

Interoperability Maturity Model

IMM Guideline

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Table of Contents

1	IMM Guidelines	2
1.1	Two important definitions	2
1.1.1	Public service	2
1.1.2	Interoperability	4
1.2	Model objectives	4
1.3	Maturity levels	5
1.4	Areas of Interoperability	5
1.4.1	Overview	5
1.4.2	Service Delivery (B).....	6
1.4.3	Service Consumption (C)	6
1.4.4	Service Management (D).....	7
1.4.5	Case examples	7
1.5	Interoperability Attributes.....	9
1.5.1	Relation to other ISA works	9
1.5.2	Interoperability Patterns	10
1.6	Questionnaire.....	10
1.6.1	Questionnaire Types	10
1.6.2	Questionnaire Structure	11
2	Annex: IMM Glossary.....	12

1 IMM Guidelines

This document provides the guidelines & definitions for using the Interoperability Maturity Model (IMM) in order to assess and improve the interoperability maturity of a public service. First, we provide an introduction to the most important definitions 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 questionnaires and the method how the maturity level is determined. The annexed glossary summarises all the definitions used in the IMM.

1.1 Two important definitions

The following two definitions are important to understand before the IMM is explained:

- *Public service* – activities 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 intervention;
- *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.¹

1.1.1 Public service

From a conceptual point of view, a public service starts with a trigger, follows 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 public services is illustrated in Figure 1.

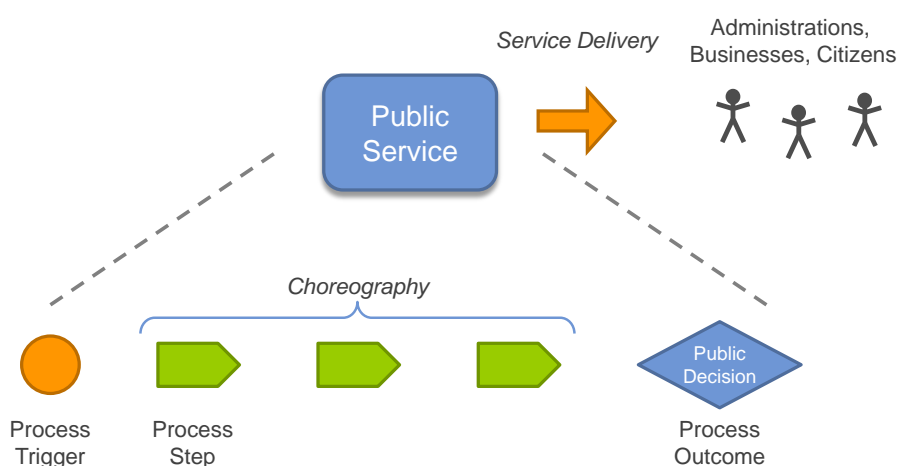


Figure 1 Conceptual model for a public service

¹ http://ec.europa.eu/isa/documents/eif_brochure_2011.pdf

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

- The service’s process 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.

The following four design rules apply when defining a public service:

1. The public service has a single service outcome / public decision. When multiple service outcomes are recognised, multiple public services will need to be defined and assessed separately through the IMM;
2. The 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 their respective service;
3. The public service has a single primary end user group. Service can be delivered towards three types of end users: citizens, business and other public administrations. In case the same public service is delivered to different types of end-user, these services should be assessed separately from one another through the IMM.¹
4. The 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. The IMM shall thus not be used to only assess pure machine-to-machine services, even though this would be theoretically feasible by omitting the assessment area of Service Delivery, see section 1.4.2.

Examples of 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 PRV (2);
- Administrations (3) are offered the service to obtain European vehicle information (1) via the web service (4) of EUCARIS (2).

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 different from the one for businesses).

1.1.2 Interoperability

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

All relationships that interconnect the 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 concerned with how the relationship between internal and external domains is defined and implemented..

