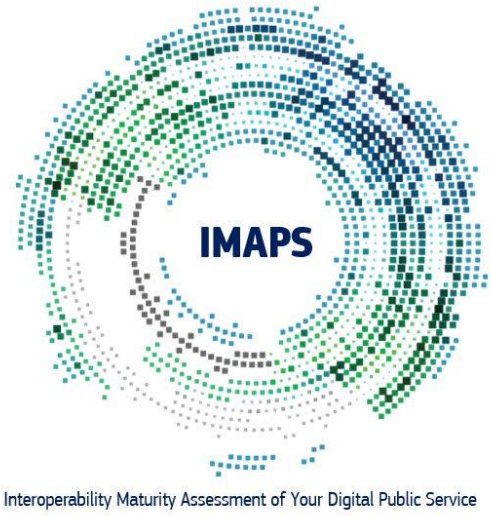
SIMAPS v1.0.0

Semantic Interoperability Maturity Assessment of a Public Service

User guide



LIMAPS Legal Interoperability

OIMAPS Organisational Interoperability

SIMAPS Semantic Interoperability

TIMAPS Technical Interoperability

Disclaimer

The information and views set out in this publication are those of the author(s) and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this document. Neither the Commission nor any person acting on the Commission's behalf may be held responsible for the use, which may be made of the information contained therein.

TABLE OF CONTENTS

Table of Abbreviations

Acronym	Description
ABB	Architectural Building Block
CAMSS	Common Assessment Method for Standards and Specifications
CarTool	Cartography Tool
DIGIT	Directorate-General for Informatics
EC	European Commission
EIF	European Interoperability Framework
EIRA© (EIRA)	European Interoperability Reference Architecture
EU	European Union
IQAT	Interoperability Quick Assessment Toolkit
IMM	Interoperability Maturity Model
ISA	Interoperability Services for Public Administrations
IMAPS	Interoperability Maturity Assessment of Public Services
MS	Member State
PA	Public Administration
SIMAPS	Semantic Interoperability Maturity Assessment of Public Services

Glossary of terms

Term	Description
Attribute	Structural part of each SIMAPS component. Each attribute assesses a specific aspect of public service, e.g. the semantic interoperability specifications of data, information and knowledge delivered by the public service to its end users and/or other client services
Component	Fundamental structural part of the SIMAPS model. Each component refers to a different pillar of public service lifecycle. SIMAPS has two components: Service Delivery and Service Consumption
Item	Structural part of each SIMAPS attribute. Items are the questions of the SIMAPS questionnaire (survey)
Option	Options are the possible replies to one SIMAPS item
Principles	Rules applied on public service to enable and ensure semantic interoperability
(*Overall*) Weight	Weight refers to the absolute numerical factor that each component/attribute/item contributes into the structural part it belongs. Overall weight refers to the overall numerical factor that each component/attribute/item contributes to the whole SIMAPS survey

EXECUTIVE SUMMARY

This document provides the guidelines and definitions for using the Semantic Interoperability Maturity Assessment of Public Services (SIMAPS) model in order to assess and improve semantic interoperability maturity of a digital public service. SIMAPS is the **semantic specialisation** of IMAPS survey that assesses the behavioural aspects of a digital public service from the semantic interoperability viewpoint.

In the following chapters, we provide an introduction to the most important chapters in the context of SIMAPS and we present the objectives of SIMAPS, the defined maturity levels and the approach and attributes of semantic interoperability that are the subject of observation and assessment.

Finally, we conclude with an explanation of the structure of the SIMAPS questionnaire and the methodology used to determine the maturity levels of semantic behavioural interoperability of a public service.

