DLV04.01- List of cases where interoperability challenges may occur

Study on functional, technical and semantic interoperability requirements for the single digital gateway (SDG) implementation

01/08/2018

Table of Contents

List of figures

List of Tables

Document characteristics

Property	Value
Release date	01/08/2018
Status:	Submitted for Review
Version:	5.0
Authors:	Everis
Reviewed by:	
Approved by:	

Document history

Version	Description	Date
1.0	Document submitted for review	25/05/2018
2.0	Document submitted for review	29/06/2018
3.0	Document submitted for review	16/07/2018
4.0	Document submitted for review	18/07/2018
5.0	Document submitted for review – Revised version	01/08/2018

1. Introduction

The present document, framed into the project "*Study on functional, technical and semantic interoperability requirements for the single digital gateway implementation*" aims at presenting a list of situations where organisational, semantic or technical interoperability challenges may appear and should be addressed, in the development and use of the Single Digital Gateway (SDG) IT tools.

The SDG will be aligned with the proposal for a Regulation (hereafter *proposal for a Regulation*) of 2 May 2017 [COM(2017)256]. The proposal aims at making it easier for EU citizens and businesses, who need to navigate regulatory and administrative requirements, to access the necessary information, procedures and assistance services online.

This document describes a set of interoperability challenges – in alignment with the European Interoperability Framework (EIF) – stemming from the different data exchanges envisaged between each of the SDG IT tools and the different Service Providers. It is worth to point out that other challenges that do not fall within the remit of interoperability are not part of the scope of this document.

The challenges introduced will be further assessed in DLV04.02 – Analysis of interoperability challenges.

2. Methodology

The EIF defines interoperability as "the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations, through the business processes they support, by means of the exchange of data between their ICT systems[1]". From this definition, the EIF establishes an interoperability model structured in four interoperability layers: legal, organisational, semantic and technical:

Figure 1 – EIF Interoperability model[2]: four interoperability layers

Inspired in the EIF Interoperability model and in the context of the SDG, legal, organisational, semantic or technical interoperability challenges may appear when IT systems exchange information both cross-systems and cross-borders e.g. sharing links, crawling links, sharing statistics gathered at National level, etc. The EIF defines the different layers as:

- **Legal interoperability**: "Legal interoperability is about ensuring that organisations operating under different legal frameworks, policies and strategies are able to work together[3]";
- **Organisational interoperability**: "refers to the way in which public administrations align their business processes, responsibilities and expectations to achieve commonly agreed and mutually beneficial goals[4]";
- **Semantic interoperability**: "Semantic interoperability ensures that the precise format and meaning of exchanged data and information is preserved and understood throughout exchanges between parties, in other words 'what is sent is what is understood'[5]";
- **Technical interoperability**: "covers the applications and infrastructures linking systems and services. Aspects of technical interoperability include interface specifications, interconnection services, data integration services, data presentation and exchange, and secure communication protocols[6]".

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1 See: New European Interoperability Framework Promoting seamless services and data flows for European public administrations: https://ec.europa.eu/isa2/sites/isa/files/eif_brochure_final.pdf
2 See: idem, pg. 22
3 See: idem, pg. 27
4 See: idem, pg. 28
5 See: idem, pg. 29
6 See: idem, pg. 30

To ensure an alignment of the Legal, Organisational, Semantic and Technical layers, the interoperability governance is defined as the *"decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability at national and EU levels[7]"*.

Legal interoperability is deemed out of scope for the purpose of this document since the proposal for a Regulation already lays down the legal basis, therefore the analysis focuses on the three remaining interoperability layers.

A **three-step** approach has been followed to come up with the different interoperability challenges:

(1) The different exchanges of data between Service Providers and the SDG IT tools[8] have been analysed, since the notion of interoperability lies in each particular exchange, along with the purpose and the most salient interoperability needs for each tool;

(2) A long list of interoperability challenges has been drafted up, classifying them by SDG IT tool(s) affected and by EIF layer;

(3) Finally, a short list has been further elaborated by streamlining and rationalising the already identified challenges.

It shall be noted that the due to the similarities in terms of functioning and needs between the search facility and the common assistance finder, related challenges have been assessed together, as if they were an unique entity, as shown in the table below.

Section 4 presents the final list of challenges by describing their high-level characteristics of the rationalised challenges stemming from step 3.