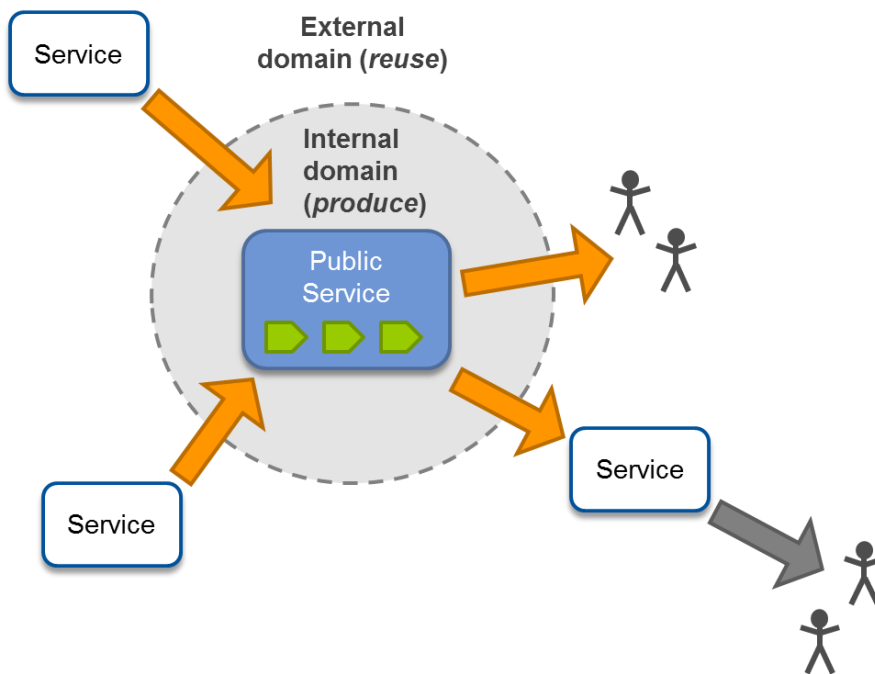


Figure 2 Visualisation of interoperability (the internal domain versus the external domain)

1.2 Model objectives

The IMM has the objective to deliver insight into two important aspects of interoperability maturity:

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

Although the IMM is publicly available for all interested organisations and citizens, the main target audience are the service owners of public services that operate in an environment in which interoperability is required to deliver a public service towards end users.

Improving interoperability is a continuous activity. Therefore organisations are encouraged to frequently use the model and the improvement guidelines it contains.

1.3 Maturity levels

The IMM uses a five stage model to indicate the interoperability maturity of the public service. The reason for the usage of these various maturity levels is two-fold:

- To measure the interoperability maturity of the public service as a whole and of the underlying aspects;
- To indicate which capabilities and next steps are required to improve interoperability maturity.

A five stage approach is seen often in proven maturity models and is considered best practice for assessing and improving organisational 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 service has almost no interoperability in place
2	Opportunistic	Fair interoperability – the service implements some elements of interoperability best practices
3	Essential	Essential interoperability – the service implements the essential best practices for interoperability
4	Sustainable	Good interoperability – all relevant interoperability best practices are implemented by the public service
5	Seamless	Interoperability leading practice – the service is a leading example for others

Table 1 Five maturity stages of IMM

The desired interoperability level for a public service is at minimum level 4: ‘Sustainable’. At this level, the 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 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 public service. Summarising what has been said so far, the following interactions may occur. The numbering of the areas (B, C, etc.) 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 with B.

- *Service Delivery (B)* – Providing end-users access to the 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 for example;
- *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, cost-benefit analysis and the provisioning of the services towards other administrations or businesses.

