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RESEARCH REPORT

Software Reuse through Open Source Software in the Public Sector - A qualitative survey on Policy and Practice

A report commissioned by the Danish Agency for Digital Government (Digitaliseringsstyrelsen) and Local Government Denmark (KL).

RISE RAPPORT 2024:7

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Software Reuse through Open Source Software in the Public Sector - A qualitative survey on Policy and Practice

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Abstract

Software Reuse through Open Source Software in the Public Sector - A qualitative survey on Policy and Practice

This report delves into how Public Sector Organizations (PSOs) and the public sector at large facilitate software reuse, specifically through Open Source Software (OSS) as an instrument. The report is commissioned by the Danish Agency for Digital Government (Digitaliseringsstyrelsen[1]) and Local Government Denmark (KL[2]), which provide input on how Danish PSOs can specifically improve at reaping benefits by reusing existing software and creating value by developing software in a way that can be reused.

A qualitative survey is conducted on a sample of 15 countries considered mature in their digital practices, as indicated through a set of digital maturity indicators. These countries are surveyed in terms of government policies, rationales, support mechanisms, means of promotion, and success stories related to software reuse. The surveyed countries exhibit diverse policies, emphasizing interoperability, digital sovereignty, transparency, and cost efficiency. Economic arguments, interoperability, and transparency are prominent goals, while digital sovereignty varies. Security concerns are discussed, acknowledging both risks and benefits of OSS. The report identifies emerging support structures, including Open Source Program Offices (OSPOs), crucial for institutional capacity. Success stories highlight the transformation to sustainable governance enabled through the use of neutral proxy organizations acting as stewards for public sector OSS projects.

Recommendations are provided that focus on fostering software reuse through OSS adoption, aiming to guide policy- and decisionmakers at national, regional, and local government levels. The report contributes valuable insights for countries, like Denmark, seeking to leverage software reuse through OSS in their digital transformations.

Keywords: Open Source Software, Software Reuse, Policy, Open Source Program Office, Software catalogue, Public sector, Public administration, Government

RISE Research Institutes of Sweden AB

RISE Report 2024:7
ISBN: 978-91-89896-48-2

[1] https://digst.dk/
[2] https://www.kl.dk/

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1 Introduction

Software reuse involves the reuse of software and its underlying source code and related knowledge artifacts. One means of enabling such reuse is to release and share software as Open Source Software (OSS) under an OSS license, implying that anyone for any reason may use, inspect, modify, and redistribute the source code. For Public Sector Organizations (PSOs), software reuse, both in general and through OSS, provides important enablers for ensuring and improving interoperability, digital sovereignty, innovation, and cost efficiency in the public sector.

In this report, we investigate how PSOs and the public sector at large enable and facilitate software reuse, specifically through OSS as an instrument. The report is commissioned by the Danish Agency for Digital Government (Digitaliseringsstyrelsen) and Local Government Denmark (KL), 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.

We specifically examine a sample of 15 countries considered mature in their digital practices, as indicated through a set of digital maturity indicators. These countries are surveyed in terms of:

- *Government policies for software reuse through OSS, and the actors involved.*
- *Rationale (e.g., security and transparency) for promoting and enabling software reuse through OSS, including transparency and security considerations.*
- *Support for software reuse through OSS.*
- *Means for promotion, exhibiting, and sharing of software for reuse.*
- *Success stories of reused software, and lessons learned.*

Findings from the country case studies are synthesized in this report, and a set of recommendations are presented to allow for PSOs (both Danish and those in other countries) to consider what steps to take to best leverage the opportunities software reuse through OSS may bring.

The report is structured as follows: First, a brief overview of the research methodology applied. Second, the synthesized findings from the case studies are presented in the five overarching categories listed above. Thirdly, recommendations for policy and practice are provided based on the synthesized findings. Lastly, conclusions are summarized, followed by the 15 country reports provided in the Annex section.

2 Research design

2.1 Sampling

The directive for this report was to select 15 countries that, overall, are in the best position across major international maturity indicators on digital maturity, specifically considering:

- The Digital Economy and Society Index (DESI)[3]
- eGovernment Benchmark 2022[4]
- UN E-Government Survey 2022[5]
- OECD Digital Government[6]

Taking maturity, geographical representation, and resource constraints into account, 15 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 (New Zealand) and provide examples of mature OSS adoption (France).

Tabell 1 Overview of samples countries, the underlying rationale, and responsible investigator.:

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

[3] https://digital-strategy.ec.europa.eu/en/policies/desi
[4] https://digital-strategy.ec.europa.eu/en/library/egovernment-benchmark-2022
[5] https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2022
[6] https://www.oecd.org/gov/digital-government/

Country	Rationale
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

2.2 Interview framework

A theoretical framework was developed based on the questions provided by the directive for this study. The framework draws from earlier reports investigating best practices of OSS in the public sector (Blind et al., 2022; Linåker et al., 2023).

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: o **General strategies** for e-government services and internal use o **Specific domain**, e.g., Science, Employment Service, Digital Infrastructure, Public procurement. o **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? o **Cyber security** 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: Governance and support	

Area	Question
Current state and use of OSS	- What role does software reuse through OSS play in the country?
Organizational Support	- 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?
Dimension: Digital sovereignty and cyber security	
Digital sovereignty	- See dimension for Policy, and Governance and support specifically in relation to Digital Sovereignty.
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?
Cyber security	- See dimension for Policy, and Governance and support specifically in relation to Cyber security and OSS supply-chain security.
Dimension: Software inventory and promotion	
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?
Dimension: Success stories of reused software and OSS	
Success	- Which solutions are considered as a success in terms of (re)use and collaboration within the country?

Area	Question
stories	- What is particularly good about the highlighted solutions? - What do they do to ensure that the solution is maintained?

2.3 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 (n.d.) provided a starting point for many of the countries within Europe. The policy analysis of individual countries presented in Blind et al. (2020) also provided essential input and starting points for the research.

Case descriptions were compiled based on desk research and later verified and complemented through interviews with at least one representative per country with in-depth knowledge, typically coming from inside the government. The final case descriptions were then cross-analyzed and synthesized with a narrative discussion across five high-level themes and several subthemes. Recommendations for practice were compiled to provide actionable takeaways for Public Sector Organizations (PSOs), both within the Danish context and in other countries.

2.4 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, 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 15 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 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.

3 Findings

3.1 Policy and Stakeholders

Government policies for software reuse through OSS and the actors involved.

Summary: The majority of 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.

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 15 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 discernable 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 allows for a more nuanced understanding and a basis for drawing conclusions and offering recommendations in subsequent sections.

3.1.1 Internal versus external focus, inbound versus outbound

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 a majority of the countries in the sample have policies of that nature. Yet the two Asian countries included in the analysis 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.

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.

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 Estonia, France, and the Netherlands, these aspects are considered in separate policies, whereas in Malta and Iceland 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, focused on inbound consumption (procurement), while more recent policies, such as in Estonia, have shifted to include the outbound aspect. In some countries, such as Colombia, 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).

3.1.2 Type of intervention and level of prescriptiveness

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 National Development Plans (2018-2022 and 2022-2026) mentions the promotion of OSS. Similarly, recent government programs in Finland and Luxembourg 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 as a mechanism for releasing and reusing software developed with public funds (outbound context). Notable examples include Denmark and Iceland 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. France and the Netherlands 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. 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.

3.1.3 Definition and ownership

Policies can further differ in terms of ownership and the process by which they have been adopted. As noted above, such differences may be attributed to the varying institutional frameworks and are also linked to underlying policy objectives. Some policies have been adopted through the legislative process, as in the case of France and the Netherlands, where the outbound policies are regulated by the Digital Republic law (Loi n° 2016-1321 du 7 octobre 2016 pour une République numérique (1), 2016), and the Open Government Act (Wet open overheid, 2023). The policies can also come in the form of government instructions, as in France, where an advisory policy for the inbound context has been issued by the Prime Minister's office (Secretariat General du Gouvernement Direction des Systèmes d'Information et de Communication, 2012). Similarly, both inbound and outbound policies in the UK have been adopted directly by the Government Digital Service, which is a part of the Cabinet Office.

Policies may also be detailed in more general policies, as in the case of Iceland, where the in- and outbound policies are defined as part of the national digital strategy from Digital Iceland, a unit within the Ministry of Finance and Economic Affairs (Digital Iceland, 2021). In Sweden, there are no general policies except for certain guidance provided in government reports. On the other hand, several PSOs have implemented their own internal policies and guidelines, including the Agency for Digital Government (DIGG, 2022a), the National Insurance Agency (Försäkringskassan, 2019), and Sundsvall municipality (Sundsvalls kommun, 2023). There are also guiding documents that have been developed in collaboration between the PSOs (eSam, 2022). These, in turn, provide guidance for other PSOs for the course of action related to the (re)use and release of software as OSS.

3.1.4 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. In Denmark, national policies are defined in guiding architectural documents, 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. In contrast, policies and guidelines found in Sweden are typically limited to single PSOs. 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.

3.2 Policy goals

Rationale (e.g., security and transparency) for promoting and enabling software reuse through OSS, including transparency and security considerations.

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.

3.2.1 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, Spain, and the UK.

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., 2022).

3.2.2 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.

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. Although not as explicit, other countries, such as New Zealand, Sweden, and Iceland, also explicate the value in promoting interoperability and harmonization across public services and the national digital infrastructure.

3.2.3 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 (Loi n° 2016-1321 du 7 octobre 2016 pour une République numérique (1), 2016).

In Sweden, digital sovereignty is also implicitly mentioned in several PSO-specific policies. 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. 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. 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. 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. 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.

3.2.4 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.

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. The Netherlands also emphasizes this through several reports commissioned by the government. In France, the guidelines and support from the National government OSPO focus on encouraging contributions back to OSS projects used and developed further.

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 and the National Agency for the Security of Information Systems (Agence nationale de la sécurité des systèmes d'information – ANSSI) in France. 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. It has published guidelines for appropriate software management methods and responses to vulnerabilities and license issues.

3.2.5 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. 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, Sweden, and New Zealand, 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.

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. This reflects a broader trend toward openness and collaboration in the development and provision of government services.

3.3 Implementation and support

Support for software reuse through OSS.

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.

3.3.1 Complementary 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, while in other countries the role is more blurred on the organizational level, as with Digital Iceland in Iceland and Red.es in Spain.

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. 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 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. ADDULACT in France, OS2 in Denmark, and the Dutch Association of Municipalities (VNG).

3.3.2 Various means for supporting policy implementations

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. 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. 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. It provides more detailed guidance on how to implement this requirement in the Service Manual.

Concerning the practical process for releasing OSS, many guidelines provide rich advice both in itself, such as in New Zealand and France, but also by highlighting external sources of best practice, as done by Digitaliseringsstyrelsen in Denmark. 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, 2021). 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, n.d.-c).

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.

3.4 Promotion for reuse

Means for promotion, exhibiting and sharing of software for reuse.

Summary: Several countries maintain software catalogues to showcase and enable software reuse. In some cases, the use of a national catalogue is mandated by law. Catalogues differentiate in various aspects, such as the type of software they index (public sector software in general and/or OSS), how they are maintained (e.g., national government OSPO or through crowdsourcing), and the level of accessibility (open to the public or for PSOs only). The public-code.yml metadata standard helps enable interoperability and cross-border reuse. The Netherlands is planning for an additional step through the creation of a national software repository for hosting and collaborating on OSS projects' development and maintenance.

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. 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 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[7] for public sector OSS projects, which facilitates findability and 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. 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 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[8]. The European Commission has also created their own

[7] https://yml.publiccode.tools/
[8] https://opencode.de/en

environment[9]. 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 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.

[9] https://code.europa.eu/

3.5 Success stories

Success stories of reused software, and lessons learned.

Summary: There are several success stories of public sector OSS projects, such as X-Road, Signalen, and gvSIG, demonstrating the potential and opportunities for (re)use and collaborative development of OSS. The highlighted projects exemplify the common practice of hosting projects in independent organizations where the Public Sector Organizations (PSOs) are either members or owners. These joint organizations help pool resources and collaborate on planning, procurement, development, and maintenance of the project(s). More capable PSOs, such as larger cities and municipalities, typically play a leading role in the development and ensuring the long-term sustainability of the projects.

There are several successful projects reported in the different cases investigated. One common denominator is that many of these OSS projects are hosted under a foundation or association where the PSOs as members or owners co-fund and collaborate on the development and maintenance of the OSS projects, either through internal or procured resources.

X-Road is among the better known OSS projects initiated by the public sector. It has been implemented in over 20 countries, including Colombia, Finland, Iceland and Japan. According to the NIIS website X-Road community and have 3445 contributors and 373 million users worldwide. In 2017, the governments of Estonia and Finland established the Nordic Institute for Interoperability Solutions (NIIS) in order to deepen their cooperation in a more formal manner and jointly manage the development of X-Road.

Another example of such organizations is OS2, an association-based OSPO in Denmark which hosts 25+ OSS projects varying across three levels of maturity, from a prototype phase to the mature level and being used across multiple PSOs. OS2forms, a type of e-service platform, is highlighted as an example, gathering 11 municipalities who jointly fund and coordinate the development and maintenance of the project by leveraging OS2s standardized processes and the use of three separate vendors to avoid the risk of lock-in.

A similar example can be found in the Dutch OSS project Signalen, an incident report system for public spaces, which emerged organically and is primarily developed and maintained by a team of developers within the City of Amsterdam. Currently, the intention is to move the ownership of the project to VNG and for the association to serve as a neutral hosting ground. VNG, in this regard acts as an association-based OSPO similar as to OS2 and ADDULACT (France), with a primary focus on bringing municipalities together, who commonly lack the needed resources and capabilities to consider OSS both from a use and development perspective.

The potential of OSS and its re-use was also used when the UK Government created a "'one-stop-shop" for digital government services, as well as a common platform for all government websites, GOV.UK. This platform is built on open technologies and most components are being developed on GitHub under the MIT License. GOV.UK provides

a common basis and slot-in templates for government units to adopt on their websites, so that departments can easily add services to their website. GOV.UK was developed by GDS and has been adopted by all government departments, meaning that all central government websites run on the same platform and use common components. GOV.UK is considered a success for GDS and the UK Government, having been adopted by other governments, driven by the OSS approach.

We also observed cases of individual projects that moved beyond the domain of a single PSO to a project-specific foundation, i.e., not to an association similar to OS2 or VNG who has the goal of enabling its members to initiate new OSS projects, not necessarily related. Notable examples include the gvSIG project – a catalogue of tools for managing and visualising geographical information data (gvSIG, n.d.), founded in 2004 and maintained jointly by Generalitat Valenciana and the gvSIG association. Another corresponding example regards Decidim, an OSS platform for enabling citizen participation, primarily on a city level (Decidim, n.d.). Since the initial application of Decidim in Barcelona in 2016, the development has progressed beyond the city and is now facilitated by the independent not-for-profit organization The Decidim Free Software Association, which is similar to the setup of the gvSIG project. Yet another example is the Tokyo Metropolitan Government Stopcovid19 website. After being released as OSS it received more than 2,000 improvement requests. The source code has been reused all over Japan and as of 20 April 2021 63 sites using the source code were built in 54 regions.

The examples further show the importance of capable actors leading the development of new OSS projects initially and driving the transformation to a sustainable governance and maintenance model. Amsterdam in the case of the Signalen project, Valencia in the case of gvSIG, and Barcelona in the case of Decidim all proved essential to help the transition, and enable other PSOs, especially on the municipal level to onboard and participate in the collaborations.

A more informal approach exhibited in Sweden demonstrated how a set of PSOs have collaborated on the development of a moderator panel and outlook-plugin for Jitsi which is hosted under the GitHub organization of the Agency for Digital Government. This has proved an exploratory process for how PSOs can collaborate on the development, as well as how to think about the long-term maintenance of the project, now providing a template for how new components can be developed collaboratively. The example shows that a formal organization may not always be needed to enable a sustainable governance and maintenance of a project, although it is worth noting that the collaboration behind the plugins is still early in their maturity process.

5 Recommendations

5.1 Policy for software reuse through OSS

For policy- and decisionmakers in a country's national, regional, and local levels of government, it is recommended to:

- **Investigate and consider how software reuse, specifically through OSS as an instrument, can be used for improving:**
  - **interoperability** among public services and digital infrastructure, and towards third party actors, both on a national and international level**.**
  - **digital sovereignty** by empowering PSOs to make technical design and sourcing decisions based on national, regional, and local law, norms, and values.
  - **transparency in public services**, e.g., in terms of collecting and managing data, making algorithm-based decisions, or define interfaces that third-party actors may interact with.
  - **cost efficiency** by facilitating shared development and maintenance costs, lower license fees, and increased competition in tenders.