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3. Summary of interoperability challenges

The table below summarises challenges per IT tool.

IT Tool	EIF Layer	Need	Challenges	Rationalised challenges
Search Facility & Common assistance finder	Organisational	Standardised link format	Guarantee involvement of service providers in the definition and implementation of the format of the links	Setting up a sound and efficient organisational model
		Common metadata model	Guarantee involvement of service providers on definition and implementation of the metadata required to publish data in a common format	
		List of all sources of information	Ensure identification of all service providers	
		Interoperability agreements	Ensure availability of interoperability agreements	
		Availability of a working group	Ensure the involvement of all service providers	
			Ensure the sponsorship of the working group	
		Avoid duplication of information	Align business processes to bypass duplication issues	
	Semantic	Common metadata model	Maximise harmonisation of the format of the content description	Need for a common foundational data model
		Standardised link format	Guarantee an harmonised format of the links	
		Multilingualism	Exchanges between ICT systems across linguistic boundaries, the meaning of the information exchanged must be preserved	
	Technical	Available and accessible links	Content should be accessed by human and machine interfaces (crawling)	Guarantee data exchange
		Interfaces with Service Providers on information and procedures, and assistance and problem services	Finding a common machine readable output format from the member states	
		Consumption of information stored in databases	Communication and exchange of information with different data sources	
Feedback on quality	Organisational	Common data model	Guarantee involvement of service providers in the definition and mapping towards the data model	Setting up a sound and efficient organisational model
		List of all sources of information	Ensure identification of all service providers	
		Interoperability agreements	Ensure availability of interoperability agreements	
		Availability of a working group	Ensure the involvement of all service providers	
			Ensure the sponsorship of the working group	

IT Tool	EIF Layer	Need	Challenges	Rationalised challenges
	Semantic	Common data model	Maximise understanding and harmonisation of feedback on quality	Need for a common foundational data model
	Technical	Interfaces with quality feedback systems	Finding a common machine readable output format from the member states	Guarantee data exchange
User feedback on SM	Organisational	Common data model	Guarantee involvement of service providers in the definition and mapping towards the data model	Setting up a sound and efficient organisational model
		List of all sources of information	Ensure identification of all service providers	
		Interoperability agreements	Ensure availability of interoperability agreements	
		Availability of a working group	Ensure the involvement of all service providers	
			Ensure the sponsorship of the working group	
		List of all assistance services	Ensure identification of all service providers	
	Semantic	Common data model	Maximise understanding and harmonisation of the format of the requests for assistance services	Need for a common foundational data model
	Technical	Interfaces with assistance services	Finding a common machine readable output format from the member states.	Guarantee data exchange
Statistics of use	Organisational	Common data model	Guarantee involvement of service providers in the definition and mapping towards the data model	Setting up a sound and efficient organisational model
		List of all sources of information	Ensure identification of all service providers	
		Interoperability agreements	Ensure availability of interoperability agreements	
		Availability of a working group	Ensure the involvement of all service providers	
			Ensure the sponsorship of the working group	
		List of statistic services	Ensure identification of all statistics service providers	
	Semantic	Common metadata model	Maximise understanding and harmonisation of statistical information	Need for a common foundational data model
	Technical	Interfaces with statistical services	Make sure the data that is exchanged is comparable	Guarantee data exchange
Dashboard	Organisational	Interoperability agreements	Ensure availability of interoperability agreements	Setting up a sound and efficient organisational model
	Technical	Interface with translation management system	-	Guarantee data exchange

Table 1 - Interoperability challenges

4. Identification of interoperability challenges

The final list revealed that most of the tools face similar challenges, nonetheless with specificities inherent to their own purpose and specific data exchanges. In the same way, one particular challenge was deemed to be transversal to all tools: "Setting up a sound and efficient organisational model", as organisational aspects are always recommended to be tackled holistically. These two findings conditioned the way this section has been structured; first, a section with the common challenge for all SDG tool is presented; and afterwards, a description for all the challenges framed into each tool is presented under the section 'specific challenges'.

