or internally hosted instances of GitLab.

A less formal but generally recognized example is offentligkod.se[9] in Sweden, a software catalogue listing OSS used and/or developed by Swedish PSOs. The catalogue was initiated by the Swedish PSO-centered knowledge-sharing network NOSAD. All reports are contributed on a volunteer basis either by the PSOs directly or the vendors providing services based on the OSS. The catalogue is referred to by the Swedish National Procurement Office in their framework for the acquisition of OSS-based software and services.

Summary: Many policy support initiatives are in place or emerging among the surveyed countries. Some initiatives have been fragile in terms of support and funding leading to dormancy in some cases while in others, the support efforts have been picked up in later years. The report identifies the emergence of support functions and centers of competency for OSS and software reuse, also referred to as Open Source Program Offices (OSPOs). These OSPOs have developed at national, institutional, and local government levels, playing a crucial role in building institutional capacity for software reuse through OSS. Association-based OSPOs specifically help less capable PSOs to pool resources and enable a sustainable maintenance and governance of common OSS projects.

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[5] koodivaramu.eesti.ee
[6] https://developer.overheid.nl/
[7] https://opencode.de/en
[8] https://code.europa.eu/
[9] https://offentligkod.se

5. Discussion and Suggested Indicators

5.1. Policy motivations and design

OSS-focused policies is not unique or to be considered an obscurity. Our survey shows how they are widely present internationally on the local, regional and national levels, aligning with earlier studies (Bouras et al., 2014; Blind et al., 2021; Thévenet, 2024). Our study further aligns with earlier work (Lostri, E. and Lewis, J, 2023) in how policies are formed and passed, e.g., as parliamentary bills, directives and regulations, strategies (general or OSS specific), or more informal expressions of support for OSS. The mix in form and scope indicate the need and potential for complementary policies that can guide government and public entities, which may organizationally and politically disconnected.

The need for complementary policies are further nuanced due to their inbound and outbound natures, i.e., whether they are focused on the acquisition and procurement of new software, or release of software developed through public funds. Policies will have different details pending on the direction, where the former will typically consider how the procurement process applies or should be tailored, while the latter will focus more on whether, and in what form, software can be released (e.g., related to security or privacy reasons). In earlier surveys, the contrast has been more generally labeled under procurement and R&D (Lostri, E. and Lewis, J, 2023) while we believe that the directional distinction need to be made clear (in line with the paradigm of open innovation) to more explicitly communicate the intent of the policy.

The type of intervention that the policies come with further varies ranging from softer high-level enforcements to prescriptive requirements, e.g., on how OSS solutions should be considered in an acquisition process, or whether software developed through public funds should be released as OSS. In line with Van Loon and Toshkov (2015), we observe that softer statements may imply limited to no effect when there is no support for the policy. On the other hand, we know from earlier work that the expected benefits of acquiring OSS solutions or releasing software as OSS can easily be outweighed by the potential costs and risks Linåker and Regnell (2020). Pragmatic case-by-case decisions is the norm in business-driven contexts, which brings light to why open-by-default policies should be applied in government.

A balance needs to be struck, and especially aligned with the overarching goals and motivations of the policies. In business, any OSS strategy is in the end-of-the-day profit-driven and influenced by the strive for market success. For governments in our survey, incentives range from promoting interoperability, growing digital sovereignty and vendor-independence, or increasing transparency, to increasing cost-efficiency. Whatever the rationale, the policies need to make clear the decision space and conditions for how the policies apply. France and the Netherlands (among many others) require software developed through public funds to be opened up by default, either automatically or on request. In both cases conditions are provided for when exemptions can be

made and for what reasons, aligning with the overarching policy goals.

While most of our surveyed policies are focused on the governments and public sector, the cases of South Korea and Japan signal the options of also promoting OSS adoption and development in the national industries. This should be considered more explicitly by governments at large as many of the raised policy goals essentially are dependent on a skillful and competitive industry and vendor ecosystem. Small and medium sized enterprises knowledgeable about OSS development are, for example, critical for competitive and cost-efficient tenders, while also ensuring vendor independence for governments and public entities. National policies should, hence, take a holistic approach in how OSS adoption, development and collaboration, across whole of society.

Policies should further, aligning with Blind et al. (2021), consider both how procurement processes as well as skills development can be promoted and tailored. Inbound procurement focused policies can help to provide guidance and commitment of public entities wish for OSS-based solutions, motivating increased investments by SMEs. Skills strategies, training programs and calls for national capacity building can help grow the availability of a skilled workforce, required both for governments, industries and vendors to adopt OSS, and leverage it per their defined goals.