  Any investigation should include or consult with the broader ecosystem of actors both inside and outside public sector with knowledge and expertise in OSS and software reuse with the different areas,
- **Establish an inbound policy detailing how software reuse through OSS is to be considered in the acquisition process of a new software solution.** The policy can either be advisory or preferential, implying that shared solutions (government internal or publicly available as OSS) can, or should, be evaluated on equal grounds as other options, or preferred if no special circumstances apply, e.g., related to security, integrity, or interoperability aspects.
- **Establish an outbound policy detailing how software reuse may be enabled through the sharing of acquired software solutions, either internally within government or publicly as OSS.** The policy can either be advisory or preferential, implying that the acquired solution (e.g., internally developed, or externally through procurement) either can, or should be shared if no special circumstances apply, e.g., related to security, integrity, or interoperability aspects. The policy should further clarify how the ownership of IP should be considered in an external acquisition process as this may be a precondition to be able to share the acquired solution accordingly.
- **Establish an external-focused policy detailing how software reuse and collaborative development through OSS may be promoted or enabled within national industry.** Such policy entails extending the focus beyond the public sector's own use to consider the contribution of OSS to economic growth, innovation, startups, as shown in a study published by the European Commission (Blind et al., 2021). The policy can be expressed either as an addition or update to existing innovation or industrial policy or as a specific policy promoting OSS to drive growth in the technology sector and the wider economy as witnessed in South Korea.

Several complementary policies, e.g., addressing different levels of government may provide an option, yet they should ideally be aligned and help cover all types of PSOs within the country. Any policy should be owned and actively maintained by a central PSO with responsibility for, or well-established trust in the contexts of digital government, transformation, or procurement in the concerned context. Further, any policy should be explicitly founded and explained in the context of concerned policy goals.

5.2 Implementation and support

To enable the implementation and support of any policy on software reuse through OSS,

- **Establish national government OSPOs to ensure effective implementation of any policy on software reuse through OSS per the defined policy goals.** These OSPO(s) may are typically hosted in, or under, central government entities responsible for digital government and/or in domain specific PSOs guiding the broader public sector. In France, the Free Software Unit inside DINUM constitutes the OSPOs, while in other countries the role is more blurred on the organizational level as with Digital Iceland in Iceland and Red.es in Spain. Another form of OSPO structure is constituted by the Association-based OSPOs exemplified by OS2 in Denmark. These are specifically tasked with supporting their members or owners but could also function with a wider mandate in supporting the public sector nation-wide if granted the resources needed.
- **PSOs should identify, set up, and leverage administrative and legal bodies as neutral arenas and stewards to pool resources, host, and collaborate on joint OSS projects and enable software reuse.** In Denmark, OS2, an independent association, has been set up and evolved organically, driven by the member PSOs, including municipalities, regions, and state agencies. In the Netherlands and France, the Association for Municipalities (VNG) and ADDULACT respectively has taken on this role.
- **Municipalities, cities, and regions with the capabilities and resources should take on a leading role and drive the development and other PSOs on the local level in leveraging OSS in their digital transformation.** This will benefit all parties as the collective action can increase cost efficiency, open innovation, technical sovereignty, and interoperability. The cities of Barcelona, Amsterdam, and Valencia exemplify larger municipalities may develop, and drive OSS towards sustainable governance and maintenance.
- **PSOs across the public sector should be provided support in defining how software reuse through OSS may be leveraged in their own policies for digital transformation, in line with the national policies, and establish OSPOs to execute on these.** Scaling the institutional capacity across the public sector is pivotal as the use, development and collaboration of OSS otherwise may risk being constrained by the National Government OSPO(s). The OSPOs provide interfaces between PSOs horizontally and vertically across the public sector and enable collaboration and sharing of OSS. In the Netherlands, the institution-centric OSPO within the

Ministry of the Interior and Kingdom Relations is supporting PSOs under it, while also supporting the establishment of a National government OSPO.

- **Initiate and facilitate common networks across the public sector to promote knowledge-sharing and new collaborations.** Networks can help bridge between PSOs and other stakeholders, including vendors, industry, academia, civil society, and hacker communities. In France and Sweden, such networks are a force multiplier in sharing knowledge, and enabling stakeholders to meet and collaborate on new and existing OSS projects. In the Netherlands, said networks are being used to support the growth and establishment of new OSPOs while also raising awareness and knowledge across PSOs.
- **Engage in the national and international OSS ecosystem through key organizations, networks, and communities.** Several of the OSPOs in the different countries are engaged in the European Commission's OSPO network where they meet monthly to share knowledge, and identify and collaborate on joint initiatives, e.g., the cross-border reuse of OSS solutions, and meta data standards to facilitate identification of public sector OSS in the different countries.
- **Establish guidelines related to inbound policies, detailing when and how OSS should be considered in the acquisition and development of new software solutions.** These guidelines should cover various options and configurations (e.g. OSS, open core-offerings, and proprietary solutions) and offer guidance on how these can be identified, evaluated, and compared on common criteria, including requirements fulfilment, total cost of ownership, health and sustainability, need and availability of professional support, interoperability, data management, etc.
- **Establish guidelines related to outbound policies, detailing when and how software developed through public funds can be released as OSS.** These guidelines should cover the decision process of considering decision parameters listed in any overarching policy, e.g., in terms of security, or integrity that may warrant the software, or parts of it to remain closed. Guidance should further be provided on how to practically go about in releasing and publishing the software as OSS, and, e.g., choosing a suitable license, and building a sustainable community around the OSS.
- **Invest in specialised training and education programs focused on OSS to enhance workforce capabilities nationally across the public sector and vendor ecosystems.** These programmes, covering OSS opportunities and risks, development processes, culture, and related business models, can be developed and provided by OSPOs and related networks of PSOs, or by wider cross-sector communities.
- **Create a catalogue of public sector software to promote and enable reuse within the public sector.** Several countries maintain software catalogues to showcase and enable software reuse. The use of the catalogue should be encouraged (or enforced as in Spain). Catalogues should preferably be as inclusive as possible and consider both public sector software in general and OSS), have an organization responsible for maintenance, consider use of crowdsourcing for information gathering, be as open as possible for transparency and enabling for further reuse, and strive towards adopting the public-code.yml meta data standard to improve findability of software, and interoperability across catalogues.

- **Create a national software repository for hosting and collaborative development of public sector OSS projects.** Maintaining an own instance may improve interoperability to other services such as a national software catalogue, gain control and transparency over data produced, and lower barriers for adoption and sharing of OSS among PSOs.

6 Conclusions and future outlook

This report has surveyed the policies and practices related to software reuse, focusing on OSS in 15 digitally mature countries. The resulting analysis, grounded in desk research and interviews, provides a comprehensive overview with individual case studies for each country.

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 when it comes to 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.

The introduction of government policies promoting the (re)use of OSS in the public sector is driven by a variety of factors, with policy documents commonly referencing several of these elements to advocate for the encouragement of OSS. Key policy goals observed include:

- interoperability among public services and digital infrastructure and towards third-party actors, both on a national and international level;
- digital sovereignty by empowering PSOs to make technical design and sourcing decisions based on national, regional, and local law, norms, and values;
- transparency into how public services function, e.g., in terms of collecting and managing data, making algorithm-based decisions, or define interfaces that third-party actors may interact with; and
- cost efficiency, e.g., by enabling shared development and maintenance costs, lower license fees, and increased competition in tenders.

Economic arguments were generally present among the policies, with varying emphasis, while interoperability and transparency played a strong role in specific cases. Digital sovereignty was present to varying degrees in many policies but not so prominent as compared to the general EU level. The security aspect of OSS is mentioned with both positive and negative views. One perspective emphasizes the risk of exposing source code, making vulnerabilities easily identifiable and exploitable. Another viewpoint sees OSS as secure due to its transparency, allowing numerous eyes to review and address issues early, reducing vulnerability risks.

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 sustainable maintenance and governance of common OSS projects.

Several success stories were identified. Often, these started out as initiatives of a single PSO with subsequent adoption elsewhere enabled by a transformation to a sustainable governance and maintenance. In terms of promotion, many of the countries have established software catalogs that list software used and available for reuse, either internally within the government or publicly as OSS.

Based on the findings, several recommendations are made for PSOs on the national, regional, and local levels of government. The authors of the report hope these recommendations serve as actionable insights for policy- and decision-makers in Denmark and other countries seeking to leverage software reuse through OSS as instruments in their digital transformations.

What we have not observed is a forward-looking approach to planning, steering, and following up on goals and practices for enabling software reuse through OSS, and its impact, short and long term. Current indicators for digital maturity, of which some were used for the sampling in this report, to various degrees touch on the topic of OSS in relation to digital transformation, but none go into detail looking at actual steps take to enable software reuse, or potential policy goals attached. We thoroughly recommend that such metrics are developed, both among countries aiming to leverage OSS as an instrument in their digital transformation, and among the organizations maintaining the indicators for digital maturity as they act as a guiding light for countries looking to mature and evolve. The recommendations of this report may serve as part of the foundation for such indicators.

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8 Country report: Colombia

8.1 Abstract

Policy and stakeholders: The promotion of OSS is included in Colombia's National Development Plans of 2018-2022 and 2022-2026, giving the Directorate of Digital Government (Mintic) the responsibility for promoting open technologies without prejudice to investment in closed technologies. Resolution 537 of 2018 granted public entities licenses for the reuse of technological solutions previously exclusive to the Ministry of ICT.

Policy goals: Policy initiatives aimed at promoting OSS are introduced with the arguments of avoiding double-contracting and ensuring better management of public resources. OSS is also seen as a way to foster open innovation and to improve relationships and trust between government, citizens, and business.

Implementation and support: Mintic maintains a Free Software Initiative which focuses on promoting uptake of widely used and well-maintained OSS, including Python, OpenRefine, and X-Road. It provides installation guides and offers training programs for public sector users as well as SMEs.

Promotion for reuse: The Public Software Colombia portal showcased 86 solutions, with 50 published under Resolution 537. However, these are no longer updated and utilized by public entities.

Success stories: The most significant example of OSS use in the Colombian public sector is the implementation of X-Road which was announced in 2020 and which has been rolled out to 64 government entities. Within the global X-Road community, Colombia now has the biggest number of individual contributors.

8.2 Policy and Stakeholders

In recent years Colombia's national government has committed significant political and capital resources in its "National Development Plans" (DNP, 2018; DNP, 2022) towards realising the social and economic benefits of digital transformation. Colombia placed 3rd in the 2019 OECD digital government ranking and has been classified as a "Watch Out" economy according to the Digital Evolution scorecard (Bhaskar, Chakravorti, et al, 2020). Colombia is third in Latin America among the countries with the most contributions to OSS and is number 30 in the world.[10]

Public sector initiatives relating to the use of OSS should be seen as part of a wider effort by the Colombian government to realise the benefits of digital transformation. The origins of several of these initiatives can be traced to recommendations, technical support, and evaluation provided by international organisations such as the World

[10] eafit.edu.co/noticias/agenciadenoticias/2023/Los-tiempos-del-software-no-libre-terminaron-Chris-Aniszczyk-director-de-tecnología-de-CNCF

Bank, OECD, ITU and USAID (OECD, 2019, USAID[11] For example, the OECD has provided support for Colombia's progress according to the six dimensions included in the OECD Digital Government Policy Framework – among them "open by default"[12], which refers to the existence of government policies and strategies that encourage OSS.[13] Similarly, USAID has promoted Colombia's uptake of its 9 principles for digital government, including "use open standards, open data, OSS, and open innovation".[14]

While not the sole focus of any policy, OSS is nevertheless mentioned and promoted in numerous official texts. The use of open standards and open technology infrastructure is one of three horizontal strategic themes in the NDP. More specifically, article 147 of Law 1955 of 2019, which established NDP 2018-2022, assigned to the Directorate of Digital Government (Mintic) the task of "promoting technologies based on free software or OSS, without prejudice to the investment in closed technologies."[15] This task was subsequently re-affirmed in the NDP 2022-2026. *Against this background the NDP set a specific target* that 27 of its national governmental entities should be using OSS by 2020. In 2021[16], Mintic announced that this target was surpassed and that 76 national entities of the Executive Branch already use these tools.

The Public Software Colombia initiative was established within Mintic in 2017 and has its origins in an agreement between the Information and Communication Technologies Fund (FONTIC) and the World Bank in 2015.[17] The goal was to support MINTIC in fostering innovation by conceptualizing an open collaboration scheme, designing and implementing an open data initiative, and preparing a national strategy for sharing technological solutions among government institutions. A direct outcome of this initiative was Resolution 537 of 2018 which granted public entities licenses for the reproduction, communication, transformation, and distribution of source codes, enabling widespread use of technological solutions previously exclusive to the Ministry of ICT.

8.3 Policy goals

The increased use of OSS tools is presented by Mintic as a way to promote open innovation through more efficient, effective and transparent relationships between markets, citizens and the government.

OS adoption is also encouraged with the more specific aim of optimizing the management of public resources and to avoid the situation where the government pays for the same solution more than once.

[11] WEF Enabling Colombia's Transition to a Data Driven Economy 2021.pdf (weforum.org)
[12] The OECD Digital Government Policy Framework: Six dimensions of a Digital Government | en | OECD
[13] OECD Reviews of Digital Transformation: Going Digital in Colombia | en | OECD
[14] Digital Ecosystem Country Assessment (DECA) Colombia (usaid.gov)
[15] Colombia country review: Regulation at the forefront of digital transformation (digitalregulation.org)
[16] https://www.mintic.gov.co/portal/inicio/Sala-de-prensa/181632:Software-libre-es-una-realidad-en-76-entidades-de-la-Rama-Ejecutiva-con-apoyo-del-MinTIC
[17] https://gobiernodigital.mintic.gov.co/portal/Iniciativas/Software-libre/

8.4 Implementation and support

Mintic's Public Software initiative evolved into a broader Free Software Initiative in 2019 and 2020, and the current focus is on promoting uptake of community tools that are regularly updated, well-documented in recognized repositories like Github, Gitlab, Bitbucket, and widely used globally. The Ministry has been promoting the implementation of different tools such as Open Refine, R Language, X-Road and Python. Video tutorials have been published to guide users through installation steps, introductions, functionalities, and practical use cases. Other activities include free national training programmes for SMEs on X-Road.[18]

8.5 Promotion for reuse

The Public Software Colombia portal showcased 86 solutions, with 50 published under Resolution 537. However, these are no longer updated and utilized by public entities. The inventory of these solutions is available on the Colombian state's open data portal, named "Public Software Colombia, history of published projects."[19]

8.6 Success stories

In line with the principle to use open standards and open technology, Colombia announced in 2020 its intention to use X-Road for the first significant pilot of the NDP 2018-2022: a data exchange platform aimed at accelerating Colombia's responsible digital transformation. The project is the most significant example of OSS use in the Colombian public sector and it is being implemented as part of a public-private partnership that includes the World Economic Forum.[20] In 2022, it was reported that X-Road had been rolled out to 64 government entities. Within the global X-Road community, Colombia now has the biggest number of individual contributors[21] and the country's contribution has been acknowledged by the Estonian government.[22]

8.7 References

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[18] WEF Enabling Colombia's Transition to a Data Driven Economy 2021.pdf (weforum.org)
[19] Software Público Colombia, histórico de proyectos publicados | Datos Abiertos Colombia
[20] Launching citizen-oriented digital services in Colombia — X-Road® Data Exchange Layer
[21] X-Road World Map — X-Road® Data Exchange Layer
[22] The next round of European integration hinges on our ability to do GovTech together. It will not be easy - The European Files

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9 Country report: Denmark

9.1 Abstract

Policy and stakeholders: There are several guiding policies in place, mainly from the Agency for Digital Government that encourages the consideration of OSS in a procurement and acquisition process, as well as the release of software developed through government funds. Corresponding policies are also provided by the Association for Municipalities and Regions concerning lower levels of government.

Policy goals: The ability to reuse and gain control of the software, and thereby avoiding double contracting, and vendor lock-in are the main policy goals highlighted in the guiding policies.

Implementation and support: Several guidelines for the release and acquisition of OSS are provided by the Agency for Digital Government, Association for Regions and Municipalities, and the public sector association OS2. The latter provides an association-based Open Source Program Office, facilitating and enabling the collaborative development and maintenance of common public sector OSS projects between its members, while providing a source of best practice and support.

Promotion for reuse: A catalogue called Digitaliseringskataloget indexes services that are part of the common nation digital infrastructure used by all 98 municipalities. The platform provides an overview both of software in the common public sector infrastructure and its different parts, as well as documentation and knowledge related to the infrastructure. Public sector OSS projects are listed mainly listed either on OS2 or GitHub.