1 INTRODUCTION

1.1 Document Objectives

The present deliverable documents the guidelines and definitions for using the Semantic Interoperability Maturity Assessment of Public Services (SIMAPS) model in order to assess and improve semantic interoperability maturity of a digital public service. SIMAPS is the **semantic specialisation** of IMAPS survey that assesses the behavioural aspects of a digital public service from the semantic interoperability viewpoint. This document is also based on the updates of SIMAPS to version 1.0.0 by implementing the feedback collected during SIMAPS beta deployment and review, as this has been recorded in the respective JIRA tickets. These updates include the description of SIMAPS version 1.0.0, its purpose and scope in relation to IMAPS, as well as its design and deployment on the EU Survey portal. The objectives of the present deliverable are the following:

- the description of the **key concepts** to understand the SIMAPS;
- the presentation of **model objectives**;
- the description of the SIMAPS **maturity levels**, as well as the **behavioural interoperability aspects** that it covers;
- the description of the SIMAPS **structure** including its **attributes and components**;
- the description of how the SIMAPS **questionnaire** is structured.

1.2 Document Structure

The document is organised in the following chapters:

- **Executive summary**, which provides an overview of the deliverable objectives, activities and conclusions;
- **Chapter 1:** Serves as introduction to the document;
- **Chapter 2**: Includes the description of the key concepts used in SIMAPS;
- **Chapter 3**: Presents the SIMAPS model objectives;
- **Chapter 4**: Includes the maturity levels of SIMAPS, as well as the behavioural interoperability aspects that it covers;
- **Chapter 5:** Presents SIMAPS structure, in components, attributes and items, demonstrating how their design ensures alignment with IMAPS, EIF and EIRA;
- **Chapter 6**: Presents the SIMAPS questionnaire and how it is structured.

2 SIMAPS KEY CONCEPTS

The following concepts are key to understand the SIMAPS:

- *Public service* – services that public authorities identify as being of particular importance to citizens (A2C), businesses (A2B) and public administrations (A2A) and that would not be supplied (or would be supplied under different conditions) if there were no public intervention. Examples are transport networks, postal services and social services.
- *Digital public service* – the digital delivery of a public service via channels such as interactive digital collaborations (chat, messaging functionality), mobile application, web portal / website, email and machine-to-machine interface.
- *Interoperability* – the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective IT systems.
- *Semantic Interoperability* - Semantic interoperability enables organisations to process information from external sources in a meaningful manner and ensures that the precise meaning of exchanged information is understood and preserved throughout exchanges between different parties. In the context of the European Interoperability Framework (EIF), semantic interoperability also encompasses the syntactic interoperability in the sense of describing the exact format of the information to be exchanged in terms of grammar, format and schemas.

2.1 Public Service

From a conceptual point of view, a public service starts with a trigger, goes through a number of steps and delivers an outcome towards an end user. The outcome may be, but not necessarily, a public decision (e.g. issuing of a license involves a decision, issuing of an electronic fee involves a decision, etc.). The aforementioned conceptual model of a public service is illustrated in the below figure.

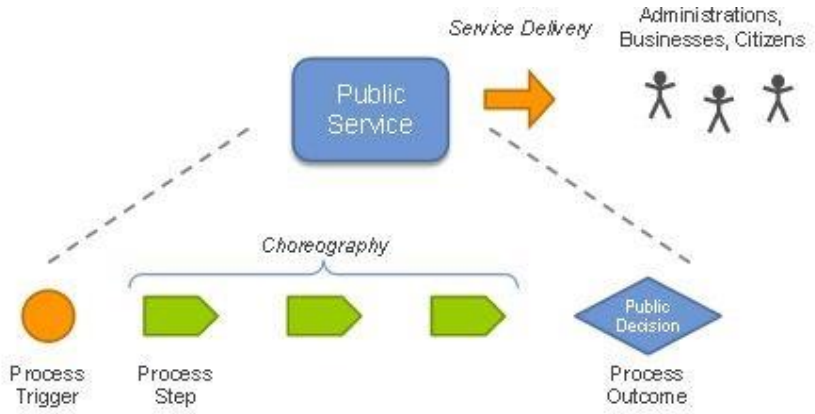


Figure 1: Conceptual model of a public service

For illustration purposes, the conceptual model is applied to the public service "Income tax declaration". In simple terms:

- The service's trigger is the new fiscal year.
- The main process steps it comprises are the following:
  i. Collect information;
  ii. Let citizen validate information;
  iii. Check declaration
- The outcome is the public decision on the amount of income tax, which is due.