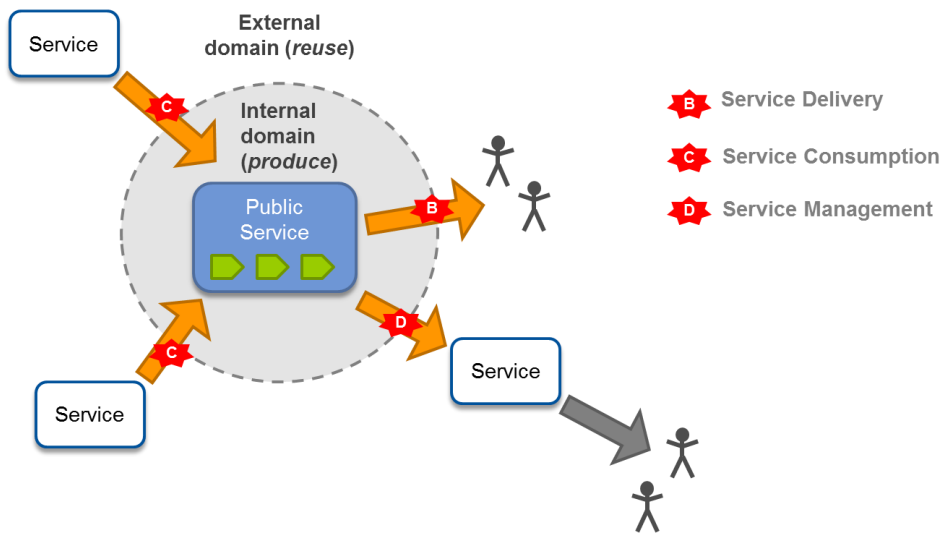


Figure 3 Overview of the interoperability areas of the IMM model

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

1.4.2 Service Delivery (B)

The public administration delivers the public service towards end users i.e. citizens, businesses or other administrations. We call this *Service Delivery*. It covers the interoperability aspects from an end-user perspective only. The service that is being delivered to the end user represents the focal point of the IMM in terms of correctly scoping and delimiting the public service under evaluation. If service delivery is scoped correctly, the scoping of the other areas becomes more straightforward.

Note that a public service only used by internal employees of the public administration does not qualify as service delivery whilst delivery of services to staff from other, external public administrations does. The qualifying criterion here is the relation of the public service with the external domain as described above. The most important interoperability aspect covered by the service delivery area is how the service is made available to the end-user through various delivery channels (e.g. counter, paper forms, software application, online portal). A public service is considered more interoperable when end-user service delivery is electronic and supported by multiple channels and devices to enhance usability.

1.4.3 Service Consumption (C)

For delivering the public service towards the end user, the 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 public services:

- *Functional service* – a common functionality (e.g. issuing a license, procurement, planning, risk assessment module) shared across organisations;
- *Security service* – a specific type of functional service to share common security functions (e.g. identity provisioning 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.

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 such as enterprise architecture, orchestration, procurement and cost-benefit analysis that detail to what extent the organisation has mechanisms in place to facilitate interoperability. It also addresses the aspect that organizations that deliver (machine-to-machine) services towards other administrations or businesses are considered more interoperable. This attribute is called service provisioning.

Depending on the type of public service involved, the service can be either delivered autonomously by a public administration or require service interactions with other public administrations or businesses. These service interactions can be either based on consumption (the public service reuses an existing services) or on provisioning (the public service provides a service towards another organisation). *Service Management* encompasses the coordination of all external interactions to ensure the outcome of the public service is achieved in the optimum manner. Organisations are considered more interoperable when interactions with other services are managed in a central, coordinated and consistent way.

1.4.5 Case examples

The following case examples (see Table 2) illustrate the interoperability areas of delivery, service consumption and service management (with a focus on the interoperability attribute service provisioning). They are taken from true 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.

Public Service	Service Delivery	Service Consumption	Service Management (attribute service provisioning)
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	Not applicable
Online Patent Filing	Businesses are offered the service to register and pay for the filling of patents.	Payment services identity and access management services	Search classification service

	<p>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></p>	eSignature services	
Government E-invoicing	<p>Business are offered the service to send online invoices towards the various government administrations.</p> <p>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 electronic invoicing. The sending and receipt of e-Invoices can take place through two channels: Digipoort (direct access or via an intermediary) or the e-Invoicing portal www.facturereenaandeoverheid.nl.</i></p>	<p>Payment services Identity and access management services eSignature services</p>	<p>Open Data provisioning Purchasing catalogue service Contract register Purchase order sender Invoice receiver</p>
Cross-Border Vehicle Identification Service	<p>Administrations are offered the service to obtain vehicle information</p> <p>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. 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 Identity and access management services eSignature services Data access Vehicle Information PKI Data storage (e.g. logging)</p>	<p>Vehicle inquiry for registration authority end users Vehicle inquiry for registration authority through customized client application Vehicle inquiry for enforcers Vehicle inquiry for enforcers through customized client application</p>

Table 2 Examples of Interoperability Areas for public services

As the table indicates, it can be the case that an interoperability area of the model does not apply to a public service (for example Service Provisioning is not relevant for the public service ‘Electronic Health Record Access’).

1.5 Interoperability Attributes

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 we have defined and categorised the interoperability attributes.

1.5.1 Relation to other ISA works

Various related ISA works have been utilised to build the current set of Interoperability Attributes in this version of the model:

- *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 an important starting point for defining the Interoperability Attributes. To make this interrelation explicit, each interoperability attribute within IMM is linked towards one or more EIF-layers (technical interoperability, semantic interoperability, organisational interoperability and legal interoperability);
- *Alignment with various other ISA initiatives – the IMM is continuously being aligned with and provides input into the following ISA initiatives:*
 - EIRA¹;
 - TES²;
 - NIFO³;
 - CAMSS⁴;
 - SEMIC⁵;
 - Base registries⁶;
 - Cost-Benefit model⁷;
 - ICT implications⁸;
 - Sharing & Reuse⁹.