Success stories: Several examples are provided in the context of OS2. OS2forms, a type of e-service platform, gathers 11 municipalities who jointly fund and coordinate the development and maintenance of the project by leveraging OS2s standardized processes and the use of three separate vendors to avoid the risk of lock-in.

9.2 Policy and stakeholders

There is currently no law or general policy prescribing the use or consideration of OSS in an acquisition and procurement process, nor in terms of releasing release government-owned software as OSS. There are, however, guidelines authored by the Agency for Digital Government that encourage and support the adoption and release of OSS for state-level PSOs (Digitaliseringsstyrelsen, 2022a), echoing findings and proposals from the software strategy authored by the National Technology Council in 2002 (Teknologirådet, 2002).

The national IT project guidelines also emphasize in its principles that procured or developed software should be based on the reuse of existing solutions to the largest possible extent (Digitaliseringsstyrelsen, 2022b). If there are no existing solutions that can be used as is, customization of existing solutions should be preferred before developing any solution from scratch. Similar encouragement is provided by the

national principles form 2014, which highlights that public sector software should be released as OSS to enable reuse as far as possible (Digitaliseringsstyrelsen, 2014).

Further clarity on legal matters was brought by a legal notice issued in 2020 by a law firm (Advokatfirmaet Poul Schmith, 2020), commissioned by OS2 (Offentligt digitaliseringsfællesskab) - an association-based OSPO where municipalities initiate and collaborate on OSS projects addressing common needs. The legal note made it clear that municipalities can collaborate on OSS solutions with each other through the association, as well as share software where there is an ownership of the intellectual property, regardless of whether it is being developed internally or through external resources. There are now calls for the need to also expand the legal review to also consider regional and national PSOs, and specific topics such as how public entities of different sorts (including universities and government-owned enterprises) may mix funding to sponsor development.

9.3 Policy goals

The guidelines form the Agency for Digital Government highlight the need for flexible yet interoperable solutions that can be reused and modified based on current needs. The importance of reuse is further echoed in a set of earlier released principles on OSS use in the public sector, noting that taxpayers should not need to fund the acquisition of software solutions several times (Digitaliseringsstyrelsen, 2014).

The architectural principles, also authored by the Agency for Digital Government (2022c), specifically emphasize that PSOs should avoid becoming dependent on any vendor or proprietary technology. Similar encouragement is also provided on the municipal level in corresponding principles from the Association of Municipalities (KL, n.d.). Open standards and sustainable OSS solutions should be considered and used as far as possible. The choice between OSS and proprietary technology should, however, be based on what creates the best value in relation to the needs at hand. The national principles from 2014 further describe how OSS can enable and improve the competitiveness among software vendors and enable sovereignty and control over how the software is used, developed, and shared (Digitaliseringsstyrelsen, 2014).

Adoption and consideration of OSS in the acquisition process on the municipal level have been established in Aarhus municipality formally since 2011 through a local government decision and later enforced through the city's official OSS policy (Aarhus Kommune, 2014). The policy highlights that it is not a goal in itself. Instead, it is viewed as a means of achieving their overarching wishes of adopting software based on open standards, avoiding recurring licensing fees, avoiding lock-in effects to vendors and proprietary technologies, and enabling the general strife towards engaging in collaboration that further helps to increase the potential benefits.

9.4 Implementation and support

There are several guidelines to help guide PSOs in both acquiring and releasing OSS in alignment with the different policies. The most recent guidelines from the Agency for Digital Government present strategies to use in the acquisition process for how OSS may be considered and how to scan the market for available options

(Digitaliseringsstyrelsen, 2022a). The guidelines further discuss licensing options and how to develop, collaborate, and establish a sustainable community. Further and complementary guidelines are also provided in earlier publications (Digitaliseringsstyrelsen, 2014; Teknologirådet, 2002).

Additional guidelines related to the acquisition process are provided by OS2 (2017), which is also the preferred source of knowledge in the public procurement guidelines (KL, 2023). OS2 further provides standardized processes for the collaborative development and maintenance of OSS projects among its members (Frey, 2023), and help to implement the municipal-level architectural principles (KL, n.d.). The association was created in 2012 and consists of 80+ out of 98 municipalities, but it also includes a smaller number of regions and national public agencies. Membership is voluntary and commonly driven by a member PSO's IT, digitization, or finance department.

The main goal and purpose of the association are to develop and maintain a governance framework that members can work within to own and share IT solutions based on business needs. The association is facilitated by a central secretariat of four members plus nine part-time product owners, i.e., employees at the member PSOs who work part-time overseeing the technical planning and maintenance of specific OS2 projects. Member fees are used to pay wages and expenses of the secretariat. Each OSS project has its separate funding from the users of the project, which is dedicated to the development of the OSS.

The larger and more resourceful municipalities play a pivotal role in the OS2 collaborations. Aarhus, which is the second largest city, is one of the key members. Their policy from 2014 details several actions to support and enable the implementation of the policy (Aarhus Kommune, 2014). Tasks address both the establishment of acquisition guidelines, procurement templates, a white book addressing legal questions and concerns, internal and external communication plans, and a project management model for developing and collaborating on OSS projects. A dedicated task force, similar to a local government OSPO, was established to support and lead the implementation of the various tasks. While some of the tasks were implemented, others were left after the project ended due to limited financing.

There is currently no formal national government OSPO present providing hands-on support for implementing the guidelines and principles from the Agency of Digital Government. OS2 fills a complementary role on the national level, given its wide member base which includes some regions and state agencies. It is worth noting that project-based national government OSPO was present through the National Knowledge Center for Software (Videncenter for Software), which ran during the period 2006-2008, although with a general focus on executing the national software strategy and not only on OSS (Open Source Observatory and Repository, 2012). The Knowledge Center, e.g., developed guidelines clarifying legal conditions for adoption and development of OSS (Mygind, 2008), and established the national software catalogue Softwarebørsen.dk (Open Source Observatory and Repository, 2012).

9.5 Promotion for reuse

Although no longer available, the national software catalogue Softwarebørsen.dk provided an important resource by indexing software applications used and of interest to the Danish PSOs (Open Source Observatory and Repository, 2012). The catalogue was a collaboration between the National Knowledge Center for Software and the vendor ecosystem in Denmark.

Today a wider-purpose Digitalization catalogue platform Digitaliseringskataloget is available although mainly focused on indexing services that are part of the common nation digital infrastructure used by all 98 municipalities (KOMBIT, n.d.). The platform provides an overview both of software in the common public sector infrastructure and its different parts, as well as documentation and knowledge related to the infrastructure.

Another, though narrower, software catalogue is that of OS2, listing the 25+ OSS projects developed and maintained by the association (OS2, n.d.). The projects are in turn mainly hosted on GitHub, which also hosts seven PSOs identified as government institutions, including the Royal Library, the National Tax Administration, and the National Museum of Denmark (GitHub, n.d.)

9.6 Success stories

Successful examples of OSS projects include:

- OS2forms – A Drupal plugin enabling the creation and management of forms and forms data, similar to e-service platforms.
- OS2iot – An IoT platform enabling the management of IoT devices and the collection and management of data produced by the devices.
- OS2valghalla - A web-based system for managing democratic elections.
- OS2kitos – A tool to create an overview of personal data and manage GDPR compliance within an organization.

Looking at OS2forms specifically, the project gathers 11 municipalities who jointly fund and coordinate the development and maintenance of the project by leveraging OS2s standardized processes and the use of three separate vendors to avoid the risk of lock-in. A technical steering committee with representatives from five of the municipalities meets biweekly to walk through the backlog and roadmap. A governance steering committee with Chief Digital Officers from the municipalities also meets recurringly to decide on the overarching strategic direction of the project. The collaboration is facilitated by a project coordinator from OS2, supporting the continuous procurement of development and conformance with governance and processes defined by OS2.

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10 Estonia

10.1 Abstract

Policy and stakeholders: the role of OSS has been emphasized in Estonian policy documents promoting interoperability since the early 2000s. These documents promote but do not prescribe OSS when developing and acquiring software for the public sector. In 2021, the Estonian parliament adopted rules mandating that software developed with public funds be made available for reuse both within and outside the public sector.

Policy goals: Public sector use of OSS has been motivated by technical considerations promoting interoperability. Co-developing eGovernment solutions with the private sector and (re)using open and interoperable building blocks is viewed as the best way to accelerate digital transformation of the public sector. More recently, the Estonian government has recognized the value of having a global community of developers contribute to the software it uses.

Implementation and support: In 2017, the governments of Estonia and Finland established the Nordic Institute for Interoperability Solutions (NIIS) in order to deepen their cooperation in a more formal manner and jointly manage the development of X-Road.

Promotion for reuse: Estonia maintains a public OSS catalogue, koodivaramu.eesti.ee, on GitHub since 2019.

Success stories: The Estonian government initiated X-Road, the OSS data exchange layer that serves as the foundation of eGovernment services in Estonia and that is now implemented in over 20 countries worldwide.

10.2 Policy and stakeholders

Estonia is a world leader in digital government, regularly topping international rankings such as the European Commission's DESI Index for Digital Public Service, the eGovernment Benchmark and the United Nations E-Government Survey. The use of OSS is widely considered to have played a crucial role in the digital transformation of Estonia since the early 2000s,[23] e.g. the Estonian government was the initiator of X-Road which is perhaps the most well-known and widely adopted public sector OSS initiative.

The earliest policy document on OSS dates from 2003, with the Estonian Informatics Centre promoting the use of OSS in the public sector. Concrete recommendations included using OSS components when possible, organising trainings to introduce OSS, and installing Linux on workstations (Joinup, 2020).

[23] Address to Meet the Chiefs lunch in Canberra | Department of Social Services Ministers (dss.gov.au): "Estonia has been an exemplar in this area for more than 20 years. The government's approach is simple – it's a distributed architecture and is based on open-source software. And it works."

The principles of openness, reusability, technology neutrality and adaptability are all emphasized in Estonia's "State IT Interoperability Framework", a first version of which was published in 2004 by the Ministry of Economic Affairs. Version 3.0 was adopted in 2011 and emphasizes the that public sector institutions should follow the principles of openness when developing the architecture of their information systems and procuring software. The use of open standards is *mandated* and OSS must be *considered* in public procurement. The reusability principle means both that public sector solutions are meant to be reused by all the market operators and that when creating their own information systems, public sector institutions should consider solutions made by other institutions.

In 2021, the Estonian Parliament amended the Estonian State Property Act paving the way for rules requiring software to which the state owns the property rights in whole or part should be made available publicly. If only parts are owned by the state, those parts owned by the state should be made available. Certain exceptions apply, e.g. when publishing code would be a detriment to the state, such as potential threat to public order and national security or cybersecurity reasons.

10.3 Policy goals

Public sector use of OSS has mainly been driven by technical considerations promoting technical interoperability. Co-developing eGovernment solutions with the private sector and (re)using open and interoperable building blocks has been viewed as the best way to accelerate digital transformation of the public sector.

More recently, Estonia's Digital Agenda 2030 from 2021 puts emphasis on open innovation and reiterates that the development of digital government should rely on architectural principles that allow for reuse. Solutions created for the Estonian state based on these principles, it is argued, can be more easily adapted both with regard to business and technology, thereby increasing the export potential of digital government solutions. (Ministry of Economic Affairs and Communications, 2021). The Estonian government has also recognized the value of having a global community of developers contribute to the software it uses.[24]

10.4 Implementation and support

In 2017, the governments of Estonia and Finland established the Nordic Institute for Interoperability Solutions (NIIS) to deepen their cooperation in a more formal manner and jointly manage the development of X-Road. With a budget of 2.5 million EUR in 2021, equally shared by its three members (Estonia, Finland, and Iceland), the NIIS develops and maintains the X-Road software. NIIS publishes how-to and troubleshooting articles and maintains a helpdesk supporting its now global community.[25] Other supporting activities include the X-Road Community Event 2021 and a public bug bounty program for X-Road.

[24] The next round of European integration hinges on our ability to do GovTech together. It will not be easy - The European Files

[25] https://nordic-institute.atlassian.net/wiki/spaces/XRDKB/overview?homepageId=4915263

10.5 Promotion for reuse

The government Estonia has maintained a software catalogue on koodivaramu.eesti.ee since 2019. Under the rules adopted in 2021, all OSS solutions developed for the government are made public and are freely available.

10.6 Success stories

X-Road is arguably the most widely used open source project initiated by the public sector. X-Road, the data exchange layer for information systems used by Estonia and Finland, is a technological and organisational environment enabling a secure Internet-based data exchange between information systems. The X-Road technology is used nationwide in the Estonian public administration.

The entire X-Road source code is publicly available for anyone to use, and it has been implemented in over 20 countries to date (including countries in this report: Colombia, Finland, Iceland and Japan).[26] As of 2022, X-road connected more than 900 public and private organisations, providing more than 3000 services (Observer Research Foundation, 2022). According to the NIIS website, the X-Road community counts 3445 contributors and 373 million users worldwide. The Estonian government has recognized that OSS has contributed to the country being seen as an international leader when it comes to digital transformation.

10.7 References

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11 Finland

11.1 Abstract

Policy and stakeholders: The first policy document to encourage the use of OSS was published in 2003 by the Ministry of Finance. More recently, the programme of the 2019-2023 government included the aim to increase public sector uptake of OSS and the intention to introduce rules prescribing OSS in procurement unless there were serious grounds for acting otherwise. Individual PSOs have adopted more explicit policies on OSS.

Policy goals: OSS policies relating both to procurement and publication of code are motivated by the obligation to maximize the public benefit and to ensure responsible use of taxpayer funds. Recent policy statements also highlight the role of OSS in delivering the benefits of open innovation.

Implementation and support: Guidelines relating to public sector procurement of OSS were published by the central government in 2009, including advice relating to licenses.

Promotion for reuse: A catalog of public sector OSS projects is hosted by the the Finnish Centre for Open Systems and Solutions (COSS) a non-profit association, and made available at avoinkoodi.fi (a simpler list is available in English at Opencode.fi)

Success stories: Oskari, a web mapping framework initially developed as Finland's national geoportal and now widely used, was submitted by the Finnish Land Registry as a contender for the European Commission's OSOR awards in 2023. The Finnish Covid Tracker was released as open source by the Finnish Institute for Health and Welfare with the aim of ensuring its quality and security.

11.2 Policy and stakeholders

In Finland, the first policy document to encourage the use of OSS was published in 2003 by the Ministry of Finance. In a working paper entitled "The Openness of the Code and Interfaces of State Information Systems" government agencies were advised to consider OSS alternatives to proprietary software (Source: Joinup, 2020).

More recently, the programme of the 2019-2023 Government entitled, "Inclusive and competent Finland – a socially, economically and ecologically sustainable society" (Finnish Government, 2019), contains an explicit intention to "enhance the use of OSS solutions in public information systems and procurement". Openness of public information will become the overarching principle of information policy and the Government will advance the primacy of open source software in public information systems and in the related procurement. In pursuit of this aim, provisions will be introduced mandating the acquisition of OSS for public information systems, unless substantial reasons exist for acting otherwise.

Several individual PSOs have adopted more explicit OSS policies, including the Finnish Meteorological Institute (FMS), the National Land Survey (NLS), and the Finnish Transport Agency. The policy of the FMS is based on the principle of OSS as part of

open science. Accordingly, all code that is produced through publicly funded research should be released as OSS (The Finnish Meteorological Institute). The NLS's principle is to prefer the use of open source in the procurement of IT services and in the publication of IT services developed by the NLS. The goal is to maximise the benefits provided for society. As a rule, the results of publicly funded activities must be openly available, and there must be specific grounds for any non-publication. For example, copyrights and information security determine whether applications can be published as open source in full or in part (National Land Survey, 2023).

11.3 Policy goals

OSS policies relating both to procurement and publication of code are motivated by the obligation to maximize the public benefit and to ensure responsible use of taxpayer funds.

When releasing the Covid Tracker code as open source, the Finnish Institute for Health and Welfare cited increased security and quality as reasons for making it public.

11.4 Implementation and support

Between 1992 and 2019, the Public Administration Information Management Advisory Board (JUHTA) acted as a supporting body for the Ministry of Finance and as a co-operation body for public administration authorities. JUHTA was in charge of giving recommendations on public administration information management, including the use of OSS in public administrations

In 2008, JUHTA published an Open Source Procurement Guide for public administrations as an appendix to its National recommendation of terms and conditions of public IT procurement, JHS 166 (JUHTA, 2008). The guideline describes the specific conditions that apply to the acquisition process of OSS in procurement. It also contains information on how public sector actors can handle legal issues pertaining to open source licences, risks, and their management. The guidelines were updated in 2015 taking into account agile development and open source software in the main part of the document.