2.2 Digital public service

The Semantic Interoperability Maturity Assessment of Public Services (SIMAPS) assesses the semantic behavioural interoperability of a digital public service. The following four design rules apply when defining a digital public service:

1. The digital public service has a **single outcome / public decision**. When multiple service outcomes are recognised, then multiple digital public services will need to be defined and assessed, each one through a separate SIMAPS assessment;
2. The digital public service has a **single service owner** i.e. the public administration responsible for the service. When the ownership of a service is distributed amongst multiple public administrations (e.g. multiple local administrations providing birth certificates), then each service owner needs to conduct a separate assessment for his respective service;
3. The digital public service has a **single primary end user group**. Public services can be delivered towards three of end users: citizens, businesses and other public administrations. In case the same digital public service is delivered to different types of end users, then these services should be assessed separately from one another through the SIMAPS;
4. The digital public service has a **virtual end user interface**. SIMAPS at the outset has been designed to evaluate services, which are delivered to end users. This is a corollary to the previous design rule.

Examples of digital public services that conform to the aforementioned design rules are the following:

- Citizens (3) are offered the service to access their Electronic Health Record (1) via the eHealth portal (4) of the Danish Sunhed (2);
- Citizens (3) are offered the service to issue an e-administrative fee (1) via the GSIS portal (4) provided by the Ministry of Digital Government (2);
- Administrations (3) are offered the service to obtain European vehicle information (1) via the web service (4) of the EUCARIS (2).

2.3 Interoperability and IMAPS

Interoperability in a digital public service is an attribution defined as "the extent it enables peer-to-peer collaboration with public services towards mutually beneficial goals, involving the sharing of data, information and knowledge between them regardless their legal, organisational, semantic and technical environment". Figure 2 illustrates the digital public service in the context of interoperability.

Interoperability is of multidimensional nature involving structural interoperability, behavioural interoperability and governance interoperability:

1. The **structural interoperability** is "the extent its structure has been developed reusing and/or sharing components in support of a peer-to-peer collaboration"
2. The **behavioural interoperability** is "the extent its manifested behaviour exchanges data, information or knowledge with its environment in support of a peer-to-peer collaboration"
3. The **governance interoperability** is "the extent its agreed choreography rules support a peer-to-peer collaboration"

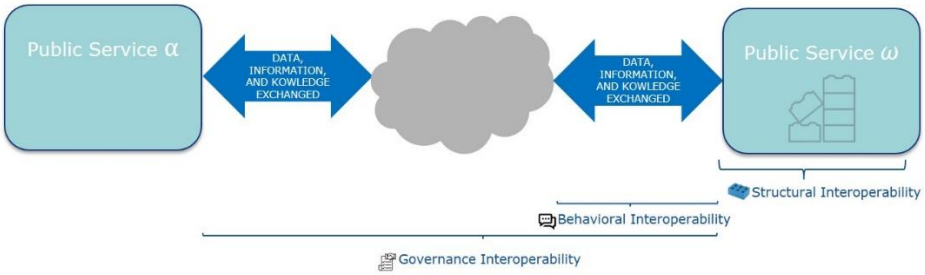


Figure 2: Interoperability dimensions

In addition, all relationships that interconnect the digital public service with the outside environment are considered relevant for assessing interoperability and thus, they are taken into account in the IMAPS. Interoperability and IMAPS are concerned with how the relationship between internal and external domains is defined and implemented.

In particular, IMAPS measures how well a public administration interacts with **external** entities to organise the efficient provisioning of its public services to other public administrations, businesses and citizens. IMAPS uses the term “behavioural” to refer to the fact that it assesses aspects that have to do with how the public services “behave” while interacting with each other or with their end users (citizens, business or other Public Administrations).

The figure below describes all possible instances where interoperability with the outside world may occur from the digital public service viewpoint. It distinguishes between the internal domain (here the organisation **produces** the public services) and the external domain (here the public service **reuses** existing services from other administrations and/or businesses.

