TIMAPS v1.3.0

Technical Interoperability Maturity Assessment of a Public Service

User guide
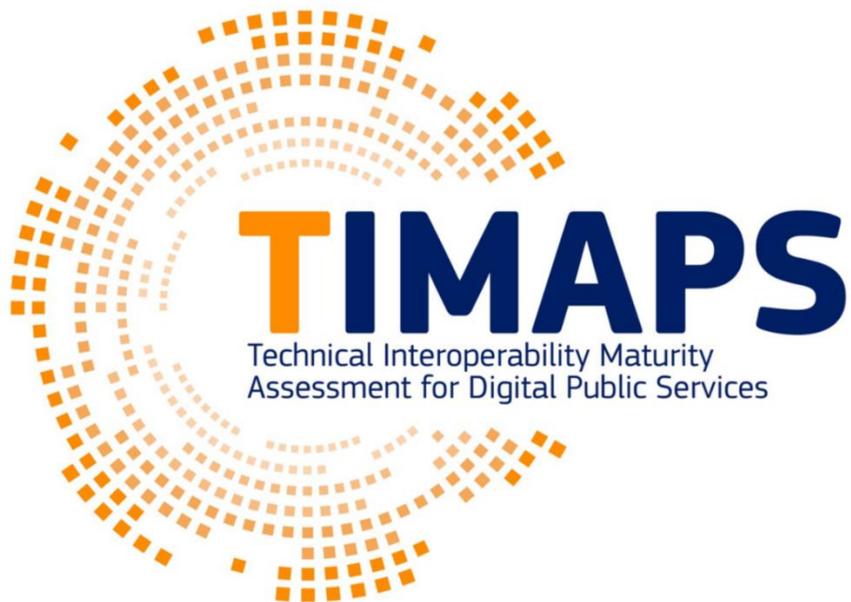
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Acronym	Description
ABB	Architectural Building Block
CAMSS	Common Assessment Method for Standards and Specifications
CarTool	Cartography Tool
DIGIT	Directorate-General for Informatics
EC	European Commission
EIF	European Interoperability Framework
EIRA© (EIRA)	European Interoperability Reference Architecture
ELAP	EIRA Library of Architecture Principles (ELAP)
ELIS	EIRA Library of Interoperability Specifications
EU	European Union
HL SAT	High Level Solution Architecture Template
IMAPS	Interoperability Maturity Assessment of a Public Service
IQAT	Interoperability Quick Assessment Toolkit
ISA	Interoperability Services for Public Administrations
MS	Member State
PA	Public Administration
SIQAT	Structural Interoperability Quick Assessment Toolkit
TIMAPS	Technical Interoperability Maturity Assessment of a Public Service

Glossary of terms

Term	Description
Attribute	Structural part of each TIMAPS component. Each attribute includes questions (items) that assess a specific aspect of the digital public service. Each of the TIMAPS survey components has questions (items) that are organised under the following attributes: the technical interoperability specifications of data, information and knowledge delivered by the digital public service to its end users and/or other services, the technical interoperability enablers and the technical interoperability manifestations.
Component	Fundamental structural part of the TIMAPS model that reflects how the respective questions (items) in the questionnaire (survey) are organised. Each component refers to a different pillar of the digital public service lifecycle. TIMAPS has two components: Service Delivery and Service Consumption, which means that the respective questions refer to these two specific categories.
Item	Structural part of each TIMAPS attribute. Items are the questions of the TIMAPS questionnaire (survey)
Option	Options are the possible replies to one TIMAPS item
Principles	Rules applied on digital public service to enable and ensure technical 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 TIMAPS survey

EXECUTIVE SUMMARY

This document provides the guidelines and definitions for using the **Technical Interoperability Maturity Assessment of a Public Service (TIMAPS)** tool in order to assess and improve the technical interoperability maturity of a digital public service. It also includes the questions and the options of the TIMAPS questionnaire as well as the respective recommendations. TIMAPS is the **technical specialisation** of IMAPS survey that assesses the behavioural aspects of a digital public service from the technical interoperability viewpoint.

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

In addition, we present an explanation of the structure of the TIMAPS questionnaire, the methodology used to determine the maturity levels of technical behavioural interoperability of a public service and the questions and options of the questionnaire.

Finally, we conclude with the recommendations that the end-user receives for each question. After filling in the online questionnaire, the respondent receives a PDF with advice on how to improve the technical behavioural interoperability of his digital public service.

1 INTRODUCTION

1.1 Document Objectives

The main objective of the **Technical Interoperability Maturity Assessment of a Public Services (TIMAPS)** is to provide insight into how digital public services can improve their technical behavioural interoperability maturity. TIMAPS is the **technical specialisation** of IMAPS survey that assesses the behavioural aspects of a digital public service from the technical interoperability viewpoint. This document is based on the updates of TIMAPS v1.2.0 to version 1.3.0 by implementing the feedback collected during TIMAPS v1.2.0 deployment and review, as this has been recorded in the respective JIRA tickets as well as suggestions received by the experts. These updates include the description of TIMAPS version 1.3.0, 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 TIMAPS;
- the presentation of **model objectives**;
- the description of the TIMAPS **maturity levels**, as well as the **behavioural interoperability aspects** that it covers;
- the description of the TIMAPS **structure** including its **attributes and components**;
- the description of how the TIMAPS **questionnaire** is structured, its questions and their options;
- the description of how the TIMAPS **recommendations** are generated including the recommendations per question.

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 TIMAPS and their link to IMAPS;
- **Chapter 3**: Includes the maturity levels of TIMAPS;
- **Chapter 4:** Presents TIMAPS structure, in components, attributes and items, demonstrating how their design ensures alignment with IMAPS, EIF and EIRA;
- **Chapter 5**: Presents the TIMAPS questionnaire and how it is structured**;**
- **Chapter 6:** Presents the TIMAPS recommendations and how they are generated

2   TIMAPS KEY CONCEPTS

The following concepts are key to understand the TIMAPS:

- *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.
- *Technical Interoperability* - Technical interoperability refers to systems and services that link applications and infrastructures (via interfaces, data integration services and secure communication protocols). In the context of EIF, this 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.

2.1   Digital public service

The Technical Interoperability Maturity Assessment of Public Services (TIMAPS) assesses the technical 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 TIMAPS 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 TIMAPS;
4. The digital public service has a **virtual end user interface**. TIMAPS 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 issue an e-administrative fee (1) via the GSIS portal (4) provided by the Ministry of Digital Government (2);

- New parents (3) could get a birth certificate, register for parental leave, and access other relevant services (1) through one single eGovernment portal (4) instead of interacting with multiple agencies. The eGovenrment portal uses open standards such as XML, SQL and HTML;
- Citizens (3) are offered the national electronic service of citizens' identities (eID) (1) via the eID portal (4) provided by the Ministry of Interior (2).

2.2 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"
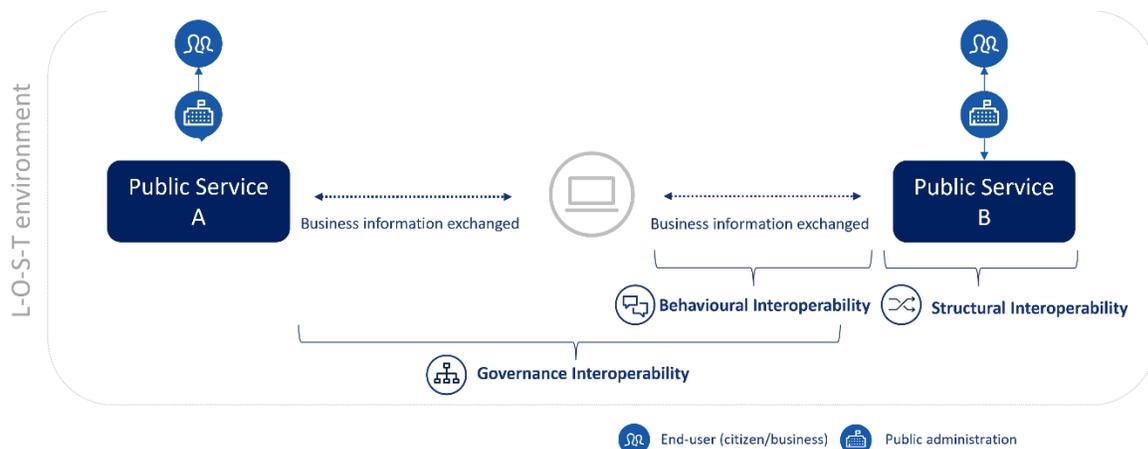
Figure 1: Interoperability dimensions

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).

2.3   Technical Interoperability and TIMAPS

TIMAPS assesses the behavioural aspects of a digital public service, via an approach similar to this of IMAPS, but from the **technical behavioural interoperability viewpoint**.

Technical interoperability refers to systems and services that link applications and infrastructures (via interfaces, data integration services and secure communication protocols). **In the context of the European Interoperability Framework (EIF)**, this 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. **Technical Interoperability** is usually associated with hardware/software components, systems and platforms that enable machine-to-machine communication to take place. The interoperability of information systems is essential in providing integrated government services.

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

- the technical behavioural interoperability **specifications** of data, information and knowledge delivered and consumed by the public service and its end-users or other client services;
- the technical 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 technical behavioural interoperability **manifestations** of the public service delivering and consuming data, information and knowledge (manifestations can be performance, results, user experience).

TIMAPS Objectives

TIMAPS delivers insights into two important aspects of technical interoperability maturity:

- Provide insight into the **current technical 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 technical interoperability maturity.**

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

2.4   IMAPS and TIMAPS User Journey

The figure below illustrates a **typical user journey** for the IMAPS end user and shows how IMAPS recommendations can trigger the need for an assessment with TIMAPS survey.

Figure 2: IMAPS to TIMAPS user journey

It is briefly mentioned that although TIMAPS can serve as a stand-alone survey that can provide an assessment of a digital public service from a technical behavioural interoperability point of view, the recommended use case is to first perform an assessment with IMAPS, and following its recommendations, then to perform an assessment with TIMAPS.

2.5   TIMAPS Target users

TIMAPS can be used by the following end-users:

- IT Requirements Managers: to analyse and assess the functionalities of a To-Be digital public service;
- IT Architects: to design, develop and assess an interoperable software solution for a digital public service;
- IT experts: to get insights on the future technical necessities and possibilities for a digital public service.

3 TIMAPS MATURITY LEVELS

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

- Measure the technical 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 technical 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 TIMAPS are summarised in the table below.

