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Interoperability Maturity Assessment For Public Services

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1 SCOPE OF THIS DOCUMENT

This document aims to help people responsible for creating and managing public services to assess the maturity of these services from an interoperability point of view. This group formulates the intended audience of this document which is based on the Interoperability Maturity Model (IMM), created by the ISA programme (https://joinup.ec.europa.eu/elibrary/document/interoperability-maturity-model), as an assessment tool.

The purpose of the document is to be used as training material during the training courses of the program "Evaluation of electronic public services Interoperability - Interoperability Maturity Model (IMM)" that are implemented by the National Centre of Public Administration and Local Government in Greece.

The scope of this document[1] includes providing clarifications on the guidelines that ISA programme has developed, focusing on interoperability concepts that are used by the model, and presenting some indicative examples of public services analyzed and developed during IMM training courses that were implemented by the National Centre of Public Administration and Local Government in Greece.

The structure of this document is as follows:

- Sections 3 and 4 present the main interoperability and public service concepts necessary for the use of IMM. Service definition is one of the most important issues and the answers provided to the IMM questionnaire during a public service

[1] This document should be used in addition to the documentation created by ISA for the IMM Model.

assessment will be highly depended on the service description and the definition of the user groups the services are addressed to.

- Section 5 introduces the IMM and the main concepts thereof. Readers are expected to be familiar with basic interoperability concepts and initiatives such as the European Interoperability Framework, European Interoperability Strategy, European Interoperability Reference Architecture. As a result, only concepts used by the IMM are clarified herein.
- Sections 6 and 7 focus on the completion of the IMM questionnaire using specific examples and explaining the rationale of the answers that were provided.
- Section 8 presents a set of suggested assignments that can be used during the training courses, as well as, a set of self-assessment questions.

2 SCOPE OF IMM

By definition, the aim of the IMM Model is to assess interoperability of a public service i.e. the relation and the connection that a public service has with the external environment. From that point of view, any relation to the internal environment is not taken into account as it is regarded not relevant to interoperability.

From that point of view IMM can be used for the following indicative purposes:

1) To assess a public service in order to derive recommendations that can help improving the service to become more interoperable,
2) To create a comparative assessment for similar services that are offered by different organizations or different governments and countries as benchmarking.

3 INTRODUCTION TO PUBLIC SERVICES AND INTEROPERABILITY

The objective of this section is to assist trainees understandng the basic entities that constitute the interoperability model for public e-services. In this context, trainees will be able to

- Describe the main Interoperability initiatives and actions such as:
    - European Interoperability Strategy.
    - European Interoperability Framework.
    - The interoperability levels.
    - The European Interoperability Reference Architecture.
- Report actions related to the national interoperability framework.
- Understand the main elements of the national interoperability framework.

3.1 Introduction to Public Services

Public Service is the 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. It is a set of deeds and acts performed by or on behalf of a public agency for the benefit of a citizen, a business or another public agency[2].

Public services operate according to rules that are derived from some combination of legislation and policy which can be set at local, regional, national or supranational level.

[2] http://joinup.ec.europa.eu/site/core_vocabularies/registry/corevoc/PublicService/PublicService.en.html

The provision of public services is a key task for governments. People care about public services and depend on them being properly delivered. Public services provide the most common interface between people and the state, and their functioning shapes people's lives.

3.2 Electronic Public Service

As information and communication technologies (ICTs) have permeated almost every area of modern life, it stands to reason that the reach of ICTs would extend to public services[3]. Electronic Public Services (e-services) is referring to the provision of services via the Internet (the prefix 'e' standing for 'electronic', as it does in many other usages). All over the world, public administration transforms several services to e-services in order to (a) improve its operations, (b) simplify administrative procedures and (c) to minimize cost and time of public services delivery.

3.3 Introduction to Interoperability

Interoperability is often defined as the ability of heterogeneous IT systems to exchange data and share information [6]. While the term was initially defined for information technology, a broader definition takes into account social, political, and organizational factors that impact system to system communication. Speaking from an eGovernment perspective, interoperability refers to the collaboration ability of cross-border services for citizens, businesses and public administrations.

[3]This shift on the provision of public e-services can be perceived as an instance of organizational change through the implementation of information technology in Public Administration.

3.4 European Interoperability Initiatives and Actions

Interoperability between public administrations is crucial for achieving European integration and concerns core aims of the European Union. Member States and end-users have a great interest in overcoming barriers to easy delivery of European public services[4] across borders and sectors. While end-users are the final recipients of these services, the prime partners for the delivery of public services are the European public administrations.

Interoperability issues are not only technological, but also cover a wide range of aspects, such as: lack of a cross-border and cross-sector legal basis for interoperability, insufficient awareness and political will, or lack of agreement on the governance structures required. Especially in the European Union, interoperability is considered a wider concept which encompasses the ability of European public organizations to work together towards mutually beneficial and commonly agreed goals in a heterogeneous but interconnected legal environment. Thus, the following definition is used in regard to Interoperable European public services[5]:

> *Interoperability, for European public service delivery, is the ability of disparate and diverse organizations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organizations, through the business processes they support, by means of the exchange of data between their respective ICT systems.*

[4] A European public service means 'a cross-border public sector service supplied by public administrations, either to one another or to European businesses and citizens'.

[5] as defined in the European Interoperability Framework - EIF

As part of its strategy, the European Commission is taking concrete actions for the development of Cross-border interoperable Electronic Public Services. These include: (a) the **European Interoperability Strategy** (EIS) which is a systematic approach to govern interoperability at EU level, by setting strategic priorities and objectives, (b) **The European Interoperability Framework** (EIF) which provides guidance for the provision of European Public Services and a common set of core concepts for the design and update of national interoperability frameworks (NIFs), and (c) , the **European Interoperability Reference Architecture** (EIRA), a reference architecture for designing and describing digital public services across borders and sectors. Figure 1 depicts the above actions which are analysed in the following sections, together with the **Cartography of services and tools** which is typically a mapping of existing reusable solutions.

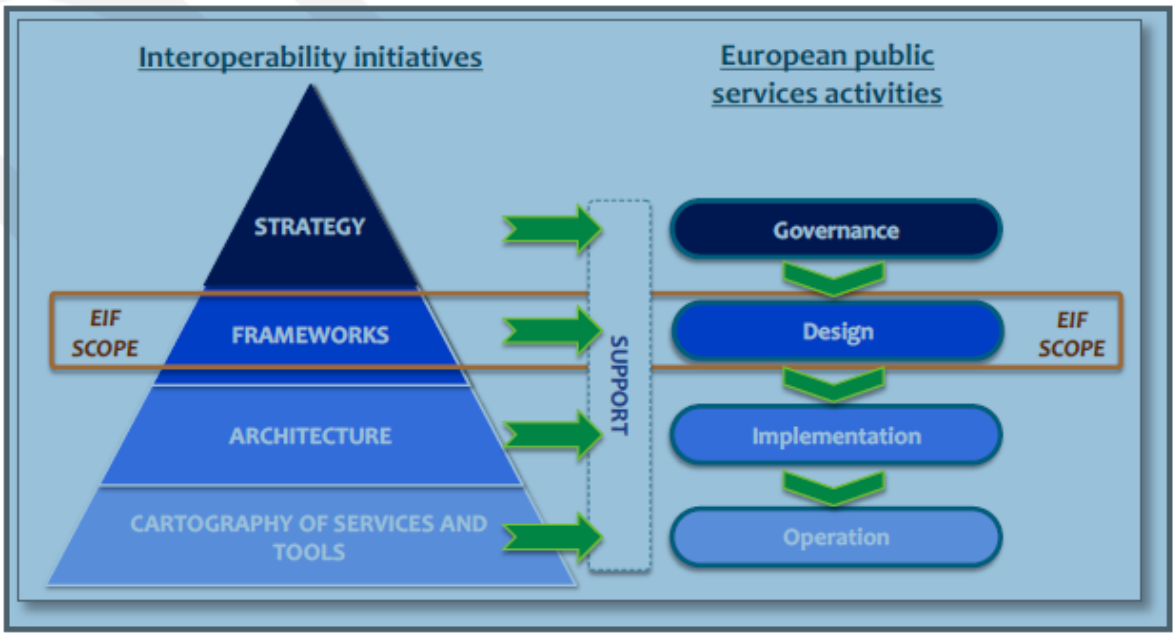


Figure 1: European Interoperability Initiatives

3.4.1 The European Interoperability Strategy

The **European Interoperability Strategy (EIS)** can be defined as an action plan to address cross-boundary interoperability aiming at facilitating the implementation of EU policies and initiatives. The EIS stands on the top of the interoperability activities stack. Its main goal is to define, in agreement and cooperation with Member States, **a focused set of concrete actions both at national and EU level** which will improve interoperability of public services in Europe.

EIS provides direction and sets priorities for actions needed to improve interaction, exchange and cooperation among European public administrations across borders and across sectors when establishing European public services. The strategy clusters future interoperability activities under three headings:

• Trusted information exchange;

• Interoperability architecture;

• Assessment of the ICT implications of new EU legislation

These activities are to be supported by accompanying measures on awareness-raising and sharing of best practice.

3.4.2 The European Interoperability Framework

An interoperability framework is an agreed approach to interoperability for organizations that want to collaborate in order to provide joint delivery of public services. An Interoperability Framework is, therefore, not a static document and may have to be adapted over time as technologies, standards and administrative requirements change.

The European Interoperability Framework (EIF) is maintained under the ISA program[6,] in close cooperation between the Member States and the Commission. They work together in the spirit of Article 170 of the Treaty on the Functioning of the European Union[7].