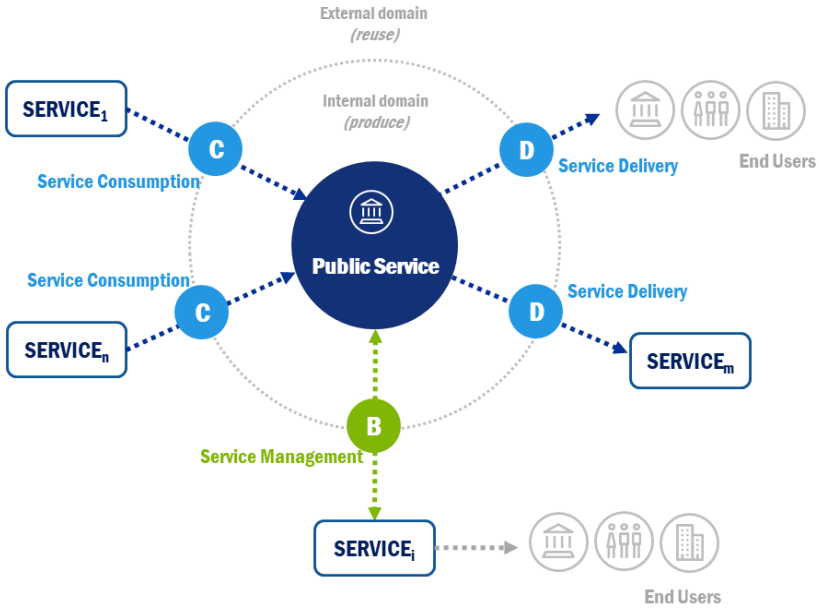


Figure 3: IMAPS behavioural interoperability viewpoint

2.4 SIMAPS

SIMAPS inception initiates from the fact that the IMAPS model is not granular enough to assess how the service delivery model of digital public services and the semantic aspects of the organisations that they belong to, affect the behavioural aspects of their interaction with their end-users (citizens, businesses, administrations) or other client services. SIMAPS assesses the behavioural aspects of a digital public service, via an approach similar to this of IMAPS, but from the **semantic behavioural interoperability viewpoint**.

Semantic interoperability enables organisations process information from external sources in a meaningful manner and ensures that the precise meaning of exchanged information is understood and preserved throughout exchanges between different parties such as different Public Administrations. In the context of the **European Interoperability Framework** (EIF), semantic interoperability also encompasses the syntactic interoperability in the sense of describing the exact format of the information to be exchanged in terms of grammar, format and schemas. **Semantic interoperability** provides also a common understanding of the data, by using common nomenclatures and data formats. It is crucial to agree on the use of common semantic standards, promote transparent and well-documented metadata policies and increase the visibility and reuse of existing semantic interoperability solutions.

In particular, SIMAPS assesses the behavioural aspects of a digital public service by limiting its focus on:

- the semantic behavioural interoperability **specifications** of data, information and knowledge delivered and consumed by the public service and its end-users or other client services;
- the semantic behavioural interoperability **capabilities** that **enable** either the delivery and consumption of data, information and knowledge by the digital public service and its end

users or other client services or ii) the discoverability of the public service or other client services;

- the semantic behavioural interoperability **manifestations** of the public service delivering and consuming data, information and knowledge (manifestations can be performance, results, user experience).

3 SIMAPS Model Objectives

SIMAPS delivers insights into two important aspects of semantic interoperability maturity:

- Provide insight into the **current semantic interoperability maturity** of a digital public service based on a set of defined interoperability attributes and maturity stages;
- Provide guidelines for how the digital public service can **improve its semantic interoperability maturity.**

Although the SIMAPS is publicly available for any organisation and citizens interested, the main target audience is the public service owners of digital public services that operate in an environment where interoperability is required to deliver a public service to end users.

Improving interoperability and in particular, semantic interoperability is a continuous activity. Organisations are therefore encouraged to use the model and its improvement recommendations regularly.

4 SIMAPS Maturity Levels

SIMAPS uses a five-stage model to indicate the semantic interoperability maturity of the digital public service. Using maturity levels allows to:

- Measure the semantic interoperability maturity of the digital public service as a whole as well as underlying aspects;
- Indicate which capabilities and next steps are required to reach higher levels, and thus improve semantic interoperability maturity.