Table 1: Five maturity levels of TIMAPS

LEVEL 01	AD HOC	Poor Interoperability – the digital public service cannot be considered inter
LEVEL 02	OPPORTUNISTIC	Fair Interoperability – the digital public service implements some elements of interoperability best practices
LEVEL 03	ESSENTIAL	Essential Interoperability – the digital public service implements the essent best practices for interoperability
LEVEL 04	SUSTAINABLE	Good Interoperability – all relevant interoperability best practices are imple by the digital public service
LEVEL 05	SEAMLESS	Interoperability Leading Practice – the digital public service is a leading inte 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.

4   TIMAPS STRUCTURE

4.1   Approach

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). **TIMAPS** assesses the behavioural aspects of a digital public service, via an approach similar to this of IMAPS, but from the **technical behavioural interoperability viewpoint**.

TIMAPS conceptual model describes all possible instances where **interoperability with the outside world may occur from the digital public service viewpoint**. It distinguishes between the **internal domain** (the internal service management) and the **external domain** (the digital public service uses/consumes existing services and exposes the produced service to thirds).

4.2   TIMAPS Components

|	
Component	Fundamental structural part of the TIMAPS model that reflects how the respective questions (items) in the questionnaire (survey) are organised. Each component refers to a different pillar of the digital public service lifecycle. TIMAPS has two components: Service Delivery and Service Consumption, which means that the respective questions refer to these two specific categories.

Figure 3: TIMAPS 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 and/or other public administrations

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

4.2.1 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 TIMAPS 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.

4.2.2 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.

4.3 TIMAPS Attributes

Attribute	Structural part of each TIMAPS component. Each attribute includes questions (items) that assess a specific aspect of the digital public service. Each of the TIMAPS survey components has questions (items) that are organised under the following attributes: the technical interoperability specifications of data, information and knowledge delivered by the digital public service to its end users and/or other services, the technical interoperability enablers and the technical interoperability manifestations.

It is reminded, as per the glossary in the introduction of this document, that TIMAPS questionnaire is structured into two components: Service Delivery and Service consumption. The attributes that compose these TIMAPS components, are presented in the table below.

Table 2: Service delivery and service consumption attributes

Service Delivery	
Attribute	**Rationale**
Data, Information, Knowledge Delivered	Assesses the technical 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 technical 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 technical 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 technical behavioural interoperability **specifications** of data, information and knowledge **consumed** by the public service **from** other server services
Service Consumption Enablers	Assesses the technical 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 technical 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.

4.4 Sources of Input

Various related programmes and initiatives inside and outside ISA[2] have been leveraged to build the current set of TIMAPS Attributes. The most important ones are:

- *European Interoperability Framework (EIF)* [1] – 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 TIMAPS 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). The basis to define TIMAPS items have been the EIF recommendations;

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[1] https://web.archive.org/web/20220301180315/https://ec.europa.eu/isa2/eif

- *European Interoperability Reference Architecture (EIRA) [2]* – EIRA compliance is ensured at the level of TIMAPS 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 TIMAPS 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 TIMAPS overall embraces the key concepts of "digitalisation" in its various aspects;
- *Structural* **Interoperability** *Quick Assessment Toolkit (SIQAT©)[3]* – SIQAT© 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 SIQAT© is to allows public service owners to evaluate the structural interoperability maturity level of their digital public service.
- *Technical interoperability experts* – The IMAPS project team conducted some rounds of interviews with the identified experts to improve the TIMAPS questionnaire.
- *A multi-dimensional framework to evaluate the innovation potential of digital public services [4]* – This report presents the main findings of a study conducted as part of the "Innovative Public Services" (IPS) Action of the ISA[2] Programme. The main outcome of the research is an original multi-dimensional framework for evaluating the interoperability readiness of digital public services. The framework was conceptualised and tested in the context of desk and field research on available evidence to support European Public Administrations willing to embrace new digital technologies and deliver innovative public services according to the four layers of the European Interoperability Framework (EIF) and in alignment with the user centricity principles defined in the Tallinn Declaration (2017).
- *Common Assessment Method for Standards and Specifications (CAMSS) [5]* - CAMSS is the European guide for assessing and selecting standards and specifications for an eGovernment project, a reference when building an architecture and an enabler for justifying the choice of standards and specifications in terms of interoperability needs and requirements. It is fully aligned with the European Standardisation Regulation 1025/2012.
- *EIRA Library of Interoperability Specifications (ELIS) [6]* - The EIRA Library of Interoperability Specifications is a library containing the standards and specifications defining the interoperability requirements of the architectural building blocks (ABBs) contained in the European Interoperability Reference Architecture (EIRA). The aim of this library is supporting solutions architects when modelling using EIRA.

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[2] https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/solution/eira
[3] https://joinup.ec.europa.eu/collection/interoperability-maturity-tools-imts-digital-public-services/solution/siqat
[4] https://ec.europa.eu/jrc/en/publication/multi-dimensional-framework-evaluate-innovation-potential-digital-public-services
[5] https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/about
[6] https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/solution/elis/release/600

- ***EIRA Library of Architecture Principles (ELAP)*** [7] - The EIRA library of architecture principles (ELAP) is intended to direct government organizations in initiating changes and implementing IT projects. Particularly when designing new or modified services, it is necessary to make visible how the principles are implemented and which considerations are made in this regard. The apply-or-explain principle applies here, whereby deviations are permitted provided that they are substantiated and recorded with good arguments so that they can be revisited at a later stage. This prevents important matters from being overlooked. The principles are described in relation to relevant policy frameworks, established standards, building blocks and examples that are already available, so that they are as recognisable as possible in practice. In the context of TIMAPS, the CAMSS terminology, ELIS requirements and ELAP principles have been used as basis and guidance to design the items and options of the questionnaire, as well as the respective interoperability aspects, linked to each item. These interoperability aspects will serve as the basis to design the High Level Solution Architecture Template (HL SAT) of TIMAPS, a specification that extends EIRA and provides high level requirements on how to design a technically interoperable digital public service.

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[7] https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/solution/elap/release/200

5   TIMAPS QUESTIONNAIRE

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

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

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

5.1   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 5):

- **Service Identifications (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, the digital public service's outcome, the service owner, the administrative level, 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 TIMAPS questionnaire as described above.

Figure 4: TIMAPS questionnaire Section A

* A2A. A digital public service is a digital service rendered in the public interest.
What is the name of the digital public service that you provide to the end users (citizens, businesses or other public administrations)?

A2B. Please provide the public service catalogue name and URI, if it is applicable for the digital public service.

* A2C. Please give a brief description of the service.

More Info ⊘

A2D. Appearance: How does the service deliver the outcome towards the end user group?

○ The service delivers the outcome towards the end users via **traditional channels** e.g. phone, postal service
○ The service delivers the outcome towards the end users via **digital channels**, e.g . through a web portal/website or an application
○ The service delivers the outcome towards other IT systems (machine-to-machine interface)

* A2E. Please specify the official email address of the contact point for the provided service:

@

Figure 5: TIMAPS questionnaire Section A

⬆ A3A. Service provider: Which public administration tier is primarily responsible for providing the service?

○ International Public Administration
○ Central Public Administration
○ Regional Public Administration
○ Local Public Administration
○ Other Legal Entity   ⬇

⬆ In case of "Other Legal Entity", please indicate in the text field below.

⬆ A3B. Are the solutions provided by a Directorate-General of the European Commission?
○ Yes ⬇
○ No

⬆ A3C. Please indicate the Directorate-General of the European Commission:

Figure 6: TIMAPS questionnaire Section A

A4. Please indicate in which sector is the service provided.

○ Education
○ Public Health
○ Public Safety
○ Environmental Protection
○ Justice
○ Transportation
○ Infrastructure
○ Social Services
○ Economy/Financial
○ Other   ↓

↑ In case of "Other", please indicate in the text field below

[   ]

A5. What is the end user group to whom the service is delivered?

☐ Public Administrations (A2A)
☐ Citizens (A2C)
☐ Businesses (A2B)

A6. At what administrative level is the service provided (multiple answers are possible)?

☐ Local (e.g. city, municipality)
☐ Regional
☐ National
☐ European
☐ International

Figure 7: TIMAPS questionnaire Section A

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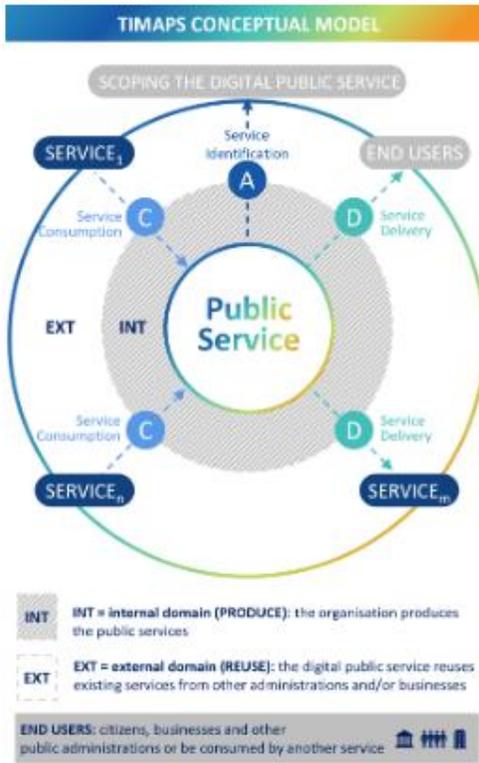
The public administration delivers the digital public service data towards other end users like administrations, businesses and citizens. We call this the **Public Service Delivery.**

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

Figure 8: TIMAPS questionnaire Section D

* D1. To what extent does the service facilitate the delivery of data, information and knowledge to other services?

Enabler / Manifestation

More Info ❓

○ The service delivers data, information and knowledge using asynchronous digital communication **without any event processing** (e.g. the end user should retrieve and download the digital outcome from a website, platform, etc.)

○ The service delivers data, information and knowledge using asynchronous digital communication **with event processing** (e.g. asynchronous messaging, where the end user receives an e-mail with the digital outcome of the digital public service)

○ The service delivers data, information and knowledge using asynchronous digital communication **with batch processing** (e.g. ETL scheduled jobs)

○ The service delivers **most data**, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.)

○ The service delivers **any data**, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.)

○ Such communication methods are **not applicable** or are not necessary (according to the scope of the digital public service)

○ **No answer**

* D2. To what extent does the service deliver data, information and knowledge via Machine to Machine (M2M) interfaces?

Enabler / Manifestation

More Info ❓

○ The digital public service delivers data, information and knowledge **via a single, custom-built non-open** Machine to Machine (M2M) interface (e.g. via a data infrastructure specific to the service, not designed for reuse, including database interconnections, database links, database views, etc.)