5.2. Support actions for policy implementation

A policy does not get implemented automatically. Accordingly so, the expected outcomes are not either realized per default. There is a need for substantial support efforts to comprehend any policy, translating its recommendations into actionable advice, and acting on such advice.

The findings align with earlier work in that internal experts and champions are critical for a sustainable adoption of OSS in public entities (Oram, 2011; Van Loon and Toshkov, 2015). Formal Support centers, also referred to as Open Source Program Offices (OSPOs), provide a source for such knowledge and advocacy, and by extension constituting an important policy enabler, helping the intended audience for any policy to understand it and implement it in practice (Linåker et al., 2023). In this study, we observed OSPOs both on the national and local government levels, providing support of open source within and across public entities aligning closely with archetypes proposed by earlier work (Linåker et al., 2023).

The role of associations such as OS2 in Denmark (Frey, 2023) and iMio in Belgium (Viseur and Jullien, 2023) in supporting its members and owners to collaborate and adopt OSS solutions has also been emphasized in earlier work (Linåker et al., 2023). Our findings confirm their role, also reporting on their existence, e.g., in the case of France through ADDULACT, and in the Netherlands through VNG. These associations may potentially also serve a role or model for collaboration and adoption of OSS on with or across other levels and parts of governments. In a sense, they can be compared to OSS foundations (as e.g.,

the Linux or Eclipse foundations), which stewards projects long-term, providing neutral governance structures, and enabling formal collaboration and pooling of resourced in supporting the maintenance of joint OSS projects (Persson and Linåker, 2024). While public entities can and should be able to initiate OSS projects, it is typically not within their resources or scope to drive and own such projects long-term. Having a host-organization set up for such prime purpose therefore makes sense on a national, and potentially also regional (cross-border) level, as in Europe, where the strive towards joint and interoperable solutions are being called for through the Interoperable Europe Act, and various efforts on strengthening the digital sovereignty of the continent.

Serving as centers of excellency and support, the OSPOs (regardless of type) typically provide the processes and tools for both adopting, developing and collaborating on OSS. Among the surveyed cases, we observed guidelines on various levels of detail (and quality), supporting both inbound and outbound OSS policies. For example, when an inbound policy requires OSS solutions to be considered first-hand in an acquisition process, how can such solutions be identified, analyzed and compared between each other and proprietary solutions, considering (among other things) security, license requirements, total cost of ownership, and need of support and education. Or the opposite, when an outbound policy requires acquired or internally developed solutions to be released as OSS, on what platform is this done, under what license? And how will the software stay maintained, and how will contributions from others be reviewed and managed? These are all questions that need their respective answer both in general and in context of each specific public entity required (or advised) to follow a related policy.

Beyond guidelines, tools and services can also provide a an important support for public entities. In this study, where we looked in detail on how share and reuse could be enabled, software catalogs provided a reoccurring theme, enabling findability of any solutions released. Examples highlight the potential of federated sharing through the public-code.yml standard, something that has recently been implemented by the European Commission[10], providing a critical step in growing interoperable solutions, as envisaged for 2030.

Our study further emphasizes that public entities cannot act in isolation, they need to collaborate and pool resources, building joint capabilities, as suggested by the joint steward structures and OSPOs in various levels and parts of society. Part of this discourse also includes the connection and collaboration with non-public actors, such as industry, academia and civil society. Of the former, the vendor and service supplier ecosystem is of utter importance, as they are typically the ones developing and maintaining OSS solutions on behalf of public entities (Linåker, Lundell, Servant, Gamalielsson, Muto and Robles, 2025). The long tradition of outsourcing, conservative and risk-aversive culture, and lack in sustainable leadership support provides some of the rationale, in alignment with related work (Persson

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[10]https://interoperable-europe.ec.europa.eu/eu-oss-catalogue

and Linåker, 2024; Cassell, 2008; Marco-Simó and Pastor-Collado, 2020).

5.3. Indicators for OSS enablement

With this study, we set out to provide input to global indexes (as the ones we leveraged in our sampling) on how OSS can be leveraged and enabled as a tool for governments and public entities in their digital transformation. Overarching goals include the promotion of share and reuse, and collaborative adoption and development of joint, transparent, sovereign, and interoperable solutions in their digital public infrastructure and services. Based on the 16 case studies, we synthesize potential indicators reflecting good practice from mature real-world examples, many of which are confirmed and validated through related work. The potential indicators also serve as direct recommendations for practice, which is also a goal for the concerned indexes, in providing guidance for its various target groups.

Below, we present the potential indicators across 14 areas, divided between the two categories, policy incentives and design, followed by policy implementation and support. Each indicator is defined to be measurable and comparable between national countries on an annual basis.