A five-stage approach is often seen in proven maturity models and is considered best practice for assessing and improving maturity. The five maturity levels for SIMAPS are summarised in the table below.

Table 1: Five maturity levels of SIMAPS

Maturity Level	Maturity Stage	Interpretation
1	**Ad Hoc**	Poor interoperability – the digital public service cannot be considered interoperable
2	**Opportunistic**	Fair interoperability – the digital public service implements some elements of interoperability best practices
3	**Essential**	Essential interoperability – the digital public service implements the essential best practices for interoperability

4	**Sustainable**	Good interoperability – all relevant interoperability best practices are implemented by the digital public service
5	**Seamless**	Interoperability leading practice – the digital public service is a leading interoperability practice example for others

The desired interoperability level for a digital public service is at least level 4: “Sustainable”. At this level, the digital public service is considered to have implemented all relevant best practices.

5 BEHAVIOURAL INTEROPERABILITY ASPECTS

5.1 Approach

The approach to develop IMAPS specialisations builds upon the fact that IMAPS measures how well a public administration interacts with **external** entities to organise the efficient provisioning of its public services to other public administrations, businesses and citizens.

IMAPS uses the term "behavioural" to refer to the fact that it assesses aspects that have to do with how the public services "behave" while interacting with each other or with their end users (citizens, business or other Public Administrations). SIMAPS assesses the behavioural aspects of a digital public service, via an approach similar to this of IMAPS, but from the **semantic behavioural interoperability viewpoint**.

The figure below describes all possible instances where semantic behavioural interoperability with the outside world may occur from the digital public service viewpoint.

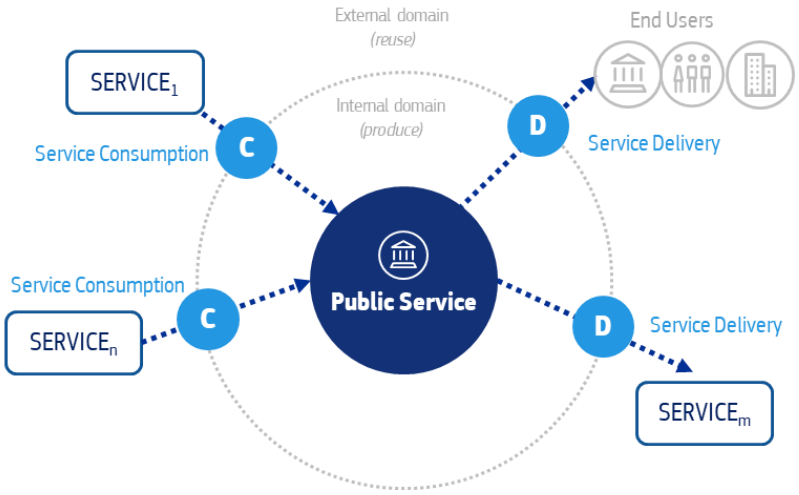


Figure 4: SIMAPS behavioural interoperability viewpoint

The behavioural interoperability aspects are described below:

- **Service Consumption (C)** – Consumption of reusable machine-to-machine services from other public administrations and businesses. This can include the consumption of functionalities, base registry information and security services;
- **Service Delivery (D)** – Delivery of the digital public service to its end users

The aspects (hereafter referred to as Behavioural Interoperability Aspects) indicated in the figure above are the object of measurement in SIMAPS, specifying where semantic behavioural interoperability plays a role from a service delivery and a service consumption viewpoint.

5.2 Service Delivery (D)

The public administration delivers the digital public service towards end users i.e. citizens, businesses or other administrations. We call this **Service Delivery**. The service that is being delivered represents the focal point of the SIMAPS in terms of correctly scoping and delimiting the digital public service under evaluation. If service delivery is scoped correctly, the scoping of the other areas becomes more straightforward. The Service Delivery area focuses on the delivery of the digital public service to its end users or other services.