○ The digital public service delivers data, information and knowledge **via a single open standard** Machine to Machine (M2M) interface for **direct exchange of files** (e.g. using Telnet, SFTP, HTTP, etc.)

○ The digital public service delivers data, information and knowledge **via multiple open standard** Machine to Machine (M2M) interfaces for **direct exchange of files** (e.g. a combination of Telnet, SFTP, HTTP, etc.)

○ The digital public service delivers any data, information and knowledge **via a single open API format** for Machine to Machine (M2M) **direct data exchange** (e.g. SOAP, REST, gPRC, etc.)

○ The digital public service delivers any data, information and knowledge **via multiple open API formats** for Machine to Machine (M2M) **direct data exchange** (e.g. SOAP, REST, gPRC, etc.)

○ Such interfaces are **not applicable** or are not necessary (according to the scope of the digital public service)

○ **No answer**

Figure 9: TIMAPS questionnaire Section D

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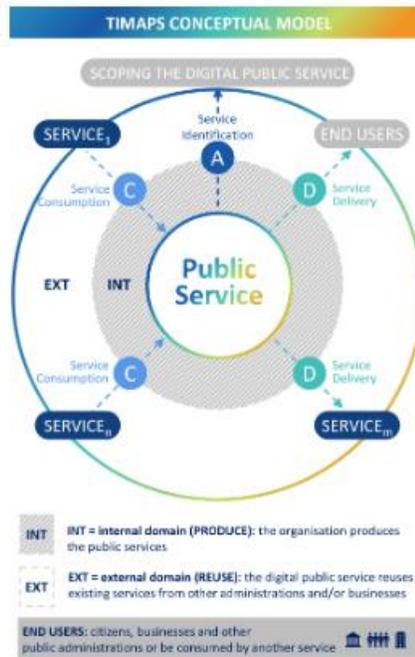
For delivering the digital public service data towards other administrations, businesses and citizens, the digital public service may be required to consume service of other public administrations or businesses. This area is called **Service Consumption.**

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 service, if applicable.

Figure 10: TIMAPS questionnaire Section C

↑ * C1. To what extent does the service facilitate the consumption of data, information and knowledge from other services?

Enabler / Manifestation

More Info ❓
- ○ The service consumes data, information and knowledge using asynchronous digital communication **without any event processing** (e.g. the service retrieves and downloads data, information and knowledge from a website, platform, etc.)
- ○ The service consumes data, information and knowledge using asynchronous digital communication **with event processing** (e.g. asynchronous messaging, where the service receives an e-mail with the data, information and knowledge required for consumption)
- ○ The service consumes data, information and knowledge using asynchronous digital communication **with batch processing** (e.g. ETL scheduled jobs)
- ○ The service consumes **most data**, information and knowledge **via synchronous digital communication** (e.g. through web services, APIs, etc.)
- ○ The service consumes **any data**, information and knowledge **via synchronous digital communication** (e.g. through web services, APIs, etc.)
- ○ **Not applicable** or not necessary (according to the scope of the digital public service)
- ○ **No answer**

**↑ * C2. To what extent does the service consume data, information and knowledge via multiple open Machine to Machine (M2M) interfaces?**

Enabler / Manifestation

More Info ❓
- ○ The service consumes data, information and knowledge **via a single, custom-built non-open** Machine to Machine (M2M) interface (e.g. via a data infrastructure specific to the service, not designed for reuse, including database interconnections, database links, database views, etc.)
- ○ The service consumes data, information and knowledge **via a single open standard** Machine to Machine (M2M) interface for direct exchange of files (e.g. using Telnet, SFTP, HTTP, etc.)
- ○ The service consumes data, information and knowledge **via multiple open standard** Machine to Machine (M2M) interfaces for direct exchange of files (e.g. a combination of Telnet, SFTP, HTTP, etc.)
- ○ The service consumes any data, information and knowledge **via a single open API format** for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)
- ○ The service consumes any data, information and knowledge **via multiple open API formats** for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)
- ○ **Not applicable** or not necessary (according to the scope of the digital public service
- ○ **No answer**

Figure 11: TIMAPS questionnaire Section C

5.2 TIMAPS Questionnaire

5.2.1 Service Identification (A) - Questions

A1A.	
Name	Contact details
Question type	Free text
Rationale	Gather contact information for eventual follow-up.
Question	Please provide your name.
Question logic	Next question

A1B.	
Name	Contact details
Question type	Free text - format check on email
Rationale	Gather contact information for eventual follow-up.
Question	Please provide your email address.
Question logic	Next question

A1C.

Name	Contact details
Question type	Free text - format check on phone number
Rationale	Gather contact information for eventual follow-up.
Question	Please provide your phone number.
Question logic	Next question

A1D.

Name	Contact details
Question type	Multiple choice (1 answer possible)
Rationale	Gather contact information for eventual follow-up.
Question	Please indicate the country of the organisation providing the digital public service. Please indicate the country if not in the list above.
Question logic	Next question

A1E.

Name	Contact details
Question type	Free Text
Rationale	Gather contact information for eventual follow-up.
Question	Please provide your role in the organisation providing the service
Question logic	Next question

A2A.

Name	Digital public service description
Question type	Free Text
Rationale	Gain insight into the digital public service the administration provides.
Question	A digital public service is a digital service rendered in the public interest.
	What is the name of the service that you provide to the end users (citizens, businesses or other public administrations)?
Examples	• Issue of birth certificate for citizens
	• Submission of yearly income tax declaration for citizens
	• Issue of an electronic fee for citizens
	• Electronic Health Record Access
	• Government e-invoicing for businesses
	• Cross-Border Vehicle Identification Service for public administrations
Question logic	Next question

A2B.

Name	Digital public service description
Question type	Free Text
Rationale	Gain insight into the digital public service the administration provides.
Question	Please provide the public service catalogue name and URI, if it is applicable for the digital public service.
Question logic	Next question

A2C.

Name	Digital public service description
Question type	Free Text
Rationale	Gain insight into the digital public service the administration provides.
Question	Please give a brief description of the service.
Question logic	Next question

A2D.

Name	Digital public service description
Question type	Multiple choice (1 answer possible)
Rationale	Gain insight into the digital public service the administration provides.
Question	Appearance: How does the service deliver the outcome towards the end user group? - The service does not deliver the outcome directly towards a person but towards other IT systems (machine-to-machine interface) - The service delivers the outcome towards the end users via traditional channels e.g. phone, postal service - The service delivers the outcome towards the end users via digital channels, e.g. through a web portal/website or an application
Question logic	Next question

A2E.

Name	Digital public service description
Question type	Email - format check on email
Rationale	Gain insight into the digital public service the administration provides.
Question	Please specify the official email address of the contact point for the provided service
Question logic	Next question

A3A.

Name	Sector of the service
Question type	Multiple choice (1 answer possible)

Rationale	This question determines the scope / boundaries of the public administration providing the digital public service.
Question	Service provider: Which public administration tier is primarily responsible for providing the service? • International Public Administration • Central Public Administration • Regional Public Administration • Local Public Administration • Other Legal Entity. In case of "Other Legal Entity", please indicate in the text below
Question logic	Next question

A3B.

Name	Sector of the service
Question type	Single Option
Rationale	This question determines the scope / boundaries of the public administration providing the digital public service.
Question	Are the solutions provided by a Directorate-General of the European Commission? • Yes • No
Question logic	Next question

A3C.

Name	Sector of the service
Question type	Multiple choice (1 answer possible)
Rationale	This question determines the scope / boundaries of the public administration providing the digital public service.
Question	Please indicate the Directorate-General of the European Commission • Administration and Payment of Individual Entitlements • Agriculture and Rural Development • Budget • Climate Action • Communication • Communications Networks, Content and Technology • Competition • Consumers, Health, Agriculture and Food Executive Agency • Data Protection Officer • Defense Industry and Space • Economic and Financial Affairs • Education, Audiovisual and Culture Executive Agency • Education, Youth, Sport and Culture • Employment, Social Affairs and Inclusion • Energy • Environment

- European Anti-Fraud Office
- European Civil Protection and Humanitarian Aid Operations
- European Climate, Infrastructure and Environment Executive Agency
- European Neighbourhood and Enlargement Negotiations
- European Personnel Selection Office
- European Research Council Executive Agency
- European School of Administration
- Eurostat - European statistics
- Executive Agency for Small and Medium-sized Enterprises
- Financial Stability, Financial Services and Capital Markets Union
- Foreign Policy Instruments
- Health and Food Safety
- Historical Archives Service
- Human Resources and Security
- Informatics
- Infrastructure and Logistics in Brussels
- Infrastructure and Logistics in Luxembourg
- Inspire, Debate, Engage and Accelerate Action
- Internal Audit Service
- Internal Market, Industry, Entrepreneurship and SMEs
- International Partnerships
- Interpretation
- Joint Research Centre
- Justice and Consumers
- Legal Service
- Library and e-Resources Centre
- Maritime Affairs and Fisheries
- Migration and Home Affairs
- Mobility and Transport
- Publications Office
- Regional and Urban Policy
- Research Executive Agency
- Research and Innovation
- Secretariat-General
- Structural Reform Support
- Task Force for Relations with the United Kingdom
- Taxation and Customs Union
- Trade
- Translation

Question logic	Next question

A4.	
Name	Sector of the service
Question type	Multiple choice (1 answer possible)

Rationale	This question determines the scope / boundaries of the public administration providing the digital public service.
Question	Please indicate in which sector is the service provided. • Education • Public Health • Public Safety • Environmental Protection • Justice • Transportation • Infrastructure • Social Services • Economy/Financial • Other. In case of "Other", please indicate in the text field below.
Question logic	Next question

A5.

Name	End user group(s) to which the service is delivered
Question type	Multiple choice (>1 possible answer)
Rationale	Determine the end user group(s) to which the digital public service is delivered.
Question	What is the end user group to whom the service is delivered? • Public Administrations (A2A) • Citizens (A2C) • Businesses (A2B)
Question logic	Next question

A6.

Name	Administrative level
Question type	Multiple choice (>1 possible answer)
Rationale	Gain insight into the government providing the digital public service.
Question	At what administrative level is the service provided (multiple answers are possible)? • Local (e.g. city, municipality) • Regional • National • European • International
Question logic	Next question

Maturity scoring: This section is not scored.

