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Sharing and Reuse of IT Solutions Framework

Fostering collaboration among Public Administrations

OBSOLETE

ISA Programme
European Commission

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Introduction

In the aftermath of the financial and economic crisis, public administrations and governments are under increased pressure to perform more efficiently, deliver services faster and cheaper, and meet stakeholders' needs more effectively.

Modern, innovative and efficient public administrations are an essential prerequisite to sustain the recovery of Europe's growth potential and competitiveness, as underlined by the Europe 2020 Strategy [1] in its flagship initiative on sustainable growth.

The Digital Single Market Strategy of the European Commission recognises that digital technologies have great potential to help public administrations deliver better services for less [2]. In order to fully exploit such potential, it is necessary to facilitate the efficient and effective electronic cross-border and cross-sector interaction within and between public administrations, citizens and businesses. For this purpose, the European Commission has developed the European Interoperability Framework, which provides guidance and recommendations to improve interaction, exchange and cooperation among European public administrations across borders and across sectors for the delivery of European public services.

The sharing and reuse of IT solutions plays an important role in this regard[1], as it enables administrations to develop services more quickly and at a reduced cost, and promotes greater interoperability, standardisation and cooperation among public administrations. These are also key aspects of a true EU Digital Single Market; where individuals and businesses can seamlessly access services and undertake activities online, irrespective of their nationality or Member State of residence. Some public administrations and governments across the EU already promote the sharing and reuse of IT solutions by adopting new business models [3], promoting the use of open source software for key ICT services [4] and when deploying digital service infrastructures.

Much more still needs to be done as there are some key challenges that limit the sharing and reuse of IT solutions, including the following:

- **Communication barriers –** lack of awareness of available IT solutions and common needs together with the existence of a multilingual environment
- **Legal barriers –** uncertainty with regard to intellectual property rights' (IPR) limitations and exceptions coupled with the fact that IT requirements are not considered early enough in the policy making lifecycle
- **Technical barriers –** limited use of common standards and reference architectures, which reduces the interoperability within and across sectors and borders

[1] Its importance is also recognised in the European Interoperability Framework, which lists reusability as one of the underlying principles to enhance interoperability.

- **Organisational barriers –** fragmented IT infrastructures based on obsolete business models with a lack of coordination among public administrations to design, procure and run IT solutions

To help public administrations overcome these challenges, the **Sharing and Reuse Framework (SRF)** proposes **ten key recommendations** (marked with a sign) that public administrations are encouraged to follow in order to promote the sharing and reuse of IT solutions and increase trust.

The SRF addresses EU, national, regional and local public administrations that aim at reducing costs, increasing their efficiency and fostering interoperability by reusing, sharing or jointly developing IT solutions that meet common requirements. The SRF should be taken into account by decision makers, legal professionals, IT architects, developers and communication experts when:

- sharing a tool once it has been developed
- reusing existing tools
- using an existing service
- collaborating in the development of a tool or service
- sharing the provision of a service

Public administrations should follow the SRF recommendations at each development stage of IT solutions; from their inception to maintenance. Furthermore, it is important that central bodies, such as central or regional governments and agencies, as well as EU institutions, support this process by creating a climate of innovation in their administrations, encouraging staff to take an active role in the process, and promoting the use of information and communication technologies. To facilitate this effort, the SRF also includes **thirteen recommended measures** (marked with a sign) which specifically target central bodies.

By promoting the sharing and reuse of IT solutions, public administrations and central bodies achieve cost savings, increase the quality of eGovernment services and advance the interoperability of public sector IT systems. All of this contributes to the development of the EU Digital Single Market and enhances the EU's position as world leader in the digital economy.

Structure of the recommendations

The Sharing and Reuse Framework describes ten recommendations that relate to each of the four identified barriers. Each recommendation is structured as follows:

Generic recommendation - addresses public administrations in general at every governance level. It identifies the specific barrier that prevents administrations from sharing or re-using IT solutions, and provides a generic recommendation to overcome it.

Detailed recommendations addressing public administrations in general – these provide more specific recommendations to conquer the barrier identified by the generic recommendation. They address administrations at all levels of governance.

Recommended measures for central bodies - these propose activities to be undertaken by central bodies (e.g. Member States' central or regional governments and agencies as well as EU Institutions) to support their administrations in implementing the recommendations of the framework.

Supporting instruments - examples of initiatives offered by the European Commission, Member States and other organisations to overcome barriers to sharing and reuse of IT solutions.