In February 2009, a recommendation specifically drafted for the use of OSS was adopted (JUHTA, 20019). The Public Administration Recommendation for the use of Open Source Software (JHS 169) aimed to:

- Lower IT-buyers' threshold to take advantage of OSS in public sector acquirements.
- Increase the public sector's IT-buyers' knowledge about OSS.
- Provide advice on how to solve legal and commercial problems on acquiring the software.
- Spread good practices in OSS procurement.

The JHS recommendations as they were on 1 January 2020 are still available for reference and may still be used while bearing in mind that some parts of them are no longer up to date and that support for using the recommendations is no longer available.

11.5 Promotion for reuse

A catalog of Finnish public sector IT projects, which have published their source code on GitHub is maintained by the Finnish Centre for Open Systems and Solutions (COSS) a non-profit association, and made available at avoinkoodi.fi (a simpler list is available in English at Opencode.fi). The projects of more than 20 government ministries and agencies, as well as several municipalities, are listed.

11.6 Success stories

Oskari is a web mapping framework initially developed as Finland's national geoportal. Based on its success the NLS has presented Oskari for consideration by the European Commission's OSOR awards. The development of Oskari began in 2009 when the NLS started to build a national geoportal to support the implementation of the INSPIRE directive. Because a traditional geoportal couldn't completely fulfill user needs, NLS FI decided to create an open source service platform in order to support and encourage a wide use of the national spatial data infrastructure (SDI) as a part of e-Government services. Oskari has since evolved to serve a broad user base, including government agencies, private sector organizations, municipalities, and non-profits, offering tailored mapping applications. The platform's continuous development and active community support have transformed it into a stable and robust ecosystem, accommodating diverse applications and meeting evolving needs over time.

Finland has also leveraged OSS in its response to Covid. The Finnish Institute for Health and Welfare published the source code of the Koronavilkku app openly to ensure its security and quality. In addition, the Koronavilkku.fi, website was built on open source (Finnish Institute for Health and Welfare, 2020).

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12 Country report: France

12.1 Abstract

Policy and stakeholders: A government instruction (Circulaire 5608/SG) provides an advisory policy encouraging the consideration of OSS in acquisition and procurement, or refactoring of existing systems. The release of public sector software is required through the Digital Republic law which considers source code as a type of open data and administrative document. The law is further supported by another government instruction (Circular n°6264/SG) requiring an increased inter-governmental collaboration.

Policy goals: Cost-efficiencies is considered an important goal enabled through the reuse, lower licensing-costs, and increased competitiveness. Transparency and increased sovereignty are highlighted in the context of the Digital Republic law. The ability of attracting skilled IT professionals is also highlighted by the Interdepartmental Administration for Digital (DINUM).

Implementation and support: Guidelines for the use and release of OSS is provided by DINUM, and its Free Software unit, the national government Open Source Program Office of France. The unit supports PSOs in the general implementation of the OSS policies, and facilitates a national cross-sectoral community for knowledge sharing and collaboration. ADULLACT, a municipal association-based OSPO, enables knowledge sharing and collaboration on projects between its members.

Promotion for reuse: The national software catalogue hosted on the code.gouve.fr platform, maintained by the national government OSPO, index large parts of the OSS used and developed by PSOs in France. ADULLACT, further maintains an overview of the projects facilitated and maintained by the association. An additional catalogue focused OSS developed by students and teachers is actively used and maintained by the Association of Computer Science Teachers in France.

Success stories: Many successful stories can be found as the maturity of OSS is high in France. One example concerns Geotrek, a webmapping software suite used to map and display hike routes in the French national parks. The parks and other PSOs collaborate through a decentralized and informal structure, procuring development both individually and collaboratively.

12.2 Policy and stakeholders

PSOs on the national level of government in France are explicitly encouraged to consider OSS in any acquisition and procurement process and any more considerable redesign and refactoring of existing systems, according to the instructions in Circulaire 5608/SG issued by the Prime Ministerial office in 2012 (Secretariat General du Gouvernement Direction des Systèmes d'Information et de Communication, 2012). The instructions further encourage a systematic mapping to identify any OSS alternatives available.

While Circulaire 5608/SG has an inbound consumption-oriented focus, the Digital Republic law introduced in 2016 has an outbound contribution-oriented focus (Loi n° 2016-1321 du 7 octobre 2016 pour une République numérique (1), 2016). The law, which is mainly focused on open data, effectively considers source code as an administrative document and type data to be made available to the public and, by extension, requires software developed through public funds by PSOs on all levels of government to be made available as OSS. The law considers OSS to be released in terms of four categories:

- Level A – Contributory: Source code is published, external contributions are actively sought and processed.
- Level B – Open: source code is published, external contributions are processed but not actively sought.
- Level C – Published: Source code is published, but outside contributions are not processed.
- Level D – Unreleasable: Source code is not released to the public.

The law's orientation was further emphasized through instructions in Circular n°6264/SG (Circulaire n°6264/SG du 27 avril 2021 relative à la politique publique de la donnée, des algorithmes et des codes sources, 2021). The instructions further warranted the need for inter-governmental collaboration on OSS through DINUM (Interdepartmental Administration for Digital - Direction interministérielle du numérique), which led to the creation of the common software catalogue on code.gouv.fr building on top of preexisting catalogues (Direction Interministérielle du Numérique, n.d-a), and the expansion of responsibilities of department administrators per each ministry responsible for the implementation of the instructions in their ministry.

12.3 Policy goals

An important and highlighted policy goal relates to cost-efficiencies through the reuse and lower licensing costs. The intended impact has been verified through studies showing how the French policies have led to a substantial increase in contributions to OSS projects on the general level from France, which has helped to generate "a social value of $20 million per year", as well as a noticeable increase of growth in new technology-oriented startups and IT employees (Nagle, 2019). Beyond the economic aspects, other highlighted policy goals include transparency (especially in the context of the Digital Republic law), and increasing the attractivity of the public sector towards technically skilled workforce needed within the public sector.

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 (Loi n° 2016-1321 du 7 octobre 2016 pour une République numérique (1), 2016). Yet, the topic is not on the level of debate in terms of OSS as in, e.g., Germany and Sweden, and mainly discussed from a cloud and AI-perspective.

12.4 Implementation and support

Several guidelines and resources are in place to support the implementation and execution of the several policies that apply. One important resource is the contribution policy, which defines rules, principles, and best practices for PSOs to consider when releasing software as OSS (Direction Interministérielle du Numérique, 2019). The policy has been iteratively developed and validated through different actors inside and outside the government. In 2024, the contribution strategy will be replaced by a more comprehensive set of documentation providing guidance on the use, development and release of OSS (Direction Interministérielle du Numérique, 2023).

Licenses to be considered (by PSOs on all levels of government) is declared in Décret n° 2021-1559 (Décret n° 2021-1559 du 1er décembre 2021 complétant la liste des licences de réutilisation à titre gratuit autorisées pour les administrations, 2021), including both a set of permissive licenses and those with obligation of reciprocity. Further clarification and description are provided through the external Open platform of French public data (Direction Interministérielle du Numérique, n.d.). Default is that no restrictions should apply and that any restrictions need to be clearly justified with regard to the public interest, hence, pointing towards a preference of permissive licenses over copyleft alternatives.

The guidelines are further supported and maintained by the Free Software Unit inside DINUM, a National-government Open Source Program Office (OSPO), providing a general support function and centre of competency for OSS matters inside the French public sector. The OSPO was initiated after recommendations several sources, including Circular n°6264/SG (Circulaire n°6264/SG du 27 avril 2021 relative à la politique publique de la donnée, des algorithmes et des codes sources, 2021), the OSS and Digital Commons Action Plan (Ministère de la Transformation et de la Fonction publiques, 2021), and a precursive parliamentary report by Bothorel et al. (2020). In line with the several source, the OSPO provides support and training for PSOs to enable the use, development, and release of OSS.

As part of this mission, the OSPO is also tasked with facilitating BlueHats, a cross-sector community of individuals and organisations focused on the adoption and development of OSS in the public sector (Direction Interministérielle du Numérique, 2021). Related to BlueHats, the OSPO 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, n.d.-c).

Beyond the national government OSPO constituted by the Free Software Unit at DINUM, there is also what may be compared to as an association-based OSPO (Linåker, 2023) in the case of ADULLACT (n.d.), founded in 2002. The association aims to enable its members of regions and municipalities to share knowledge and develop best practice. A secondary objective is to collaborate on common OSS projects and related initiatives, both in terms of development and hosting, functions financed through the organisation’s membership fees.

The sustainability of OSS is of national concern, for example, indicated through Circulaire 5608, which recommends that 5-10 percent of any funds saved through an

OSS-related acquisition is dedicated to contributing back to the concerned OSS projects and their dependencies. Guidelines and support from the National government OSPO is also focused on encouraging contributions back to OSS projects that are used and developed further. The level of sustainability of a project is also a factor in the consideration before adopting an OSS. General guidelines for such considerations are, however, not available for the moment.

On the single PSO-level, there are examples that do consider sustainability a top priority. The French National Agency for the Security of Information Systems (Agence nationale de la sécurité des systèmes d'information – ANSSI), serving under the Prime Minister's office as the national authority on cybersecurity, sees OSS as a critical aspect in its mission to understand, prevent and respond to cyber risk. They have an OSS strategy in place developed with the support from the National government OSPO. In their work, ANSSI supports and contributes to critical projects, including RUST, the Linux kernel, and the Debian project (Agence nationale de la sécurité des systèmes d'information, 2023). They contribute both in terms of funding and sponsorship, technical writing, and code, and participate in key security related foundations and projects such Suricata, a high-performance engine for detection and prevention of intrusion into computer networks, hosted under the Open Information Security Foundation.

12.5 Promotion for reuse

The national software catalogue hosted on the code.gouve.fr platform, maintained by the national government OSPO, index large parts of the OSS used and developed by PSOs in France (Direction Interministérielle du Numérique, n.d-a). Projects considered to have higher potential for reuse are listed explicitly on a short-list (Direction Interministérielle du Numérique, n.d.-d). The association-based OSPO, ADULLACT, further maintains an overview of the projects facilitated and maintained by the association (ADULLACT, n.d.-b). An additional catalogue focused OSS developed by students and teachers is actively used and maintained by the Association of Computer Science Teachers in France (Association des enseignantes et enseignants d'informatique de France, n.d.). In terms of GitHub (n.d.), 45 PSOs have registered their organisations as hosting OSS projects on the platform.

12.6 Success stories

The number of OSS projects developed and maintained by the French public sector is, accordingly, extensive. Two success stories worth highlighting regards the projects Demarches-simplifies.fr (n.d.), and Geotrek (n.d.), both finalists in the Open Source Observatory OSS awards (Open Source Observatory, 2023). Demarches-simplifies is a platform designed to meet the urgent need of the state to apply the directive of 100% dematerialization for administrative procedures.

Geotrek is a webmapping software suite used to map and display hike routes in the French national parks. The project in developed by a set of national parks in France in close collaboration with a vendor, although others are also involved. The governance and development process is decentralized and informal, where each PSO procures development needed enabled due to a modular architecture. For common needs, the

PSOs pool funding and create a more comprehensive procurement including multiple vendors to avoid lock-in, and grow new suppliers that can support the PSOs in implementing the OSS.

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13 Country report: Iceland

13.1 Abstract

Policy and stakeholders: There is an advisory policy from Digital Iceland, a unit within the Ministry of Finance and Economic Affairs, that encourages the release of public sector software as OSS. A more formal policy is in place from the Prime minister's office advising on the consideration of OSS in any acquisition or procurement process.

Policy goals: Increased transparency, reusability, standardization of services, and vendor-independence are the main policy goals highlighted in the digital strategy and the dedicated OSS policy. Increased innovation and cost-efficiencies are also highlighted.

Implementation and support: Technical guidance on how to develop and release OSS is provided by Digital Iceland, who also provide reoccurring related training sessions for PSOs. They develop general digital infrastructure using an open-by-default approach, and actively help other PSOs to integrate to the infrastructure, which involves both training and awareness building in line with the Digital policy.

Promotion for reuse: Digital Iceland enables reuse of common components in the integration of PSO's backend systems into the Island.is platform. Components of the platform is also actively reused PSOs and service suppliers developing integrations towards the platform.

Success stories: The Island.is platform provides a common front-end to government services and integrates common services such as single-sign-on, and personal inboxes. Each PSO can then integrate into the platform with their own systems based on their own needs. The integration on the X-road OSS project further simplifies data sharing. The development is carried out iteratively through teams of developers procured from several service suppliers to allow for an agile requirement process and avoid lock-in to any specific vendor.

13.2 Policy and stakeholders

Iceland's current policy on OSS is defined and shaped by Iceland's digital policy, which encourages publicly funded and developed OSS to be released as OSS. Actions listed in the policy include the cooperation "on digital services across borders, e.g., a pilot project on activating electronic IDs between the Nordic countries and the Baltic states" and "with diverse companies through open software continued by Ísland.is" (Digital Iceland, 2021).

The policy is owned by Digital Iceland, which is a unit within the Ministry of Finance and Economic Affairs. The unit, however, works horizontally across government, closely with ministries, institutions, and municipalities on digital reforms. The unit considers OSS part of its Digital Standard (Digital Iceland, n.d.-a.), encouraging reuse and collaborative development. While the digital policy applies to all PSOs, Digital Iceland has internal policy further detailing the consideration and use of OSS in the

internal development of the agency (Digital Iceland, 2023). As Digital Iceland supports other PSOs in using and integrating to the common infrastructure, the policy also has implicit implications for these PSOs as well.

In terms of the use and adoption of OSS, in the context of acquisition and procurement, there is an explicit polity from 2008, which emphasizes that OSS and proprietary options should be considered equally in any acquisition and procurement process (Prime Minister's Office, 2007). The policy further states that any acquisition or procurement should use OSS and open standards as far as possible to enable compatibility and data transferability and avoid becoming locked into any specific vendor or technology. While the policy is still valid, the implementation of it is limited and has been replaced to large extents by the digital policy which calls for the use of standardized solutions that enables reuse among PSOs, where OSS is considered one of the mechanisms available.

13.3 Policy goals

The digital policy of explicates that OSS is a means of "developing digital services and innovative solutions [...] in cooperation with a diverse group of companies and experts" (Digital Iceland, 2021). Increased standardization, and reusability of services along with innovation and transparency and a closer gap between the public and private sectors are highlighted drivers. Cost-efficiency through reuse is also an important driver, as is that of avoiding lock-in to single vendors. Digital sovereignty is discussed generally in terms of data management and use of cloud services in general and less in relation to how OSS may be considered an instrument in the context. Potential for cost-efficiencies and increased transparency are further emphasized in the Digital Standard of Digital Iceland (Digital Iceland, n.d.-a.).

The digital policy is also in line with the Ministry of Finance and Economy's general plan for government operations for 2021-2022, which highlights the need to make use of and promote as a means for sharing software, reducing development costs, and increased innovation (Ministry of Finance and Economy, 2022a; 2022b). The OSS policy from 2008 highlights reusability as an explicit goal for any software financed with public money, and as a means of achieving vendor-independence.

13.4 Implementation and support

Following the establishment of the policy in 2008, a working group was initiated with the goal of providing an action plan on how OSS could be introduced into PSOs (Hillenius, 2012). The action plan noted that the country is too small to warrant a competence centre for providing support to PSOs in adopting OSS-based solutions. Instead, a project manager, together with a group of experts, was proposed to support a transition towards OSS among the larger public institutions, including all the ministries, the city of Reykjavik, and the National Hospital. These were to provide models for others to follow and create a foundation on which migration plans could be based (Hillenius, 2012).

The action plan also proposed the creation of a platform with information, educational material, and communication tools to facilitate knowledge sharing and networking.

Dedicated conferences and meetings would help to strengthen knowledge sharing. Other actions proposed included the increased use of OSS in universities, the introduction of OSS on school curriculums, a website with OSS used and released by PSOs, and a general procurement framework for software services. Specific recommendations included the priority of OSS in grant allocations and that software developed with public funds should be released as OSS.

Much of the support defined in the action plan is today carried out by Digital Iceland, who works horizontally across the Icelandic public sector. Technical guidelines and best practices are provided through online resources. Reoccurring trainings are also facilitated on best practices in terms of agile development and use of OSS.

Digital Iceland is, however, very developer-centric as they develop much of the public services through the joint platform Island.is. They strive to develop and release as much as possible as OSS to avoid lock-in effects and enable the reuse of components, not just inside the government but also in industry, which actively contributes to and reuses the publicly funded and released OSS components. The platform and its components are permissively licensed under the MIT license to enable broad adoption of the OSS.