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

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

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

⁴ http://ec.europa.eu/isa/Actions/02-IOP-architecture/2-2Action_en.htm

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

⁶ http://ec.europa.eu/isa/Actions/01-trusted-information-exchange/1-2Action_en.htm

⁷ Action tbc in next ISA work program

⁸ http://ec.europa.eu/isa/Actions/03-ict-implications-assessment/index_en.htm

⁹ http://ec.europa.eu/isa/Actions/04-accompanying-measures/4-2-5Action_en.htm

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

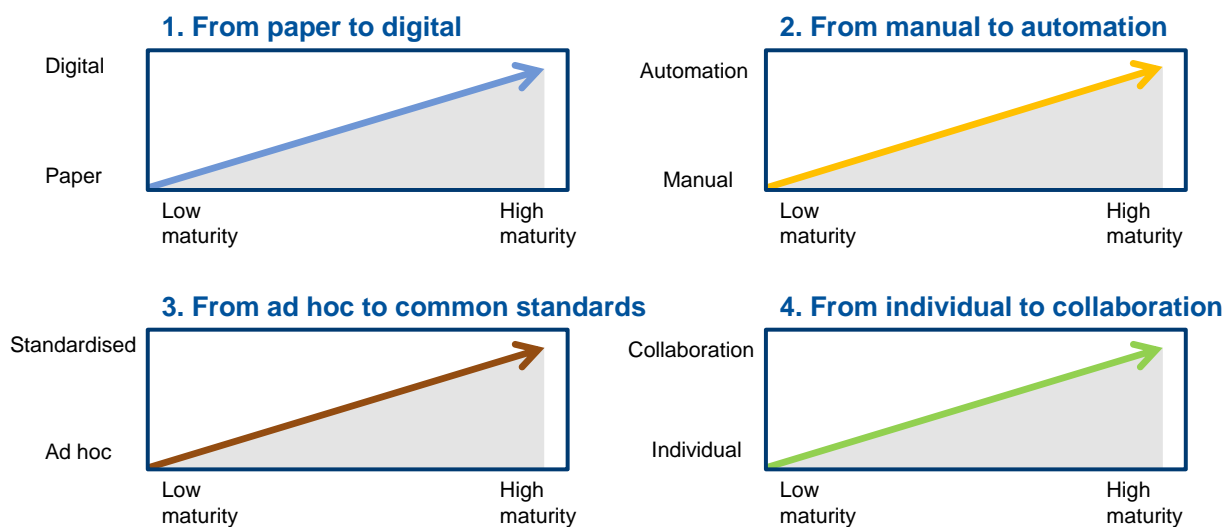


Figure 4 Examples of Interoperability Patterns

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.

1.6.1 Questionnaire Types

The IMM questionnaire comes in two forms that follow the same defined structure and assessment criteria. IMM Lite (User friendly EU Survey hosted self-assessment tool) and IMM Full (Excel driven maturity model intended to gain deeper insight in the area of Service

Consumption) are complimentary toolsets that drive the creation of tailored results, recommendations and confidential improvement guidance,

1.6.1.1 IMM Lite

A compact and highly user-friendly version of the model available online via EU Survey (<https://ec.europa.eu/eusurvey/runner/IMMSurvey>). Designed as a self-assessment tool the IMM assessment criteria has been condensed into targeted question sets in order to evaluate key interoperability aspects of a public service. Such insight results in personalised, confidential feedback and recommendations how a service can improve. The IMM Lite is designed to take approximately 20-30 minutes to complete. After filling in the questionnaire a report will be generated with the interoperability scores plus recommendations how to further improve your public service.

1.6.1.2 IMM Full

The IMM Full provides deeper insight by assessing each digitally consumed service on a case by case basis. Use this model if you want an in-depth analysis of your service landscape. IMM Full is estimated to take approximately 60-120 minutes to complete but can take significantly longer considering service complexity. Typically it is considered beneficial to organize a guided workshop with the support of ISA to fill in the model. After filling in the Excel the interoperability score is automatically generated. You will be provided in a later stage with recommendations how to further improve your public service.