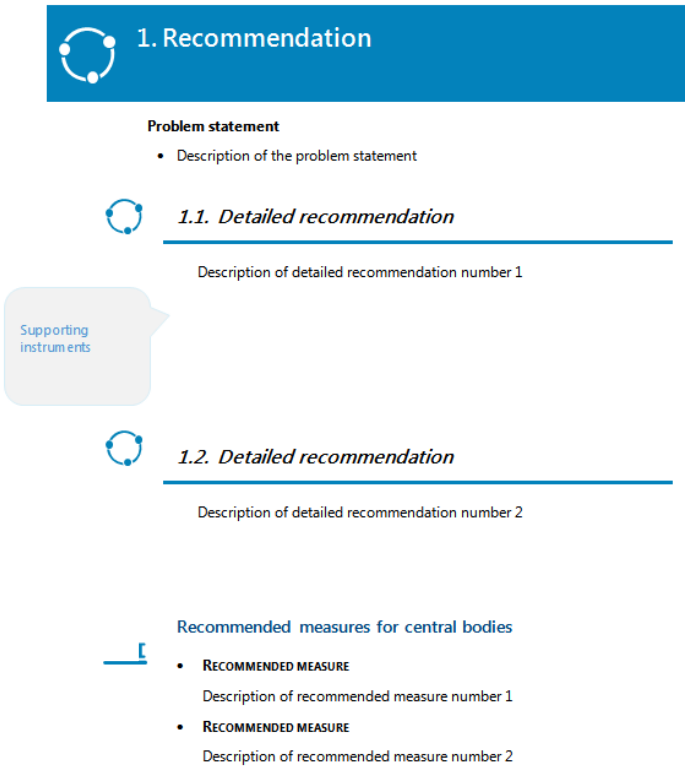

Figure 1 - Structure of recommendations

Communication

1. Increase visibility and trust of available IT solutions

Problem statement

- In order to reuse IT solutions, it is, firstly, necessary to know that such solutions exist and to obtain a sufficient level of trust to use an IT solution developed by other administrations. Public administrations already make their reusable assets available online in a number of national and European repositories. However, while there is already a significant number of repositories that provide a space to share solutions, their visibility remains limited. Key reasons explaining such a lack of visibility include the abundance of available IT solutions, rendering particular solutions hard to find, and the poor quality or lack of solution descriptions.

1.1. Use common repositories to share your solutions

To facilitate access to IT solutions, it is recommended to make them available through a **single access point, such as Joinup**. Therefore, public administrations should publish their IT solutions on common repositories instead of limiting such publication to their own websites. A common repository is a system devoted to the proper description, structuring and publishing of IT solutions together with the relevant documentation and process description in an integrated schema.

By populating a comprehensive repository of IT solutions open to different organisations, public administrations increase their discoverability; thus, enhancing the potential of the IT solutions to be shared and reused.

Joinup is a European platform which provides a **single access point** for public administrations to: download solutions from a central repository; share experiences and good practices; and work together in a collaborative way. [28]

1.2. Use standard ways to describe your IT solutions

If public administrations do not trust IT solutions, they may be extremely reluctant to reuse them. Raising awareness and communicating about IT solutions, as well as providing examples of their successful reuse, help build trust, credibility and confidence.

To facilitate the dissemination of information about IT solutions, public administrations are encouraged to use standard ways [5] to document their solutions. This standardised description can then be published in common repositories, thus increasing the visibility of the solutions and, consequently, their potential to be reused. Moreover, using standard ways to describe IT solutions enables robust filtering and categorisation of the IT solutions and facilitates multilingualism. It also increases the visibility of technical specifications used and the policy areas which the solution relates to.

1.3. Provide insights into the quality and usage of your IT solutions

Information about the quality and usage of a reusable IT solution is fundamental to assessing its quality and is eventually used to decide whether to reuse the solution or not. To this end, administrations that share their IT solutions shall document, among others, the following information:

- the governance and business models, including how sustainability is ensured
- the aim of the solution and related policies or legislation
- the solution's target audience, including the size of the organisation(s) using it
- the targeted sector (for sectoral solutions)
- their functional requirements and use cases
- process description
- their maintenance structure
- test scenarios and test results
- user experience tests
- planned future releases
- reuse and deployment cases & metrics.