To further avoid any lock-in while also improving innovation outputs, Digital Iceland has adopted an agile approach in its development where expertise and development resources are procured in teams from multiple consultancies and assigned to tasks based on current needs. External collaboration is also highlighted as a core enabler, exemplified through a centre of excellence with 14 technology partnerships in place. Standardised tools, platforms, and components, of which a large part is OSS, are used and reused to increase the development pace and rigor.

13.5 Promotion for reuse

Digital Iceland enables reuse of common components in the integration of PSO's backend systems into the Island.is platform. Components of the platform is also actively reused PSOs and service suppliers developing integrations towards the platform.

13.6 Success stories

The X-road OSS project is used, through the Stream service, to connect public sector organisations with each other and ensure safe and traceable communication of data. Iceland is members of the international collaboration NIIS (Nordic Institute for Interoperability Solutions) which is working on the development of the X-road OSS project (Digital Iceland, nd-c).

The Island.is platform hosted by Digital Iceland, is openly and actively developed as OSS on GitHub, counting 133 contributors to date, and has a mature development infrastructure and documentation. The platform provides a centralised home for integrating, hosting and developing digital services across government such as the Digital Mailbox, and the aforementioned Stream service (Digital Iceland, nd-b.). Citizens can access the services and manage different life events via a common interface (Open Access Government, 2023). An increasing number of services are being

developed and integrated to the platform, as are the number of public institutional websites being transferred to the platform, both explicit goals in the Digital Policy (Digital Iceland, 2021).

While the platform provides a unified interface for government services, the data and much of the underpinning services are still managed in a distributed manner by the different PSOs responsible for the specific use case, e.g., taxes or social welfare. This is an intentional policy within the national government to enable each agency to make and execute their own decisions while still improving accessibility and quality of service to the citizens. The platform is modelled with input from GOV.UK, and developed with experiences from other countries such as Estonia and Finland.

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14 Japan

14.1 Abstract

Policy and stakeholders: While there is no national level OSS policy focused on public sector use, the Ministry of Economy, Trade and Industry (METI) has been promoting OSS uptake by Japanese tech companies since the early 2000s as part of an externally focused industrial strategy.

Policy goals: The Japanese government has acknowledged the potential benefits of OSS for the country's economy, focusing on technological independence, economic development, and security.

Implementation and support: In 2019, METI established a Task Force for Evaluating Software Management Methods, etc. toward Ensuring Cyber/Physical Security. The taskforce has published a report on management methods for ensuring the security of OSS as well as a guidance document on the introduction of Software Bill of Materials (SBOM) for software management.

Promotion for reuse: There is no official government catalogue of public sector OSS solutions but the Japan OSS Promotion Forum (JOPF), a business association, has published an annual overview of OSS solutions used in Japan since 2014.

Success stories: A Japanese version of Decidim**,** an open source platform for citizen participation has been used in several local democracy initiatives. After being released as open source, the Tokyo Metropolitan Government Stopcovid19 website received more than 2,000 improvement requests. The source code has since been reused by local authorities in 54 regions.

14.2 Policy and stakeholders

The Japanese government, through the Ministry of Economy, Trade and Industry (METI) has been using and promoting OSS since the early 2000s. In 2003, Japan, along with China and South Korea, signed a cooperation agreement for the joint development of non-Microsoft software products, with a specific emphasis on OSS, seeking cost reductions and technological independence.

In 2004, METI published a guideline endorsing the usage of open software. Since then, the majority of government activities related to OSS has been focused on industrial support. There is currently no explicit encouragement or preference for OSS with regards to the public sector's own development or acquisition of software at the national level.

14.3 Policy goals

The Japanese government's interest in OSS relates to the potential benefits for the country's economy, focusing on technological independence, economic development, and security.

14.4 Implementation and support

One of the outcomes of the first Northeast Asia OSS Promotion Forum was the establishment in 2004 of the Japan OSS Promotion Forum (JOPF). Its membership consists of more than a hundred organisations from both the public and the private sector with METI participating as an observer. Its activities involved support of OSS adoption in various sectors through committees and working groups. JOPF also maintains the Open Source License Laboratory (OLL) which contributes to OSS licensing research and promotes healthy OSS use.

On September 5, 2019, METI established a Task Force for Evaluating Software Management Methods which focuses on examining appropriate software management methods, responses to vulnerability and license issues. In 2021 the Task Force published a "Collection of Use Case Examples Regarding Management Methods for Utilizing OSS and Ensuring Its Security". The document summarizes the points to note when utilizing OSS, and for each point, provides use case examples. The compilation was extended in 2022 with five new case studies.

In July 2023, the Task Force published a second document entitled “Guidance on Introduction of Software Bill of Materials (SBOM) for Software Management.” The guidance is aimed at software suppliers as a compilation of the advantages of introducing SBOM in companies and the key points that companies should recognize and undertake in actually introducing SBOM.

The guide provides basic information on SBOM, including advantages of introducing SBOM to companies, addressing misconceptions, and presenting key facts. It outlines key phase-by-phase points for companies to recognize and implement wheb introducing SBOM, namely [i] Environment and system development phase, [ii] SBOM production and sharing phase, and [iii] SBOM use and management Phase.

14.5 Promotion for reuse

There is no official government catalogue of public sector OSS solutions but the Japan OSS Promotion Forum (JOPF), a business association, has published an annual overview of OSS solutions used in Japan since 2014.

14.6 Success stories

In 2020, the initial Japanese version of the Decidim platform, developed by Professor Yoshimura of the University of Tokyo’s Research Centre for Advanced Science and Technology and Hal Seki, Representative Director of Code for Japan, was shared on Code for Japan’s Github. Its adoption by Kakogawa City Hall in Hyogo Prefecture marked the beginning of a series of successful initiatives, including the Yokohama City Engagement Platform, the Cabinet Office's Smart City Guidebook Subcommittee, the Hyogo Prefecture version of Decidim, and the Liberal Democratic Party of Yokohama City Councilors’ Mirai Creative Platform.

Another noteworthy example is the Tokyo Metropolitan Government Stopcovid19 website, which, upon release as open source, garnered over 2,000 improvement

requests. The source code has been widely reused across Japan, resulting in the creation of 63 sites in 54 regions as of April 20, 2021. Furthermore, 13 prefectures and cities have employed the source code as official websites, fostering collaboration among local governments to address issues facing Japan collectively.

14.7 References

15 Luxembourg

15.1 Abstract

Policy and stakeholders: While there is no government policy focusing solely on OSS, the programme of the 2018-2023 government programme includes a specific mention to promote its use within the public administration. The National Interoperability Framework of Luxembourg recommends but does not prescribe OSS.

Policy goals: OSS policy statements appear to be motivated by two sets of influences. On the one hand, OSS is seen as part of the government's commitment to open innovation and collaboration with the private sector. Specific initiatives have also been motivated with reference to enhanced cybersecurity and digital sovereignty.

Implementation and support: There are no specific structured proposals or policies for providing direction or guidance for OSS on the national level but the Luxembourg House of Cybersecurity is in the process of establishing an OSPO which may serve as a blueprint for other PSOs.

Promotion for reuse: There is no central catalogue of public sector OSS projects but the Luxembourg House of Cybersecurity is on GitHub and the Catalogue

Success stories: Launched by the Ministry for Digitalisation in 2023, LuxChat is an open source platform for real-time communication using Matrix open standard and protocol. Motivated by data security and digital sovereignty concerns, the Luxchat services provide end-to-end encryption and retain all messages in decentralised servers located in Luxembourg.

15.2 Policy and stakeholders

While Luxembourg lacks an explicit policy focused solely on Open Source, its government places a strong emphasis on "open innovation" and the programme of the 2018-2023 coalition (Luxembourg Government, 2018) includes a specific mention of the intention to promote the use of OSS, open standards and open data within the public administration.[27] In addition, the Ministry for Digitalisation which was created in 2018 lists "open by default" as one of its strategic axes (Ministry for Digitalisation, 2018).

OSS is further mentioned in the National Interoperability Framework (NIF) which was adopted by the Government Council in 2019 and which applies across the public sector of Luxembourg (Ministry for Digitalisation (2019). The first of 11 principles of the NIF relates to "Openness" and includes the following specific recommendations:

- Ensure fair conditions for 'open source' software and actively and fairly consider the use of such software, taking into account the total cost of ownership of the solution.

[27] https://gouvernement.lu/dam-assets/documents/actualites/2018/12-decembre/Accord-de-coalition-2018-2023.pdf

- Apply by default, for new services, the principle of openness when defining the architecture of information systems.
- Prefer open specifications, duly considering functional needs, maturity, market adoption, and market innovations.

However, according to the document, public sector entities may use “less open” or “not open” specifications or software when open alternatives do not exist, when such alternatives do not cover functional needs, have not reached a sufficient level of maturity or quality, or when they do not have sufficient market adoption.

15.3 Policy goals

The above policy initiatives should be seen against the background of a significant effort by the Luxembourgish government to achieve digital government. To support Luxembourg in this transition, the Ministry for Digitalisation has commissioned a study from the OECD to evaluate how the country lines up with the principles in the *Recommendation of the Council on Digital Government Strategies*, including “Openness and Engagement” which encourage governments to be open, transparent and inclusive in their processes and operations, and to engage with stakeholders from the public sector, private sector and civil society. The review process revealed that further efforts can be done to advance towards a Government as a Platform approach with the implementation of a toolbox of common enablers and components that ministries and administrations can easily reuse (OECD, 2020[6]).

The promotion of open technologies is thus framed in the general context of open government and open innovation. Additional drivers include cybersecurity and digital sovereignty concerns which motivated the decision to develop LuxChat, a national secure instant OSS messaging solution. The cost-saving argument is less prevalent in Luxembourg although the NIF mentions that OSS can contribute to lower development costs and reduce lock-in effects.

15.4 Implementation and support

There are no specific structured proposals or policies for providing direction or guidance for OSS on the national level (Thill, 2023). The Luxembourg House of Cybersecurity (LHS), under the Ministry of the Economy (Ministère de l’Économie) is in the process of establishing its OSPO supported by a core team of experts within the Ministry. The intention is that the OSPO at The House of Cybersecurity will serve as a blueprint for PSOs in Luxembourg.

The LHS is the backbone of leading-edge cyber resilience in Luxembourg and aims at capitalising on and further developing innovation, competencies, collaboration and capacity building. It has published a report on the value of open source in the open data community. The report highlights the role of OSS in advancing European digital autonomy, promoting application sharing and reuse, and fortifying our economy's digitization. The specific recommendations include establishing a national catalog of open-source applications for both public and private sectors, increasing awareness and utilization of open-source code, bridging the gap between management and developers, emphasizing end-user feedback in open-source projects, facilitating public funding for

small entities, and fostering policy innovation through the creation of an Open Source Programme Office.

While not explicitly focused on OSS, the National Committee for Interoperability (CNI) was established in 2019 to advance interoperability generally at the national and sectoral level. The Ministry for Digitalisation has also set up a Competence Center for Interoperability (CCIO) which is meant to act as a coordinator of NIF-related activities and initiatives.

15.5 Promotion for reuse

There is no central catalogue of public sector OSS projects but the Luxembourg House of Cybersecurity is on GitHub,[28] some of the products listed in the catalogue of the National Interoperability Committee is OSS.[29] In addition, the Open Data platform in Luxembourg lists some of the Open Source software developed by local organisations[30]

15.6 Success stories

There are many prominent initiatives in Luxembourg relating to the use of OSS solutions. LHS has long established practice of developing OSS tooling for their own use cases. One notable example concerns MISP, an OSS cyber threat management and sharing platform with an active community with contributions from governments, banks, and private companies worldwide. The experience is behind the ambition to make Luxembourg a pioneer in the open cybersecurity data economy through OSS.

Launched by the Ministry for Digitalisation in 2023, LuxChat is an open source platform for real-time communication using Matrix open standard and protocol. Motivated by data security and digital sovereignty concerns, the Luxchat services provide end-to-end encryption and retain all messages in decentralised servers located in Luxembourg.

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[29] https://digital.gouvernement.lu/dam-assets/dossiers/nif/iop-product-catalogue-of-the-national-interoperability-committee-01-00.pdf
[30] https://data.public.lu/fr/datasets/?q=open%20source

OECD the "Digital Government Review of Luxembourg", from the Organisation for Economic Co-operation and Development (OECD).

Thill (2003)

16 Ireland

16.1 Abstract

Policy and stakeholders: While OSS solutions are used quite widely throughout the Irish public sector, there is no specific policy that explicitly encourage such uptake**.**

Policy goals: Recent statements by the Irish government CIO has emphasized the potential of OSS to enable pan-societal and pan-European activities as well as enhance collaboration, security, and transparency.

Implementation and support: There are no specific national-level initiatives.

Promotion for reuse: There are no national-level initiatives to promote public sector OSS solutions.

Success stories: The Irish government has recognized the value of using open source in its response to the COVID pandemic. The source code for Ireland's Covid tracker was published as open source on GitHub.

16.2 Policy and stakeholders

While OSS solutions are used quite widely throughout the Irish public sector (Joinup, 2020), there is no specific policy that encourage such uptake. (SCL, 2008) In 2004, the Minster for Finance acknowledged the potential of OSS with regards to accelerating internal processes and improving eGovernment without endorsing its use. The procurement policy of the Irish public administration is described as having emphasis on value for money, open competition, and the best technological fit. Without explicitly mentioning OSS, products are to be evaluated on their merits, including openness in terms of future procurement and, where possible, avoidance of lock-in to a particular supplier. With respect to the costs of software, consideration is given to the total cost of ownership which, in addition to the licensing element, also includes the issues and costs associated with development, maintenance, customisation, adherence to open standards, etc.[31]

16.3 Policy goals

As noted above, there are no official strategies or policy programmes explicitly encouraging OSS use, but in recent statements the Irish Government CIO (Department of Public Expenditure and Reform) has acknowledged the potential for open source to support better collaboration, stronger security and greater transparency (Skillnet Ireland, 2022). With regards to its experience developing an open source Covid Tracker, the Irish Health Executive has emphasized open innovation aspects,

[31] https://www.oireachtas.ie/en/debates/debate/dail/2004-11-24/49/?highlight%5B0%5D=open&highlight%5B1%5D=source&highlight%5B2%5D=software&highlight%5B3%5D=source&highlight%5B4%5D=open&highlight%5B5%5D=source&highlight%5B6%5D=software&highlight%5B7%5D=software&highlight%5B8%5D=open#s124

describing it as “a great demonstration of innovation within the Irish health sector combined with the IT capabilities of the Irish software industry”. Both the possibility of assisting others by allowing countries to build their own app based on Ireland’s code, as well as the possibility that Ireland’s development team can benefit from work undertaken by other countries to improve the code and effectiveness of the app has been recognized. (Digital Health, 2020)

16.4 Implementation and support

There are no national-level initiatives to mention.

16.5 Promotion for reuse

There are no national-level initiatives to mention.

16.6 Success stories

The Irish government has recognized the value of using OSS in its response to the COVID pandemic, notably through the development of the COVID Contact Tracing App and the Digital COVID Certificate at the European level. Collaborating with software company NearForm, the government successfully launched the tracing app in 3months (Nearform website). Within 48 hours of its release on July 7, 2020 it reached one million download – an accomplishment lauded by Ireland's Minister for Health, Stephen Donnelly. (Digital Health, 2020)

The app’s code was open sourced under an MIT licence and made available on GitHub, along with a series of app design and development reports and documentation. The code has since been used to develop apps in Gibraltar and Northern Ireland, as well as other countries in Europe, the Middle East and Africa, and states in the US, providing digital contact tracing for 55 million people (O’Callaghan et al., 2022)

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17 Country report: Malta

17.1 Abstract

Policy and stakeholders: A national policy on OSS is provided by the Malta Information Technology Agency (MITA) provides, advising on both the release of public sector software as OSS, and for the consideration of OSS in an acquisition process.

Policy goals: Cost-efficiencies and interoperability between services are key policy goals highlighted in the OSS policy and overarching digital strategy of the Malta Information Technology Agency.

Implementation and support: MITA is seen as the main source of support on the use and development of OSS. The support was more formalized when the country's OSS policy was first introduced.

Promotion for reuse: A public sector-internal marketplace is available promoting reuse of software developed by PSOs, not necessarily available as OSS.

Success stories: The reuse and customization of a risk assessment tool, and proximity tracing protocol for tracing apps was performed by MITA during the Covid crisis, illustrating a broader collaboration both between the international community and Maltese PSOs, including the Ministry of Health, MITA, and the University of Malta.