5.2.2   Service Delivery (D) - Questions

D1.	
Name	Use of synchronous digital communication in data delivery
Category	Enabler
Weight	35%
Question type	Multiple choice (1 answer possible)
Rationale	This item examines the type of digital communication (synchronous or asynchronous) that the service uses to deliver data, information and knowledge to its end users.
	This item examines the technical behavioural interoperability specifications of the data, information and knowledge delivered by the digital public service to its end users. This item is compliant with the EIRA ABB Machine to Machine Interface
Question	To what extent does the service facilitate the delivery of data, information and knowledge to other services? • The service delivers data, information and knowledge using ad-hoc asynchronous digital communication without any ETL actions (e.g. other services have to specifically request, filter, sort, and aggregate data from internal service sources, etc.) • The service delivers data, information and knowledge using ad-hoc asynchronous digital communication with some ETL actions (e.g. basic filtering, sorting, and aggregation of data of data is provided to requests from other services, etc.) • The service delivers data, information and knowledge using asynchronous digital communication with scheduled batch processing (e.g. ETL scheduled jobs that provide data to other services, etc.) • The digital public service delivers most data, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.) • The digital public service delivers any data, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.) • Such communication methods are not applicable or are not necessary (according to the scope of the digital public service) • No answer
Examples	• An API uses web services to communicate using the HTTP protocol. A web service represents a standardized way of providing interoperability between disparate services • Event Based/Brokered Messaging • Data Streaming • Data is transferred by allowing one service to establish a direct connection to another service's database to read and write data (synchronous)

Question logic	Next question

D2.	
Name	Data delivery via multiple open Machine to Machine (M2M) interfaces
Category	Enabler
Weight	35%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses the technical means (machine to machine interfaces) that are used by the service to deliver of data, information and knowledge to other services (at the level of information systems).
	This item examines the technical behavioural interoperability specifications of the data, information and knowledge delivered by the digital public service to its end users. This item is compliant with the EIRA ABB Machine to Machine Interface
Question	To what extent does the service deliver data, information and knowledge via multiple open Machine to Machine (M2M) interfaces? • The service delivers data, information and knowledge via a single, custom-built non-open Machine to Machine (M2M) interface (e.g. via a data infrastructure specific to the service, not designed for reuse, including database interconnections, database links, database views, etc.) • The service delivers data, information and knowledge via a single open standard Machine to Machine (M2M) interface for direct exchange of files (e.g. using Telnet, SFTP, HTTP, etc.) • The service delivers data, information and knowledge via multiple open standard Machine to Machine (M2M) interfaces for direct exchange of files (e.g. a combination of Telnet, SFTP, HTTP, etc.) • The service delivers any data, information and knowledge via a single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.) • The service delivers any data, information and knowledge via multiple open API formats for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.) • Such interfaces are not applicable or are not necessary (according to the scope of the service) • No answer
Examples	• Data exchange between services is done using file transfers • A specific data exchange mechanism is used such as eDelivery Building Blocks • A data infrastructure is used for promoting data delivery and sharing

Question logic	Next question

D3.	
Name	Data delivery via multiple service delivery modes
Category	Manifestation
Weight	30%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses the service ability to deliver data, information and knowledge on multiple devices using different app versions.
	This item examines the technical behavioural interoperability specifications of the data, information and knowledge delivered by the service to its end users. This item is compliant with the EIRA ABB Human Interface
Question	To what extent does the service deliver data, information and knowledge via multiple service delivery modes? (mobile (Android, iOS), tablets, GUI PC base, voice, sms, video, email)
	• The service delivers data, information and knowledge via a single, unique, non-open service delivery mode (i.e. via a menu-based interface (GUI PC base or equivalent))
	• The service delivers data, information and knowledge via a single, unique, open service delivery mode (e.g. via a single device, web application, platform and/or browser, like sms-only, email-only, voice-only, etc.)
	• The service delivers data, information and knowledge via a limited set of service delivery modes (i.e. via limited mobile devices e.g. only on iOS, or via limited platforms and/or browsers e.g. only via Chrome browser or web application, etc.)
	• The service delivers most data, information and knowledge via multiple service delivery modes, using different app versions, Android versions, web applications, third-party library versions, as well as touchscreen GUIs
	• The service delivers any data, information and knowledge via multiple service delivery modes using different app versions, Android versions, web application, third-party library versions, as well as touchscreen GUIs
	• Such delivery modes are not applicable or are not necessary (according to the scope of the service)
	• No answer
Examples	• Command Line Interface.
	• Menu-driven Interface.
	• Graphical User Interface.
	• Touchscreen Graphical User Interface

Question logic	Next question

D4.	
Name	Technical documentation
Category	Enabler
Weight	40%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses whether the service provides adequate technical documentation to integrate the delivered data, information and knowledge with other services. Guidelines on how to integrate with other services in the context of service delivery means that the service provides the guidelines on how other services can consume its data. This item examines a technical behavioural interoperability capability that enables and facilitates the service to deliver data information and knowledge towards its end users. This item is compliant with the EIRA ABB Machine to Machine Interface.
Question	To what extent does the service provide technical documentation on how to integrate the data, information and knowledge delivered with the data, information and knowledge of other services? • The service provides no technical documentation on how to integrate the data, information and knowledge delivered • The service provides limited technical documentation on how to integrate the data, information and knowledge delivered (e.g. ad-hoc information on service capability) • The service provides high level technical documentation on how to integrate the data, information and knowledge delivered (e.g. it lacks clarity on how to reuse them) • The service provides adequate technical documentation (e.g. service capability, service usage, data sources)on how to integrate the data, information and knowledge delivered • The service provides detailed technical documentation about the consumed services (e.g. service capability, service usage, data sources) on how to integrate the data, information and knowledge delivered, using an open expression language (e.g. ODRL) • Such technical documentation is not applicable or is not necessary (according to the scope of the service) • No answer
Examples	• Documentation on the usage of the service • Documentation on how to integrate with other services • Documentation on the capabilities of the service • The Open Digital Rights Language (ODRL) is a policy expression language that provides a flexible and interoperable information model, vocabulary, and encoding mechanisms for representing

	statements about the usage of content and services. The ODRL Vocabulary and Expression describes the terms used in ODRL policies and how to encode them.
Question logic	Next question

D5.	
Name	Invocation of other services in data delivery
Category	Manifestation
Weight	40%
Question type	Multiple choice (1 answer possible)
Rationale	This item examines the ability of the service to interact and connect with other services to accomplish specific tasks for the data, information and knowledge delivery. An orchestration service is used to describe business process activities for web services in order define how they can be.
	This item examines a technical behavioural interoperability manifestation that facilitates the service to deliver data, information, knowledge towards its end users (in terms of user experience). This item is compliant with the EIRA ABB Orchestration Service.
Question	To what extent is the service able to invoke other services to deliver data, information and knowledge in a performance-oriented way i.e. align data synchronization between different services? • The service does not invoke any other service to deliver data, information, knowledge to other services • The service invokes other services to deliver data, information, knowledge to other services in an asynchronous manner (e.g., intermediate backend manual steps might be required) • The service uses an orchestration service to invoke other services to deliver data, information and knowledge (e.g, other services will be automatically coordinated and invoked) • The service uses an orchestration service described in a standardised format (e.g. written in WS-BPEL) to invoke some other services to deliver data, information and knowledge • The service uses an orchestration service described in a standardised format (e.g. written in WS-BPEL) to invoke all other services to deliver data, information and knowledge • Such functionality is not applicable or is not necessary (according to the scope of the service) • No answer
Examples	• New parents could get a birth certificate, register for parental leave, and access other relevant services through one easy process instead of interacting with multiple agencies • Instead of visiting multiple websites or apps, people could navigate and access information and services in one place

	• Using the same solution for recurring service transactions, such as identification or payment
Question logic	Next question

D6.	
Name	Data verification in data delivery
Category	Manifestation
Weight	20%
Question type	Multiple choice (1 answer possible)
Rationale	This item examines the potential of the service to provide information about the origin and integrity of the data, information and knowledge delivered against relevant interoperability specifications (like the eIDAS regulation). This is important from a quality control perspective but may also be a prerequisite step before other services can consume and integrate the delivered data, information and knowledge. This item examines a technical behavioural interoperability manifestation that facilitates the service to deliver data, information, knowledge towards its end users (in terms of user experience). This item is compliant with the EIRA ABB Trust Service Provisioning.
Question	To what extent does the service provide data verification means for the data, information and knowledge delivered? • Ad-hoc data verification means to give information about the origin and integrity of the data, information and knowledge delivered. • The service provides ad-hoc data verification means to give information about the origin and integrity of the data, information and knowledge delivered. • The service provides a custom 'electronic seal' in electronic form, to ensure the origin and integrity of the data, information and knowledge delivered. • The service provides a custom 'electronic seal' in electronic form, following a standard baseline profile, compatible to eIDAS, in order to ensure the origin and integrity of the data, information and knowledge delivered. • The service provides a custom 'electronic seal' in electronic form, following a standard baseline profile, compatible to eIDAS, in order to ensure the origin and integrity of the data, information and knowledge delivered, while also the user is authenticated and authorised to access the requested data, information and knowledge delivered. • Such verification means are not applicable or are not necessary (based on the scope of the service) • No answer

Examples	• An 'electronic signature' means data in electronic form which is attached to or logically associated with other data in electronic form and which is used by the signatory to sign. • DSS (Digital Signature Services) is an open-source software library for electronic signature creation and validation. DSS supports the creation and verification of interoperable and secure electronic signatures in line with European legislation. In particular, DSS aims to follow the eIDAS Regulation and related standards closely.
Question logic	Next question

D7.	
Name	Accessibility
Category	Manifestation
Weight	25%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses how easy it is for users with disabilities to access and consume the data, information and knowledge delivered by the digital public service. This item examines a technical behavioural interoperability manifestation of the service delivering data, information and knowledge towards its end users (in terms of user experience). This item is compliant with the EIRA ABB Human Interface
Question	To what extent does the service deliver data, information and knowledge in compliance with web accessibility specifications? • The service does not publish any data, information and knowledge in compliance with any web accessibility specifications • The service publishes data, information and knowledge in compliance with custom proprietary guidelines for the accessibility of web content • The service publishes data, information and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level A (basic features) • The service publishes publishes data, information and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AA (most frequently requested features) • The service publishes publishes data, information and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AAA (highest level of web accessibility) • Not applicable or not necessary (according to the scope of the service) • No answer

Examples	• Certain datasets e.g. alternative text linked to images are published in line with the web accessibility requirements Web Content Accessibility Guidelines 2.0 • Datasets are published in line with the web accessibility requirements Web Content Accessibility Guidelines 2.0 and 2.1, facilitating the inclusion and accessibility for all types of people including users with disabilities
Question logic	Next question