5.3 Service Consumption (C)

For delivering the digital public service towards the end user, the digital public service may be required to consume services of other public administrations or businesses. This area is called **Service Consumption** and it focuses on the consumption of reusable machine-to-machine (client) services from other public administrations and businesses. This can, indicatively, include the consumption of functionalities, base registry information and security services.

Digital public services that consume (reuse) existing services where possible are considered more interoperable than organisations that produce (develop) their own proprietary services without reusing existing functionalities.

5.4 SIMAPS Attributes

5.4.1 SIMAPS Components' attributes

SIMAPS components' attributes are presented in the table below.

Table 2: Service delivery and service consumption attributes

Service Delivery	
Attribute	**Rationale**
Data, Information, Knowledge Delivered	Assesses the semantic behavioural interoperability **specifications** of data, information and knowledge delivered by the public service to its end users and/or other client services.
Service Delivery Enablers	Assesses the semantic behavioural interoperability **capabilities** that enable either i) the delivery of data, information and knowledge by the digital public service to its end users **and/or other** client **services** or ii) the discoverability of the public service.
Service Delivery Manifestations	Assesses the semantic behavioural interoperability **manifestations** of the public service delivering data, information and knowledge (manifestations can be performance, results, user experience).
Service Consumption	
Attribute	**Rationale**
Data, Information, Knowledge Consumed	Assesses the semantic behavioural interoperability **specifications** of data, information and knowledge **consumed** by the public service **from** other server services
Service Consumption Enablers	Assesses the semantic behavioural interoperability **capabilities that enable the** public service **to either i) discover other server services and/or ii) consume their** data, information and knowledge
Service Consumption Manifestations	Assesses the semantic behavioural interoperability manifestations of the public service **consuming** data, information and knowledge (manifestations can be performance, results, user experience).

It is briefly noted that there is a symmetry in the way the Service Delivery and Service Consumption attributes have been defined, from the delivery viewpoint to the consumption viewpoint. This means that there is no attribute in Service Delivery that is not also examined in the Service Consumption component from the service consumption viewpoint and vice versa.

5.4.2 Sources of Input

Various related programmes and initiatives inside and outside ISA have been leveraged to build the current set of SIMAPS Attributes. The most important ones are:

- *European Interoperability Framework* – The European Interoperability Framework (EIF) serves as an important framework for organisations to promote and improve interoperability and therefore is considered as a paramount starting point for defining SIMAPS attributes. The respective items per attribute have been specifically formed to assess the level of

conformance with the elements of EIF structure (principles/layers/conceptual model)[1]. The basis to define SIMAPS items have been the EIF recommendations;

- *European Interoperability Reference Architecture (EIRA)* – EIRA compliance is ensured at the level of SIMAPS attributes. In this context, the respective items per attribute have been specifically formed to assess the level of conformance with the EIRA Architecture Building Blocks (ABBs). The basis to define SIMAPS items has been the context of each one of the EIRA ABBs.
- *Digital Single Market* - the Digital Single Market strategy aims to open up digital opportunities for people and business and enhance Europe's position as a world leader in the digital economy. Select attributes were defined to align with this ambition; the terminology of SIMAPS overall embraces the key concepts of "digitalisation" in its various aspects;
- *Interoperability Maturity Assessment of a Public Service (IMAPS)*[2] – IMAPS is an online survey that helps public service owners evaluate, consider and improve all key interoperability aspects of their digital public service (legal, semantic, organisational, or technical). Ultimately, they can view and monitor the service's compliance with the New European Interoperability Framework (EIF). Not only can IMAPS be used to assess the interoperability of any public service – from open data portals, and e-voting platforms, to public procurement services, and much more – it is applicable to services at all levels of government (international, national, regional and local).
- *Interoperability Quick Assessment Toolkit (IQAT©)* [3] – IQAT© has been developed in the context of Action 2016.36 Assessment of trans-European systems supporting EU policies of the Interoperability solutions and common frameworks for European public administrations, businesses and citizens. The objective of the IQAT© is to allows public service owners to evaluate the structural interoperability maturity level of their digital public service.