The European Interoperability Framework describes four levels of interoperability:

Legal

Legal interoperability covers the broader environment of laws, policies, procedures and cooperation agreements needed to allow the seamless exchange of information between different organizations, regions and countries. In the European Union each public administration contributing to the provision of a European public service (usually) works within its own national legal framework, and incompatibilities between legislation in different Member States can make working together more complex. Legal initiatives may be needed to remedy such situations.

Organizational

Organizational interoperability focuses on integrating business processes and meeting user requirements by making services available, easily identifiable, accessible and user-focused and should address:

- business process alignment
- organizational relationships
- and change management.

[6]The first version of the European Interoperability Framework (EIF 1.0) was issued under the Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens programme (IDABC). The EIF continues under the new ISA programme, which replaced the IDABC programme on 31 December 2009.

[7] Under this Article, to help achieve the objectives referred to in Article 26 concerning the internal market, the European Union should help establish and develop trans-European networks and promote the interconnection and interoperability of national networks as well as access to such networks.

Semantic

Semantic interoperability refers to the ability to ensure that the precise meaning of exchanged information is unambiguously interpretable by any other system, service or user. Achieving semantic interoperability in the EU context is a relatively new undertaking. Given the different linguistic, cultural, legal, and administrative environments in the EU, there are significant challenges to ensuring that the precise meaning and formats of exchanged information is understood and preserved by all parts.

As part of the effort to ensure semantic interoperability, ISA has promoted the establishment of core concepts and vocabularies and the Asset Description Metadata Schema (ADMS) as part of the semantic interoperability initiative. A core concept is a simplified data model that captures the minimal, global characteristics/attributes of an entity in a generic, country and domain neutral fashion. It can be represented as core vocabulary using different formalisms (e.g., XML, RDF, JSON).

Technical

Technical interoperability means the ability of two or more information and communication technology applications or systems, to accept data from each other and perform a given task in an appropriate and satisfactory manner without the need for extra operator intervention. Technical interoperability should be ensured, whenever possible, via the use of standards and specifications.

3.4.3 The European Interoperability Reference Architecture (EIRA)

EIRA is an architecture content metamodel defining the most salient Architectural Building Blocks (ABBs)[8] needed to build interoperable e-Government services. The EIRA is a four-view reference architecture for delivering interoperable digital public services across borders and sectors. It defines the required capabilities for promoting interoperability as a set of Architecture Building Blocks (ABBs). The EIRA has four main characteristics:

- **Common terminology to achieve a minimum level of coordination**: It provides a set of well-defined ABBs that provide a minimal common understanding of the most important building blocks needed to build interoperable public services.
- **Reference architecture for delivering digital public services**: It offers a framework to categorize (re)usable solution building blocks (SBBs) of an e-Government solution. It allows portfolio managers to rationalize, manage and document their portfolio of solutions.
- **Technology- and product-neutral and a service-oriented architecture (SOA) style**: The EIRA is built upon The Open Group Architecture Framework (TOGAF[9]), a global framework for Enterprise architecture and the model is expressed in ArchiMate[10]. In fact, the EIRA ABBs can be seen as an extension of the model concepts in ArchiMate , as explained in the next section (4.1.3.1)
- **Alignment with EIF :** The EIRA is aligned with the European Interoperability Framework (EIF) and complies with the context given in the European Interoperability Strategy (EIS) . The views of the EIRA correspond to the

[8] An architectural building block is an abstract component that captures architecture requirements and that directs and guides the development of solution building blocks. An ABB represents a (potentially re-usable) component of legal, organisational, semantic or technical capability that can be combined with other architecture building blocks. An architecture building block describes generic only characteristics and functionalities.
[9] http://www.opengroup.org/subjectareas/enterprise/togaf
[10] http://pubs.opengroup.org/architecture/archimate2-doc/toc.html

interoperability levels in the EIF: legal, organizational, semantic and technical interoperability.

3.4.3.1 Key Concepts of Enterprise Architecture and the ArchiMate language

3.4.3.1.1 Enterprise Architecture

The term **architecture** refers to fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution (ISO/IEC/IEEE 42010:2011 , Systems and software engineering -- Architecture description).

An architecture is usually developed and maintained because key "stakeholders" within an organization have concerns that need to be addressed by the business and IT systems within the organization. The role of the architect is to address these concerns, by identifying and refining the requirements that the stakeholders have, developing views of the architecture that show how the concerns and the requirements are going to be addressed.

The term architecture is often prefixed with the term **enterprise** in order to better define the environment within, the architecture is used. The term **enterprise architecture** therefore, is used to describe the fundamental concepts and properties of a system within an organizational unit, organization, or collection of organizations that share a set of common goals and collaborate to provide specific products or services. The enterprise architecture defines the components or building blocks that make up the overall system, enabling an organization to manage the overall IT investment in a way that meets the needs of its business.

3.4.3.1.2 The ArchiMate Language

To provide a uniform representation for diagrams that describe enterprise architectures, the **ArchiMate** enterprise architecture modeling language has been developed by the Open Group Consortium. The ArchiMate Specification[11] provides instruments to enable Enterprise Architects to describe, analyze, and visualize the relationships among business domains in an unambiguous way. Just as an architectural drawing in classical building architecture describes the various aspects of the construction and use of a building, the ArchiMate Specification offers a common language for describing the development and operation of business processes, organizational structures, information flows, IT systems, and technical infrastructure. It offers an integrated architectural approach that describes and visualizes the different architecture domains and their underlying relations and dependencies.

The ArchiMate language consists of

- the **ArchiMate Core**, that focuses on the description of the four architecture domains defined by the TOGAF standard (business, data, application, and technology architectures, as well as their inter-relationships)
- the **extensions** to model the motivations for the architecture, and its implementation and migration planning.

The main elements of ArchiMate are shown in the following picture:

[11] Eira is aligned with ArchMate 2.1 specification. The latest ArchiMate® 3.0 Specification was released in June 2016, and is a major update to the ArchiMate 2.1 Specification. New features included in Version 3.0 include elements for modeling the enterprise at a strategic level, such as capability, resource, and outcome.

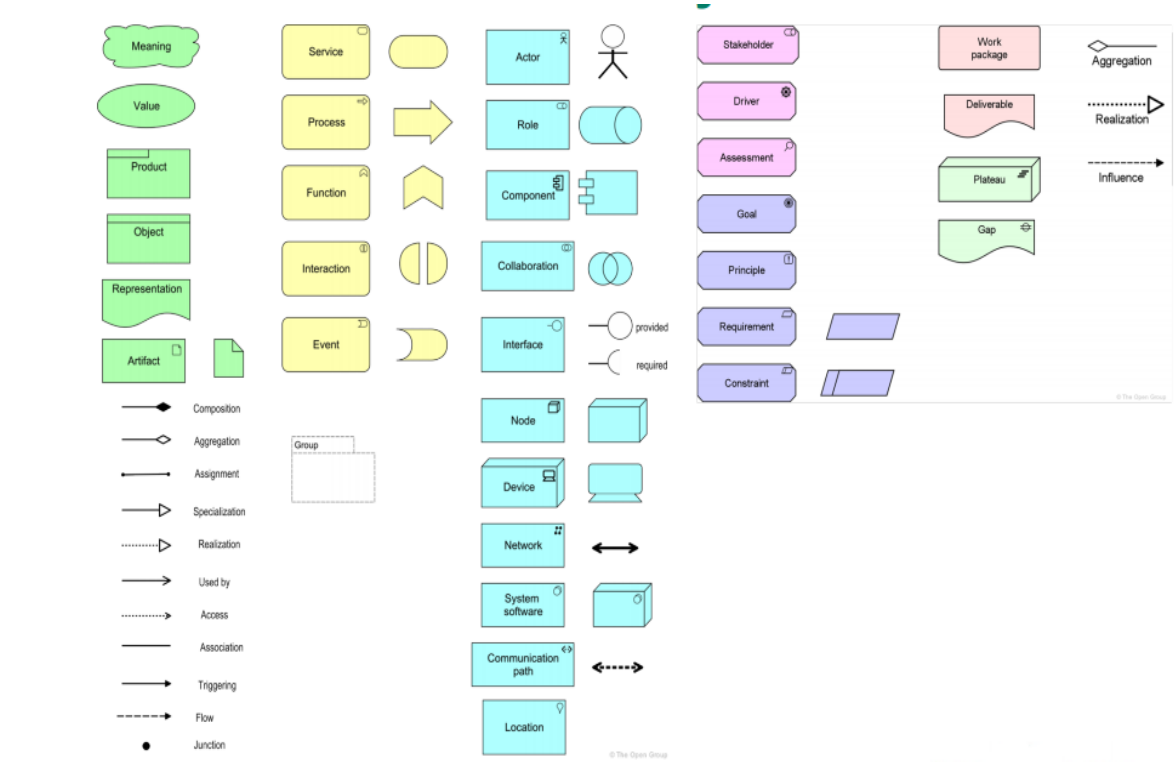


Figure 2: Archimate main elements

3.4.3.1.3 EIRA & ArchiMate

EIRA is expressed in ArchiMate, using :

- 1 high-level overview
- 4 ArchiMate views that corresponds to the 4 level of interoperability described in the EIF (Legal, Organizational, Semantic, Technical).
- 1 interoperability specification underpinning view
- 140 Architectural Building Blocks e.g. Public Policy, Public Service
- 200 relationships between different ABBs

The **EIRA high-level overview**, depicted in the following Figure, visualizes the focal architecture building blocks of each view. It provides an introductory overview of the most important EIRA ABBs. It aligns the EIRA with the service delivery model, described within the Interoperability Maturity Model, and the European Interoperability Framework (EIF) conceptual model for public services.