D8.	
Name	Multilingualism
Category	Manifestation
Weight	25%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses the ability and the extent of the service to be available in multilingual environments and be consumed by multilingual end-users. This item examines a technical behavioural interoperability manifestation of the service delivering data, information and knowledge towards its end users (in terms of user experience). This item is compliant with the EIRA ABB Machine Translation.
Question	To what extent does the service deliver multilingual data, information and knowledge? • The service delivers data, information and knowledge in only one language • The service delivers certain data, information and knowledge in some of the officially recognised languages by the public administration delivering the service • The service delivers certain data, information and knowledge in all officially recognised languages by the public administration delivering the service • The service delivers all data, information and knowledge in all officially recognised national languages, as well as in English, French and German • The service delivers all data, information and knowledge in all EU officially recognised languages • Not applicable or not necessary (according to the scope of the service) • No answer
Examples	• The electronic procurement platform of Belgium delivers its data in all national languages i.e. Flemish, French and German • The national business register delivers its data only in the national language • The Publications office of EU delivers data in all official EU languages

Question logic	Next question

D9.	
Name	Discoverability
Category	Manifestation
Weight	50%
Question type	Multiple choice (1 answer possible)
Rationale	This item examines the means and the ways that the service is made visible (discoverable) to its end-users and assesses how easy and sustainable it is for them to discover it.
	This item examines a technical behavioural interoperability capability that enables and facilitates the service to deliver data information and knowledge towards its end users. This item is compliant with the EIRA ABB Service Discovery and Registry.
Question	To what extent is the service made discoverable towards its end users or other services?
	• The service is made discoverable towards its end users or other services only via ad-hoc communication (e.g. upon request, via e-mail, etc.)
	• The service is made discoverable towards its end users or other services through service portals or service catalogues
	• The service is made discoverable towards its end users or other services through communication on the website of the public service or other related websites (e.g. Joinup)
	• The service is made discoverable towards its end users or other services through communication on the website of the public service or other related websites, as well as digital service registries along with its specifications (description, publication details, etc.)
	• The service is made discoverable towards its end users or other services through communication on the website of the public service or other related websites, as well as digital service registries (client-side server discovery) along with its specifications (description, publication details, etc.), and server-side service discovery (e.g. through a router)
	• Not applicable or not necessary (according to the scope of the service)
	• No answer
Examples	• Online service portals
	• Service catalogues such as Joinup enriched with metadata, RDF, etc. about the service for automated discoverability

	• UDDI is an XML-based standard for describing, publishing, and finding web services.
Question logic	Next question

Maturity scoring: The overall weight of this area in the total maturity score is 70%. For more information, please see section 6.3.

5.2.3 Service Consumption (C) - Questions

C1.	
Name	Use of synchronous digital communication in data consumption
Category	Manifestation
Weight	50%
Question type	Multiple choice (1 answer possible)
Rationale	This item examines the type of digital communication (synchronous or asynchronous) that the service uses to consume data, information and knowledge.
	This item examines the technical behavioural interoperability specifications of data, information and knowledge consumed by the service from other services. This item is compliant with the EIRA ABB Machine to Machine Interface.
Question	To what extent does the service facilitate the consumption of data, information and knowledge from other services?
	• The service consumes data, information and knowledge using manual backend intervention for content discovery (e.g. the service retrieves and downloads data with explicit data source set from a human)
	• The service consumes data, information and knowledge for most content using automatic content discovery (e.g. the service retrieves and downloads data through content catalogue registries)
	• The service consumes data, information and knowledge for any content using automatic content discovery (e.g. the service retrieves and downloads data through content catalogue registries)
	• The service consumes most data, information and knowledge for most content using automatic content discovery via synchronous digital communication (e.g. through web services, APIs, etc.)
	• The service consumes most data, information and knowledge for any content using automatic content discovery via synchronous digital communication (e.g. through web services, APIs, etc.)
	• Such communication methods are not applicable or are not necessary (according to the scope of the service)
	• No answer

Examples	• ePayment service consumes data from the tax register for citizens in a synchronous way
	• eProcurement platform consumes data from the business register for economic operators in a synchronous way
	• eHealth service consumes data from the register of patients in an asynchronous way (scanning of documents, etc.)
Question logic	Next question

C2.	
Name	Data consumption via multiple open Machine to Machine (M2M) interfaces
Category	Manifestation
Weight	50%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses the technical means (machine to machine interfaces) that are used by the service to consume data, information and knowledge from other services (at the level of information systems).
	This item examines the technical behavioural interoperability specifications of the data, information and knowledge consumed by the service from other services. This item is compliant with the EIRA ABB Machine to Machine Interface
Question	To what extent does the service consume data, information and knowledge via multiple open Machine to Machine (M2M) interfaces?
	• The service consumes data, information and knowledge via a single, custom-built non-open Machine to Machine (M2M) interface (e.g. via a data infrastructure specific to the service, not designed for reuse, including database interconnections, database links, database views, etc.)
	• The service consumes data, information and knowledge via a single open standard Machine to Machine (M2M) interface for direct exchange of files (e.g. using Telnet, SFTP, HTTP, etc.)
	• The service consumes data, information and knowledge via multiple open standard Machine to Machine (M2M) interfaces for direct exchange of files (e.g. a combination of Telnet, SFTP, HTTP, etc.)
	• The service consumes any data, information and knowledge via a single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)
	• The service consumes any data, information and knowledge via multiple open API formats for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)
	• Not applicable or not necessary (according to the scope of the service
	• No answer

Examples	• Data exchange between services is done using file transfers • A specific data exchange mechanism is used such as eDelivery Building Blocks • A data infrastructure is used for promoting data delivery and sharing
Question logic	Next question

C3.	
Name	Discoverability
Category	Manifestation
Weight	50%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses the technical behavioural interoperability capabilities in place to ensure how easily the consumed services is being discovered by other services or by end users. This item checks the means by which the consumed service is visible (discoverable) to other public services or end-users. This item is also compliant with the EIRA v6.1.0 ABB 'Service Discovery and Registry. This item examines a technical behavioural interoperability capability that enables and facilitates the service to consume data information and knowledge towards its end users. This item is compliant with the EIRA ABB Service Discovery and Registry.
Question	To what extent is the service able to discover services to consume data, information and knowledge? • The service is not able to discover services to consume data, information and knowledge (e.g. it discovers them only upon request, via e-mail, etc.) • The service is able to discover services to consume data, information and knowledge via limited online means (e.g. service portals or service catalogues) • The service is able to discover services to consume data, information and knowledge via major online means (e.g. shared platform of services, like Joinup) • The service is able to discover services to consume data, information and knowledge via major online means, along with their specifications (description, publication details, etc.) • The digital public service is able to discover services to consume data, information and knowledge via digital service registries (client-side server discovery) along with its specifications (description, publication details, etc.) on a formal standard (e.g. UDDI, RDF, etc.).

	• Not applicable or not necessary (according to the scope of the service) • No answer
Examples	• Online service portals • Service catalogues such as Joinup enriched with metadata, RDF, etc. about the service for automated discoverability • Shared platform of digital public services
Question logic	Next question

C4.	
Name	Technical documentation
Category	Manifestation
Weight	50%
Question type	Multiple choice (1 answer possible)
Rationale	This item aims to assess how the service manifests its technical behavioural interoperability performance towards its end users, by assessing through which channels the service consumes data, information and knowledge from other services. This question captures both traditional (non-digital) and digital channels. This item examines a technical behavioural interoperability manifestation of the service consuming data, information and knowledge (in terms of performance). This item is compliant with the EIRA ABB Machine to Machine Interface.
Question	To what extent does the service has access to technical documentation about the consumed services on how to integrate the data, information and knowledge consumed? • The service has no access to any technical documentation on how to integrate the data, information and knowledge consumed from other services • The service has access to limited technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. ad-hoc information on service capability) • The service has access to high level technical documentation on how to integrate the data, information and knowledge consumed from other services, but it lacks clarity on how to reuse them • The service has access to adequate technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. service capability, service usage, data sources) • The service has access to detailed technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. service capability, service usage, data sources) using an open expression language (e.g. ODRL).

	• Not applicable or not necessary (according to the scope of the service) • No answer
Examples	• The service consumes data from business registers and it provides in its documentation the guidelines on how to reuse these data • The service consumes data from national land registers, but it is not describe the data consumption process in detail in its documentation • The National Criminal Records Portal consumes data from national registries, but the consumed data are meant for internal use
Question logic	Next question

C5.

Name	Integration with specific technologies and standards of the data consumed
Category	Manifestation
Weight	50%
Question type	Multiple choice (1 answer possible)
Rationale	This item aims to assess how technical behavioural interoperability performance is realised by assessing how the service handles the integration with specific technologies e.g. RPC, CORBA or standards e.g. REST/SOAP. This goes towards the rigidity with which upstream services are integrated. The service should ensure that such cases are handled in a decoupled manner and that an upstream service's bad choice of technologies doesn't impact its own design and operation. This item examines a technical behavioural interoperability manifestation of the service consuming data, information and knowledge (in terms of performance). This item is compliant with the EIRA ABB Machine to Machine Interface.
Question	To what extent does the service handle the integration with specific technologies and standards while consuming data, information and knowledge from other services? • There is no integration in place to handle the specific technologies and standards (e.g. RPC or CORBA, REST/SOAP) imposed in the consumption of other services • There is ad-hoc integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services (e.g. if an upstream service uses RPC for communication, the service must adapt to it) • There is limited integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services • There is sustainable integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services (e.g.

the service integrates with an upstream service that uses SOAP standard for exchanging structured information, but it is not done in a decoupled manner)
- There is full integration in place to handle in a decoupled manner the specific technologies (e.g. RPC, CORBA) and standards (e.g. REST/SOAP) imposed in the consumption of other services
- Not applicable or not necessary (according to the scope of the service)
- No answer

Examples	- If an upstream service uses RPC for communication, the digital public service must adapt to it - The service integrates with an upstream service that uses SOAP standard for exchanging structured information, but it is not done in a decoupled manner
Question logic	Next question

C6.	
Name	Multilingualism
Category	Manifestation
Weight	50%
Question type	Multiple choice (1 answer possible)
Rationale	This item assesses the ability and the extent of the service to consume multilingual data, information and knowledge from multilingual environments. This item examines a technical behavioural interoperability manifestation of the service consuming data, information and knowledge (in terms of performance). This item is compliant with the EIRA ABB Machine Translation.
Question	To what extent does the service consume multilingual data, information and knowledge? - The service consumes data, information and knowledge in only one language - The service consumes certain data, information and knowledge in some of the officially recognised languages by the public administration consuming the service - The service consumes certain data, information and knowledge in all officially recognised languages by the public administration consuming the service - The service consumes all data in all officially recognised national languages, as well as in English, French and German - The service consumes all data, information and knowledge in all EU officially recognised languages - Not applicable or not necessary (according to the scope of the service)

	• No answer
Examples	• The national business register consumes data from national portals only in the national language
	• The Publications office of EU consumes public procurement notices from all the Member States in all official EU languages
Question logic	Next question

Maturity scoring: The overall weight of this area in the total maturity score is 30%. For more information, please see section 6.3.