[1] Compliance of SIMAPS with EIF at the level of principles, layers and conceptual model has been also validated following the paradigm of CAMSS approach to demonstrate their scenarios' conformance with EIF.

[2] https://joinup.ec.europa.eu/collection/imaps-interoperability-maturity-assessment-public-service/about

[3] https://joinup.ec.europa.eu/solution/interoperability-quick-assessment-toolkit

6 SIMAPS QUESTIONNAIRE

SIMAPS uses a questionnaire structure for assessing the semantic behavioural interoperability maturity of a digital public service. This section details the questionnaire type, question types and assessment structure in more detail.

SIMAPS questionnaire is a compact and highly user-friendly tool available online. Designed as a self-assessment tool, SIMAPS assessment criteria have been condensed into targeted question sets in order to evaluate key semantic behavioural interoperability aspects of a digital public service. Such insight results in personalised, confidential feedback and recommendations on how a service can improve.

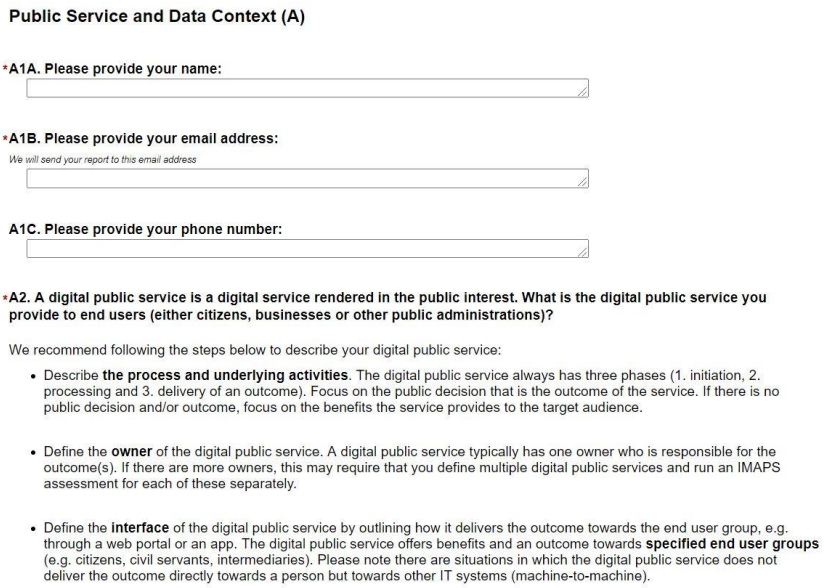
SIMAPS Questionnaire is designed to take approximately 20-30 minutes to complete. Once the questionnaire is completed, a report is generated with the semantic behavioural interoperability scores plus recommendations on how to further improve the digital public service's semantic behavioural interoperability.

6.1 Questionnaire Structure

This section outlines the structure of the questionnaire. The four main sections of the questionnaire are in line with the earlier presented overview of behavioural interoperability aspects (section 2.4):

- Public Service and Data Context (A): This section assesses the scope of the digital public service (the object of measurement, i.e. the digital public service to examine), service landscaping and gathers important information for follow-up (contact details, etc.);
- Service Delivery (D): The section assesses how the digital public service delivers its service;
- Service Consumption (C): This section assesses if and how services are consumed from other administrations and businesses.

The following figures illustrate the sections A, D and C of SIMAPS questionnaire as described above.



Public Service and Data Context (A)

*A1A. Please provide your name:

*A1B. Please provide your email address:

We will send your report to this email address

A1C. Please provide your phone number:

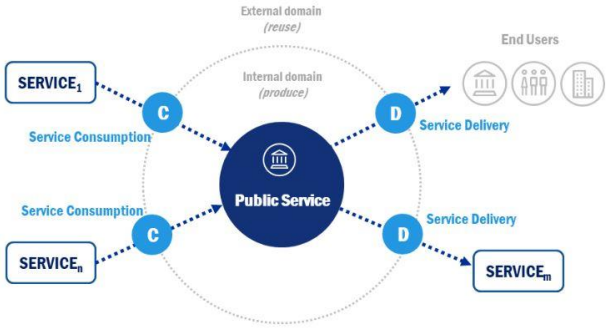
*A2. A digital public service is a digital service rendered in the public interest. What is the digital public service you provide to end users (either citizens, businesses or other public administrations)?

