

ISA Action 4.1.2: Interoperability Maturity Model

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1 IMM Guideline

This document provides the guidelines & definitions for using the Interoperability Maturity Model (IMM) in order to assess and improve the interoperability maturity of a digital public service. First, we provide an introduction to the most important concepts in the context of the IMM. Secondly, we present the objectives of IMM, the defined maturity levels and the areas and attributes of interoperability that are the subject of observation and assessment. Finally, we conclude with an explanation of the structure of the IMM questionnaire and the method that determines the maturity levels.

1.1 Three key concepts

The following three concepts are key to understanding the IMM:

- *Public service* – services that public authorities identify as being of particular importance to citizens (A2C), businesses (A2B) and public administrations (A2A) and that would not be supplied (or would be supplied under different conditions) if there was no public intervention¹;
- *Digital public service* – the digital delivery of a public service via channels such as interactive digital collaboration (chat, cognitive agent), mobile app, web portal / website, e-mail and a 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.²

1.1.1 Public service

From a conceptual point of view, a public service starts with a trigger, goes through a number of steps and delivers an outcome towards an end user. The outcome may, but must not necessarily, be a public decision (e.g. issuing of a license involves a decision; whilst communicating the results of a job search does not). This conceptual model of a public service is illustrated in Figure 1.

¹ Based on DG Competition

http://ec.europa.eu/competition/state_aid/overview/public_services_en.html

² http://ec.europa.eu/isa/documents/eif_brochure_2011.pdf

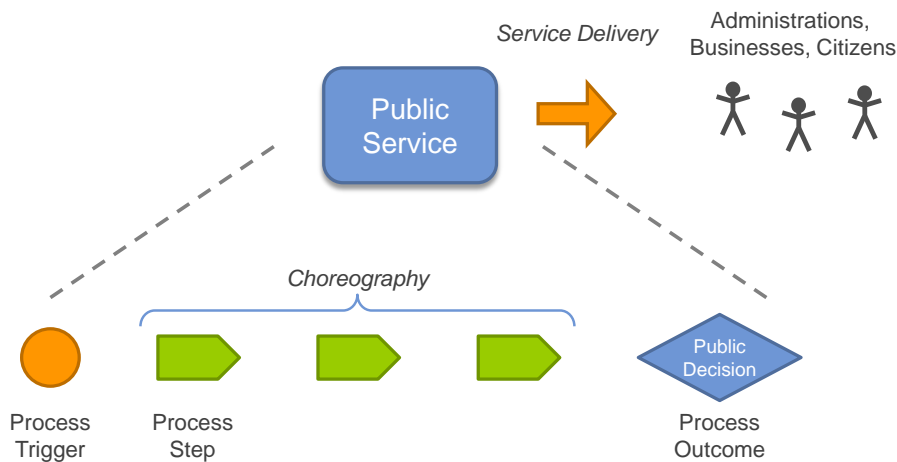


Figure 1 Conceptual model for a public service

For illustration purposes, the conceptual model is applied to the public service “Income Tax Declaration”. In simple terms:

- The service’s trigger is “the new fiscal year”.
- The main process steps it comprises are:
 - ☐ Collect information;
 - ☐ Let citizen validate information;
 - ☐ Check declaration;
- The outcome is the public decision on the amount of income tax which is due.

1.1.2 Digital public service

The IMM assesses the interoperability of a digital public services. The following four design rules apply when defining a digital public service:

1. The digital public service has a single service outcome / public decision. When multiple service outcomes are recognised, multiple digital public services will need to be defined and assessed, each through a separate IMM assessment;
2. The digital public service has a single service owner (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), 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. Services can be delivered towards three types of end users: citizens, business and other public administrations. In case the same digital public service is delivered to different types

of end-users, these services should be assessed separately from one another through the IMM.¹

4. The digital public service has a visual end user interface. The IMM 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 which conform to these four design rules are (note that the numbers refer to the three design rules above):

- Citizens (3) are offered the service to access their Electronic Health Record (1) via the eHealth portal (4) of the Danish Sunhed (2);
- Businesses (3) are offered the service to register and pay for the filling of patents (1) via the website (4) of the European Patent Office (2);
- Administrations (3) are offered the service to obtain European vehicle information (1) via the web service (4) of EUCARIS (2).