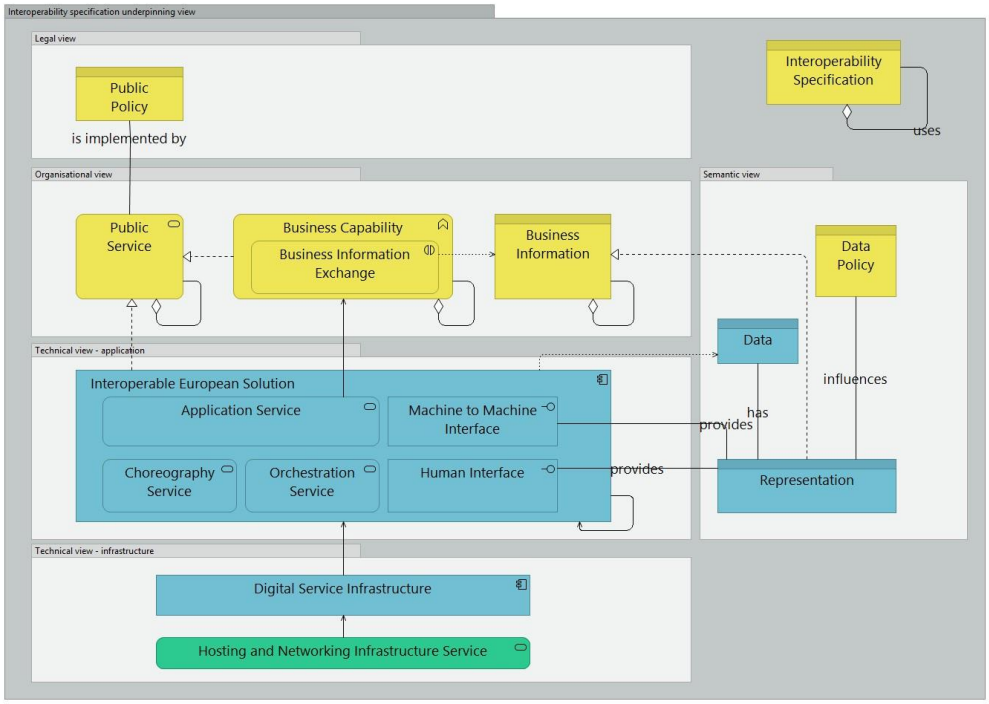
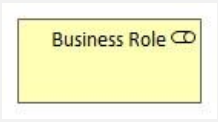
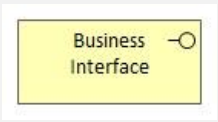


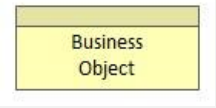
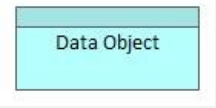
Figure 3: EIRA high-level overview

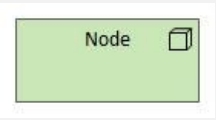
The EIRA uses the following ArchiMate model concepts[12]:

Table 1: ArchiMate model concepts

Model concept	Definition
	A *business actor* is defined as an entity that performs behaviour in an organisation such as *business processes* or *functions*.
	A *business role* is defined as a named specific behaviour of a *business actor* participating in a given context. The actor performs the behaviour of the role.
	A *business process* is defined as a unit of internal behaviour or collection of causally-related units of internal behaviour intended to produce a defined set of products and services.
	A *business interface* declares how a *business role* connects with its environment.
	A *business function* describes internal behaviour performed by a *business role* that is required to produce a set of products and services. It is performed by a single role within an organisation.
	A *business interaction* is defined as a unit of behaviour performed as a collaboration between two or more *business roles*.
	A *contract* is defined as a formal or informal specification of an agreement that specifies the rights and obligations associated with a *product*.

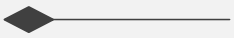
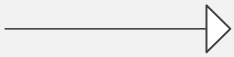
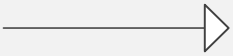
[12] An introduction to the European Interoperability Reference Architecture (EIRA) v1.0.0 (https://joinup.ec.europa.eu/catalogue/distribution/eira_v1_0_0_overviewpdf?lang=en)

	A *business service* is defined as the externally visible ("logical") functionality, which is meaningful to the environment and is realized by business behavior (*business process, business function, or business interaction*).
	A *business object* is defined as a unit of information that has relevance from a business perspective.
	An *application component* is defined as a modular, deployable, and replaceable part of a system that encapsulates its contents and exposes its functionality through a set of interfaces.
	An *application interface* declares how a *component* connects with its environment. An *application interface* specifies how the functionality of a component can be accessed by other components. An *application interface* exposes an *application service* to the environment. The *application service* may be exposed through different interfaces.
	An *application service* is defined as an externally visible unit of functionality, provided by one or more components, exposed through well-defined interfaces, and meaningful to the environment. An *application service* exposes the functionality of components to their environment.
	A *data object* is defined as a coherent, self-contained piece of information suitable for automated processing.
	An *infrastructure service* is defined as an externally visible unit of functionality, provided by one or more *nodes*, exposed through welldefined *interfaces*, and meaningful to the environment.
	A *network* is defined as a physical communication medium between two or more *devices*.

	A *node* is defined as a computational resource upon which *artifacts* may be deployed for execution.

The EIRA uses the following ArchiMate 2.1 relationships:

Table 2: Archimate relationships

Relationship	Description	Relationship	Description
	Composition		Access
	Aggregation		Specialisation
	Used by		Association
	Realisation		Triggering
	Assignment		

The EIRA ABBs can be seen as a specialization of ArchiMate model concepts. **Specialization** is an extension mechanism for the ArchiMate language that is foreseen by the ArchiMate specification[13].

Another extension mechanism of the ArchiMate, are **attributes**, which provide a means to express supplementary information. The EIRA includes a set of attributes that stem from the following sources:

[13] For example, the ABB 'Public Service' in EIRA is a specialization of the ArchiMate model concept 'Business Service'

- **ADMS description metadata**: The Asset Description Metadata Schema (ADMS) provides a standard way to *describe* solution building blocks. Describing solution building blocks using the ADMS attributes provides important descriptive metadata that can be used by others to better understand what a solution building block is about.
- **EIF principles**: The EIRA includes attributes that relate to the twelve principles of the European Interoperability Framework. The attributes indicate whether or not a solution adheres to a specific principle of the European Interoperability Framework. These attributes start with **{eif_principlex}** where X is the principle number.

The EIRA release[14] contains an XML file which contains the ArchiMate model of the EIRA. This file can be opened with **Archi**[15], a free and open source modelling tool to create ArchiMate models and sketches.

3.4.4 The National Interoperability Observatory

The National Interoperability Observatory is focusing on sharing experience and best practices on policies, systems, challenges and successes related to interoperability.

NIFO analyses the National Interoperability Frameworks (NIFs) of the Member States and associated countries and their alignment with the European Interoperability Framework (EIF). The aim of this observatory is to serve as a source of inspiration towards the establishment and further development of the National Interoperability Frameworks. The analysis is based on a model that allows the various aspects of the NIFs to be compared with the EIF and aims to highlight characteristics that are similar. The model takes into account the Digital Agenda.

[14] https://joinup.ec.europa.eu/catalogue/distribution/eira_v1_0_0zip
[15] http://www.archimatetool.com/

NIFO issues annually the e-Government factsheets and the factsheets for the alignment of National Interoperability frameworks with EIF.

The aspects that are evaluated in National Interoperability Framework against EIF are:

1) The Principles
2) The Conceptual model
3) The Interoperability Levels
4) The Interoperability Agreements
5) The Governance

4 PUBLIC SERVICE DEFINITION

The objective of this section is to assist trainees understanding the conceptual model of an electronic service considering the IMM approach.

4.1 Defining a public service

In the context of interoperability maturity, the IMM measures how well a public service is able to interact with other organisations or departments of the same organization to realise mutually beneficial and agreed common goals through the exchange of information and reuse of services. This exchange of information is preferably done by electronic means although the manual exchange is not out of the scope of IMM. In the manual cases the maturity is lower respectively to other cases that are done electronically.

The service to be assessed should have the following components at the conceptual level (Figure 4):

1. A trigger for the Service Process: A trigger can be either a new application submitted by the end user (e.g. a new Business Registration) or a decision that derives from the legal framework and the legislation (e.g. the annual preparation of the budget)

2. Each service has an indicative process flow and steps. This is necessary in order to better define the service and it can also be used for bench marking purposes since similar steps are usually in the same domain of services e.g. service related to the public procurement. Indicative types of steps include the collection of information, validation of information, processing, reporting, and support of decision making.

3. The outcome of the service. The outcome of the service can be a decision, new information that will be further reused etc.

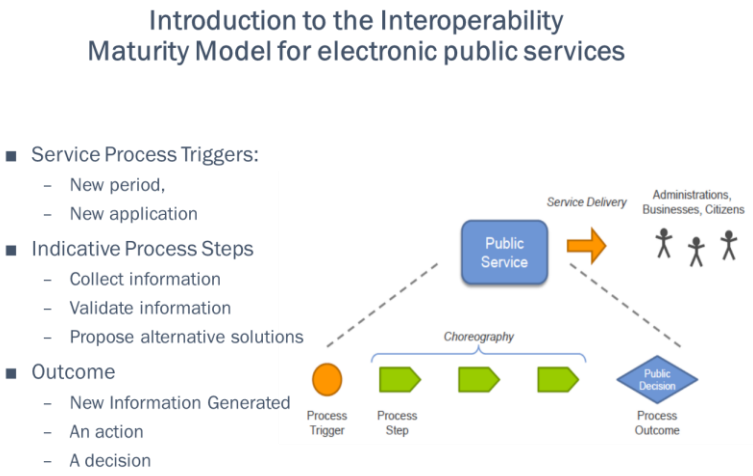


Figure 4: Conceptual model of a public service

Moreover it is important to record which organization or department is the service owner. The service owner has the responsibility to coordinate the different contributing authorities in order to achieve the output of the public service. Generally speaking, each public service has an interaction with the end user getting the input required and providing the requested output. The process steps are implemented by the responsible authorities and/or systems. The service owner can either be defined by specific legislative act or in practice can be the authority that will explain to the end user why the result of the service was (or was not) the one that was initially expected. The machine to machine services are not currently in the cope of IMM model[16].