Recommended measures for central bodies

- **OPERATE NATIONAL/REGIONAL REPOSITORIES AND FEDERATE THEM AT THE EU LEVEL**

  Central bodies should support public administrations that want to publish their IT solutions in common repositories by operating such repositories, and federate them to a central European repository (see also section 1.1). Central bodies should ensure that these repositories use **standard ways, such as ADMS.AP** and EIRA (also see section 6.1) to describe and categorise solutions, and that they support multiple languages.

ADMS and **ADMS.AP** are examples of **standard ways** to describe IT solutions, enabling the federation of disperse catalogues and the robust filtering and categorisation of assets. [5]

- **PROVIDE GUIDANCE ON REPOSITORIES**

  Central bodies should provide common repositories, which help public administrations assess to which extent a given solution is reusable. Such guidance could be made available, for example, in the form of a **checklist** to help assess the compliance level of a solution with the reusability criteria defined by the repository. Another way could be to provide automatic metric systems in repositories that help assess the solution's complexity and its community's level of activity.

The Reusability Factsheet is a template to facilitate the evaluation of reusable solutions, which can be taken into account when populating repositories [10]

- **ORGANISE WORKSHOPS TO RAISE AWARENESS AND SHARE KNOW-HOW**

  Central bodies should organise local workshops focusing on the sharing and reuse of solutions (e.g. organised around specific themes, such as eID, GIS solutions) in order to raise awareness but also develop the necessary expertise across public administrations.

2. Identify common needs - define and share generic sets of requirements

Problem statement

New European or national legislation often specifies common high level technical requirements, such as exchange data formats and high level workflows. However, these are rarely accompanied by supporting instruments defining lower-level workflows, levels of collaboration, and data models, which could be used by multiple administrations when developing new ICT solutions to support their implementation[1].

While these ICT needs might be the same in various countries or organisations, the collaborative development and the reuse of IT solutions can be hampered by the fact that public administrations are often not aware of these common requirements or believe that common requirements simply do not exist..

Generally, public administrations' lack of awareness regarding others' needs for shared IT solutions hinders the identification of generic requirements, thus limiting the possibility of collaborating on common IT solutions.

2.1. Define sets of requirements supporting common business processes

Public administrations should define sets of requirements for new IT systems, based on common parts of business processes that could be implemented in common IT solutions.

2.2. Identify generic functionalities that can be used in multiple solutions

Public administrations should identify generic functionalities that can be implemented as generic building blocks and reused in various systems (for example single sign-on, document transfer, archiving, etc. See also recommendation 6 for further information).

[1] The **Services Directive** (Directive 2006/123/EC) is an example of international legislation that led to common needs for IT solutions (Points of Single Contact) in Member States [21].

2.3. Communicate your needs

A key factor in the successful development of common and broadly reused IT solutions is the extent to which they meet, or can be adjusted to, the business needs of various organisations.

In order to increase awareness about existing requirements, public administrations should communicate their needs as early as possible in the process in order to facilitate alignment of development efforts.

Recommended measure for central bodies

- **PROVIDE A FORUM TO EXCHANGE INFORMATION AMONG PUBLIC ADMINISTRATIONS**

  Central bodies should set up and maintain a forum where public administrations can exchange information about requirements as well as existing solutions that can meet those requirements.

- **SUPPORT THE HARMONISATION OF BUSINESS PROCESSES WHEN IMPLEMENTING NEW LEGISLATION**

  Central bodies should define and publish "common business processes" for the ICT implementation of each new policy and legislation. This would allow public administrations to reduce the time and effort needed to implement new legislation or policy. The definition of the common processes should be made public by the time the legislation has been adopted.

3. Take into account the multilingual EU environment when developing IT solutions

Problem statement

As one of the underlying principles of the European Interoperability Framework states [6], public administrations shall take into account multilingualism when developing the internal structure and documentation of IT solutions in order to enhance their potential to be reused.

However, the multilingual aspect is often overlooked.

The absence of multilingual support within the structure of the solution often makes any reuse impossible or too expensive. For example, translations of an application's interface can become complex or nearly impossible if internationalisation rules have not been followed during development.

3.1. Follow basic internationalisation principles

There are several guidelines available on **internationalisation principles**. An example of such a guideline is W3C's Internationalization (i18n) Activity. [9].

Localisation involves adapting an IT solution in order to meet language, cultural, and other types of requirements of a specific market, such as numeric systems, date and time formats, use of currency, etc. IT solutions that cannot be localised with reasonable effort have reduced potential to be reused across borders. Thus, public administrations should ensure that they follow basic **internationalisation principles** during the development of IT solutions.