1.1.3 Interoperability

Interoperability at its core addresses how different and often varied organisations work together towards agreed common goals. Figure 2 displays the digital public service in the context of interoperability. It distinguishes between the internal domain (here the organisation produces the public services part of its service portfolio) and the external domain (here the public service reuses existing services from other administrations and/or businesses).

All relationships that interconnect the digital public service with the outside environment are considered relevant for assessing interoperability and are thus taken into account in the IMM. Making reference to the below Figure, interoperability and the IMM are thus concerned with how the relationship between internal and external domains is defined and implemented.

¹ There is one exception to this, which is a service that from the organizational, legal, semantic and technical perspective is exactly the same regardless of the end user group. Such cases are rare. Typically, services delivered to different end user groups are (slightly) different (example: the tax declaration service for citizens is somewhat different from the one for businesses).

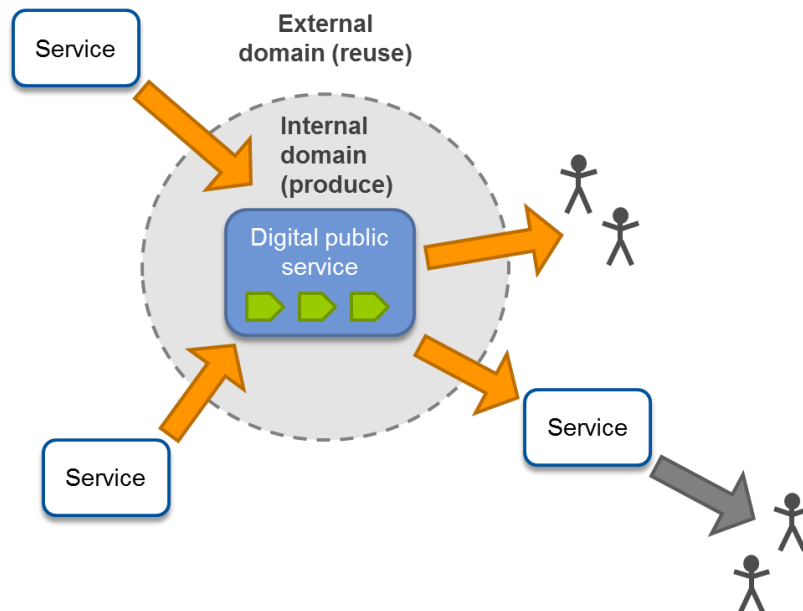


Figure 2 Visualisation of interoperability (the internal domain versus the external domain)

1.2 Model objectives

The IMM delivers insights into two important aspects of interoperability maturity:

- Provide *insight into the current 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 interoperability maturity*.

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

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

1.3 Maturity levels

The IMM uses a five stage model to indicate the interoperability maturity of the digital public service. Using maturity levels allows to:

- Measure the 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 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 the IMM are summarised in the table below:

Maturity level	Maturity stage	Interpretation
1	Ad Hoc	Poor interoperability – the digital public service cannot be considered interoperable
2	Opportunistic	Fair interoperability – the digital public service implements some elements of interoperability best practices
3	Essential	Essential interoperability – the digital public service implements the essential best practices for interoperability
4	Sustainable	Good interoperability – all relevant interoperability best practices are implemented by the digital public service
5	Seamless	Interoperability leading practice – the digital public service is a leading interoperability practice example for others

Table 1 Five maturity stages of IMM

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.

1.4 Areas of Interoperability

1.4.1 Overview

In the context of interoperability maturity, the IMM measures how well a digital public service is able to interact with other organisations to realise mutually beneficial and agreed common goals through the exchange of information and reuse of services.