[16] During the aforementioned training courses at the National Center of Public Administration and Local Government in Greece, there were discussions that IMM could easily handle the machine to machine services provided that some parts of the questionnaire could be parametrical in order to be able to cover the different cases.

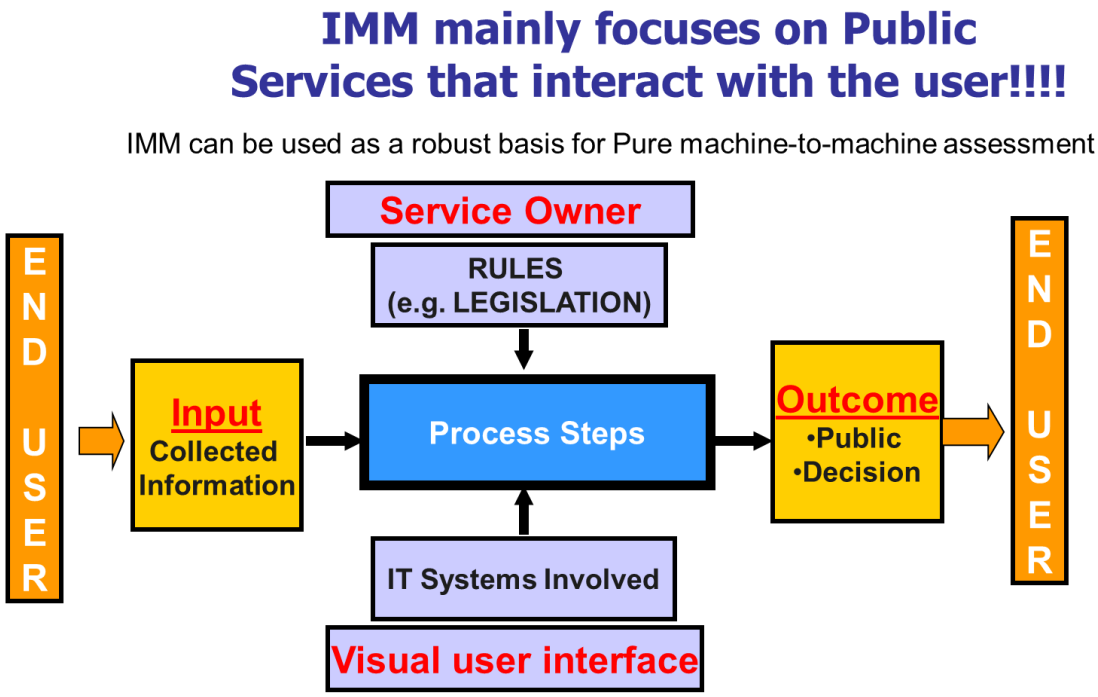


Figure 5: Public Services that interact with the end user

It is important for the assessment of the service to define accurately the internal and external environment of the service.

This is highly depended on the viewpoint of a public service.

Areas of Interoperability in a public service

- *Service Delivery (B)*
  - Providing end-users access;
- *Service Consumption (C)*
  - Reuse machine-to-machine services from other organizations.
- *Service Management (D)*
  - Controlling and monitoring the process flow related to service.

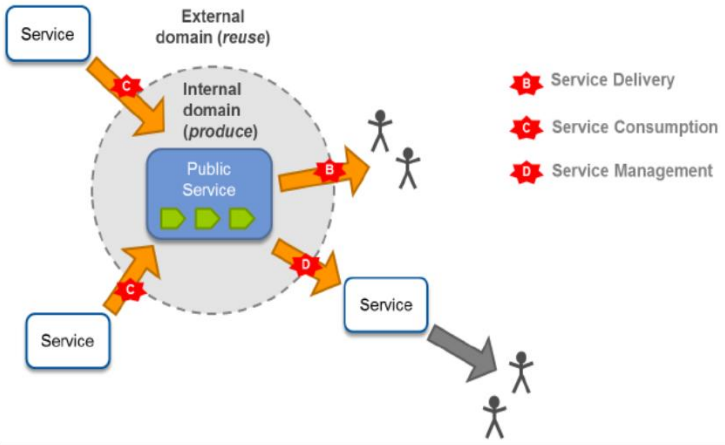


Figure 6: Interoperability areas of the IMM model – Definition of the internal and external domain

5 INTRODUCTION TO THE INTEROPERABILITY MATURITY MODEL

The objective of this section is to assist trainees to:

- Understand the services that will be used as reference use cases for the evaluation with IMM.
- Refer to good practices for interoperable electronic public services

5.1 Introducing the IMM

The following components are crucial for the interoperability of a service and therefore they have been reflected to specific sections of the IMM questionnaire.

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.

The definition of the **Internal Domain** and the **External Domain** is crucial for the description of the service. Ideally internal domain services are the ones that are produced in the context of the service to be assessed, typically by the same organization or department.

External Domain Services are the ones produced by other organizations or departments and consumed for the provision of the public service to be assessed, as well as from other services.

The maturity of the interoperability can be mapped to the following scale as shown in Table 3.

Table 3: Interoperability maturity levels

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

Typical examples that can be analyzed using the IMM model are:

I. A doctor wants to have access to a patient's health record,

II. An economic operator that can participate in a public procurement procedure,

On the other hand, services that are not addressed at specific users and are either part of a general infrastructure, such as a telecommunication network or machine to machine services cannot be assessed using IMM model in its current form.

6 EXAMPLES OF PUBLIC SERVICE DEFINITION

For the purposes of this document we will use the following examples of services to be assessed:

1) Business Registration service.

2) e-Administrative Fee, i.e. a public service that allows citizens and businesses to pay fees related to the use of other public services. This service typically produces a unique digital code which is used to complete an ePayment transaction with a public authority. Based on this code, the payment can be made via banks that support online payment or by credit / debit / prepaid card through the e-Administrative Fee website.

One of the most critical tasks that have to be undertaken when assessing a public service is its unambiguous definition which includes the end-user group that the service is addressed to, the starting and ending points, the outcomes and the channels through which this service is provided.

It is important to stress out that an inaccurate definition of the service might lead to misleading results. For instance, the end-users of the public services related to the Business Registration is the Business Person that aims to establish a new legal entity e.g. a limited company or a personal company. The public service of the business registration may be offered electronically directly to the Business Person or can be offered through a counter/desk i.e. a notary depending on the legislation of a country.

If the above two attributes are assigned different values the assessment of the same public service will most likely be different. For example, if the service is offered through a notary which makes use of the Business Registration service, the end-user group becomes the

notaries, instead of the Business Person. This might alter the results as the service processes might differentiate depending on the end-user group.

In another service definition, the service being assessed could be the one provided by the notary, which makes use (consumes) the Business Registration Service, on behalf of the Business Person. In that case the service being assessed is different.

6.1 Description of the Business Registration Service:

In this section, the attributes and processes that comprise the Business registration service are being defined.

Business registration is a crucial service across Europe since it allows the update of the information that a Business Registry offers. The role of business registries defined in the paragraph 1 of Article 3 of Directive 2009/101/ EC (OJ L 258 / 1.10.2009) and is fundamental for protecting the interest of the members of a company and the third parties that cooperate with the company. Moreover the Services Directive (2006/123/EC[17]) was the main driver for the creation of Points of Single Contact that offer electronic services to the Business Persons (either natural of legal) for registering either a company or an activity to the member states across Europe. The business registries across Europe must also be connected therefore a lot of interoperability work has been done in order to define the semantics of the information that should be exchanged. The Business registry interconnection is described in the Directive 2012/17/ EU.

Last but not least according to the directive EU 2015/849 for the prevention of the use of the financial system for the purposes of money laundering it is crucial that the information for the beneficial owners i.e. the shareholders of a company should be exchanged.

[17] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:376:0036:0068:en:pdf

Considering the above mentioned legal framework one can easily understand that the Business Registration Service across Europe is generally offered electronically by a Single point of contact and a lot of semantic work has been done in the direction of business Registry interconnection and the exchange of information for beneficial owners.

This is a hypothetical service that is used only as an example to show the potential differences according to the interoperability maturity level and provide explanations for the different potential answer in the IMM questionnaire.

The Business Registration Service is being offered using different delivery channels. In some countries depending on the type of company only notaries can use this service therefore the Business Person uses the service only through a counter/desk. In some other countries the service is being offered electronically and some specific information can be submitted using postal services. In some other countries the service is being offered fully electronically. In some countries the principle of no wrong door is being applied and more delivery channels are being offered.

6.1.1 Preconditions

The end user that will use the service must be typically registered in a base registry and be able to be authenticated in order to use the service. Moreover, a digital signature may be required and, therefore, the end user should also have a qualified digital certificate for digital signature. The user will collect all the supporting documents and information that is required to use the service if this information cannot be retrieved by consuming other interoperable services.

6.1.2 Flow of events

1. The user uses his/her credentials to login to the website that the service is offered.
2. In case of an interoperable service the data and documents required can be retrieved and presented in prefilled forms.
3. The user begins the process to register the company.