The effort and detail required to create IT solutions that support several languages should not be underestimated. For example, a key challenge entails ensuring that the IT solution is flexible enough to handle different ways of displaying and processing information in other countries and cultures. In fact, developers might make unconscious assumptions about their users' language and customs when they design their IT solutions. For instance, the displayed numerical value of currency differs depending on whether it refers to US or Canadian dollars.

When developing IT solutions, public administrations can overcome barriers to localisation and international deployment by applying internationalisation principles, such as enabling the use of Unicode for textual data and separating localisable elements from source code or content. By ensuring that internationalisation principles are taken into account, public administrations guarantee that IT solutions can be adapted to various languages and regions without engineering changes.

3.2. Provide documentation in multiple languages

In a multilingual environment, such as the European Union, documentation about IT solutions needs to be available in different national languages, in order to facilitate reuse.

Public administrations should document their IT solutions in multiple languages, or at least in English, to help users understand what the solution is about and how to reuse it.

However, in certain circumstances, the significant volume of content to be translated makes it very difficult to carry out this task exclusively via human translations.

To support this task, public administrations can rely on the use of **machine translation services,** such as the **MT@EC** offered by the European Commission.

The European Commission has developed **MT@EC** [8], a **machine translation service** which can be accessed over a secure internet connection and used by any European public administration.

Recommended measure for central bodies

- **SUPPORT INTERNATIONALISATION PRINCIPLES**

  Central bodies should support the use of internationalisation principles among public administrations by raising awareness and promoting good practices.

Legal

4. Promote legal certainty

Problem statement

Uncertainty with regard to the liability exposure of the involved stakeholders and the infringement of property rights assigned, for example through copyright and patents, have chilling effects on the sharing and reuse of IT solutions.

In order to reduce the degree of legal uncertainty with regard to intellectual property rights' (IPR) limitations and exceptions, public administrations are encouraged to follow a number of recommendations listed below.

4.1. Use standard templates for liability agreements

The European Commission has developed the **Guidelines and Templates for Agreements** between public administrations [18] to support administrations working in collaborative IT projects.

To facilitate collaborative software development and cooperation between the project partners, it is recommended to use **standard templates for liability agreements**.

These standard templates are practical instruments (such as licence-, consortium-, or collaboration agreements) that cover different intellectual property rights (IPR) aspects that should be taken into account when sharing and reusing IT solutions.

Using standard templates makes it easier for public administrations to adopt the right approach to IPR, licensing and the reuse of IT solutions, and, thus, increases the potential for their reuse.

4.2. Use certificates of origin and collaboration agreements

The use of **certificates of origin and collaboration agreements** provides developers with guidelines on the requirements to be followed when contributing to the development and maintenance of IT solutions. It also ensures that the guardian of the project's output has the necessary ownership or grants of rights over all contributions to allow further distribution under the chosen licence. Following this approach also provides consumers with some form of legal assurance of the provenance and integrity of the contribution.

4.3. Use licences with the least legal friction possible

Public administrations should use licences with the least legal friction possible, i.e. with the minimum possible restrictions in terms of sharing and reuse of IT solutions.

Furthermore, to limit incompatibilities between licences, and thus promote legal interoperability of IT solutions, public administrations should reuse existing licences instead of writing their own. By doing so, public administrations avoid licence proliferation that leads to the coexistence of multiple licences with similar terms but potential incompatibilities that limit reuse.

The **European Union Public Licence (EUPL)** is the first European Free/Open Source Software (F/OSS) licence that allows software to be freely used, modified, and shared. [22]

4.4. Detect licence compatibility issues

Currently, hundreds of licences are recognised as open (i.e. they allow IT solutions to be freely used, modified and shared) and are used around the world by public administrations. Such a proliferation of licences may create compatibility issues, which could limit the sharing and reuse of IT solutions. When merging two pieces of software code with different licences, for example, the restrictions imposed by a first licence may not be compatible with the restrictions imposed by a second one, making it impossible to use the combined solution.

In order to reduce such risk, it is important that public administrations **detect licence incompatibilities** as early as possible, for example with the support of specific tools.

The European Commission offers an online licence wizard to help administrations find the most appropriate licence to distribute their work and identify **potential licence incompatibilities** early on. [25]

Recommended measures for central bodies

- **SELECT AND PROMOTE THE USE OF APPROPRIATE LICENCES**

  To enable the reuse of IT solutions, central bodies should select appropriate licences and promote their use.