17.2 Policy and stakeholders

The latest OSS policy was adopted in 2019 through the Malta Information Technology Agency (MITA) (2019), addressing all PSOs. This is the third version of the strategy, whereas the first one was defined in 2010 because of the Smart Island strategy launched in 2008 (Malta Information Technology Agency, 2008). The policy addresses the acquisition of OSS in terms of adoption, procurement, reuse, distribution, and licensing of OSS.

PSOs shall actively consider and pursue the adoption of OSS when deemed cost-effective and superior to its alternatives. OSS-based solutions should be evaluated on the same merits as any software solution and in alignment with the general Maltese procurement guidelines and regulations. The policy highlights the importance of the OSS to fulfil all business requirements that preside and that there is no disruption or negative impact on related and interconnecting IT infrastructure. The need for support arrangements on any OSS is explicitly stated.

In terms of reuse, the policy recommends that established OSS projects should be investigated, both on a national and European level. Regarding distribution, organisations are to consider the option of open sourcing software where they have IP ownership to its source code. This should be done on a case-by-case basis, considering appropriate OSS business models, and done under the EUPL license.

17.3 Policy goals

The purpose of the OSS policy is to encourage the adoption of cost-effective OSS throughout the public sector and maximize the distribution and reuse of solutions as OSS. This is in line with MITA's overarching strategy, which further stresses the need to design solutions that are interoperable, scalable, and, within legal parameters, share and reuse software, services, and data – all well in line with the opportunities and rationale for considering OSS.

17.4 Implementation and support

The previous version of the policy was released in 2010, along with a white paper by the MITA (2010). Several suggestions were proposed to support the implementation and enablement of the policy, e.g., the establishment of a general OSS policy along with appropriate processes and guidelines to support the acquisition of OSS. The guidelines highlight the need to perform an analysis of the total cost of ownership for the OSS to enable a comparative evaluation between different alternatives. Templates have also been developed to enable the consideration of OSS in a simpler and more harmonized approach. Early on, MITA provided support on training and application of the guidelines. This knowledge is now considered to be spread out across PSOs.

An internal discoverability platform for OSS was also suggested, along with an End-User group of experts, including civil administrators from the Malta Information Technology Agency, IT service providers, academics, and representatives from the Malta OSS community (Hillenius, 2010). The End-user group provided a means to educate and raise awareness among decision-makers within different PSOs, including the Malta Information Technology Agency, on how to use and consider OSS in operations and acquisition processes.

The white paper also triggered an intensified collaboration with local vendors, as well as European networks. Showcasing of solutions, knowledge-sharing on their implementation, and promotion of reuse within and across borders were the main drivers. The white paper further suggests collaboration and guiding universities and education providers on developing and providing training on OSS, both for teachers and students, something that is considered to be implemented.

17.5 Promotion for reuse

The discoverability platform suggested by the aforementioned white paper may be compared to a marketplace consisting of software developed and used by Maltese PSOs. These do not necessarily have to be released as OSS. The main driver is to enable and motivate reuse between PSOs. The marketplace is still active today but closed and only available for public servants.

17.6 Success stories

During Covid, MITA leveraged OSS as a mechanism to develop tools and infrastructure to enable tracking of incidents. One example includes the Risk Assessment Tool,

originally developed during the Hack the Crisis hackathon organized by Garage48 and Accelerate Estonia. The project was reused and further developed by the Maltese COVID-19 Response Team and the University of Malta. The former included representatives both from MITA and the Ministry of Health. A related project, also reused and customized to the Maltese context by MITA was the Decentralised Privacy-Preserving Proximity Tracing (DP3T) project, an open protocol for COVID-19 proximity tracing using Bluetooth Low Energy functionality on mobile devices, which ensures that personal data and computation stay entirely on an individual's phone (GitHub, 2021). The protocol was developed by a core team of over 25 scientists and academic researchers from across Europe.

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18 Country report: The Netherlands

18.1 Abstract

Policy and stakeholders: Consideration of OSS in the acquisition and procurement process as been encouraged in advisory government policies since 2007 originating from the Ministry of Economy. In terms of release, an "Open, unless" policy has emerged through several government reports, mainly originating from the Ministry of the Interior and Kingdom Relations. The policy gives preference to the release of public software as OSS unless special circumstances apply. This has further been strengthened in the Open Government Act where source code can be requested to be published as OSS through a public request.

Policy goals: Transparency into algorithms and public services, along with increased control and sovereignty over technical sourcing and design decisions are specifically highlighted, along with the potential for a more efficient, streamlined, and collaborative government.

Implementation and support: Several reports provide understanding on the benefits and risks of OSS, and in terms of how to assess whether a public sector software can be released in alignment with the "Open, unless" policy. The OSPO within the Ministry of the Interior and Kingdom Relations focus on supporting its related agencies in implementing the policy, but also provides a source of knowledge for the general public sector. The Dutch Association of Municipalities (VNG) further acts as an association-based OSPO where municipalities can pool resources and collaborate on the development of common OSS projects. The Dutch OSPO-network further helps to foster cross-governmental and sectoral collaboration and knowledge sharing.

Promotion for reuse: The Developer Overheid platform provides a library of both API:s and OSS repositories from the various PSOs across the Dutch public sector. There is a long-term goal to evolve the platform to a common source code storage and collaboration platform, e.g., based on the OSS social coding platform GitLab, an approach adopted e.g., by the German government.

Success stories: Signalen, an incident report system for public spaces is a OSS project which emerged organically and is developed and maintained by a team of developers within the City of Amsterdam. Currently, the intention is to move the ownership of the project to VNG and for the association to serve as a neutral hosting ground, enabling further communities to join and collaborate on the project.

18.2 Policy and stakeholders

Consideration of OSS in the acquisition and procurement process was encouraged in 2002 through a parliamentary vote requiring that OSS be considered on equal grounds as with proprietary options (Bressers, 2005; Procee et al., 2022). This was later formalized in a government action plans on the use of OSS and open standards (Ministry of Economic Affairs, 2007), and later reemphasized in a subsequent government action plan (OSOR, 2012).

In terms of the release of software developed through public funds as OSS, political consensus was formed later in 2016 through the discussion and adoption of parliamentary motions (Oosenbrug, 2016; Oosenbrug et al., 2016) and questions (Thaens and van IJzerloo, 2017) on the topic. A series of reports were triggered as a consequence of investigating the benefits, needs, and conditions for OSS adoption in the Dutch public sector (Gartner, 2017; Thaens and van IJzerloo, 2017).

Continuing from the earlier reports, the Digital Government Agenda in 2018 iterates on the need to remove legal barriers and develop knowledge on the publication and adoption of OSS (Digital Government, 2018). The subsequent Government Data Agenda highlights OSS as an instrument for increasing transparency in terms of algorithms and the use of data by PSOs (Digital Government, 2019).

A formal policy letter on the open sourcing of government software, aligning with earlier motions from 2016 (Oosenbrug, 2016; Oosenbrug et al., 2016), was sent to the parliament in 2020 (Knops, 2020a). The letter introduced the principle of "Open, unless", implying that government software should be open sourced by default except for on a case-by-case basis if special conditions apply, e.g., related to security, integrity, or if the cost of open sourcing greatly exceeds the expected return. The policy is today considered a guideline addressing all of the government, encouraging the release of OSS.

The letter further highlights the need for the Market and Government Act to be revised as it was considered to require the costs of creating and publishing the source code to be charged, thereby inhibiting the contribution and release of OSS by PSOs (Knops, 2020a), something that has been suggested in earlier work as well (Gartner, 2017). A more recent report, however, indicates that the law does not have to be an obstacle to publication, and the Cabinet has also submitted an amendment to the law to further clarify this aspect (Procee et al., 2022).

The adoption of the Open Government Act (Wet open overheid), considering government-owned source code as general government information, further requires PSOs to make source code public on request, provided this is possible without disproportionate effort (Procee et al., 2022). Such a process is initiated through a freedom of information request of source code related to a specific software. This has only been trialed a few times, most notably of the Digital Identification software DigiD developed by Logius (2023). The case is looked to as setting a precedence for how freedom of information requests can be made for software. The Reuse of Government Information Act further requires PSOs to facilitate the reuse of that code as much as possible, e.g., by choosing a licence that clearly explains the rights under which the software may be reused.

18.3 Policy goals

In their action plan from 2007, the Ministry of Economic Affairs explicates the need for "*promotion of a level playing field in the software market and promotion of innovation and the economy by forceful stimulation of the use of open source software and by giving preference in contracts to open source software if equally suitable.*"

Rationale and benefits underpinning the “Open, unless” policy are many, as identified through the great set of reports. Transparency provides major driver, e.g., into algorithms and software behind government decisions or calculation models (Digital Government, 2019). This has been highlighted by recent examples of how such algorithms can be used unethically (DutchNews, 2021). The Open Government Act and the possibility to make freedom for information requests provides an important lever for such transparency (Logius, 2023).

Digital sovereignty and supplier independence is another driving force that has increased in importance in recent years (Thaens and van IJzerloo, 2017). The Digital Commons framework is highlighted as means of creating and supporting a technically sovereign digital infrastructure, both on the national and European levels (van Huffelen, 2023). A third policy and value driver highlighted regards the general reuse of software and how this can render in a more efficient, streamlined, and collaborative government (Gartner, 2017).

18.4 Implementation and support

Support initiatives have been implemented and suggested iteratively since 2003 with the initiation of the Open Standards and Open Source Software (OS&OSS) program, which, among other things, included the creation of the first national government OSPO focused on educating and creating guidelines for procurement and acquisition. The OS&OSS program was later disbanded in 2005.

A later report investigated the need for a new National-government OSPO and specific knowledge in terms of how to consider OSS in an acquisition and procurement process (Thaens and van IJzerloo, 2017). While there was limited interest in funding an OSPO, there was consensus on the need to grow and share knowledge on the benefits of OSS and how to enable consideration of it in tender processes. The report recommends that a referral system of OSS experts be established and that a software catalogue be created like the US code.gov platform, which facilitates discoverability and reuse of OSS used and developed by the government (much of what is already done for open data sets), and that procurement expertise on OSS is developed. The latter should help raise knowledge both inside the government and among vendors to increase competition.

An annex to the letter to parliament by Knops (2020b) lays out a series of actions, e.g., the growth of a community inside government and the development of best practices to enable the release of OSS and the creation of sustainable communities. OSS is also to be considered a selection criterion for the allocation of funds from the Digital Government innovation budget. A report analysing the costs and benefits of releasing software as OSS was also produced as a consequence (Ecorys, 2021), again reemphasizing earlier findings (Gartner, 2017; Thaens and van IJzerloo, 2017), but also the need for investment to enable the value potential.

The principle of “Open, unless” (Knops, 2020a) was reiterated in the Value-Driven Digitalisation Work Agenda (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2022), announcing a modernization of the “Government-wide Digital Infrastructure (RDI) using appropriate agreements, standards and facilities, guided by government-wide principles: standardisation, reuse and open source”. The follow-up report by Procee et al. (2022) takes further steps in analysing how the policy

can be implemented and supported in practice by proposing a series of activities similar to earlier reports, including the use of an assessment framework for analysing whether software should be released as OSS or be exempt from the “Open, unless” policy. The report also suggests the creation of a national government OSPO within the Ministry of the Interior and Kingdom Relations (in contrast to earlier reports (Thaens and van IJzerloo, 2017)).

The new OPSO was created in 2023 and is tasked with supporting its overarching ministry, as well as the PSOs under it in applying the “Open, unless” policy, and releasing and collaborating on OSS using best practice. Initially, partnerships will be established to conduct pilots in releasing government software as OSS. The OSPO will further work on developing and executing on a national OSS strategy in line with the “Open, unless” policy. They also provide training, education, and advocacy on different aspects of OSS, e.g., related to procurement and security, highlighting both best practice and common misunderstandings.

The OSPO is currently in a build-up phase with a two-year horizon, working to identify needs, roles, and functions of the OSPO using a bottoms-up approach through close dialogues with the ministry and its several agencies. There is a plan for a future national government OSPO located at the CIO office of the government offices which would support the “Open, unless” policy across government.

On the municipal level, there is an association-based OSPO represented by the Dutch Association of Municipalities (Vereniging van Nederlandse Gemeenten - VNG). They are currently establishing an incubator based on Signalen, a pilot OSS project, where the goal is to learn and establish processes for municipalities to initiate and collaborate on OSS-based solutions addressing common needs. Larger municipalities such as Amsterdam, which have established local government OSPOs, are leading the development. The different OSPOs are interconnected through the Dutch OSPO network, which convenes on a regular basis to share and generate knowledge and best practices, with the goal of growing common institutional capabilities to jointly profit from OSS as an instrument for digital transformation. Other members of the network include the Tax and Customs Administration, Kadaster, Alliander, and the Province of South Holland.

18.5 Promotion for reuse

The earlier report by Thaens and van IJzerloo (2017) explicitly suggested the creation of a software catalogue similar to the US code.gov platform, which facilitates the discoverability and reuse of OSS used and developed by the US government. In response, the Developer Overheid platform has been designed containing both API:s and OSS repositories from the various PSOs across the Dutch public sector.

The platform is maintained by the Ministry of the Interior and Kingdom Relations and the Dutch Association of Municipalities (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, n.d.). The source code repositories listed on the platform originates from a volunteer initiative where a researcher compiled repositories that could be traced to a Dutch PSO. The long-term goal, as expressed by the OSPO is to evolve the platform to a common source code storage and collaboration platform, e.g., based on

the OSS social coding platform GitLab, an approach adopted e.g., by the German government (Zentrum Digitale Souveränität, n.d.).

18.6 Success stories

A success case worth highlighting include the Signalen project, a report and management system for incidents and complaints from citizens to the responsible PSOs. The project has emerged organically and is developed and maintained by a team of developers within the City of Amsterdam. Currently, the intention is to move the ownership of the project to the VNG and for the association to serve as a neutral hosting ground, enabling further communities to join and collaborate on the project. There are currently about 15 municipalities that are contributing to the joint funding, although this only accounts for one-third of the development costs (of which the City of Amsterdam sponsors the rest). To reach a sustainable level, the VNG sees a need for at least 30 to 40 municipalities to share the costs. VNG is working actively to grow the community of Signalen both nationally and internationally, e.g., in Denmark through their sister association OS2.

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19 Country report: New Zealand

19.1 Abstract

Policy and stakeholders: A software extension of New Zealand Government's open access and licensing framework (NZGOAL-SE) advice and encourages the release of public software is no special circumstances apply. The policy is owned by the “Government Chief Digital Officer" role within our Department of Internal Affairs. There is no policy addressing the consideration in relation to proprietary options in an acquisition and procurement process.

Policy goals: Cost efficiencies and transparency aspects are highlighted in the Digital Service Design Standard, while the NZGOAL-SE framework also emphasises open innovation, economic growth, creation of trusted communities between public and private actors, and interoperability as important goals.

Implementation and support: Both the Digital Service Design Standard and the NZGOAL-SE framework provides comprehensive information and support for releasing software OSS. Information on how to consider OSS in relation to an acquisition and procurement process, however, is limited, as is the active support and promotion of software reuse.

Promotion for reuse: Beyond GitHub, there is limited discoverability of OSS used and developed by the New Zealand public sector. A Marketplace is available that provides public entities with a common place to find digital services that can be consumed and the related suppliers.

Success stories: The Common Web Platform project, based on the vendor-sponsored OSS-based Content Management System (CMS) - SilverStripe CMS, launched in 2013, served as a platform for government agencies to build their own websites and web-based platforms. The project was later replaced by an internally developed system.

19.2 Policy and stakeholders

The New Zealand Government's open access and licensing framework — known as NZGOAL — provides guidance about releasing copyright and non-copyright material in terms of information, data, and content for reuse by others considering the Creative Commons licensing regime (New Zealand Government, 2014). These guidelines were created in 2010 and have had a positive effect on the dissemination, reuse, and collaboration of open government data (Open Source Open Society, 2016).

An effort to also consider the reuse and open licensing of software was triggered in 2015 following an analysis of New Zealand's effort on the Open Government Partnership (OGP) plan. A software extension (New Zealand Government, 2016) of the NZGOAL framework (NZGOAL-SE) was drafted through a public consultation process (Land Information New Zealand, 2016), using an open consensus tool (Loomio) for discussing its content and a social coding platform (GitHub) to manage its editing (Government Information Services, 2016).

The open process allowed for an inclusive process, helping to build awareness and commitment of the policy among, e.g., public sector organizations and vendors (Open Source Open Society, 2016). An open-by-default policy was considered to risk adding friction rather than a broader commitment to the policy. The writing process was also appreciated as being in line with the culture and means of collaborating implied by open government.