4. The website presents the types of companies that can be electronically registered.
5. The user selects the type of company and the location for the seat of the company. The address of the seat of the company can be described using specific semantics standards.
6. The Business Person begins filling in the forms, creates a first draft and uploads the required documents as attachments to the application. The main forms are:
    I. The forms for the selection of the Company name and the alternative name. This form requires checking the proposed name and alternative name against existing names that reside in the business registry. It is not allowed for two companies to have similar name or alternative name as this may confuse the consumers.
    II. The forms that are related to the activities of the company. This information is needed for taxations purposes and should be provided according to specific standards.
    III. The forms related to the founders, management board, signatory power, and auditors. These forms can be partially prefilled using information from base registries regarding the natural persons that have the above mentioned roles in the company. The rest of the information that is required for the business registration service is either provided by the end user or is being manually extracted from additional supporting documents that are being submitted by the end user.
    IV. The forms that the seat of the company, the capital[18], the articles of association are declared and/or submitted[19].
    V. The bank/insurance certificates either for the fee payment or the capital deposit. This information should be retrieved from banks and/or insurance institution.

[18] In the context of Business Registration Service the 'capital' is the asset that a company possesses mainly for liability reasons. The capital can be a deposit in a bank, a bank insurance guaranty, any other assets such as property, belongings etc.
[19] The articles of association or the constitution of a company is a private agreement that the founders of the company sing and describes the scope of the company, the way the company is going to function, the role of the management etc. This can be inserted directly to the Business Registration form or in some countries can be made by a notary. In the case that the private agreement is made by the notary then is being submitted to the application form.

7. The service owner verifies the provided information and registers the company to the Business Registry.

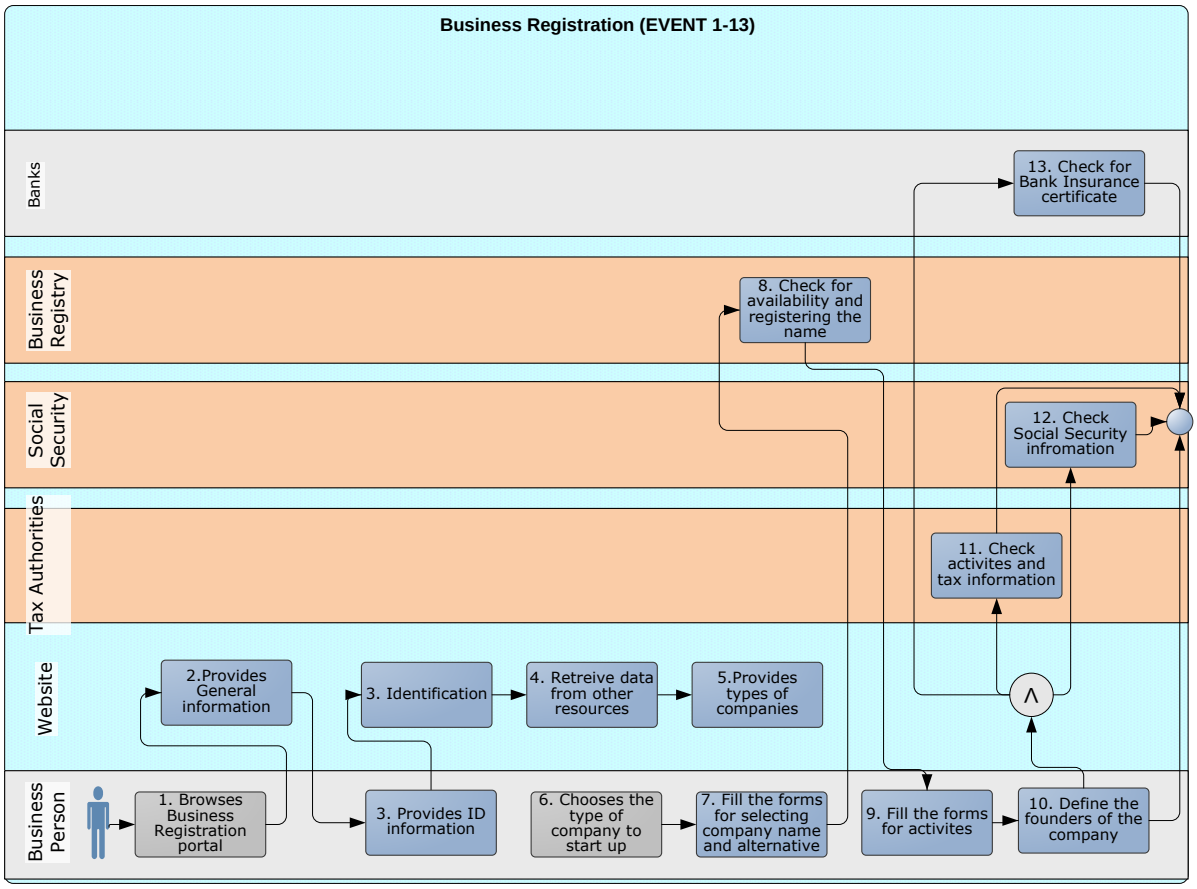


Figure 7: Business Registration flow diagram - Events 1-13

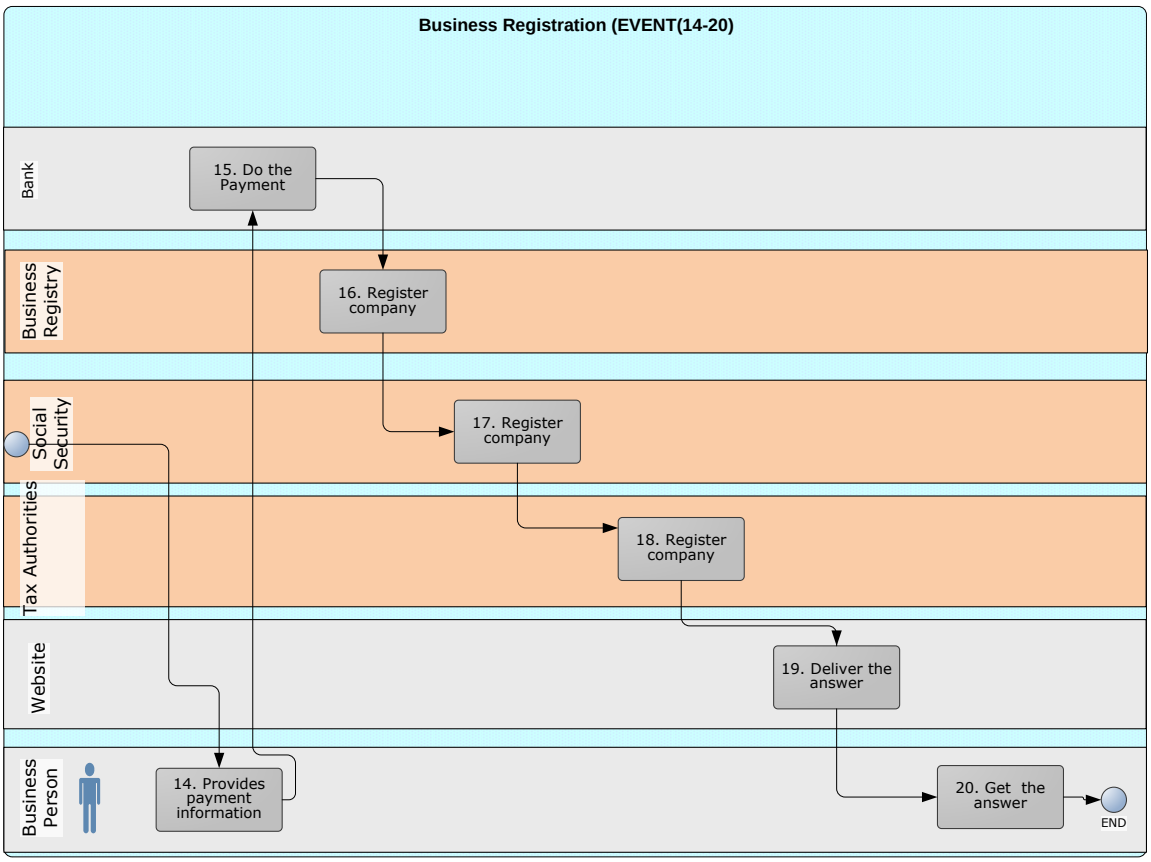


Figure 8: Business Registration flow diagram - Events 14-20

6.1.3 Output – Post Condition

The newly registered company gets a unique identifier that is a number from the business Registry and/or the tax authorities.

Optional: In some cases the legal representative of the company gets the necessary credentials for accessing other related public services.

6.2 Description of the e-administrative fee Service

The e-Administrative Fee (or e-Fee for simplicity) is an electronic Service offered to citizens and businesses and issues an electronic fee which is a token in the form of a unique digital code that is submitted to a public authority as part of another public service to complete the required payment for using this service. This token becomes valid as soon as the interested party pays the corresponding fee either via banks' online payment systems or by credit / debit / prepaid card through the e-Administrative Fee website. The e-administrative fee service allows the central control of government revenue originating from the provision of public services to citizens and businesses.

The e-administrative fee service is being triggered by a citizen or a business representative who initiates the transaction provided by the e-administrative fee website. The service is accessible through different channels and can be reused from many other public authorities. The outcome, i.e. the valid tokenized fee, can be used in other electronic or conventional services. Following the issuance of the valid tokenized fee the user can either submit it in the context of using another public service to complete a transaction related to it, or reclaim money due to unwillingness to spend it. Both of these tasks are outside of the e-administrative fee public service analysed in this document. The same stands for the clearance procedure followed by the e-administrative fee public authority.

6.2.1 Prerequisites

The following requirements shall be met for the sound provision of the e-Administrative Fee service.