We recommend following the steps below to describe your digital public service:

- Describe **the process and underlying activities**. The digital public service always has three phases (1. initiation, 2. processing and 3. delivery of an outcome). Focus on the public decision that is the outcome of the service. If there is no public decision and/or outcome, focus on the benefits the service provides to the target audience.
- Define the **owner** of the digital public service. A digital public service typically has one owner who is responsible for the outcome(s). If there are more owners, this may require that you define multiple digital public services and run an IMAPS assessment for each of these separately.
- Define the **interface** of the digital public service by outlining how it delivers the outcome towards the end user group, e.g. through a web portal or an app. The digital public service offers benefits and an outcome towards **specified end user groups** (e.g. citizens, civil servants, intermediaries). Please note there are situations in which the digital public service does not deliver the outcome directly towards a person but towards other IT systems (machine-to-machine).

Figure 5: SIMAPS questionnaire Section A

Service Delivery (D)



The public administration delivers the digital public service data towards other end users like administrations, businesses and citizens. We call this the **Public Service Delivery.**

The service being delivered represents the focal point of the SIMAPS in terms of correctly scoping and delimiting the digital public service data under evaluation.

The Service Delivery area focuses on the data, information and knowledge delivered by the digital public service, the Service Delivery Enablers and the Service Delivery Manifestations.

Figure 6: SIMAPS questionnaire Section D

Service Delivery Enablers

**Assesses the semantic behavioural interoperability capabilities that enable either i) the delivery of data, information and knowledge by the digital public service to its end users and/or other client services or ii) the discoverability of the public service.*

---

* **D8. Please specify how your public service handles the reference data delivered to other public services.**
More Info

***Enabler** / Manifestation*

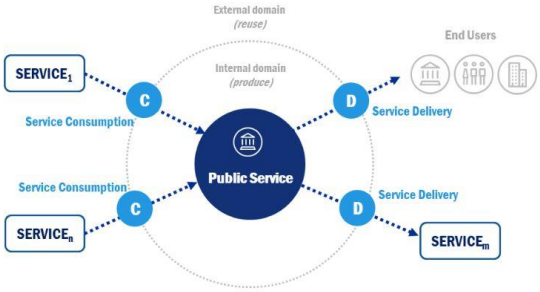
- ○ No reference data with other public services is handled
- ○ Reference data is defined bilaterally between MS
- ◉ Reference data is handled under EU/international level taxonomies/vocabularies
- ○ Reference data is handled on the semantic interoperability specifications listed in ELIS

* **D9. To what extent is semantic interoperability considered when delivering data, information, knowledge to other public services?**
More Info

***Enabler** / Manifestation*

Figure 7: SIMAPS questionnaire Section D

Service Consumption (C)



For delivering the digital public service data towards other administrations, businesses and citizens, the digital public service may be required to consume service of other public administrations or businesses. This area is called **Service Consumption.**

This section comprises the "Data, information and knowledge consumed", the "Service Consumption Enablers" and the "Service Consumption Manifestations".

Please answer the following questions regarding the service consumption of your digital public service.

Figure 8: SIMAPS questionnaire Section C

Data, information and knowledge consumed

**Assesses the semantic behavioural interoperability specifications of data, information and knowledge consumed by the public service from other server services.*

---

* **C1. To what extent is the public service consuming semantically aligned data (data that is compliant to e-Government Vocabularies or to semantic agreements)?**
More Info

*Enabler / **Manifestation***

- ○ The public service only consumes data collected by the public service itself
- ○ The public service consumes data collected from other public services (government authorities, official statistics, …) but is not semantically aligned
- ○ The public service consumes data collected from other public services and certain data is semantically aligned
- ○ The public service consumes data collected from other public services and all data is semantically aligned

* **C2. Does your public service consume open data sets from other public services?**
More Info

*Enabler / **Manifestation***

Figure 9: SIMAPS questionnaire Section C