Figure 3 displays all possible instances where interoperability with the outside world may occur from the viewpoint of a digital public service:¹

- *Service Delivery (B)* – Delivery of the digital public service;
- *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 Management (D)* – Controlling and monitoring the process flow related to service interactions with the external domain from trigger to outcome. This area includes Service Management aspects such as enterprise architecture, procurement, and service level management.

¹ The numbering of the areas (B, C, D) is based on the sections of the questionnaire. As there is a service context section (A) in the questionnaire, the numbering of the areas starts at B.

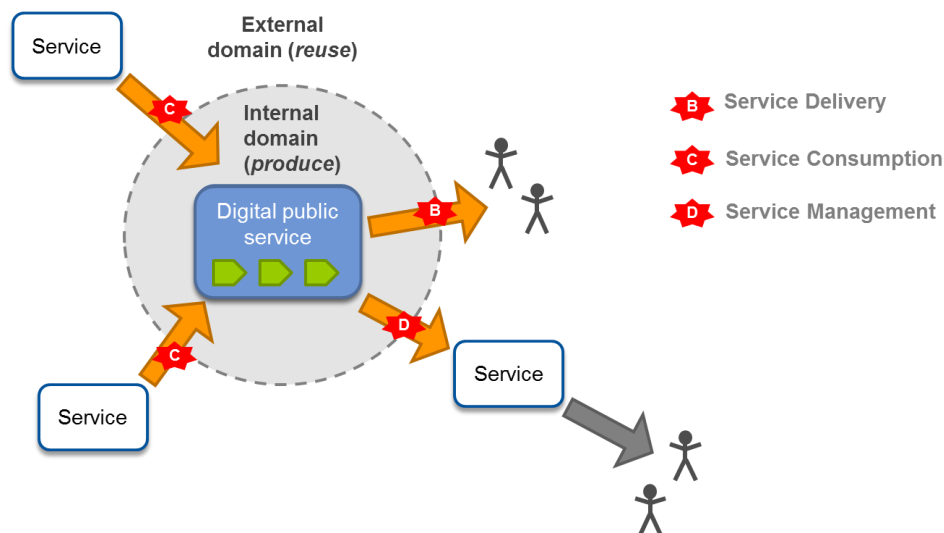


Figure 3 Overview of the interoperability areas of the IMM model

The areas (hereafter referred to as Interoperability Areas) indicated in the figure above are the object of measurement in the IMM, specifying where interoperability plays a role from a service management, service delivery and service consumption viewpoint.

1.4.2 Service Delivery (B)

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 IMM 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 channels through which the digital public service is made available and on important interoperability aspects such as pre-filling, privacy, feedback and open semantic standards.

1.4.3 Service Consumption (C)

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

There are various types of services that can be consumed by digital public services:

- *Functional service* – a common functionality (e.g. issuing a license, procurement, planning, a risk assessment module) shared across organisations;
- *Security service* – a specific type of functional service to share common security functions (e.g. identity management and authentication) across organisations;
- *Base registry service* – a specific type of functional service to share trusted, authentic and verified data (about e.g. citizens, land, vehicles) across public administrations.

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.

1.4.4 Service Management (D)

This area focuses on important Service Management aspects on the area of sharing and reuse and design of the digital public service. Digital public services are considered more interoperable if documentation, source code, services and support is provided towards other administrations and business for reuse. In addition this area covers important design aspects that ensure future-proof interoperability such as architecture, processes, orchestration, procurement and service level management.

1.4.5 Case examples

The following case examples (see Table 2) illustrate the interoperability areas of delivery, and service consumption. They are taken from real-life examples based on which the Interoperability Maturity Model has been developed. Such case examples are outlined to guide users of the model in defining and delimiting their public service's interconnections correctly.