- The corresponding fee provided to interested parties must be registered so that the predefined cost and the beneficiaries have been defined.

6.2.2 Flow of events

The e-Administrative Fee includes the following process steps.

1. The end user visits the e-Administrative Fee website and selects whether he/she wants to proceed as an authenticated user or not.

   I. Authenticated user: the end user (citizen or business), that has already registered with the Tax Registry service, is authenticated in order to apply for a unique identifier of the fee he/she wants to pay. The required fields "VAT number", "Surname", "Name", and "Father's Name" are pre-filled. The information is retrieved from the Tax Registry.

   II. Non-authenticated user: The end user fills in his/her "VAT number", his/her "mother's name", "date of birth", "Surname", "Name", as well as "Father's name".

2. Following automated or not completion of the required fields, the user selects the e-fee he/she wants to pay by choosing the following:

   I. Administrative Fee category

   II. Administrative Fee Type

3. Upon completing the form the user can submit it. The result is a unique e-Fee payment code and a deadline for paying the fee. This information can be printed and/or sent by email, assuming the user has provided a valid email address.

4. The next step in the process is the fee's payment through the following channels: by visiting a bank's branch or a post office, by using e-banking services, or by credit card (on the e-Administrative Fee portal). Note that due to off-line payment options, the required payment is not necessarily accomplished on-line. In any case, the stakeholders utilize the unique e-Fee payment code to unambiguously identify the transaction.

I. Payments made using a credit/debit card are accomplished real-time and the service completes upon conformation of a successful credit card payment. The e-administrative fee utilizes payment services provided by the interbanking system.

II. If the payment is successfully made using the online banking system of one of the collaborative banks, the corresponding bank sends, by the end of day, a list of e-Fee payment tokens that have been processed, i.e. a payment has been made.

5. Upon successful payment the applicant can use the valid token to pay the service he/she is willing to use. The public service informs the e-Fee service about the use of the corresponding token.

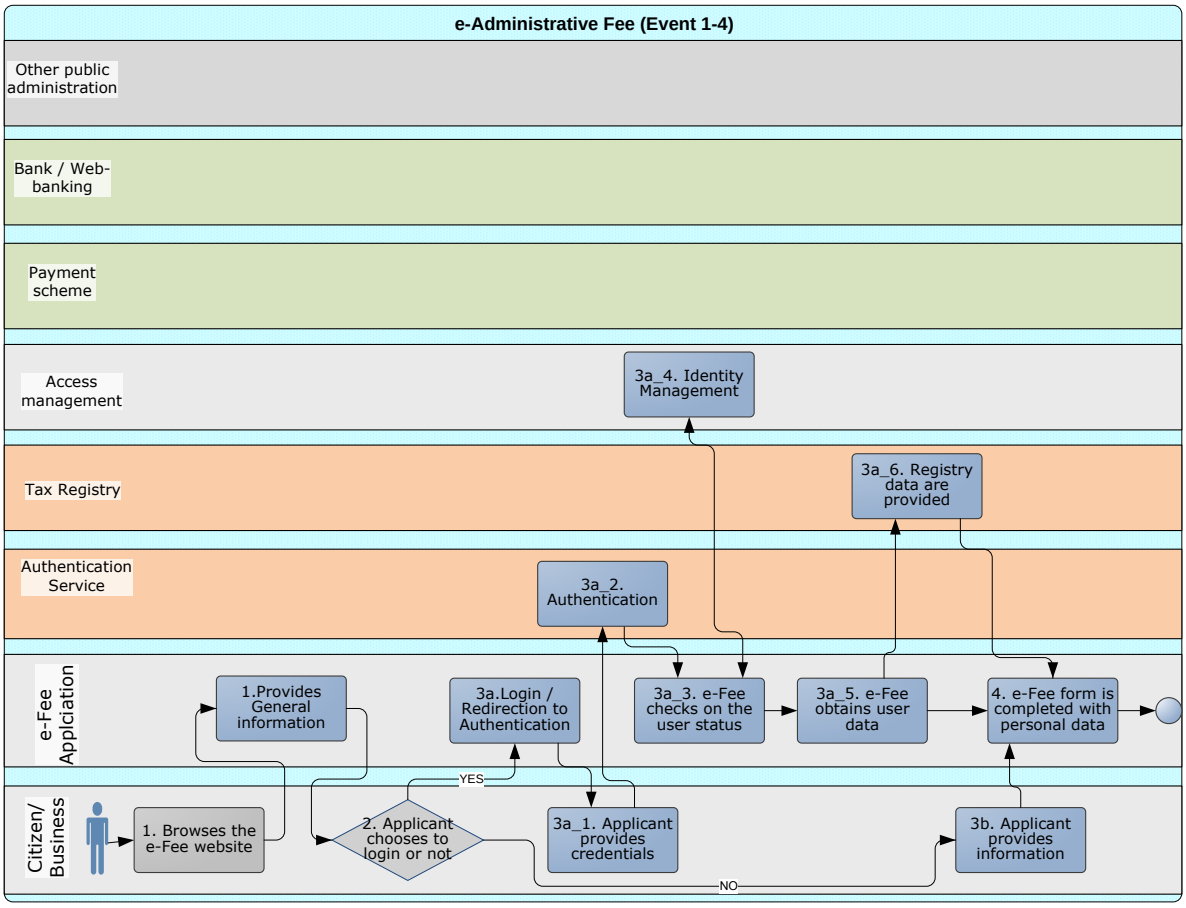


Figure 9: e-Fee flow diagram – Events 1-4

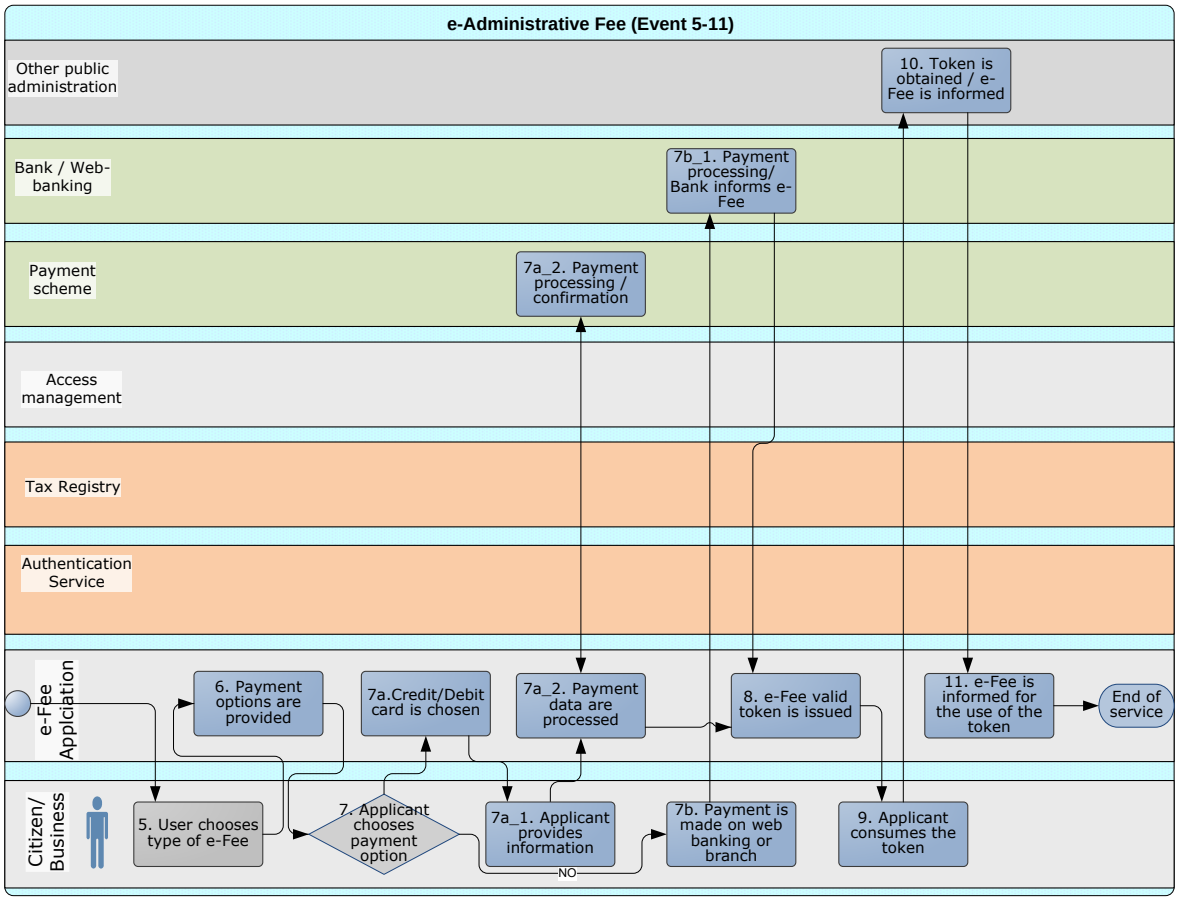


Figure 10: e-Fee flow diagram – Events 5-11

6.2.3 Output – Post Condition

The user gets a token, i.e. a unique identifier which is used in order to do the payment either electronically e.g. e-banking services, credit or conventionally (visit a bank's branch or a post office).

Upon successful payment of the e-Fee where the status of the token changes to valid and the applicant has a valid (paid) e-Fee digital code which he/she can use to pay another public service. This is the last step of the service, i.e. the service completes upon using the e-Fee token to pay another service.