6 TIMAPS RECOMMENDATIONS

The main objective of the **Technical Interoperability Maturity Assessment of a Public Service (TIMAPS)** is to provide insight into how digital public services can improve their technical behavioural interoperability maturity. After filling in the online questionnaire, the respondent receives a PDF with advice on how to improve the technical behavioural interoperability of his digital public service. This section presents how these recommendations are generated.

6.1 Principles

The following five principles are applied to generate recommendations:
- **Principle 1:** Each technical interoperability item include 5 options, each one of them corresponding to one of the 5 interoperability levels;
- **Principle 2:** The improvement tables provide recommendations on how to improve maturity gradually for a specific technical interoperability item;
- **Principle 3:** When a digital public service does not yet reach the maximum level for a specific technical interoperability item, a recommendation is given to make the step towards the next technical interoperability level;
- **Principle 4:** When a digital public service successfully attains the maximum maturity level for a technical interoperability attribute, no recommendation is given[8];
- **Principle 5**: When the maturity improvement is not based on specific technical interoperability characteristics per level, a sliding scale (e.g. from less to more) is used. In this scenario, a generic recommendation (not maturity level specific) is given to improve the maturity further along the sliding scale.

6.2 Recommendations overview

For each improvement step, the recommendation tables in the following chapters show:
- The question the recommendation relates to;
- The assessed maturity level;
- The next maturity level to be reached through improvement[9];
- The recommendation as to how to reach the next maturity level.

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[8] The reason for this is that in this case- according to the model- the service is already implementing a technical interoperability attribute in a way that it corresponds to best practice. There are no direct recommendations to improve further
[9] With the exception when this is considered a sliding scale

6.3   Recommendations

6.3.1   Service Delivery (D) – Scoring table

Table 3: Service Delivery scoring model

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
D1	The service delivers data, information and knowledge using ad-hoc asynchronous digital communication without any ETL actions.	The service delivers data, information and knowledge using ad-hoc asynchronous digital communication with some ETL actions.	The service delivers data, information and knowledge using asynchronous digital communication with scheduled batch processing.	The service delivers most data, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.)	The service delivers any data, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.)	Such communication methods are not applicable or are not necessary (according to the scope of the service)	No answer
D2	The service delivers data, information and knowledge via a single, custom-built non-open Machine to Machine (M2M) interface (e.g. via a data infrastructure specific to the service, not designed for reuse, including database interconnections, database links, database views, etc.)	The service delivers data, information and knowledge via a single open M2M interface (e.g. via file transfer, exchange of flat files, documents, etc.).	The service delivers most data, information and knowledge via multiple, open M2M interfaces (e.g., a combination of Telnet, SFTP, HTTP, etc.).	The service delivers any data, information and knowledge via a single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.).	The service delivers any data, information and knowledge via multiple open API formats for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)	Such interfaces are not applicable or are not necessary (according to the scope of the service)	No answer
D3	The service delivers data, information and	The service delivers data, information	The service delivers data, information	The service delivers most data, information	The service delivers any data, information	Such delivery modes are not	No answer

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
	knowledge via a single, unique, non-open service delivery mode (i.e. via a menu-based interface (GUI PC base or equivalent).	and knowledge via a single, unique, open service delivery mode (e.g. via a single device, platform and/or browser, like sms-only, email-only, voice-only, etc.).	and knowledge via a limited set of service delivery modes (i.e. via limited mobile devices e.g. only on iOS, or via limited platforms and/or browsers e.g. only via Chrome browser or web application, etc.)	and knowledge via multiple service delivery modes, using different app versions, Android versions, web applications, third-party library versions, as well as touchscreen GUIs	and knowledge via multiple service delivery modes using different app versions, Android versions, web application, third-party library versions, as well as touchscreen GUIs	applicable or are not necessary (according to the scope of the service)	
D4	The service provides no technical documentation on how to integrate the data, information and knowledge delivered.	The service provides technical documentation on how to integrate the data, information and knowledge delivered only for the core services.	The service provides technical documentation on how to integrate the data, information and knowledge delivered for core and additional services.	The service provides adequate technical documentation and a local testing environment.	The service provides detailed technical documentation about the consumed services (e.g. service capability, service usage, data sources) on how to integrate the data, information and knowledge delivered, using an open expression language (e.g. ODRL)	Such technical documentation is not applicable or is not necessary (according to the scope of the service)	No answer
D5	The service does not invoke any	The service invokes other	The service uses an orchestratio	The service uses an orchestratio	The service uses a cloud orchestration	Such functionality is not	No answer

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
	other service to deliver data, information, knowledge to other services.	services to deliver data, information, knowledge to other services in an in an asynchronous manner (e.g., intermediate backend manual steps might be required).	n service to invoke other services to deliver data, information and knowledge (e.g, other services will be automatically coordinated and invoked).	n service described in a standardised format (e.g. WS-BPEL) to invoke other services to deliver data, information and knowledge.	service described in a standardised format (e.g. written in Topology and Orchestration Specification for Cloud Applications (TOSCA)) to invoke other services to deliver data, information and knowledge	applicable or is not necessary (according to the scope of the service)	
D6	The service does not provide any data verification means for the data, information and knowledge delivered	The service provides ad-hoc data verification means to give information about the origin and integrity of the data, information and knowledge delivered.	The service provides a custom 'electronic seal' in electronic form, to ensure the origin and integrity of the data, information and knowledge delivered.	The service provides a custom 'electronic seal' in electronic form, following a standard baseline profile, compatible to eIDAS, in order to ensure the origin and integrity of the data, information and knowledge delivered.	The service provides an encrypted connection and data, information and knowledge delivered is digitally signed, using an electronic certificate and a signature from a trusted authority, while the user is authenticated and authorised to access and distribute the data between end points	Such verification means are not applicable or are not necessary (based on the scope of the service)	No answer

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
D7	The service does not publish any data, information, and knowledge in compliance with any web accessibility specifications	The service publishes certain data, information, and knowledge in line with Web Content Accessibility Guidelines 2.0 (WCAG) Level A (basic features).	The service publishes certain data, information, and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AA (most frequently requested features).	The service publishes data, information, and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AA (most frequently requested features).	The service publishes data, information, and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AAA (highest level of web accessibility)	Not applicable or not necessary (according to the scope of the service)	No answer
D8	The service delivers data, information and knowledge in only one language	The service delivers certain data, information and knowledge in some of the officially recognised languages by the public administration delivering the digital public service	The service delivers certain data, information and knowledge in all officially recognised languages by the public administration delivering the service.	The service delivers all data in all officially recognised national languages, as well as in English, French and German.	The service delivers all data, information and knowledge in all EU officially recognised languages	Not applicable or not necessary (according to the scope of the service)	No answer
D9	The service is made discoverable towards its end users or other services only via ad-hoc communication (e.g. upon request, via e-mail, etc.).	The service is made discoverable towards its end users or other services through service portals or service catalogues.	The service is made discoverable towards its end users or other services through communication on the website of the public service or other	The service is made discoverable towards its end users or other services through communication on the website of the public service or other	Congratulations, you are at the "Seamless" level.	Not applicable or not necessary (according to the scope of the service)	No answer

Ite m	Ad hoc (1)	Opportunist ic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answ er
			related websites (e.g. Joinup).	related websites, as well asll digital service registries along with its specification s (description, publication details, etc.).			

6.3.2 Service Delivery (D) – Recommendations

The table below presents the respective recommendation to each option in TIMAPS questionnaire. As mentioned above, the purpose of the recommendations is to propose the needed actions to be taken by the digital public service owners in order to **achieve a higher level of technical interoperability maturity**.

In case the selected option is associated to "Seamless level (5)", then no action is required from the public service owners and the recommendation is by default "Congratulations, you are at the Seamless level".

Table 4: Service Delivery Recommendations

Question	Addressed Level	Next Level	Recommendation
D1.	Ad hoc (1)	Opportunistic (2)	Currently, the service delivers data, information and knowledge using ad-hoc asynchronous digital communication without any ETL actions. 'Consider performing the necessary actions so as to enable the service to deliver data, information and knowledge using ad-hoc asynchronous digital communication with some ETL actions (e.g. basic filtering, sorting, and aggregation of data of data is provided to requests from other services, etc.)
	Opportunistic (2)	Essential (3)	Currently, the service delivers data, information and knowledge using ad-hoc asynchronous digital communication with some ETL actions. 'Consider performing the necessary actions so as to enable the service to deliver data, information and knowledge using asynchronous digital communication with scheduled batch processing (e.g. ETL scheduled jobs that provide data to other services, etc.)
	Essential (3)	Sustainable (4)	Currently, the service delivers data, information and knowledge using asynchronous digital communication with scheduled batch processing.

Question	Addressed Level	Next Level	Recommendation
			'Consider performing the necessary actions so as to enable the service to deliver most data, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.).
	Sustainable (4)	Seamless (5)	Currently, the service delivers most data, information and knowledge via synchronous digital communication. 'Consider performing the necessary actions so as to enable the service to deliver any data, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.).
D2.	Ad hoc (1)	Opportunistic (2)	Currently, the service delivers data, information and knowledge via a single, custom-built, non-open M2M interface. 'Consider performing the necessary actions so as to enable the service to deliver data, information and knowledge via a single open M2M interface (e.g. via file transfer, exchange of flat files, documents, etc.).
	Opportunistic (2)	Essential (3)	Currently, the service delivers data, information and knowledge via a single open M2M interface (e.g. via file transfer, exchange of flat files, documents, etc.). 'Consider performing the necessary actions so as to enable the service to deliver most data, information and knowledge via multiple, open M2M interfaces (e.g., a combination of Telnet, SFTP, HTTP, etc.).
	Essential (3)	Sustainable (4)	Currently, the service delivers most data, information and knowledge via multiple, open M2M interfaces (e.g., a combination of Telnet, SFTP, HTTP, etc.) 'Consider performing the necessary actions so as to enable the service to deliver any data, information and knowledge viaa single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)
	Sustainable (4)	Seamless (5)	Currently, the service delivers any data, information and knowledge via a single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.) 'Consider performing the necessary actions so as to enable the service to deliver any data, information and knowledge via multiple open API formats for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)
D3.	Ad hoc (1)	Opportunistic (2)	Currently, the service delivers data, information and knowledge via a single, unique, non-open service delivery mode (i.e. via a menu-based interface (GUI PC base or equivalent). 'Consider performing the necessary actions so as to enable the service to deliver data, information and knowledge via a single, open service delivery mode