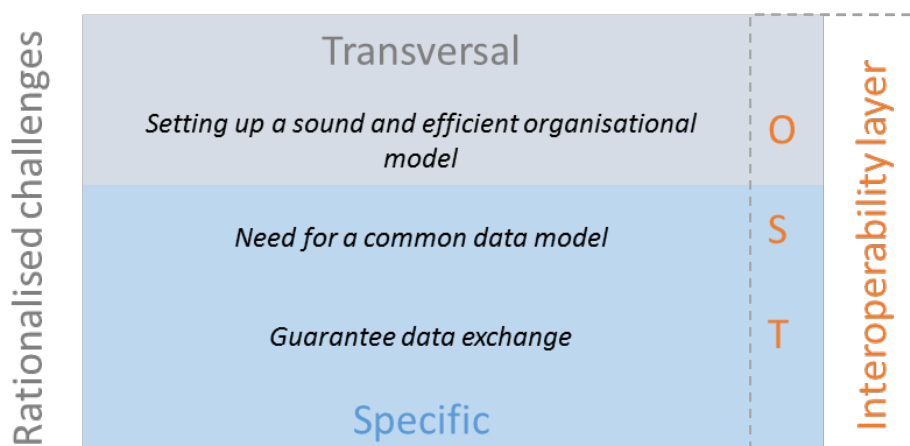The image below synthesises this grouping:

Figure 2 - Rationalised challenges

4.1. **Transversal challenge**

4.1.1. **Setting up a sound and efficient organisational model**

According to the EIF, organisational interoperability focusses on "the way in which public administrations align their business processes, responsibilities and expectations to achieve commonly agreed and mutually beneficial goals[9]".

Organisational interoperability ensures that all required stakeholders are identified and that they meet their responsibilities, but also that they have the capabilities to do so. In this sense, organisational interoperability aligns not only responsibilities, but also the required infrastructures and systems to exchange the agreed information within the defined business processes. For instance, organisational relationships should have a clearly defined structure that can be put in place by using instruments such as service level agreements (SLAs) to set the minimum performance or availability requirements.

Along the SDG lifecycle, the organisational model will be the framework on how different authorities collaborate to achieve their mutually agreed goals. Public organisations need detailed agreements on collaboration and synchronization of their business processes to

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[9] See: New European Interoperability Framework Promoting seamless services and data flows for European public administrations: https://ec.europa.eu/isa2/sites/isa/files/eif_brochure_final.pdf, pg. 28

integrate into the service provided by SDG. The agreements would include organisational structures (e.g. working group with a strong sponsorship), roles and responsibilities, institutional arrangements between all the actors, and other policies and agreements that are necessary to develop and maintain the SDG. Within this governance context, the interoperability agreements (concrete and binding documents which set out the precise obligations of two parties cooperating across an 'interface' to achieve interoperability) are crucial to guarantee the exchange of information and thus the functioning of the SDG.

When setting up a governance model, it is important to include all stakeholders to facilitate cooperation, so that all can agree on governance priorities and align resources accordingly. The arrangements and agreements that are part of the governance model should take into account the Service Providers' capabilities to meet the responsibilities agreed upon.

It is worth to point out that alternatives to avoid duplicated content available on the search facility needs to be explored. Specific use cases in this regards should be documented and discussed with different stakeholders in order to agree on the way forward.

4.2. Specific challenges

4.2.1. Search Facility and common assistance finder

Main purpose: the search facility provides users with links to access information and procedures located on the Commission and Member States websites. The common assistance finder will give access to links and information on assistance and problem solving services which citizens and businesses can refer to with questions or problems related to their rights, obligations or procedures.

Data exchange(s):

- Links to access information and procedures located on the Commission and Member States websites.
- Links to assistance and problem solving services.

4.2.1.1. Need for a common data model

Service Providers should provide links to the SDG, the format in which links are provided needs to be standardised in order to guarantee that the information can be automatically retrieved and processed regardless of the links submitted. The proposal for a Regulation does not define a mandatory format to share links, however, the use of different formats may challenge the efficiency of how this information is shared and ultimately processed.

The lack of a common metadata model for the Service Providers to structure information may hinder the quality of the search results. In this regard, it is worth exploring the possibilities of the **Core Public Services Vocabulary (CPSV),** a common data model for describing key business events and public services and the **Asset Description Metadata Schema (ADMS)**, a simple specification for describing reusable interoperability solutions. Both will permit to enrich the information delivered by Service Providers when elaborating or updating the content of their websites, thus facilitating translation of content and improving the functioning of the search facility and the common assistance finder. The usage of a standard data model it would be an important step to dramatically improve the functioning of the search facility and the common assistance finder.