5.3.1. Policy incentives and design
- 1. Inbound Policies for Acquiring OSS

    1.1 Maturity scale (e.g., 0=None, 1=Drafted, 2=Adopted, 3=Implemented, 4=Monitored for results)

    1.2 Definition scale (e.g., 0=None, 1=Strategy, 2=Government instruction, 3=Legislative)

    1.3 Prescription scale (0=No policy, 1=Advisory, 2=OSS with conditions, 3=Mandatory OSS-first, 4=Mandatory with reporting/monitoring)

    1.4 Coverage breadth (% of government organizations, % of regional/municipal agencies covered)

    1.5 Share of procurement procedures (past 12 months) where OSS was evaluated as an option (%)

    1.6 Presence of measurable targets or KPIs related to acquisition and use of OSS in policy documents (Yes/No)

    1.7 Number and frequency of public progress reports on inbound OSS policy implementation

    1.8 Frequency of inbound OSS policy review/updates (yearly, every two years, etc.)

- 2. Outbound Policies for Sharing and Publicizing OSS

    2.1 Maturity scale (e.g., 0=None, 1=Drafted, 2=Adopted, 3=Implemented, 4=Monitored for results)

    2.2 Definition scale (e.g., 0=None, 1=Strategy, 2=Government instruction, 3=Legislative)

    2.3 Prescription scale (0=No policy, 1=Advisory, 2=OSS-first with conditions, 3=Mandatory, 4=Mandatory with reporting/monitoring)

    2.4 Coverage breadth (% of government PSOs, % of regional/municipal PSOs covered)

    2.5 Percentage of government-developed/procured solutions released as OSS annually (%)

    2.6 Clarity of IP rights and ownership in procurement processes (Scored via policy review checklist)

    2.7 Cumulative reuse of software solutions between PSOs (annual)

    2.8 Presence of measurable targets or KPIs related to acquisition and use of OSS in policy documents (Yes/No)

    2.9 Number and frequency of public progress reports on OSS policy implementation

    2.10 Frequency of outbound OSS policy review/updates (yearly, every two years, etc.)

- 3. Externally-Oriented OSS Policies

    3.1 Existence of OSS-targeted provisions in national innovation/industrial policy (Yes/No)

    3.2 Value/number of grants/subsidies awarded to OSS-related projects (annual)

    3.3 Industry engagement rate (measured via survey: % of businesses reporting interaction with government OSS initiatives)

5.3.2. Policy implementation and support
- 4. Existence of public sector OSPOs (Open Source Program Offices)

    4.1 Number of OSPOs formally established at each government level (national, regional, local), and Institutes for Higher Education (annual count)

    4.2 Percentage of central government domains (e.g., health, justice, education) with an active OSPO

    4.3 Number PSOs formaly supported by these OSPOs per year

    4.4 Mandate clarity score: Based on review, % of OSPOs with a documented mandate aligned to policy goals

    4.5 Coverage ratio: Proportion of all eligible entities (by level) that have an OSPO

- 5. Existence of neutral steward bodies for joint OSS projects

    5.1 Count of independent legal/administrative bodies acting as OSS stewards (annual) for public sector OSS projects

    5.2 Number of public sector OSS projects hosted or supported by steward bodies

    5.3 Stakeholder engagement: Number/type of diverse PSOs participating in joint initiatives coordinated by these stewards

- 5.4 Annual budget or resource allocation for such collaborative public sector OSS projects

- 6. Subnational entities leading and scaling OSS development

  - 6.1 Number and share (%) of municipalities/regions that actively engage in least one OSS project (yearly, collected via survey)

  - 6.2 Annual investment in OSS projects at the subnational level (collected via survey)

  - 6.3 Share of subnational entities reporting OSS contributes to (collected via survey):
    - Cost savings (
    - Digital innovation (
    - Improved interoperability (
    - Enhanced technical sovereignty (

- 7. Support and capacity-building for PSO OSS policies

  - 7.1 Number of support programs or guidance documents issued to PSOs on OSS policy/strategy formulation per year

  - 7.2 Proportion of PSOs (national/regional/local) provided with OSS policy support in past 12 months

  - 7.3 Number and percentage of PSOs that established OSPOs following national alignment guidelines

  - 7.4 Frequency and participation rate in workshops, webinars, or consultations on OSS policy and reuse

- 8. Public sector networks for OSS knowledge sharing

  - 8.1 Number of active knowledge-sharing networks, platforms, or events initiated for OSS in the public sector (annual)