- **PROVIDE SUPPORT ON IPR-RELATED MATTERS**

  The provision of practical advice on IPR related matters is a concrete way in which central bodies should support public administrations in dealing with IPR and licensing issues associated with the sharing and reuse of IT solutions. This may include, for example, helping them better understand the rights and obligations associated to a given solution and understand whether there are third party rights associated with it.

5. Procure IT solutions in a transparent and open way

Problem statement

The European Commission has developed **The Guide: Using standards for ICT procurement** to help procurement officials, IT managers, strategists and architects within public organisations, and policy makers at central government level use standards and other technical specifications in the procurement of ICT. [26]

Even if public administrations see the benefits of procuring IT solutions that rely on open specifications and standards, practical limitations (such as compatibility with proprietary interfaces and data formats) may force them not to pursue such practices. This often results in poor procurement cases such as:

- referencing to non-standard specifications, which only a few suppliers will know about
- referencing to a specific source, trademarks, patents, etc., which favour certain undertakings or products

Such poor practices eventually often result in having one supplier entrenched over a number of years to provide mission critical systems, which is then very difficult to move away from. This is sometimes called "vendor lock-in" and is estimated to cost European public administrations €1.1 billion a year[1]. As well as increasing costs, it reduces the available supplier base, excludes new and innovative companies from providing alternative solutions, and causes the market to stagnate.

5.1. Use common standards and specifications in ICT procurement

Using standards and open specifications is crucial to avoid lock-in. In the context of ICT procurement, public administrations should consider referencing to European and national standards or international ICT specifications identified by the European Commission[2]. As standards determine a key element of a technology and create a level playing field for all IT suppliers, by referencing them, public administrations allow competitors to provide alternative solutions in order to reduce vendor lock-in and increase competition.

When public administrations use common standards and open specifications, it helps them:

- increase efficiency - it is easier to link IT systems together when they use common standards

[1] http://www.openictprocurement.eu/introduction-background/

[2] The European Commission can identify ICT technical specifications that are not national, European, or international standards, provided they meet precise requirements. Once identified and approved, these specifications can then be referenced in European public procurement. [19] and [27]

- achieve costs savings - administrations that use custom specifications could face higher long term maintenance and integration costs. Choosing common standards ensure long term cost savings
- increase competition in the European Single Digital Market - IT systems that rely on open specifications and standards, support better interoperability and ensure that systems can be replaced by new ones from different vendors[3]

5.2. Share assessments of standards and technical specifications

The Common Assessment Method for Standards and Specifications (CAMSS) helps public administrations assess specifications in a transparent and common manner. The CAMSS catalogue on Joinup allows administrations to **share and reuse these assessments** [11]

In the context of IT procurements, public administrations shall use a transparent and robust method to assess and select the most appropriate ones to use.

Using a **common assessment method, such as CAMSS,** to assess specifications provides useful information not only for the specific procurement exercise but also for other public administrations that might have to answer similar questions in the future, thus avoiding duplication of efforts and also enabling faster assessments.

Sharing the assessments of standards and technical specifications with others, public administrations promote a more efficient use of public funds, reduce duplication of efforts and improve transparency in the procurement process.

A common way to share the findings of such an assessment is to create a "common list" of standards and specifications along with their assessments to be reused by different public administrations.

5.3. Use standard clauses and contractual templates that facilitate sharing and reuse of IT solutions

Examples of standard clauses can be found on Joinup: **"Sharing and Re-using" clauses for contracts.** [12]

Public administrations should use **standard clauses and contractual templates that facilitate the sharing and reuse of IT solutions**.

The use of standard clauses and contractual templates is common practice in public administrations. However, these standard templates rarely address the sharing and reusing of IT solutions.

Using standard clauses to avoid vendor lock-in and to increase the potential for the procured solution to be shared with other administrations saves time

3 as recognised under Principle 3: Openness and transparency of the European Interoperability Framework.

and can increase the degree of legal certainty. As such clauses are usually issued by institutions and organisations that are experts in the field, they are drafted in a way that leave little room for different interpretation. Public administrations should, therefore, **develop such standard clauses or reuse already available ones**.