The policy was drafted on the initiative of the Land Information New Zealand (LINZ) with the help of an external expert and OSS expert from an OSS vendor with experience in collaborating closely with the government (Upston, 2016). The policy addresses government agencies and is now owned by the "Government Chief Digital Officer" role within our Department of Internal Affairs.

General guidelines prescribe that government agencies generally avoid owning and exploiting IP, and leave ownership to procured vendors (State Services Commission, 2008). Special circumstances do, however, allow for government agencies to require ownership when the intention is to release the developed software as OSS (New Zealand Government, 2016). Such intention is recommended to be specified explicitly at the outset of a public procurement process.

The policy is advisory and encourages the release of developed software as OSS when possible, with exceptions for cases when an open sourcing would imply, e.g., a breach in contract or privacy, disclosure of trade secrets and other sensitive information, or create an unacceptable security or privacy-related risk. The standard is briefly referred to in the public procurement guidelines in relation to how public sector organizations can distribute or share ownership of developed and procured IP (Ministry of Business, Innovation & Employment, 2019).

19.3 Policy goals

The policy is seen to enable public sector organizations to legally reuse and build on each other's work. Cost efficiency, open innovation, economic growth, creation of trusted communities between public and private actors, transparency, and interoperability are the prime drivers highlighted (New Zealand Government, 2016). A case study explores how the Social Investment Agency released its Social Investment Analytical Layer as OSS, triggering both reuse and contributions from both researchers and government agencies (Government Information Services, 2017). The study estimates that nearly 1 million NZD was saved in related efficiency gains.

The rationale that publicly funded software should be publicly available is also referred to as a general argument (New Zealand Government, 2019; 2022b). Reuse is further thought to reduce inconsistency of experience across government services, to enable services with a consistent look and feel, regardless of which agency or provider is offering them, and by extension, to improve accessibility and trust towards the services.

19.4 Implementation and support

Suitable OSS licenses are suggested, including both permissive and copyleft options, along with a rationale for choosing between different options. Explanations are provided on policy and legal context, including areas of public procurement and

copyright. Security is also addressed as a general topic to bring clarity to uncertainties of perceived risks that OSS may imply and how such risks may be properly analysed. Principles and processes for how to decide what to share as OSS, and for reviewing and releasing the software is also provided.

Additional guidance is also provided through the Digital Service Design Standard maintained by the Digital Public Service Branch in the Department of Internal Affairs (New Zealand Government, 2022a), which provides principles and guidance on design thinking for anyone who designs or provides government services. One of the 12 principles highlights the need to work in the open (New Zealand Government, 2019), prescribing that the use of open standards, common government platforms, and OSS should be prioritized and that source code should be released openly in proportion to any perceived risks.

Design principles further prescribe the need to collaborate widely and reuse and enable reuse by others (New Zealand Government, 2022b). Actors should develop and collaborate in the open and leverage the use of widely accepted practices, techniques, frameworks, tools, and components, with a preference for OSS alternatives and open standards as far as possible. The design principles are further echoed in a set of behaviours defined in the Strategy for a Digital Public Service, detailing the need for collaboration and co-creation, and striving towards an open and accountable public service (New Zealand Government, n.d.).

There are currently no established OSPOs, i.e., centers of competency or support functions for the consumption, development, and collaboration of OSS beyond the established policy (NZGOAL-SE) and the Digital Service Design Standard. It is noteworthy, however, that Land Information New Zealand (LINZ) has played a pivotal part in the establishment of the policy and is among the most active public sector organisations in GitHub in terms of releasing and developing OSS projects. Hence, they seem to have played the role of a champion in the NZ public sector in promoting and enabling OSS adoption and collaboration.

19.5 Promotion for reuse

Beyond GitHub, there is limited discoverability of OSS used and developed by the New Zealand public sector. A Marketplace is available that provides public entities with a common place to find digital services that can be consumed and the related suppliers.

19.6 Success stories

Currently, there are 12 different government entities registered on the GitHub platform with varying degrees of activities. The NZ Open Data Portal has a series of active subprojects relating to the CKAN-based OSS platform used for the portal. DigitalNZ, a service run by the National Library of New Zealand, is another actively developed set of projects. The Electricity Authority is also active, most prominently with the vSPD project – vectorised Scheduling, Pricing and Dispatch – which is an audited, mathematical replica of SPD, the pricing and dispatch engine used in the New Zealand electricity market. The Land Information New Zealand (LINZ) is the most active public

sector organisation with several actively developed OSS projects relating to map, grid, and imagery data.

A previously highlighted project is the Common Web Platform project, based on the vendor-sponsored OSS-based Content Management System (CMS) - SilverStripe CMS (Findlay, 2015). The project, launched in 2013, served as a platform for government agencies to build their own websites and web-based platforms. SilverStripe, the backing vendor, reported in 2015 on how the project received a growing adoption but limited sharing and contributions from government agencies. Accordingly, the vendor proposed a series of recommendations for how the community collaboration of the OSS project could improve (from the same author as of the NZGOAL-SE policy). As of 2021, the OSS project is dormant and not actively developed.

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20 Country report: Spain

20.1 Abstract

Policy and stakeholders: Spanish PSOs are required to share public software which they own with others, where OSS is seen as a means according to Law no. 40/2015. The law is complemented by the government instructions in Royal Decree 4/2010 which provides, e.g., provides further details on licenses to consider. Existing software should always be considered in the beginning of any acquisition and procurement process.

Policy goals: The rationale overarching the several policies relates to maintaining the independence of suppliers, enabling interoperability, and driving cost-efficiencies across PSOs, explained and motivated through the reuse possibilities offered through the sharing of software as OSS. Localization to regional languages another goal driving regional governments.

Implementation and support: General guidelines for the publication and licensing of reusable assets as OSS is provided by the Secretariat-General for Digital Administration. Red.es has incorporated the earlier national government OSPO represented by CENATIC. The level of support provided as of today is though unclear. The Technology Transfer Centre fills a complementary role by enabling and promoting software reuse. Some regional governments have established their own OSPO to support its own use and development of OSS-based solutions.

Promotion for reuse: The Technology Transfer Centre maintains a general software catalogue facilitating and promoting reuse among PSOs. The PSOs, in turn, are required to consult the directory and report new software for reuse. Regional catalogues are also reported of, e.g., in the regions of Andalusia, Galicia, and the Basque Country.

Success stories: gvSIG project – a catalogue of tools for managing and visualising geographical information data (gvSIG, n.d.), founded in 2004 is maintained jointly by Generalitat Valenciana and the gvSIG association. The OSS provides an example of how a project may mature from the confines of a single PSO to a neutral governing body that can facilitate the development and collaboration of an emerging international community.

20.2 Policy and stakeholders

In Spain, current legislation and policy are primarily focused on promoting and enabling the reuse of software in general in accordance with the Spanish National Interoperability Framework (Esquema Nacional de Interoperabilidad – ENI, n.d.). OSS is considered as an instrument for such reuse. Law no. 40/2015, succeeding the eGovernment Law no.11/2007 (Ley 11/2007, de 22 de junio, de acceso electrónico de los ciudadanos a los Servicios Públicos, 2007), requires PSOs to share an application to which they own the intellectual property rights of, to another PSO upon such a request unless special conditions apply (Ley 40/2015, de 1 de octubre, de Régimen Jurídico del

Sector Público, 2015). The application may be released as OSS if this, e.g., contributes to greater transparency for the PSO's operations.

PSOs are accordingly required to consult the government's general software catalogue of applications for any reuse candidates. If these do exist, PSOs are obliged to reuse such options unless special conditions apply. The general software catalogue is maintained by the Technology Transfer Centre (Centro de Transferencia de Tecnología, n.d.). Each PSO is further obliged to maintain its own catalogue that may be reused by others. These catalogues should be interoperable and connect with the overarching catalogue.

Royal Decree 4/2010 (Real Decreto 4/2010, de 8 de enero, por el que se regula el Esquema Nacional de Interoperabilidad en el ámbito de la Administración Electrónica, 2010) complements Law no. 40/2015 (and by extension Law no. 11/2007) by specifying in detail the licensing conditions for any reuse. OSS is highlighted as a reuse mechanism, and licenses that maintain the original rights of an OSS in derivative works should be used, leaning towards what is referred to as copyleft licenses as the preference (Secretaría de Estado de Administraciones Públicas, 2022). The European Union Public License (EUPL) is explicitly highlighted, although others are not excluded if they prescribe the same conditions as stated in the Decree.

To enforce the requirements, PSOs are urged to gain ownership of the IP when software is developed from scratch through a public tender, in alignment with the national procurement legislation, which obliges the service provider performing the development to transfer any rights unless stated otherwise (Real Decreto Legislativo 3/2011, de 14 de noviembre, por el que se aprueba el texto refundido de la Ley de Contratos del Sector Público, 2011). If a pre-existing software is received, it should be under such conditions that it can be reshared with other PSOs under the conditions defined in the Royal Decree 4/2010.

The Decree echoes the requirements in Law No. 40/2015 that the General State Administration, through its Technology Transfer Centre (Centro de Transferencia de Tecnología, n.d.), is to maintain a general software catalogue of applications for free reuse between PSOs. Each PSO is, by extension, also required to publish such applications either in the general catalogue or in a catalogue integrating with the general one. Source code, documentation, license conditions, and associated costs should be shared and declared.

On the regional and local levels, there has been additional policy work (Ajuntament de Barcelona, 2018). The regional government of Galicia created the initiative Mancomún, aimed at encouraging and facilitating the adoption of OSS in the region (Thévenet, 2023). The regional government of Andalusia initiated an Order of 21 February 2005 that encourages the (re)use of OSS among PSOs and the creation and maintenance of a public software catalogue for OSS. The regional government of the Basque country also encourages OSS and reuse in the context of IT platforms among PSOs through Decree 159/2012, of 24 July. Barcelona provides an example of OSS policy and adoption on the local level (Ajuntament de Barcelona, 2018).

20.3 Policy goals

The rationale overarching the several policies relates to maintaining the independence of suppliers, enabling interoperability, and driving cost-efficiencies across PSOs, explained and motivated through the reuse possibilities offered through the sharing of software as OSS. CENTIAC highlighted several aspects in earlier reports (Centro Nacional de Referencia de Aplicación de las TIC, n.d.-a, n.d.-b), although the use of OSS as a key element for the development of electronic administration and a government open to citizens is specifically emphasized, aligning with the Law no. 40/2015 and the eGovernment Law no.11/2007. On the regional level, OSS is also seen as a means of localizing software to incorporate regional languages, and specific needs (Thévenet, 2023).

20.4 Implementation and support

The several policies have been supported mainly from Centro Nacional de Referencia de Aplicación de las TIC (CENATIC), a public entity corresponding to a national government OSPO founded in 2006. Their scope was to support the adoption and release of OSS from the Spanish PSOs. In 2013 they merged into Red.es, an entity under the Secretary of State for Digitization and Artificial Intelligence (Secretaría de Estado de Digitalización e Inteligencia Artificial), working to execute strategic programs in enabling the information society in Spain. The Technology Transfer Centre (Centro de Transferencia de Tecnología, n.d.), as earlier highlighted, also fills a complementary role in promoting and facilitating reuse across the public sector.

General guidelines for the publication and licensing of reusable assets as OSS is provided by the Secretariat-General for Digital Administration (Secretaría de Estado de Administraciones Públicas, 2022). The intention is to support the reuse of applications in alignment with Law no. 40/2015 (Secretaría de Estado de Administraciones Públicas, 2021), and Royal Decree 4/2010. The guidelines provide clarity on the legal and policy background and context for releasing OSS, provide clarity in terms of license selection, and what to consider practically when releasing software such as OSS.

In some of the regions, OSS has been supported for longer periods of time, commonly including a migration towards GNU/Linux-based environments localized to regional languages. Galicia is one of the regions where the migration as progressed the most, where the whole public sector finished its migration towards a GNU/Linux-based-environment with Libreoffice as a productivity suite in 2018 (Thévenet, 2023). The regional OSPO (La Oficina de Software Libre of La Xunta de Galicia) provides general support for regional PSOs. A regional platform is operated to collect and share knowledge on the use and release of OSS, including a guide with best practices (Manomún Iniciativas Sobre Software Libre En Galicia, 2022).

20.5 Promotion for reuse

The Technology Transfer Centre (Centro de Transferencia de Tecnología, n.d.) maintains a general software catalogue facilitating and promoting reuse among PSOs. The PSOs, in turn, are required to consult the directory and report new software for

reuse. Regional catalogues are also reported of, e.g., in the regions of Andalusia, Galicia, and the Basque Country (Ajuntament de Barcelona, 2018). The regional government of Galicia also hosts their own coding platform where the regional OSS projects are hosted (Thévenet, 2023).

20.6 Success stories

A prominent success case includes the gvSIG project – a catalogue of tools for managing and visualising geographical information data (gvSIG, n.d.). Founded in 2004 by the Generalitat Valenciana, the OSS provides a large series of use cases ranging from natural resource management to urban planning and is adopted among 160 countries. Today, the project is maintained jointly by Generalitat Valenciana and the gvSIG association. The OSS provides an example of how a project may mature from the confines of a single PSO to a neutral governing body that can facilitate the development and collaboration of an emerging international community.

Another corresponding example regards Decidim, an OSS platform for enabling citizen participation, primarily on a city level (Decidim, n.d.). The project originates from the City of Barcelona, and is based on Consul, a similar project sprung out of the City of Madrid. Since the initial application of Decidim in Barcelona in 2016, the development has progressed beyond the city and is now facilitated by the independent not-for-profit organization The Decidim Free Software Association, which is similar to the setup of the gvSIG project.

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21 South Korea

21.1 Abstract

Policy and stakeholders: The first public policy initiatives related to OSS in Korea were motivated by wanting to reduce vendor lock-in and involved attempts to move away from dominant proprietary software government computers to OSS alternatives. However, since then, the Korean government's OSS policy initiatives have focused mostly on OSS as part of industrial policy.

Policy goals: The overarching goal of South Korea's OSS policy is to stimulate economic development. The government aims to create a "software-centric society" and becoming a hub for running software businesses. The pursuit of digital sovereignty and reducing foreign dependency is another driver.

Implementation and support: The government maintains a strong institutional framework, allocating substantial budgets, such as the $12 million for the Open Source Software Competence Plaza (OSSCP), to provide comprehensive support. The Korea Copyright Commission (KCC) dedicates $3 million annually to promote OSS license compliance and governance. Guidance provided to companies ensures adherence to license terms, fostering a culture of reuse.

Promotion for reuse: The addition of Article 24-2 to the South Korean Copyright Law allows for the free reuse of governmental works, including software. The government maintains a database containing OSS product information and source code, promoting transparency and facilitating reuse**.**

21.2 Policy and stakeholders

South Korea is widely recognized as one of the most digitally advanced countries advanced in the world. It ranked second among 176 countries in the International Telecommunication Union (ITU)'s 2017 ICT Development Index. The country is also among the world's top performers in the digitalization of its public sector. According to the UN DESA's 2022 E-government Index, South Korea is the leading country in Asia, and third worldwide in e-government development.

The first public policy initiatives related to OSS in Korea were motivated by wanting to reduce vendor lock-in and involved attempts to move away from dominant proprietary software government computers to OSS alternatives. Since then, the Korean government's OSS policy initiatives have focused mostly on OSS as part of industrial policy. Public procurement and re-use of software within the public sector plays a secondary role. The Ministry of Strategy and Finance has issued a guideline on budget preparation which mentions the possibility of procuring OSS, but no preference is stated for OSS (National IT Industry Promotion Agency, 2016).

The Open Source Software Invigoration Plan of 2014 is South Korea's overarching OSS promotion policy. It outlines the South Korean government's intention to increase its use of OSS to decrease its dependence on proprietary software solutions. The plan involves switching to open standards such as HTML5 to reduce e-government services

lock-in to specific IT vendors. The plan also foresees a gradual increase in alternative operating systems, web browsers, and other software solutions. The intention to increase South Korean participation in global projects and to grow its domestic communities of OSS developers is also stated.

In 2020, the South Korean government amended the Software Promotion Act in relation to OSS[32]. Specifically, Article 25 of the amended Act states that when conducting national research and development projects in the software field, the Government shall endeavor to a) adopt a development method that discloses the source code of the software so that those other than the software developer can participate in the process of developing, maintaining, and managing the software; and b) distribute the results of national research and development projects as open source. The Minister of Science and ICT shall also make efforts to disseminate a software development culture based on openness, sharing and cooperation.