1.6.2 Questionnaire Structure

This section outlines the structure of the questionnaires. The five main sections of the questionnaires 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 public service (the object of measurement, i.e. the public service to examine), service landscaping and gathers important information for follow-up (contact details, etc.);
- **Service Delivery (B):** The section assesses how the public service delivers the public service towards end-users;
- **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 public service arranges the consumption and provisioning of external services and includes Service Management aspects such as architecture, procurement and cost-benefit analysis.

The questionnaire routing is sequential at the level of the main areas (A, B, C, D). The questions within areas A, B and D are also defined sequentially and do not contain complex questionnaire routing. This is different for Section C 'Service Consumption' within the full version of the questionnaire in which the routing is dynamically driven by the given answers.

2 Annex: IMM Glossary

Term	Definition
Business Process	<p>'A business process is a sequence of linked activities that creates value by turning inputs into a more valuable output.'</p> <p><i>http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf</i></p>
Business Process Model	<p>'A model that defines the business process, by the definition of strict steps of the business processes, precise rules, and the description of the processed data.'</p> <p><i>(EIA Project - Specific contract N° 83)</i></p>
Choreography Service	<p>'The Choreography Service enables the collaboration among groups of Services which, in turn, make up a larger, composite Service, or which interact across organizational boundaries in order to obtain and process information.'</p> <p><i>(Based on W3C http://www.w3.org/TR/ws-cdl-10/)</i></p>
Data	<p>'Facts represented as text, numbers, graphics, images, sound, or video. Data is the raw material used to represent information, or from which information can be derived.'</p> <p><i>(DAMA – Data Management International - http://www.dama.org/)</i></p>
Interoperability	<p>'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.'</p> <p><i>(based on EIF 2.0)</i></p>
Machine to Machine Interface	<p>'Description of a boundary between a system and other systems, usually including the mechanisms by which information is transferred.'</p> <p><i>(Definition from DG TAXUD)</i></p>
Metadata	<p>'Metadata is structured information of two types, data models and reference data, which can be defined as follows:</p> <ul style="list-style-type: none"> - A data model is a collection of entities, their properties and the relationships among them, which aims at formally representing a domain, a concept or a real-world thing. In practice, data models drive the design and development of information systems, as they can express the different types of information managed by an organization. - Reference data is a small, discrete set of values that are not updated as part of business transactions but are usually used to impose consistent classification. Reference data normally has a low update frequency. Reference data is relevant across more than one business systems belonging to different organizations and sectors.' <p><i>(ISA Action 1.1)</i></p>
Private Network	<p>'A Private Network is a network that is used for the only purpose of realizing the physical communication among Interoperable European Systems (e.g. sTESTA), and cannot be accessed by the public.'</p> <p><i>(EIA Project - Specific contract N° 42)</i></p>
Public Network	<p>'A Public Network is a Network that can be accessed by the public (public administrations, businesses and citizens) without specific authorizations. Interoperable European Systems can rely on Public Networks (e.g. the Internet) to realize the physical communication between nodes'.</p> <p><i>(EIA Project - Specific contract N° 42)</i></p>

Public Policy	<p>'A course or principle of action proposed or adopted by a policy making body.'</p> <p><i>(Based on Oxford Dictionary) / Aligned with definition given by EIRA)</i></p>
Public Service	<p>'Public Services are economic activities that public authorities identify as being of particular importance to citizens (A2C), businesses (A2B) and public administrations (A2A) and that would not be supplied (or would be supplied under different conditions) if there were no public intervention.'</p> <p><i>(Based on DG Competition http://goo.gl/M9CKCJ)</i></p>
(Public) Service Catalogue	<p>'A catalogue of (public) Services is a collection of descriptions of active public Services that are provided by a public administration at any administrative level (i.e. local, regional, national or pan-European). These descriptions are created following or mapped to a common data model for representing public Services.'</p> <p><i>(ISA Action 1.3)</i></p>
Specification	<p>'A Specification is a document describing the functional/technical specifications of a solution.'</p> <p><i>(EIA Project - Specific contract N° 83)</i></p>
Users	<p>'Public Administrations, Business and Citizens are consumers of Public Services.'</p> <p><i>(based on EIF 2.0)</i></p>
Sharing & Reuse	<p>'Reuse means that public administrations confronted with a specific problem seek to benefit from the work of others by looking at what is available, assessing its usefulness or relevance to the problem at hand, and deciding to use solutions that have proven their value elsewhere . In some cases, the solutions are reused once they have been adapted to specific requirements or linguistic environments.'</p> <p><i>(Sharing & Reuse Action - Def.9)</i></p>