Question	Addressed Level	Next Level	Recommendation
			(e.g. via a single device, platform and/or browser, like sms-only, email-only, voice-only, etc.).
	Opportunistic (2)	Essential (3)	Currently, the service delivers data, information and knowledge via a single, unique, open service delivery mode (e.g. via a single device, platform and/or browser, like sms-only, email-only, voice-only, etc.). 'Consider performing the necessary actions so as to enable the service to deliver data, information and knowledge via a limited set of service delivery modes (i.e. via limited mobile devices e.g. only on iOS, or via limited platforms and/or browsers e.g. only via Chrome browser, etc.)
	Essential (3)	Sustainable (4)	Currently, the service delivers data, information and knowledge via a limited set of service delivery modes (i.e. via limited mobile devices e.g. only on iOS, or via limited platforms and/or browsers e.g. only via Chrome browser, etc.). 'Consider performing the necessary actions so as to enable the service to deliver most data, information and knowledge via multiple service delivery modes, devices using different app versions, Android versions, third-party library versions, as well as touchscreen GUIs.
	Sustainable (4)	Seamless (5)	Currently, the service delivers some data, information and knowledge via multiple service delivery modes, devices using different app versions, Android versions, third-party library versions, as well as touchscreen GUIs. 'Consider performing the necessary actions so as to enable the service to deliver any data, information and knowledge via multiple service delivery modes using different app versions, Android versions, third-party library versions, as well as touchscreen GUIs.
D4.	Ad hoc (1)	Opportunistic (2)	Currently, the service provides no technical documentation on how to integrate the data, information and knowledge delivered.'Consider performing the necessary actions so as to enable the service to provide technical documentation on how to integrate the data, information and knowledge delivered for the core services.
	Opportunistic (2)	Essential (3)	Currently, the service provides technical documentation on how to integrate the data, information and knowledge delivered only for the core services. 'Consider performing the necessary actions so as to enable the service to provide technical documentation on how to integrate the data, information and knowledge delivered for the core services plus interoperability with additional

Question	Addressed Level	Next Level	Recommendation
			services and linked services / plugins (where applicable)
	Essential (3)	Sustainable (4)	Currently, the service provides technical documentation on how to integrate the data, information and knowledge delivered for core and additional services. 'Consider performing the necessary actions so as to enable the service to also provide a local testing environment.
	Sustainable (4)	Seamless (5)	Currently, the service provides adequate technical documentation and a local testing environement. 'Consider performing the necessary actions so as to enable the service to provide detailed technical documentation, a local and an online testing environment to facilitate data integration with other services.
D5.	Ad hoc (1)	Opportunistic (2)	Currently, the service does not invoke any other service to deliver data, information, knowledge to other services. 'Consider performing the necessary actions so as to enable the service to invoke other services to deliver data, information, knowledge to other services in an asynchronous manner (e.g., intermediate backend manual steps might be required).
	Opportunistic (2)	Essential (3)	Currently, the service invokes other services to deliver data, information, knowledge to other services in an in an asynchronous manner (e.g., intermediate backend manual steps might be required). 'Consider performing the necessary actions so as to enable the service to use an orchestration service to invoke other services to deliver data, information and knowledge (e.g, other services will be automatically coordinated and invoked)
	Essential (3)	Sustainable (4)	Currently, the service uses an orchestration service to invoke other services to deliver data, information and knowledge (e.g, other services will be automatically coordinated and invoked). 'Consider performing the necessary actions so as to enable the service to use an orchestration service described in a standardised format (e.g. WS-BPEL) to invoke some other services to deliver data, information and knowledge.
	Sustainable (4)	Seamless (5)	Currently, the service uses an orchestration service described in a standardised format (e.g. WS-BPEL) to invoke other services to deliver data, information and knowledge. 'Consider performing the necessary actions so as to enable the service to use an orchestration service described in a standardised format (e.g. written in WS-BPEL) to invoke all other services to deliver data, information and knowledge.

Question	Addressed Level	Next Level	Recommendation
D6.	Ad hoc (1)	Opportunistic (2)	Currently, the digital public service does not provide any data verification means for the data, information and knowledge delivered. 'Consider performing the necessary actions so as to enable the digital public service to provide ad-hoc data verification means to give information about the origin and integrity of the data, information and knowledge delivered.
	Opportunistic (2)	Essential (3)	Currently, the service provides ad-hoc data verification means to give information about the origin and integrity of the data, information and knowledge delivered. 'Consider performing the necessary actions so as to enable the service to provide a custom 'electronic seal' in electronic form, to ensure the origin and integrity of the data, information and knowledge delivered.
	Essential (3)	Sustainable (4)	Currently, the service provides a custom 'electronic seal' in electronic form, to ensure the origin and integrity of the data, information and knowledge delivered. 'Consider performing the necessary actions so as to enable the service to provide a custom 'electronic seal' in electronic form, following a standard baseline profile, compatible to eIDAS, in order to ensure the origin and integrity of the data, information and knowledge delivered.
	Sustainable (4)	Seamless (5)	Currently, the service provides a custom 'electronic seal' in electronic form, following a standard baseline profile, compatible to eIDAS, in order to ensure the origin and integrity of the data, information and knowledge delivered.. 'Consider performing the necessary actions so as to enable the service to provide an open-source software library for electronic signature creation and validation (e.g. CEF e-Signature / e-Seal building blocks).
D7.	Ad hoc (1)	Opportunistic (2)	Currently, the service does not publish any data, information and knowledge in compliance with web accessibility specifications. Consider performing the necessary actions so as to enable the service to publish limited data, information and knowledge in compliance with some web accessibility specifications (e.g. alternative text linked to images). This refinement, will enable limited the accessibility of individuals with disabilities.
	Opportunistic (2)	Essential (3)	Currently, the service publishes limited data, information and knowledge in compliance with some web accessibility specifications (e.g. alternative text linked to images). Consider performing the necessary actions so as to

Question	Addressed Level	Next Level	Recommendation
			enable the service to publish certain data, information and knowledge in line with most web accessibility specifications (e.g. documents, pdf files, alternative text linked to images, etc.). This refinement, will foster the currently limited accessibility of individuals with disabilities.
	Essential (3)	Sustainable (4)	Currently, the service publishes certain data, information and knowledge in line with Web Content Accessibility Guidelines 2.0 (WCAG) Level A (basic features). Consider performing the necessary actions so as to enable the service to publish certain data, information and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AA (most frequently requested features). This refinement, will establish essential accessibility of individuals with disabilities.
	Sustainable (4)	Seamless (5)	Currently, the service publishes certain data, information and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AA (most frequently requested features). Consider performing the necessary actions so as to enable the service to deliver any data, information and knowledge in compliance with Web Content Accessibility Guidelines 2.0 (WCAG) Level AAA (highest level of web accessibility). This refinement, will establish full accessibility of individuals with disabilities.
D8.	Ad hoc (1)	Opportunistic (2)	Currently, the service delivers data, information and knowledge in only one language. Consider performing the necessary actions so as to enable the service to deliver certain data, information and knowledge in some of the officially recognised languages by the public administration delivering the digital public service. This refinement, will enable limited semantic behavioural interoperability with some of its end users.
	Opportunistic (2)	Essential (3)	Currently, the service delivers certain data, information and knowledge in some of the officially recognised languages by the public administration delivering the digital public service. Consider performing the necessary actions so as to enable the service to deliver certain data, information and knowledge in all officially recognised languages by the public administration delivering the digital public service. This refinement, will foster semantic behavioural interoperability with most of its end users.
	Essential (3)	Sustainable (4)	Currently, the service delivers certain data, information and knowledge in all officially recognised languages by the public administration

Question	Addressed Level	Next Level	Recommendation
			delivering the service. Consider performing the necessary actions so as to enable the service to deliver all data in all officially recognised national languages, as well as in English, French and German. This refinement, will establish more robust technical behavioural interoperability maturity with its end users.
	Sustainable (4)	Seamless (5)	Currently, the service delivers all data in all officially recognised national languages, as well as in English, French and German. Consider performing the necessary actions so as to enable the service to deliver all data, information and knowledge in all EU officially recognised languages. This refinement, will enable seamless technical behavioural interoperability maturity with its end users.
D9.	Ad hoc (1)	Opportunistic (2)	Currently, the service is made discoverable towards its end users or other services only via ad-hoc communication (e.g. upon request, via e-mail, etc.). 'Consider performing the necessary actions so as to enable the service to be made discoverable towards its end users or other services through service portals or service catalogues.
	Opportunistic (2)	Essential (3)	Currently, the service is made discoverable towards its end users or other services through service portals or service catalogues. 'Consider performing the necessary actions so as to enable the service to be made discoverable towards its end users or other services through communication on the website of the public service or other related websites.
	Essential (3)	Sustainable (4)	Currently, the service is made discoverable towards its end users or other services through communication on the website of the public service or other related websites (e.g. Joinup). 'Consider performing the necessary actions so as to enable the service to also be made discoverable towards its end users or other services through digital service registries along with its specifications (description, publication details, etc.).
	Sustainable (4)	Seamless (5)	Currently, the service is made discoverable towards its end users or other services through communication on the website of the public service or other related websites, as well asll digital service registries along with its specifications (description, publication details, etc.). 'Consider performing the necessary actions so as to enable the service to also be made discoverable towards its end users or other services through digital service registries along with its specifications

Question	Addressed Level	Next Level	Recommendation
			(description, publication details, etc.) following a formal standard (e.g. Universal Description, Discovery, and Integration (UDDI)).