21.3 Policy goals

The overarching goal of South Korea's OSS policy is to stimulate economic development. In 2023, the government announced that as a part of its aims of creating a "software-centric society" and becoming a hub for running software businesses it planned to train 200,000 specialized workers and encourage the use of open-source computing to create a competitive open source-based ecosystem (Pulsenews, 2023). The pursuit of digital sovereignty by reducing its dependence on proprietary software solutions is another driver.

21.4 Implementation and support

In 2007, the South Korean government published an "Open Source Software License Guide", which is still being updated. The government aimed to help software developers and companies to fully understand the terms and conditions of typical OSS licences (Metzger, 2016).

The Open Up - Open Software Support Centre was founded in 2020 (by integrating the existing OSS Competency Plaza and Korea Open Source Software Developers Lab) and is a joint initiative by The Ministry of Science and ICT (MSIT) and The National IT-Industry Promotion Agency (NIPA). Open Up is dedicated to assisting OSS developers, communities, and companies utilizing OSS solutions. The OSS Contribution Academy offers programmes to help developers improve their OSS capabilities. Open Up also offers learning opportunities for the public sector, consulting on OSS adoption, and expertise on licensing issues. The center encourages public organizations to transition to open source and provides a free dedicated space for OSS developers and community activities, including meetings and seminars.

[32] https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=54778&type=sogan&key=54

21.5 Promotion for reuse

The re-use of governmental work, including software, was added to the South Korean Copyright Law in 2013 as Article 24-2. Governmental works (to which the government owns all rights) can be freely re-used by everyone, including the government. The law also leaves the option for the government further to incentivise the re-use of governmental work. The government maintains a database, containing OSS product information and source code that is in scope for the law (Korea Copyright Commission, 2013).

22 Country report: Sweden

22.1 Abstract

Policy and stakeholders: Sweden has no legislative or national policy requiring or encouraging the use or release of OSS. Several PSOs does, however, have corresponding internal advisory policies, including the Agency for Digital Government, Swedish Insurance Agency, Statistics Sweden, and Sundsvall municipality.

Policy goals: Several PSOs emphasise how the drivers for adopting and contributing to OSS are many, including cost savings, reuse, increase attractiveness for skilled labour, and increase of transparency for public services. The agency-specific policies further emphasize the potential for interoperable and digitally sovereign public services and infrastructure.

Implementation and support: Specific guidelines are provided from the different PSOs who have adopted internal OSS policies, as well as through the NOSAD network where knowledge is shared and collaboratively created. The network further provides a source of support by connecting experts, users, researchers, and practitioners, together helping to mature the use and adoption of OSS in the Swedish public sector.

Promotion for reuse: Offentligkod.se is a public catalogue of OSS used by PSOs within Sweden. The catalogue is maintained through NOSAD with data reported on a voluntary basis from the PSOs and vendors themselves. Another catalogue, although closed, is the Dela Digitalt platform, maintained by the Swedish Association of Municipalities and Counties, where PSOs can share insights on software solutions that they are using, either open or proprietary.

Success stories: A set of PSOs have collaborated on the development of a moderator panel and outlook-plugin for Jitsi which is hosted under the GitHub organization of the Agency for Digital Government. This has proved an exploratory process for how PSOs can collaborate on the development, as well as how to think about the long-term maintenance of the project, now providing a template for how new components can be developed collaboratively.

22.2 Policy and stakeholders

Sweden does not have a legislative or national policy requiring or encouraging the use or release of OSS. There are, however, institution-focused policies that guide and provide inspiration for other PSOs. The Swedish Insurance Agency released their guidelines for adoption and release of OSS in 2019 (Försäkringskassan, 2019), which has provided inspiration for the Agency of Digital Government, and the municipality of Sundsvall (Sundsvalls kommun, 2023). These guidelines states that OSS should always be considered if they fulfil the stated requirements, and when the total cost of ownership, including implementation and transition costs. Statictics Sweden (Statistiska Centralbyrån, 2022) is another example where an OSS policy also recently has been created.

The Agency for Digital Government revised their policy in 2022 which defines a set of principles inspired by the European Commission's OSS strategy (2020). The principles highlight the need for being as open as possible, and limitations should only be introduced when explicitly motivated (DIGG, 2022a). Active reuse, contributions back to the OSS projects, security monitoring, and use of open standards are also highlighted by the principles. The Swedish Insurance Agency's policy

An earlier and more general recommendation was provided by the Swedish government through an expert group in e-government, E-delegationen (later evolved into eSamverkan - eSam), highlighting that public e-services as far as possible should be based on open standards and use OSS to avoid dependence on any single platform or solution. E-delegationen later added that OSS should always be considered if motivated from a total cost of ownership (SOU, 2009).

22.3 Policy goals

The several institution-centric policies highlight the goal of maximising the value for themselves and others by enabling the reuse and collaborative development of software (e.g., DIGG, 2022a). The enablement of interoperability for a common digital infrastructure, and digital sovereignty in terms of technical solutions are other aspects highlighted. E-delegationen emphasises how the drivers for adopting and contributing to OSS are many, including cost savings, reuse, increase attractiveness for skilled labour, and increase of transparency for public services (SOU, 2010). A Government letter to the Swedish parliament further highlights OSS as a tool along with innovation procurement and partnerships to promote the development and adoption of digital innovations (Regeringen, 2017).

Risks and benefits of adopting OSS has been studied by various reports, e.g., by the Swedish Public Employment Service (Arbetsförmedlingen, 2021). The study concludes that any potential risk is manageable, and among other things proposes the creation of an Open Source Program Office (OSPO) to support the adoption and development of OSS, while proactively contributing to their sustainability and managing potential risks up-front. In another report, the Swedish Public Broadcasting Service provides internal view on OSS to anchor a general understand of its potential value, and related challenges (Hjelm, 2023).

22.4 Implementation and support

The Agency for Digital Government released guidelines for the development and release of OSS in 2022, following the revision of their OSS policy. The guidelines provide guidance in terms of licensing choices, where preference is given to copyleft licenses in cases where the OSS makes up part of a larger platform or infrastructure to ensure public investments are kept open (DIGG, 2022b). For cases where the OSS is intended to be spread widely both in open and closed settings, a set of permissive licenses are recommended. The guidelines further recommend (among other things) that documentation be kept up to date and licensed under a Creative Commons license, lists additional artifacts to include such as a readme file, use an open issue tracker while a project is active, and create a routine to note and reply to new pull requests and issues that are posted in a project.

Another initiative underway is the creation of a template for OSS project repositories in terms of what documentation, artefacts and processes that should be defined according to best practice to enable reuse and collaborative development (DIGG, 2023a). The repository template is developed by the agency in collaboration with the Danish OSS association OS2, and the Dutch civil society organization Foundation for Public Code. A related checklist for releasing OSS is also maintained (DIGG, 2023b).

The agency is further a driving force in an informal collaboration referred to as ASOM where mainly national level PSOs collaborate the development and maintenance of common OSS components, hosted under the Agency for Digital Government GitHub organization. Two examples include a moderation panel, and outlook-plugin for Jitsi, an OSS chat service.

Another, though more formal type of collaboration is represented by eSam (n.d.-a), an association of PSOs, also mostly on the national level. The association brings together the secretary generals and main decision makers of the PSOs, as well as experts and architects to collaborate and harmonize on solutions for e-government and common digital infrastructure projects. They have recently conducted a market survey of technical solutions that comply with data protection and cloud regulation implied from the EU level (eSam, n.d.-b). Many of the solutions identified are OSS-based and are currently undergoing evaluation among a minor set of PSOs. The association has also released their own guidelines for the use and release of OSS highlighting the existence of external resources for support (eSam, 2022).

On the municipal level, there are several initiatives ongoing and varying in maturity. One example concerns Sambruk (n.d.-a), a municipal association focused on enabling and maintaining common systems and standards for its members. The association is not specifically focused on OSS exclusively but does facilitate the maintenance of a smaller set of OSS-based solutions. The association have also started to experiment with OSS solutions from the Danish sister association OS2. Certain municipalities play an especially important role in driving the general change and transformation forward, including Sundsvall (n.d.) and Alingsås municipalities. Both have a strong local political support of OSS adoption and development, policies in place, and substantial infrastructure based and concisely developed as OSS to promote and enable reuse with other municipalities.

Complementary to aforementioned collaborations is NOSAD (Network Open Source and Data), a network for knowledge-sharing and creation in the context of OSS and open data (NOSAD, n.d.). The network facilitates monthly workshops on different themes within the context and acts as a platform for general as well as specific discussions. Subnetworks are also facilitated, including the user group for RODA, an OSS e-archival solution (NOSAD, 2023). The Swedish Open Source Program Office (OSPO) network is also facilitated under the NOSAD umbrella, brining together both public and private actors to share knowledge hands-on in physical workshops.

The National Procurement Services has in several iterations since 2007 created a framework agreement related to the procurement of OSS, e.g., through supply, integration, or support (OSOR, 2012). The framework agreement is optional to use, aside from a more general framework agreement where OSS may also be procured under. The framework focusing on OSS requires mini-competitions to be held between

the selected suppliers, and provides templates for what information to ask for, along with conditions to be included in the tender detailing, e.g., that must provide the software under the conditions implicated by an OSS license (referring to the list maintained by the Open Source Initiative), that any changes or additions to existing OSS projects should be contributed back upstream, and that all source code and related documentation should be published on a public website. The detailed conditions and templates lower the bar for PSOs with limited knowledge in terms of how to consider OSS in a procurement process. The latest version of the framework and templates are valid from 2021 (Kammarkollegiet, 2021).

22.5 Promotion for reuse

Offentligkod.se is a public catalogue of OSS used by PSOs within Sweden (NOSAD, n.d.-b). The catalogue is maintained through NOSAD with data reported on a voluntary basis from the PSOs and vendors themselves. By listing the PSOs using an OSS, other PSOs are able to know who to contact, but also creates a level of trust towards the OSS listed. Another catalogue, although closed, is the Dela Digitalt platform, maintained by the Swedish Association of Municipalities and Counties, where PSOs can share insights on software solutions that they are using, either open or proprietary (Sveriges Kommuner och Regioner, n.d.).

22.6 Success stories

In line with the exploration and adoption of GDPR and Schrems II compliant tools for collaboration and communication, several PSOs have begun experimenting with Jitsi, an OSS video chat platform. As part of the integration process, a set of PSOs have collaborated on the development of a moderator panel and outlook-plugin for Jitsi which is hosted under the GitHub organization of the Agency for Digital Government. This has proved an exploratory process for how PSOs can collaborate on the development, as well as how to think about the long-term maintenance of the project. The goal is to upstream the components to the Jitsi OSS project. The means of working has provided a template for how new components can be developed collaboratively.

One of the more well-adopted OSS is the Open ePlatform, an e-service platform originating from an EU-project in 2016 and today used by almost 200 of the 290 municipalities in Sweden. The municipalities collaborate in a user association sharing knowledge and use cases of the platform. They are also currently driving a transformation of the project as they are currently in a soft lock-in with the vendor who develops and maintains the project (Persson & Magnusson, 2023). The goal is for the project to become open for competition and support by multiple vendors, and reduce the technical debt that has grown due to the vendor lock-in.

Another example includes HAJK, a web-based editor and visualisation tool for Geographical Information System (GIS) data (Hajk, n.d.). The platform is used and collaboratively developed by about 15 municipalities. A similar OSS tool is the map framework Origo (n.d.), which has also received broad adoption. FixaMinGata, a localized version of the upstream and international OSS project FixMyStreet is another well-adopted example hosted and maintained by Sambruk (n.d.-b).

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23 United Kingdom

23.1 Abstract

Policy and stakeholders: The UK government has a history of promoting OSS use in the public sector dating back to 2002. The policy has evolved over the years, gradually becoming more prescriptive; it is not contained in one comprehensive document but rather a handful of key documents combine to make government software and code open by default (Cabinet Office, 2023).

Policy goals: The key principle motivating the UK's OSS policies is the responsible use of public funds. Since public services are funded by taxpayers, it is considered prudent to make the underlying code available for public scrutiny and reuse, unless there are compelling reasons to withhold it. The adoption of open-source code is also seen to facilitate collaboration among government developers, preventing redundant efforts and ultimately lowering overall government expenditures. Moreover, releasing source code under an open license is presented as a safeguard against vendor lock-in, promoting flexibility and interoperability in government operations.

Implementation and support: The UK government Service Manual provides detailed guidance relating to several aspects of OSS use and contribution. In addition, the Government Digital Service functions as an OSPSO-like construct, developing OSS solutions and acting as a steward for policies relating to OSS.

Promotion for reuse: While there is no official UK catalogue listing all public sector OSS solutions, a total of 78 central government entities publish their code on GitHub, including the GDS.

Success stories: The UK Government leveraged the potential of Open Source and its reusability in the creation of a "one-stop-shop" for digital government services known as GOV.UK. Adopted by all departments, it is recognized as a success for GDS and the UK Government, and has inspired reuse internationally.

23.2 Policy and stakeholders

The United Kingdom has a longstanding history of embracing open source software (OSS) in its government policies. The foundation for these policies was laid out in 2002 by the Office of Government Commerce (OGC), which provided guidance to improve the efficiency of public procurement. This guidance encouraged public sector organizations to consider OSS solutions based on value for money, avoid lock-in to proprietary products, and obtain the necessary rights for custom solutions for reuse (OGC, 2002). These principles have persisted through subsequent iterations of government policies.

In 2010, the government published "Open source, open standards and re-use: a government action plan" (Cabinet Office, 2010) which built on previous documents to develop a more comprehensive OSS strategy that evolved the UK's approach to open source. This plan considered indirect benefits of open source, such as flexibility and re-

use, embedding an open-source culture across government, and removing procedural barriers to open source adoption.

The UK government further reinforced its commitment to open source with the "Government Service Design Manual" in 2014. This manual encouraged government departments to use open standards and open source software when developing digital services. It also promoted the idea of making source code open by default, ensuring transparency and collaboration.

As part of the Government Transformation Strategy 2017-2020 public administrations are required to demonstrate that they have considered the use of OSS solutions and the open publication of their code in order to comply with Point 3 of the Technology Code of Practice.

Finally, a 2022 update to the Digital, Data and Technology Playbook recognises the expectation that government software and code is open-source by default (Cabinet Office 2022).

23.3 Policy goals

As public sector engagement and policy on OSS has evolved, so has the motivations and associated goals. Early policy documents focused on procurement and the need to consider OSS on their merits and according to total lifetime cost of ownership. Subsequent policy documents promote OSS as part of a wider focus on lowering barriers to participation, including for SMEs, reducing vendor lock in, increasing use of open standards, improving competition. The principle of responsible public spending remains a focus and includes the rationale for making code available for reuse also outside of the public sector.

23.4 Implementation and support

The Government Digital Service functions as an OSPSO-like construct, developing OSS solutions and acting as a steward for policies relating to OSS (Blind et al, 2021), including the UK government Service Manual which provides detailed guidance relating to several aspects of OSS use and contribution (Government Digital Service, 2017). Guidance is also included in the HMG ICT Strategy which specifically details the publication of a toolkit for procurers on best practice for evaluating the use of open source solutions. In addition, the National Cyber Security Centre has published guidelines about secure development and deployment practice (National Cyber Security Centre, 2018).

23.5 Promotion for reuse

The UK Service Standard for public services requires public authorities to “[m]ake new source code open”, in order “for people to reuse and build on” the code. The Service Standard additionally asks public authorities to publish code in an open repository and to retain ownership of the associated intellectual property rights, so as to make it available for re-use under an open licence (Government Digital Service, 2019). While there is no official centralised catalogue of public sector OSS. Some UK some 63 central

government entities and 33 local councils publish their code on the code sharing platform.[33]

23.6 Success stories

The UK Government leveraged the potential of Open Source and its reusability in the creation of a centralized hub for digital government services known as GOV.UK. This platform, developed by the Government Digital Service (GDS), is constructed using open technologies, with most components actively developed on GitHub under the MIT License. GOV.UK serves as a standardized foundation, offering templates that government units can seamlessly integrate into their websites. This approach enables departments to easily add services to their websites. Adopted by all government departments, GOV.UK unifies central government websites on a shared platform, utilizing common components. Recognized as a success for GDS and the UK Government, GOV.UK's open-source methodology has inspired adoption by other governments, showcasing the collaborative potential of the Open Source approach (Derek du Perez, 2019).

23.7 References

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RISE Report 2024:7
ISBN: 978-91-89896-48-2

A report commissioned by the Danish Agency for Digital Government (Digitaliseringsstyrelsen) and Local Government Denmark (KL).

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Grants Office/Informationscenter
RISE Rapport: 2024:7
ISBN: 978-91-89896-48-2