5.4. Open source software: take into account community contribution in public procurement

The Guideline on Public Procurement of Open Source Software explains how and why public administrations can acquire open source solutions [20]

One of open source software's main strengths is that the development process, at its best, involves a community of several firms, individuals and other contributors. Contribution is not limited to actual writing of lines of code; it extends to, for instance, providing detailed reports of requirements and issues. Public agencies can also provide indirect support for the development community, by asking tenderers for open source software or services to demonstrate their level of contribution to the appropriate developer community - as part of the selection process, and/or as part of the execution of the contract. This may be a useful way of determining level of knowledge of the open source software and its community available with the tenderer. Thus, it may be useful to assess the level of interaction and contribution that the tenderer has made within the appropriate community, and use it as a weighted criterion in tenders for open source software supply and/or services[4].

The **involvement of communities in the development and maintenance of IT solutions** fosters competition between service providers, especially when large communities can contribute instead of one single company.

Recommended measure for central bodies

- **SUPPORT THE USE OF COMMON STANDARDS AND SPECIFICATIONS**

  Central bodies should support the use of common standards and technical specifications, for example, by creating a common list of such solutions.

[4] This criterion must be applied carefully, as there are cases, where only a limited number of firms contribute actively to the development of a particular software application. The need to support that community by supporting the active contributors must be balanced with the need to foster competition and a diversity of contributors.

Technical

6. Document, share and reuse common solution building blocks

Problem statement

To provide better services for their citizens, public administrations are continuously increasing the volume of information exchange with each other across borders and sectors. To facilitate these exchanges, the need for interoperability in Europe is more pressing than ever. Solution developers in all domains of the public sector often deem interoperability and reusability essential to solution design.

Public administrations in Europe need to coordinate across borders and sectors when developing IT solutions to avoid the risk of creating new digital barriers for administrations, businesses, and citizens. Using a common terminology to design, assess and find common IT solution building blocks increases interoperability and decreases the development cost of often very complex IT systems through the reuse of interoperable building blocks.

6.1. Document key solution building blocks using a common reference architecture

The European Interoperability Reference Architecture (EIRA) defines the most important **architecture building blocks** needed to develop, assess, and communicate about interoperable solutions for digital public services. [23]

To carry out day-to-day operations, public administrations require complex and large-scale IT solutions. However, these solutions are often developed in their specific contexts and their functionalities are not documented and categorised in a common way. Due to this lack of visibility of the available IT components, it is difficult to organise proper IT governance. Frequently, this results in redundant expenditure and competing solutions giving rise to a costly and fragmented IT landscape.

To reduce such fragmentation and duplication of effort, public administrations should map key solution **building blocks to a common reference architecture**. Such architecture provides common terminology and structure to communicate the solution building blocks of key IT solutions. By mapping IT solutions and their building blocks to a reference architecture, public administrations make it easier for others to understand the typology of these building blocks and identify which ones meet their needs and can be reused. Furthermore, it makes it easier to identify the missing components of a given IT solution or to recognise which building blocks have to interoperate. The use of a common vocabulary and structure to design, assess, and communicate IT solutions facilitates coordination, especially in cross-border and cross-domain contexts, where different terminology and language is used. Mapping the solutions to a common

reference architecture will also facilitate their publication in common repositories.

6.2. Check the reusability of existing solutions before developing a new one

The **European Interoperability Cartography (EIC)** on Joinup [24] is a **common repository** developed by the European Commission that can be consulted to see whether similar solutions already exist and can be reused.

Before commissioning or developing new IT solutions, public administrations should check whether similar solutions already exist and can be reused. Such a check should also be performed e.g. when carrying out the ICT impact assessments of new legislation. In this way, public administrations will ensure that the reuse of common IT solutions is taken into account early on in the policymaking lifecycle.

Carrying out such a reusability check should be a prerequisite for any organisation asking for funding, in order to have clear proof that the solution to be developed does not exist yet, thus ensuring that public resources are used efficiently.

Administrations shall carry out these reusability checks by consulting **common repositories**.

Recommended measures for central bodies

- **MANAGE SOLUTIONS LIKE A PORTFOLIO USING A COMMON REFERENCE ARCHITECTURE**

  Central bodies should create a common frame of reference for a particular domain or field of interest by creating a portfolio of solutions using a common reference architecture, thus making it easier for public administrations to understand what solutions exist and promoting their reuse.

- **OFFER GENERIC AND REUSABLE BUILDING BLOCKS**

  Central bodies should offer generic, interoperable and reusable building blocks that are less bound to specific requirements and, thus, have a greater potential to be reused.

7. Enhance your IT solution's technical readiness

Problem statement

The technical characteristics of an IT solution are important when assessing its reusability. The internal architecture of an IT solution and the technologies it uses has a huge impact on its broader reusability. For example, it is often very costly or even impossible to adjust a system built in a monolithic way to satisfy slightly different business needs. Likewise, systems designed based on old and inflexible technologies may prove to be difficult to scale up to support increased usage.