7 IMM QUESTIONNAIRE BY EXAMPLE

The objectives of this section are to assist trainees to:

- Describe the main elements of the interoperability checklist.
- Identify the causes that hinder the interoperability maturity of electronic public services
- Identify and refer to the supporting material provided by the European Commission
- Describe the structure of the questionnaire
- Recognise the maturity levels and what they mean in terms of availability, utilization and architecture
- Describe the provided recommendations for improving the maturity level of the assessed electronic public services

7.1 Service Context (section A of the IMM questionnaire)

This section aims to define the service that is going to be assessed considering the initial scope of the assessment. The definition of the internal and external environment should be made at this section following the principles and guidelines that were presented in the public service definition paragraph. Moreover in this section the contact details of the responsible people that provide the input to the questionnaire are also being collected. The service owner must also be declared in this section.

This section, as previously mentioned, is crucial for the assessment, even though it does not provide any input for the interoperability maturity level of the service. This section sets the

cornerstones of the services and clarifies the assumptions that will guide the answers to the other sections of the service. The following questions are contained in section A of IMM questionnaire.

7.1.1 Question A1: Contact details

The names, emails, telephone numbers and generally the contact details of the people that are responsible for the input to the questionnaire are the potential answers in this question.

7.1.2 Question A2: Public service description

Following the guidelines of the service definition paragraph of this document, one should describe the public service. This description implies that the definition of the internal and external domain must be well clarified.

The conceptual model of the public service should be taken into account for the description of the process of the service and the underlying activities (1. initiation, 2. processing and 3. delivery of an outcome).

The way the service is being offered, e.g. the appearance (fully digital process / manual interactions) should also be described at this part of the questionnaire.

A business process model would certainly provide valuable input to this process as it can help the reader unambiguously identify all (sub)processes, stakeholders, inputs and outputs, as well as the processes flow.

Service Descriptions for the two examples analysed in this document have been provided in sections 6.1 and 6.2.

7.1.3 Question A3: Service owner

Which public administration is primarily responsible for providing the public service?

The service owner should be reported, especially when more than one responsible authorities contribute to the provision of the service.

In the case of the Business registration service, the service owner is the authority that is responsible for the operation of the Business Registry.

In the case of the e-administrative fee service, the service owner is the tax administration that collects taxes and fees.

7.1.4 Question A4: End user group to which the service is delivered

What is the primary end user group to which the public service is delivered?

The potential end user group that benefits from the services must also be described. In our examples we have the entrepreneurs that want to start up a business in the Business Registration service and citizens and businesses that interact with public administration and want to obtain a valid payment token for using a pay a fee in the e-administrative fee service.

7.1.5 Question A5: Administrative level

What is the underlying administrative level of the public service?

Typical examples of administrative levels can be Local (e.g. city, municipality), Regional, National, European and International level.

The underlying administrative level for both of our examples is national.

7.2 Service Delivery (Section B of the IMM questionnaire)

This section of the questionnaire addresses issues related to end-users access to public service, as depicted in Figure 11[20]. In the context of the IMM there are three types of end users: citizens, businesses and other public administrations. Note that according to IMM, when a public service is "delivered to different types of end-users, these services should be assessed separately from one another through the IMM" [1], unless it is a service that from the organizational, legal, semantic and technical perspective is exactly the same regardless of the end user group.

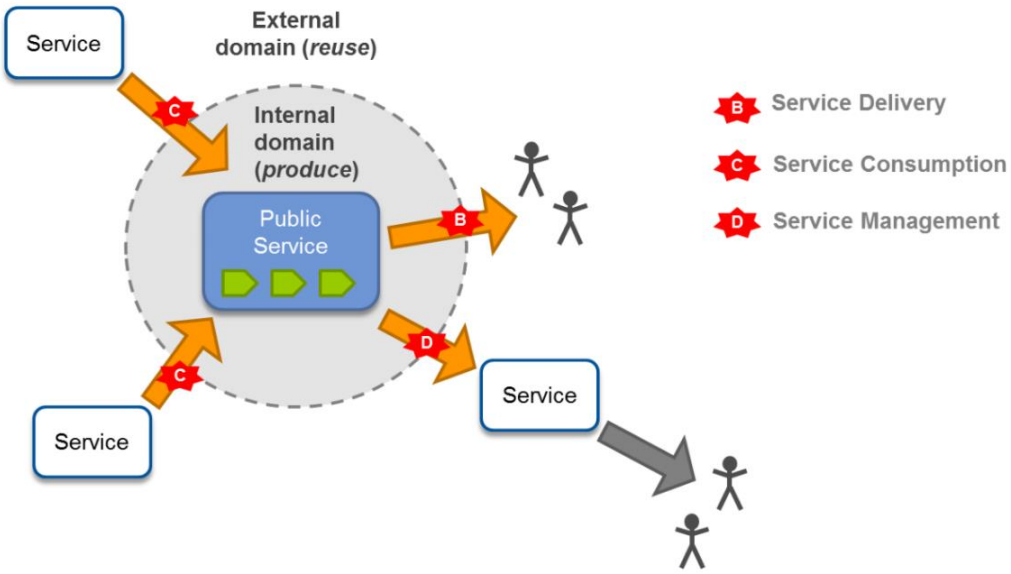


Figure 11: Overview of the interoperability areas of the IMM [1]

Section B of the IMM questionnaire deals with issues such as delivery channels of the public service, dependency on specific devices, platforms and/or solutions, form pre-filling and multilingualism as detailed in the following sections.

[20] This is only a cropped version of Figure 6 reproduced here for convenience.

7.2.1 Question B1: Delivery channels (Technical interoperability – weight: 0%)

Through which delivery channels is the public service made available to the end user (multiple answers are possible)?

This question aims to identify the channels through which the service is delivered towards the end user. Although this includes both traditional (non-digital) and digital channels the aim is to focus on the digital ones and further evaluate only those.

Valid answers for this question are:

Traditional

- Counter / desk
- Postal
- Telephone

Digital

- Dedicated application (functionality that needs be installed on a device by the end user before it can be used. This includes apps from an online application store)
- Website and/or web portal (functionality that is directly accessible for the end user via an Internet URL)
- Not applicable – the public service offers no direct delivery\channel towards the end user

If either (or both) of “dedicated application” or “Website/Portal” is chosen then the rest of the B section questions have to be answered. Otherwise the evaluation process should proceed to section C.

Business Registration Service

The Business Registration service utilizes the following delivery channels:

1. Counter desk
2. Postal
3. Telephone
4. Website
5. Portal

Considering the above, there is at least one digital channel for the delivery of the Business Registration service and therefore questions B2 to B6 have to be answered.

e-Fee Service

The e-Fee service utilizes the following delivery channels:

1. Counter desk
2. Website
3. Portal

Considering the above, there is at least one digital channel for the delivery of the e-Fee service and therefore questions B2 to B6 have to be answered.

7.2.2 Question B2: Device, platform and/or browser dependency (Technical interoperability – weight: 40%)

Can the public service be accessed using multiple devices, platforms or browsers?

This question aims to assess whether the delivery channel for the public service is device / platform / browser independent.

The valid maturity levels together with the corresponding answers are listed below:

- **Ad-hoc:** No, the public service is offered for a single device, platform and/or browser
- **Essential:** Yes, the public service is offered for multiple but not all available devices, platform and/or browsers
- **Seamless:** Yes, the public service is offered for all common available devices, platforms and/or browsers

Business Registration Service

The Business Registration service has been designed to be provided over all common web browsers and with no restrictions regarding the platform it operates. As such, it can be claimed with confidence that this service is offered for all common available devices, platforms and/or browsers, i.e. it achieves the highest maturity level: seamless.

e-Fee Service

Similarly, the e-Fee service achieves the highest maturity score as it can be accessed from all common available devices, platforms and/or browsers.

7.2.3 Question B3: Form pre-filling (Semantic interoperability; Technical interoperability – weight: 40%)

Does the public service use pre-filling of forms?

This question aims to identify whether the public service utilizes existing reliable sources of information for pre-filling forms submitted by end users, an action that is considered a good

practice. Re-use of existing trustworthy data sources to pre-fill forms should be stimulated as it minimizes end user effort and reduces the risk for erroneous data entries.

There are four valid answers for this question that correspond to three maturity levels for the form pre-filling property.

- **Ad-hoc:** No
- **Essential:** Yes, pre-filling is used but only for some data fields that are electronically available
- **Seamless:** Yes, pre-filling is used for all data fields that are electronically available
- **Seamless:** Not applicable, the public service does not require the entry of user data

Business Registration Service

For the Business Registration service pre-filling is used only for some data fields that are electronically available. For instance if the service is being offered at National level the base registries interconnection is easier and therefore more information can be retrieved from the Population Registry, the Taxation Registry the Social Security Registry. In cross border cases some of the above mentioned interconnection may not be available and a work around should be included in the service. In that case the rest of the information has to be provided by the applicant although they are or should be available from other sources (e.g. other base registries, or other competent authorities). The case of partial pre-filling can achieve a medium interoperability maturity level i.e., Essential. In that case, improvement can be done either at national of European level considering more interconnections with other source of information achieving the highest maturity level.

e-Fee Service

The e-Fee service is provided to both authenticated and non-authenticated users. Considering the former, pre-filling is used for all data fields that are electronically available, as mentioned in Section 6.2, except for the administrative fee category and type which is input directly related to the provided service, hence pre-filling is not applicable. Therefore, this service achieves the highest maturity level, i.e. seamless, for the form pre-filling property.

Note that, in the case of non-authenticated users pre-filling is not possible. However, considering that registration and authenticated provision of the e-administrative fee is provided to all potential users, in which case all fields are pre-filled, it can be claimed that the service achieves the highest maturity level.

7.2.4 Question B4: Multilingualism (Organisational interoperability; Semantic interoperability; Technical Interoperability – weight: 10%)

To what extent is multilingualism supported?