Nonetheless, Service Providers may (or not) be using their own vocabularies to provide metadata on the content they publish. In order to embrace the agreed upon vocabularies for

SDG, service providers may have two alternatives[10]: (1) adopt and implement the vocabulary that has been defined in compliance with SDG requirements; or (2) map their own vocabularies towards the agreed upon vocabulary for SDG. The usage of mapping tables may help to express in machine-readable format how concepts of one service provider relate to one or more concepts in the SDG vocabulary.

The EC, within the frame of the ISA² programme – aimed at supporting the development of digital solutions that enable public administrations, businesses and citizens in Europe to benefit from interoperable cross-border and cross-sector public services – is currently supporting CPSV and ADMS.

4.2.1.2. **Guarantee data exchange**

In some cases, information on areas relevant for citizens and business exercising their Single Market rights referred in the proposal for a Regulation may not be directly accessible in the form of static links and therefore cannot be automatically retrieved – for instance – by the search facility.

This is the case of information rooted in the **Taxes in Europe Database (TEDB)**, the European Commission's online information and search tool covering the most significant taxes in terms of revenue in the different Member States. TEDB allows the end user to access to tax information by performing a search filling specific parameters. In such cases where a database contains information relevant from the purposes of SDG, the need to enable additional technical mechanisms in order to allow the search facility to automatically retrieve information through a common agreed and defined machine readable format (e.g. by enabling APIs) needs to be taken into account.

An automated provision of links may help to smooth the discovery of links and therefore the process of indexing content. In this regard, specific interfaces may be required.

4.2.2. User Feedback tool on quality

Main purpose: the user feedback tool on quality aims to enable a high-level comparison of performance of services by allowing the users to submit information on their satisfaction with the services provided within the gateway.

Data exchange(s):

- Information on quality and availability of the services provided.

4.2.2.1. **Need for a common data model**

SDG Regulation states that the Commission shall provide users with a tool to comment anonymously on quality and availability of the services provided through the gateway. In this context, competent authorities and the Commission shall include a link to this tool on all the webpages that are part of the gateway. Alternatively, when a user feedback mechanism of similar functionalities is available on those webpages to monitor service quality, competent authorities may decide to use such mechanism by making the feedback collected available to SDG.

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[10] As the case of the ESCO classification: Commission Implementing Decision No 2018/1021

Different data models can exist when a user feedback mechanism is already available on the service providers' websites. Existent data can be gathered and interpreted in a different way because the attributes and identifiers could differ in number and nature. National differences in service naming, organisational set-up, and legal context, together with the use of different languages, increase complexity. The need for a foundational data model to bridge the different data models thus favouring data integration/aggregation stemming from disparate data sources (i.e. systems that gather feedback on quality) becomes evident.

Quality feedback on digital channels are usually measured quantitatively or qualitatively. The quantitative data involves numerical results and tends to be more precise and objective while the qualitative data more descriptive and explanatory and more subjective. Service providers nowadays can be using different ways for collecting data.

A unique view on KPIs should be agreed between Service Providers in order to maximise comparability. Potential KPI examples are Customer Effort Scope (how users feel about the effort it took for them to interact with a particular service), Customer satisfaction (measure of how the services provided met or surpassed the user expectation) or Net Promoter/NPS (measures the end user experience and the perception they have about a particular service). In light of the above, it is paramount to define a data model to which Service Providers can map their own data on quality to, after having reached an understanding on the KPIs values and their calculation.

4.2.2.2. Guarantee data exchange

The SDG needs to be capable to intake the necessary information for the functioning of the platform regardless of the underlying technological landscape (including, software products and hardware components) of the different Service Providers.

The usage of API interfaces will be necessary to guarantee data exchange on quality feedback between SDG and the Service Providers.

4.2.3. User Feedback on SM obstacles

Main purpose: the user feedback tool on obstacles aims to retrieve and publish information on obstacles by allowing users to signal anonymously obstacles encountered by them in exercising their internal market rights.

Data exchange(s):

- User feedback information on obstacles.
- Origin, number and subject matter of requests for assistance services.

4.2.3.1. Need for a common data model

Information from assistance and problem services is extremely valuable when contextualising feedback on Single Market obstacles. Similarly to the reasoning behind similar challenges for other IT tools, the need for a common information that guarantees an effective aggregation and comparison of information rooted in different Service Providers is of crucial importance. Such common information model will build upon Service Provider's data models in order to define a common view. In order to provide data to SDG, Service Providers will need to map their current data models towards the common one to guarantee accurate and comparable information.