Digital Public Service	Service Delivery	Service Consumption
Electronic Health Record Access	Citizens are offered the service to access their Electronic Health Record via the eHealth portal. Case example: <i>The service called "My Health summary" is available through the Danish eHealth portal 'Sundhed.dk' for citizens and allows authenticated users to obtain an overview of their own patient data.</i>	Payment services Identity and access management services eSignature services Personal medicine data Donor registration Living will registration Laboratory data
Online Patent Filing	Businesses are offered the service to register and pay for the filling of patents. Case example: <i>The EPO Online Filing client application provides applicants with a standard form for filing patent applications online with the European Patent Office. Once the request is filed, the applicant receives an electronic notification of receipt. If the applicant has set up an online Mailbox, he will receive all further communication from the EPO via this Mailbox, including requests for rectifying the application and the invitation to pay claims fees.</i>	Payment services Identity and access management services eSignature services
Government E-invoicing	Business are offered the service to send online invoices to the various government administrations. Case example: <i>Businesses can send all their invoices in electronic format to the Dutch government. In total, more than 78 government bodies have implemented the electronic invoicing solution. The sending and receipt of e-Invoices can take place through two channels: Digipoort (direct access or via an intermediary)</i>	Payment services Identity and access management services eSignature services

	or the e-Invoicing portal www.facturerenaandeoverheid.nl .	
Cross-Border Vehicle Identification Service	<p>Administrations are offered the service to obtain vehicle information. Case example: <i>EUCARIS is the EUropean CAR and driving license Information System. It enables public authorities to amongst others share their car registration information.</i></p> <p><i>A check in the European registers typically takes place during the re-registration of used vehicles that (possibly) originate from another country and have been registered before. Checks are carried out during vehicle registration after import and during vehicle registration in general, if it is noticed that the vehicle was or still is registered elsewhere.</i></p>	<p>Payment services</p> <p>Identity and access management services</p> <p>eSignature services</p> <p>Data access Vehicle Information</p> <p>PKI</p> <p>Data storage (e.g. logging)</p>

Table 2 Examples of Interoperability Areas for digital public services

1.5 Interoperability Attributes

The IMM assesses each interoperability area using a set of interoperability attributes. These interoperability attributes form the core of the IMM and are used for measurement and improvement of interoperability maturity. This section explains how the interoperability attributes are defined and categorised.

1.5.1 Sources of input

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

- *European Interoperability Framework* – The European Interoperability Framework (EIF) serves as an important framework for organisations to promote and improve interoperability and therefore is considered as a paramount starting point for defining the Interoperability Attributes. To make this interrelation explicit, each interoperability attribute within the IMM is linked to one or more EIF-layers (aka technical interoperability, semantic interoperability, organisational interoperability and legal interoperability);
- *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 the IMM overall embraces the key concepts of “digitalisation” in its various aspects;
- *Alignment with various other ISA initiatives* – the IMM is continuously being aligned with and provides input into the following ISA initiatives:
 - EIRA¹;

¹ http://ec.europa.eu/isa/Actions/02-IOP-architecture/2-1Action_en.htm

- ☐ TES¹;
- ☐ NIFO²;
- ☐ CAMSS³;
- ☐ SEMIC⁴;
- ☐ Base registries⁵;
- ☐ Cost-Benefit model⁶;
- ☐ ICT implications⁷;
- ☐ Sharing & Reuse⁸.

1.5.2 Interoperability Patterns

When examining the characteristics of interoperability attributes, a number of patterns emerge. The definition and combination of interoperability patterns helps in identifying the core elements of interoperability and ultimately how to measure them.

Figure 4 illustrates the relationship between interoperability maturity and the patterns. The interoperability patterns form the basis for the interoperability scoring. The interoperability patterns are:

1. **From paper-based information exchange to digital information exchange:** a public service working with paper documents is considered less interoperable than a digital public service which uses digital information;
2. **From manual to automated processing:** a public service manually processing transactions is considered less interoperable than a digital public service which has fully automated the process execution;
3. **From ad hoc to standard:** a digital public service developing its own (ad hoc) protocols and formats is considered less interoperable than a digital public service adopting widely used, standard- based solutions;
4. **From individual to collaboration:** a digital public service working stand-alone is not reusing available services and therefore is considered less interoperable than a digital public service which collaborates with other public administrations and organisations where applicable.