7.1. Ensure that your IT solution is extensible

To ensure the technical readiness of IT tools, public administrations should develop them to be **extensible**, i.e. to be able to evolve beyond its current functionalities in a way that its internal structure is minimally or not affected. Because software systems are long lived and may be modified several times for new features and added functionalities demanded by users, extensibility enables developers to expand or add to the software's capabilities and thus facilitates reuse.

7.2. Ensure that your IT solution is scalable

Scalability considerations are particularly relevant for IT solutions that are shared. The **scalability** of a solution qualifies the adaptability of a system for an increased need in the technical capacity, such as the processing power of servers, storage and bandwidth. The following questions should be answered to verify scalability of IT solutions:

- Is the solution able to easily adjust to an increasing number of organisations or users to using a single distributed system (organisational scalability)?
- Can its resource pool (servers, storage, and bandwidth) be easily expanded and contracted in order to accommodate heavier or lighter loads (load scalability)?

7.3. Plan adequate level of maintenance and support for your IT solution

The availability of **maintenance and support** around a particular IT solution also determines its technical readiness and the trust in using it. Proper support activities are indispensable to facilitate its reuse. Moreover, maintenance needs to be in place to fix bugs and optimise the tools to the needs of its users.

Public administrations should ensure that a proper organisation of maintenance and support services is in place (i.e. defined in service level agreements) to support the reuse of IT solutions. In case such support is offered by third party integrators, the level of accreditation of these companies by the original developer could be taken into account to limit the risks associated with reuse.

7.4. Assess the level of maturity of IT solutions

The **level of maturity** is a key aspect that public administrations should assess in order to determine the extent to which IT solutions are reusable. The way in which the maturity of a solution can be assessed highly depends on the type of solution.

In the case of software solutions and services, the level of maturity may be assessed by the rate of periodic updates, its level of usage by the original administration and the level of reuse by organisations other than the one(s) that developed it.

The European Commission has developed the **Reusability Guideline and Checklists** to help public administrations assess the reusability of IT solutions. [10]

Organisational

8. Enhance cross-organisation coordination

Problem statement

Public administrations rely on IT solutions of different sizes and complexity to carry out their day-to-day work and have traditionally worked independently to design, procure and maintain their own IT solutions. In many cases, this has contributed to an expensive and fragmented IT infrastructure, which often duplicates IT solutions and impedes the sharing and reuse of services.

While there is a clear need for a new approach, public administrations have difficulties in coordinating joint effort across institutions and even at different levels of government. Among the most prominent reasons why coordination may be hampered are the following:

- the limited awareness of similar activities across different sectors. Administrations may put effort into developing IT solutions that meet similar business needs across borders or different domains due to insufficient exchange of information and limited or non-existent coordination.
- lack of cross-organisational IT governance structure. This can reduce the pace and efficiency of reusing common IT solutions due to the lack of coordination and alignment among administrations in the context of IT system development.

8.1. Adopt cross-organisation IT governance

The adoption of **cross-organisation IT governance** can help public administrations implement public services faster and more efficiently.

By adopting cross-organisation IT governance, public administrations contribute to the alignment and streamlining of their business processes (supported by common IT solutions). A common IT governance structure can also increase the overall efficiency of IT spending by eliminating duplication of efforts and by focusing on developing solutions that satisfy common needs.

The European Commission presents a number of IT **governance models** in two key documents: **The Business models for sharing and reuse** and the **Governance Models for Sharing and reuse of IT Solutions**.

8.2. Follow guidelines and templates when drafting collaborative agreements

The European Commission has developed ***Guidelines and templates*** *for agreements between public administrations* to be used when sharing and reusing IT solutions. [17]

Collaborative agreements are a useful instrument to establish long-term partnerships between public administrations, use resources in an effective and economical way, and ensure that both parties accept mutual benefits as a goal.

However, writing and negotiating a collaborative agreement might be a difficult and long process, which may result in agreements that do not cover aspects of a collaborative project, such as responsibilities, handling of complains, project change control, or intellectual property rights. In turn, this may hamper an otherwise harmonious relationship and, as consequence, undermine the degree of trust between public administrations.