4.2.3.2. **Guarantee data exchange**

The usage of API interfaces will be necessary to guarantee data exchange between SDG and the Service Providers when it comes to benefit from information on assistance and problem services' cases.

4.2.4. **Statistics of use**

Main purpose: the user statistics tool aims to collect and publish information on statistics in relation to user's visits on the gateway and the Service Providers websites to improve the functioning of the gateway.

Data exchange(s):

- User statistics (aggregated) related to visits to the Service Providers websites.

4.2.4.1. **Need for a common data model**

SDG Regulation states that the competent authorities and the Commission shall ensure that statistics are collected in a standardised, aggregated and anonymous format in relation to users' visits on the gateway and the webpages to which the gateway links in order to improve the functionality of the gateway.

To collect the statistics of use, most authorities are using tools such as Piwik or Google Analytics. While both products are quite similar in terms of functionality, the data they are collecting (in the form of KPIs) and the calculations used, differs from one another. There is a need for a common data model that standardises and rationalises the way in which the information originated in the different Service Providers has to be reported, favouring aggregation and comparison of the different KPIs regardless of the data source. Therefore, data on statistics need to be adapted towards a common agreed upon information model before being made available to SDG.

4.2.4.2. **Guarantee data exchange**

To allow the exchange of information and to interconnect services the availability of API interfaces is deemed to be necessary. The development of the API interfaces will allow the exchange of information with unrelated software programs and permit the data to flow regardless of how each application was originally designed.

4.2.5. **Dashboard**

Main purpose: The Dashboard tool hosts the support processes that take place in the back office of the SDG. These processes are transversal to all the IT tools of the SDG and, although they do not affect every business process from every IT tool, they are necessary to enable the management of the platform, analyse, and monitor its results, both at national and European level and to provide a systematic approach to comprehensive analysis and evidence about the state of the Single Market.

Data exchange(s):

- Send and receive documents and/or data to and from the Translation Management System.

4.2.5.1. **Guarantee data exchange**

Authorities are entitled to ask for translation of documents in any of the 24 official languages. The main goal is to help authorities exchange information across language barriers in the EU, by providing translation capabilities. SDG should be able to exchange this information with a TMS system that will manage the translation of the documents. More operationally, SDG will send documents to be translated and receive them back translated. Therefore, both systems must be able to exchange data and documents in an interoperable, secure, reliable and trusted way.

In this regard it is key to agree on which standards will be used to favour this exchange between SDG and the TMS system by developing technical interfaces for that purpose (e.g. APIs).

5. Annexes

5.1. Terms and acronyms

5.1.1. Glossary

Term	Description
Assistance Service	EU-level or national-level applications aimed at informing effectively EU citizens and businesses about their rights and the opportunities arising from the EU, or at supporting users in addressing problems they may encounter when trying to handle administrative procedures.
Procedure	A procedure is a sequence of actions that must be taken by users to satisfy the requirements or obtain from a competent authority a decision in order to be able to exercise their rights.
Service	The means of delivering value to customers by facilitating the achievement of the outcomes that the customers want, without the need for them to have ownership of specific costs and risks.
User	Anyone who is a citizen of the Union, a natural person residing in a Member State or a legal person having its registered office in a Member State, and who accesses the information, the procedures, or the assistance or problem solving services, referred to in Article 2(2) of the SDG Regulation, through the gateway.

Table 2 - Glossary

5.1.2. Acronyms and abbreviations

Term	Description
ADMS	Asset Description Metadata Schema
CPSV	Core Public Services Vocabulary
EC	European Commission
EIF	European Interoperability Framework
EU	European Union
ISA²	Interoperability solutions for public administrations, businesses and citizens
KPI	Key Performance Indicator
LOST	Legal, Organisational, Semantic and Technical layers of the EIF
MS	EU Member States
SDG	Single Digital Gateway
SM	Single Market

Term	Description
Proposal for a Regulation	Regulation of the European Parliament and of the Council on establishing a single digital gateway to provide information, procedures, assistance and problem solving services and amending Regulation (EU) No 1024/2012
TMS	Translation Management System

Table 3 - Acronyms / Abbreviations