¹ http://ec.europa.eu/isa/Actions/02-IOP-architecture/2-14Action_en.htm

² http://ec.europa.eu/isa/Actions/04-accompanying-measures/4-2-3Action_en.htm

³ http://ec.europa.eu/isa/Actions/02-IOP-architecture/2-2Action_en.htm

⁴ http://ec.europa.eu/isa/Actions/01-trusted-information-exchange/1-1Action_en.htm

⁵ http://ec.europa.eu/isa/Actions/01-trusted-information-exchange/1-2Action_en.htm

⁶ Action tbc in next ISA work program

⁷ http://ec.europa.eu/isa/Actions/03-ict-implications-assessment/index_en.htm

⁸ http://ec.europa.eu/isa/Actions/04-accompanying-measures/4-2-5Action_en.htm

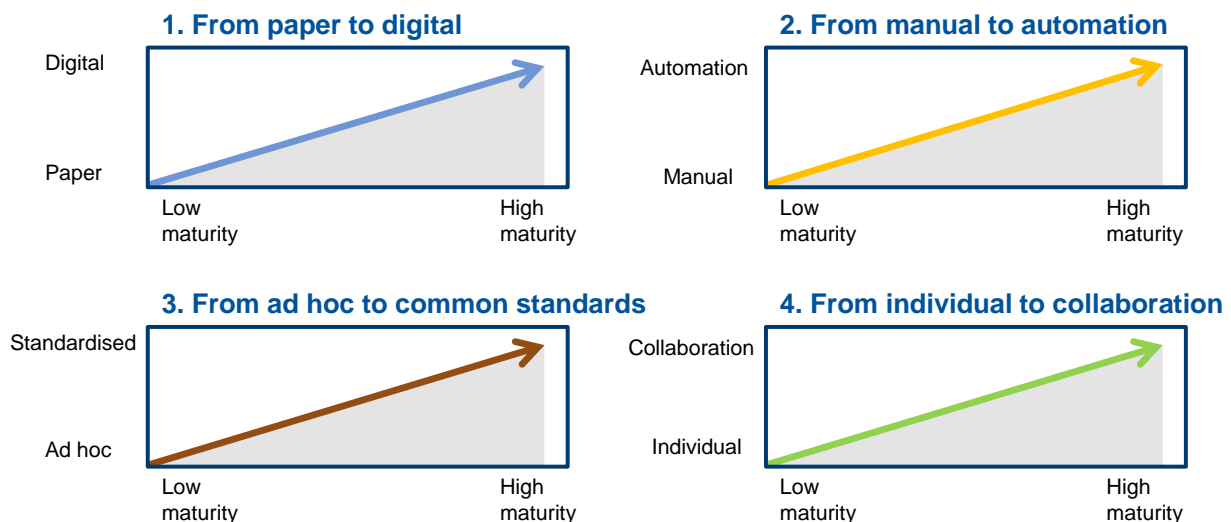


Figure 4 Examples of Interoperability Patterns

1.6 Questionnaire

The IMM uses a questionnaire structure for assessing the interoperability maturity. This section details the questionnaire type, question types and assessment structure in more detail.

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

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

1.6.1 Questionnaire Structure

This section outlines the structure of the questionnaire. The four main sections of the questionnaire are in line with the earlier presented overview of interoperability areas (section 1.4.1):

- **Service Context (A):** This section assesses the scope of the digital public service (the object of measurement, i.e. the digital public service to examine), service landscaping and gathers important information for follow-up (contact details, etc.);
- **Service Delivery (B):** 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;
- **Service Management (D):** This section assesses how the digital public service arranges the consumption and provisioning of external services and includes Service Management aspects such as architecture, procurement and service level management.

The questionnaire routing is sequential at the level of the main areas (A, B, C, D). The questions within areas A, B, C and D are also defined sequentially and need to be filled in one after the other.