Following **guidelines and standard templates** when drafting agreements for the collaborative development, maintenance or use of IT solutions between different public administrations helps build up the level of trust. This is thanks to clearly spelled out objectives and rules governing the collaborative efforts. Templates typically cover different elements of collaboration, such as:

- recommendation on the structuring of the agreement itself
- structure and recommended content of service level agreements
- financial terms of the agreement (charging structure, invoicing, payment terms)
- liabilities, IPR
- project change control, governance, responsibilities
- contributor agreements (in case of collaborative developments), etc.

9. Adopt business models that facilitate sharing and reuse

Problem statement

Budget fragmentation is one of several aspects that make it more difficult for public administrations to collaborate. The individual administration's mandate usually does not include creating value for other administrations.

Developing a reusable solution requires extra effort, such as better documentation, certain level of support, while the benefits of sharing (i.e. the sharing of efforts needed to sustain the solution) are often enjoyed only later on.

In addition, while compared implementing a custom made design, re-using a solution usually results in cost savings, sometimes it also requires extra effort, for example in terms of adjusting the administration's workflows to more generic ones supported by the reused solution.

Administrations that use common solutions may also end up with a reduced capacity to implement own designs, which can be perceived as a loss of technical capacity and financial autonomy.

9.1. Apply business models that facilitate the sharing and reuse of IT solutions

A list of successful **business and governance models** is available on Joinup and includes, among others, shared development of IT solutions by the European Commission. [3]

There is a number of **business models** that enable the delivery of public services based on the sharing of IT solutions and linked services, such as support or procurement. These business models cover different forms of collaboration, including: the development of reusable and/or shared tools; the reuse of IT solutions; the use and development of shared services and shared development [3].

Public administrations should choose and describe the most appropriate business model, taking into account the form of cooperation (i.e. common development, common provision of a service, etc.) and business needs.

For example, by adopting a common approach to procurement, public administrations can achieve increased value for money through improved planning and coordination across organisations, reduced repetition of work, and sharing of experiences and IT tools.

Similarly, shared services can also bring efficiency gains. By centralising services provided by one department and making them available to others, public administration departments can focus on their core business while

benefiting from standardised functionalities and processes. In addition to cost savings, developing shared services also facilitates knowledge sharing among the involved administrations, resulting in a wider community of expertise.

9.2. When assessing the Total Cost of Ownership (TCO) of a solution, also take into account costs related to its end-of-life management

The Total Cost of Ownership (TCO) is a financial estimate intended to help determine the short- and long-term costs of any solution by taking into account the complete costs from purchase to disposal. In the context of procurement, public administrations typically assess costs related to the following:

- acquisition and procurement, such as upfront evaluation, purchase price, licences, and hardware
- operation and management, such as migration of data and users, maintenance, upgrades, support services, training and software scaling
- change management, such as integration, customisation and corrective maintenance

However, costs related to the end-of-life management of a solution, such as the cost of migrating the data to another solution, are often disregarded and thus contribute to potential vendor lock-in issues.

Lower barriers for IT solution providers to provide support for applications using open interfaces (open specifications to manage information), allow more competition during the procurement, which results in lower total cost of ownership for open solutions.

Recommended measure for central bodies

- **SUPPORT PROJECTS WITH A HIGH POTENTIAL FOR SHARING AND REUSE**

  Central bodies should support public administrations that provide projects with a high potential for sharing and reuse by, for example, providing financial incentives to develop IT solutions that are reusable and whose benefits are shared among public administrations.

- **IMPLEMENT BUSINESS MODELS THAT ENCOURAGE PUBLIC ADMINISTRATIONS TO POOL THEIR RESOURCES**

  Central bodies should implement business models, which encourage public administrations to pool their resources together when procuring IT solutions or developing common public services.

10. Explain exceptions to sharing

Problem statement

There are circumstances where public administrations may be reluctant to participate in collaborative developments of IT solutions. This might indirectly limit the potential to share and reuse IT solutions.

Exposing the source code of a solution to a wider public makes it easier for anyone to understand the behaviour of the system and to identify weak security points; thus, may increase the risk of successful malicious attacks. On the other hand, opening up the code also allows for better scrutiny, a potentially quicker identification and fixing of weak points.

While restrictions on sharing and reuse of IT solutions may be justified, public administrations should document these decisions based on the full assessment of a restriction's potential benefits and drawbacks.

10.1. Provide explanations for restriction areas to sharing

Public administrations may exempt IT solutions from being shared, provided that they explicitly identify the circumstances and give the **reasons for such limitation**, in line with a clear policy on access restriction. Such restriction areas typically result from security or legal considerations.

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