6.3.3   Service Consumption (C) – Scoring table

Table 5: Service Consumption scoring model

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
C1	The service consumes data, information and knowledge using manual backend intervention for content discovery (e.g., the service retrieves and downloads data with explicit data source set from a human)	The service consumes data, information and knowledge for most content using automatic content discovery (e.g., the service retrieves and downloads data through content catalogue registries).	The service consumes data, information and knowledge for any content using automatic content discovery (e.g., the service retrieves and downloads data through content catalogue registries).	The service consumes most data, information and knowledge for most content using automatic content discovery via synchronous digital communication (e.g., through web services, APIs, etc.).	The service consumes any data, information and knowledge via synchronous digital communication (e.g. through web services, APIs, etc.)	Such communication methods are not applicable or are not necessary (according to the scope of the service)	No answer
C2	The service consumes data, information and knowledge via a single, custom-built non-open Machine to Machine (M2M) interface (e.g. via a data infrastructure specific to the service, not designed for reuse,	The service consumes data, information and knowledge via a single open M2M interface (e.g. via file transfer, exchange of flat files, documents, etc.).	The service consumes some data, information and knowledge via multiple, open M2M interfaces for direct exchange of files (e.g. using Telnet, SFTP, HTTP, etc.).	The service consumes any data, information and knowledge mostly via a single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.).	The service consumes any data, information and knowledge via multiple open API formats for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.)	Not applicable or not necessary (according to the scope of the service	No answer

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
	including database interconnections, database links, database views, etc.)						
C3	The service is not able to discover services to consume data, information and knowledge (e.g. it discovers them only upon request, via e-mail, etc.)	The service is able to discover services to consume data, information and knowledge via limited online means (e.g. service portals or service catalogues)	The service is able to discover services to consume data, information and knowledge via major online means (e.g. shared platform of digital public services, like Joinup)	The service is able to discover services to consume data, information and knowledge via major online means, along with their specifications (description, publication details, etc.)	The service is able to discover services to consume data, information and knowledge via major online means, along with their specifications on a formal standard (e.g. UDDI, RDF, etc.)	Not applicable or not necessary (according to the scope of the service	No answer
C4	The service has no access to any technical documentation on how to integrate the data, information and knowledge consumed from other services.	The service has access to limited technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. ad-hoc information on service capability).	The service has access to high level technical documentation on how to integrate the data, information and knowledge consumed from other services, but it lacks clarity on how to reuse them.	The service has access to adequate technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. service capability, service usage, data sources).	The service has access to detailed technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. service capability, service usage, data sources) using an open expression language (e.g. ODRL).	Not applicable or not necessary (according to the scope of the service	No answer

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
C5	There is no integration in place to handle the specific technologies and standards (e.g. RPC or CORBA, REST/SOAP) imposed in the consumption of other services	There is ad-hoc integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services (e.g. if an upstream service uses RPC for communication, the digital public service must adapt to it)	There is limited integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services	There is sustainable integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services (e.g. the digital public service integrates with an upstream service that uses SOAP standard for exchanging structured information, but it is not done in a decoupled manner)	There is full integration in place to handle in a decoupled manner the specific technologies (e.g. RPC, CORBA) and standards (e.g. REST/SOAP) imposed in the consumption of other services	Not applicable or not necessary (according to the scope of the service	No answer
C6	The service consumes data, information and knowledge in only one language	The service consumes certain data, information and knowledge in some of the officially recognised languages by the public administration consuming the digital public service	The service consumes certain data, information and knowledge in all officially recognised languages by the public administration consuming the digital	The digital public service consumes all data in all officially recognised national languages, as well as in English, French and German	The service consumes all data, information and knowledge in all EU officially recognised languages	Not applicable or not necessary (according to the scope of the service	No answer

Item	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)	N/A	No Answer
			public service				

6.3.4   Service Consumption (C) – Recommendations

Table 6: Service Consumption Recommendations

Question	Addressed Level	Next Level	Recommendation
C1.	Ad hoc (1)	Opportunistic (2)	Currently, the service consumes data, information and knowledge using manual backend intervention for content discovery (e.g., the service retrieves and downloads data with explicit data source set from a human). 'Consider performing the necessary actions so as to enable the service to consume data, information and knowledge for most content using automatic content discovery (e.g. the service retrieves and downloads data through content catalogue registries).
	Opportunistic (2)	Essential (3)	Currently, the service consumes data, information and knowledge for most content using automatic content discovery (e.g., the service retrieves and downloads data through content catalogue registries). 'Consider performing the necessary actions so as to enable the service to consume data, information and knowledge for any content using automatic content discovery (e.g., the service retrieves and downloads data through content catalogue registries).
	Essential (3)	Sustainable (4)	Currently, the service consumes data, information and knowledge for any content using automatic content discovery (e.g., the service retrieves and downloads data through content catalogue registries). 'Consider performing the necessary actions so as to enable the service to consume most data, information and knowledge for most content using automatic content discovery via synchronous digital communication (e.g. through web services, APIs, etc.).
	Sustainable (4)	Seamless (5)	Currently, the service consumes most data, information and knowledge for most content using automatic content discovery via synchronous digital communication (e.g., through web services, APIs, etc.). 'Consider performing the necessary actions so as to enable the service to consume most data,

Question	Addressed Level	Next Level	Recommendation
			information and knowledge for most content using automatic content discovery via synchronous digital communication (e.g. through web services, APIs, etc.).
C2.	Ad hoc (1)	Opportunistic (2)	Currently, the service consumes data, information and knowledge via a single, custom-built, non-open M2M interface. 'Consider performing the necessary actions so as to enable the service to consume data, information and knowledge via a single open M2M interface (e.g. via file transfer, exchange of flat files, documents, etc.).
	Opportunistic (2)	Essential (3)	Currently, the service consumes data, information and knowledge via a single open M2M interface (e.g. via file transfer, exchange of flat files, documents, etc.). 'Consider performing the necessary actions so as to enable the service to consume most data, information and knowledge via multiple, open M2M interfaces for direct exchange of files (e.g. using Telnet, SFTP, HTTP, etc.).
	Essential (3)	Sustainable (4)	Currently, the service consumes some data, information and knowledge via multiple, open M2M interfaces for direct exchange of files (e.g. using Telnet, SFTP, HTTP, etc.). 'Consider performing the necessary actions so as to enable the service to consume any data, information and knowledge via a single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.).
	Sustainable (4)	Seamless (5)	Currently, the service consumes any data, information and knowledge mostly via a single open API format for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.). 'Consider performing the necessary actions so as to enable the service to consume any data, information and knowledge via multiple open API formats for Machine to Machine (M2M) direct data exchange (e.g. SOAP, REST, gPRC, etc.).
C3.	Ad hoc (1)	Opportunistic (2)	Currently, the service is not able to discover services to consume data, information and knowledge (e.g. it discovers them only upon request, via e-mail, etc.) 'Consider performing the necessary actions so as to enable the service to discover services to consume data, information and knowledge via limited, custom online means (e.g. via websites)
	Opportunistic (2)	Essential (3)	Currently, the service is able to discover services to consume data, information and knowledge via limited online means (e.g. service portals or service catalogues). 'Consider performing the necessary actions so as to enable the service to discover services to discover

Question	Addressed Level	Next Level	Recommendation
			services to consume data, information and knowledge via major online means (e.g. shared platform of digital public services, like Joinup)
	Essential (3)	Sustainable (4)	Currently, the service is able to discover services to consume data, information and knowledge via major online means (e.g. shared platform of digital public services, like Joinup). 'Consider performing the necessary actions so as to enable the service to discover services to consume data, information and knowledge via major online means, along with their specifications (description, publication details, etc.)
	Sustainable (4)	Seamless (5)	Currently, the service is able to discover services to consume data, information and knowledge via major online means, along with their specifications (description, publication details, etc.). 'Consider performing the necessary actions so as to enable the service to discover services to consume data, information and knowledge via major online means, along with their specifications on a formal standard (e.g. UDDI, RDF, etc.)
C4.	Ad hoc (1)	Opportunistic (2)	Currently, the service has no access to any technical documentation on how to integrate the data, information and knowledge consumed from other services. 'Consider performing the necessary actions so as to enable the service to have access to limited technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. ad-hoc information on service capability).
	Opportunistic (2)	Essential (3)	Currently, the service has access to limited technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. ad-hoc information on service capability). 'Consider performing the necessary actions so as to enable the service to have access to high level technical documentation on how to integrate the data, information and knowledge consumed from other services, but it lacks clarity on how to reuse them.
	Essential (3)	Sustainable (4)	Currently, the service has access to high level technical documentation on how to integrate the data, information and knowledge consumed from other services, but it lacks clarity on how to reuse them. 'Consider performing the necessary actions so as to enable the service to have access to adequate technical documentation on how to integrate the data, information and knowledge consumed from

Question	Addressed Level	Next Level	Recommendation
			other services (e.g. service capability, service usage, data sources).
	Sustainable (4)	Seamless (5)	Currently, the service has access to adequate technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. service capability, service usage, data sources). 'Consider performing the necessary actions so as to enable the service to have access to detailed technical documentation on how to integrate the data, information and knowledge consumed from other services (e.g. service capability, service usage, data sources) using an open expression language (e.g. ODRL).
C5.	Ad hoc (1)	Opportunistic (2)	Currently, the service has no integration in place to handle the specific technologies and standards (e.g. RPC or CORBA, REST/SOAP) imposed in the consumption of other services. 'Consider performing the necessary actions so as to enable the service to have some ad-hoc integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services (e.g. if an upstream service uses RPC for communication, the digital public service must adapt to it).
	Opportunistic (2)	Essential (3)	Currently, the service has ad-hoc integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services. 'Consider performing the necessary actions so as to enable the service to perform limited integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services.
	Essential (3)	Sustainable (4)	Currently, the service has limited integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services. 'Consider performing the necessary actions so as to enable the service to introduce sustainable integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services (e.g. to integrate with an upstream service that uses SOAP standard for exchanging structured information, even if in a decoupled manner)
	Sustainable (4)	Seamless (5)	Currently, the service has sustainable integration in place to handle the specific technologies (e.g. RPC, CORBA) or specific standards (e.g. REST/SOAP) imposed in the consumption of other services (e.g. the digital public service integrates with an

Question	Addressed Level	Next Level	Recommendation
			upstream service that uses SOAP standard for exchanging structured information, but it is not done in a decoupled manner). 'Consider performing the necessary actions so as to enable the service to establish full integration in place to handle in a decoupled manner the specific technologies (e.g. RPC, CORBA) and standards (e.g. REST/SOAP) imposed in the consumption of other services.
C6.	Ad hoc (1)	Opportunistic (2)	Currently, the service consumes data, information and knowledge in only one language. 'Consider performing the necessary actions so as to enable the service to consume certain data, information and knowledge in some of the officially recognised languages by the public administration consuming the digital public service.
	Opportunistic (2)	Essential (3)	Currently, the service consumes certain data, information and knowledge in some of the officially recognised languages by the public administration consuming the digital public service. 'Consider performing the necessary actions so as to enable the service to consume certain data, information and knowledge in all officially recognised languages by the public administration consuming the digital public service.
	Essential (3)	Sustainable (4)	Currently, the service consumes certain data, information and knowledge in all officially recognised languages by the public administration consuming the digital public service. 'Consider performing the necessary actions so as to enable the service to consume all data in all officially recognised national languages, as well as in English, French and German.
	Sustainable (4)	Seamless (5)	Currently, the service consumes all data in all officially recognised national languages, as well as in English, French and German. 'Consider performing the necessary actions so as to enable the service to consume all data, information and knowledge in all EU officially recognised languages.