  - 8.2 Number of participating/members PSOs in these networks

  - 8.3 Number of cross-sectoral stakeholders (vendors, academia, NGOs) involved

  - 8.4 Documented outcomes: Number of best practices, case studies, or toolkits generated for OSS policy support

- 9. Engagement in national and international OSS ecosystems

  - 9.1 Number of OSPOs/PSOs participating in: national OSS alliances, international OSS organizations, or cross-border OSS networks

  - 9.2 Number of participants in international OSS-related events (annual)

  - 9.3 Number of collaborative OSS development efforts with international partners per year

- 9.4 Projects or initiatives cited/used by foreign PSOs or partners

- 10. Inbound policy guidelines for OSS adoption

  - 10.1 Existence and versioning of guidelines (Yes/No; publication date; most recent update)

  - 10.2 Checklist existence: whether a procurement checklist for OSS evaluation is available (Yes/No)

  - 10.3 Percentage of procurements referencing guidelines when considering new software

  - 10.4 Surveyed clarity and usability of these guidelines for PSOs and developers (1–5 scale)

  - 10.5 Coverage of key topics (evaluation, requirements, cost, interoperability, data, etc.—scored in a checklist)

- 11. Outbound policy guidelines for public software release as OSS

  - 11.1 Existence and versioning of outbound release guidelines (Yes/No; publication date; most recent update)

  - 11.2 Number of PSOs applying the guidelines in releasing software

  - 11.3 Licensing and community-building support described in guidelines (Yes/No; checklist coverage)

  - 11.4 Surveyed clarity and usability of these guidelines for PSOs and developers (1–5 scale)

- 12. Skills Development and training

  - 12.1 Share of government workforce trained in OSS skills (annual %)

  - 12.2 Number of OSS training sessions/courses delivered to internal/external stakeholders (annual)

  - 12.3 Coverage scale (government, industry, academia, civil society – scored separately)

  - 12.4 Existence of formal feedback/evaluation mechanism after OSS training (Yes/No)

  - 12.5 Reported improvement in OSS-related competencies post-training (survey-based scoring)

- 13. Catalog of public sector OSS

  - 13.1 Existence of a national catalog for public sector OSS (Yes/No; launch/version date)

  - 13.2 Total and annually added number of public sector OSS solutions listed

  - 13.3 Catalog inclusivity score: Assessed on presence of regional, local, and cross-sector contributions

  - 13.4 Compliance of listed projects with Public-code.yml metadata standard (1–5 rating via audit)

13.5 Usage rate: % of PSOs accessing or uploading to the catalog annually

- 14. National social coding and version management platform for government OSS

14.1 Existence and operational status of platform (Yes/No; launch date)

14.2 Total number of OSS projects hosted on platform

14.3 Transparency metrics: Audit logs publicly available, external contributor onboarding time (measured in days)

14.4 Accessibility/barrier score: Surveyed ease of access and use for new PSOs or developers (1–5 scale)

6. Conclusions and future outlook

The study presents a survey of policies and practices related to software reuse, focusing on OSS in 16 digitally mature countries. The resulting analysis, grounded in desk research and interviews, provides a comprehensive overview with individual case studies for each country.

The survey uncovers an evolving landscape of OSS policy in government and public sector contexts, affirming that OSS-focused policies are neither rare nor marginal, appearing at multiple levels of governance and through diverse channels, from formal legislation to informal endorsements. These policies are inherently directional—addressing both inbound processes (acquisition and procurement) and outbound processes (opening and releasing software)—and their intervention types range from high-level guidelines to explicit prescriptive mandates. A principal challenge facing policymakers is to clarify both the scope and rationale of OSS initiatives, ensuring that open-by-default principles are balanced with necessary exemptions aligned to transparency, sovereignty, interoperability, and cost-efficiency goals. As some cases demonstrate, realizing these policy aims depends on a mature and skillful vendor ecosystem, further reinforcing the notion that national strategies must take a holistic view across government, industry, academia, and civil society.

Effective implementation of OSS policies further depends on robust support structures and mechanisms internally within governments. The surveyed cases confirm both the importance and diversity of Open Source Program Offices (OSPOs), as well as the critical roles played by administrative and legal bodies, professional associations, and dedicated networks in public sector collaboration. These actors serve as essential enablers for translating policy intention into practice, providing guidance, maintaining best practices, and fostering interoperability—often through shared catalogues and repositories adopting standardized metadata such as the public-code.yml. Sustainable adoption also hinges on specialized training and shared knowledge, facilitating institutional capacity-building and bridging connections with external stakeholders.

Findings are synthesized as a comprehensive set of potential indicators for digital government indexes to leverage and guide governments in their adoption and entablement of OSS as a tool in policies and digital transformations.

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