This question is aims to identify whether the service dynamically supports two or more languages.

There are three valid answers to this question, as shown below:

- **Ad-hoc:** Not at all
- **Essential:** Partly, only the user interface is multilingual (two or more official EU languages supported)
- **Seamless:** Fully, the entire service (user interface, support documentation, technical specifications, etc.) as such is multilingual (two or more official EU languages supported)

Business Registration Service

The Business Registration service is only provided in one language and therefore it cannot claim any interoperability maturity, i.e. it is evaluated as ad-hoc.

e-Fee Service

The e-Fee service is also provided in one language only and is evaluated at the same maturity level, i.e. ad-hoc.

7.2.5 Question B5: Cross-referencing (Organisational interoperability; Technical Interoperability – weight: 5%)

Does the public service promote the usage of its own or other (public) services through linking to/interlinking with other web sites?

This question addresses the issue of promoting other services and being referenced from other sites or portals. Promoting other related (public) services can contribute to the overall use of (digital) public services. Public services that reference towards related (public) services therefore contribute to greater interoperability.

There are four valid answers, as listed below:

- **Ad-hoc:** No
- **Essential:** Yes, the public service is referencing to other sites offering related public services
- **Sustainable:** Yes, the public service is being referenced from other sites

- **Seamless:** Yes, the public service is being referenced from other sites and the public service is referencing to other sites offering related public services

Business Registration Service

The Business Registration service is being referenced from other sites and therefore is considered to achieve a maturity score of 4, i.e. sustainable.

e-Fee Service

The e-Fee service is being referenced from other sites and therefore is considered to achieve a maturity score of 4, i.e. sustainable.

7.2.6 Question B6: Service Catalogue (Organisational interoperability; Semantic interoperability; Technical interoperability – weight: 5%)

Is the public service that is being delivered part of a service catalogue?

Providing detailed information on the availability of the public service is an enabler for the usage by citizens, business and administrations. Note that what is meant here by service catalogue is a catalogue overarching various organizations (e.g. across several administrations or a national catalogue of public services).

There are three valid answers to this question that reflect to three maturity levels:

- **Ad-hoc:** No, even though there is a Service Catalogue in place
- **Essential:** No, because there is no Service Catalogue available
- **Seamless:** Yes, the public service is included in the Service Catalogue

Business Registration Service

The Business Registration Service is listed in a service catalogue, i.e. the eu-go.gr, and therefore it satisfies the requirement for providing information about its availability. As such, it achieves the highest maturity level, i.e. seamless.

e-Fee Service

The e-Fee service is not listed in a Service Catalogue as there is no such catalogue available to be used. Therefore, this interoperability limitation cannot be blamed on the authority. As a result, this module achieves a medium maturity level, i.e. essential.

7.3 Service Consumption (Section C of the IMM questionnaire)

This section of the questionnaire addresses the 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.

The service consumption section of the IMM questionnaire has two different versions depending on whether the assessment is conducted based on the IMM FULL questionnaire or the IMM Lite questionnaire. In the IMM Full version the person conducting the assessment has to answer a series of questions for each service being digitally consumed separately, while in the Lite version the same questions are only answered once for all the services being consumed. The Full version gives a deeper insight on the service being assessed while the Lite version is considered more user friendly.

The analysis provided in this section is based on the Full questionnaire for the Business Registration service and on both the Full and Lite versions for the e-Fee service.

Note that depending on the answers provided in the first 3 questions of this section, the rest of this section's questions might not have to be answered. Figure 12 presents the logic in answering the questions in Section C.

In the following sections, the analysis provided in shadowed text box refers to the Lite version of the IMM Questionnaire.

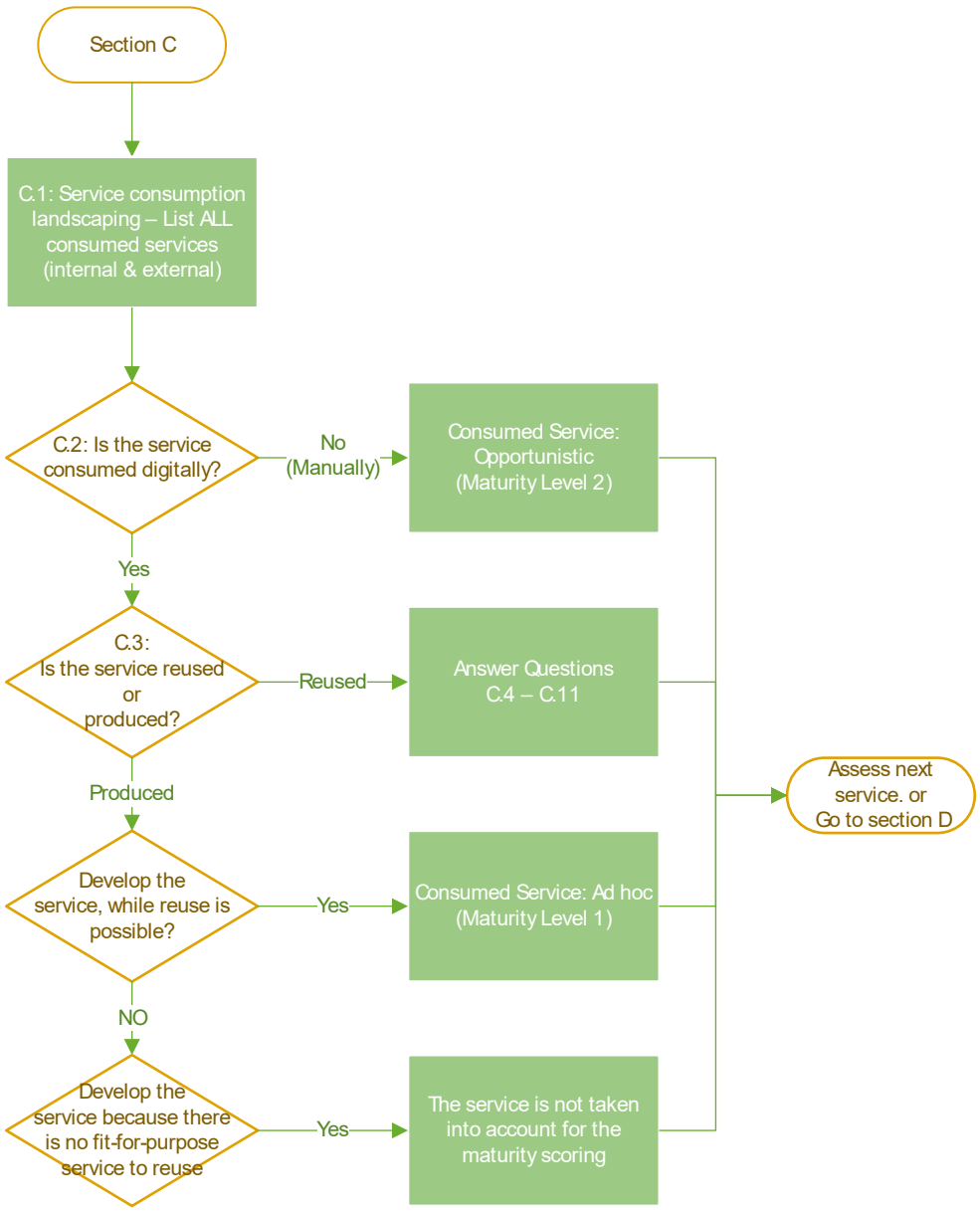


Figure 12: Section C answering flow for each consumed service

7.3.1 Question C1: Landscaping Service Consumption

Please list the services which the public service has to consume in order to work.

First, indicate for the below generic services if these are required (note that this is an indicative list)

Second, add specific services which are specific to the public service and required by it in order to work.

The expected answer is a set of services chosen from an indicative list of Generic services or specific services that are required by the public service to function.

This set of services must contain

- both services that are consumed from within the administration (internally) and from a third party (externally),
- both manually and digitally consumed services.

The provided, yet not exhaustive, list of Generic services includes the following:

- Authentication Service
- eSignature Service
- ePayment Service
- Messaging Service
- Audio-visual Service
- Data Transformation Service
- Data Validation Service
- Machine Translation Service
- Data Exchange Service

- Business Analytics Service
- Business Reporting Service
- Forms Management Service
- Records Management Service
- Document Management Service
- Content Management Service
- Access Management Service
- Logging Service
- Audit Service
- Metadata Management Service
- Networking Service
- Hosting Service
- Storage Service
- Base registry information source

Business Registration Service

The Business Registration consumes the following services (these are easily derived from the corresponding service description – Section 6.1).

1. e-Payment Service
2. Authentication Service
3. Base registry information source (Tax clearance)

4. Base registry information source (Insurance clearance)
5. Base registry information source (Legal Person Tax Registration)
6. Base registry information source (Legal person Social Security Registration)
7. Base registry information source (Registration in local chamber)
8. Base registry information source (Check the Company Name Availability)

e-Fee Service

The e-Fee service consumes the following services (see also Section 6.2).

1. e-Payment Service (for payments made using credit/debit cards)
2. Authentication service (for authenticated users)
3. Access Management Service (for the management of electronic identities)
4. Tax Registry (for obtaining registered and authenticated user information)
5. Data from Banks (for obtaining information about paid fees)
6. Data from other Public Organizations (for obtaining the status of the issued e-fee token)

7.3.2 Question C2: Manual or digital consumption of services

How do you currently consume the service (manually versus digitally)?

For the Full version of the IMM this question seeks to filter consumed services so that the ones being manually consumed are not being assessed. A service that is manually consumed is evaluated as opportunistic (maturity level 2).

Question C2 is answered for each consumed service separately. The following valid answers result in either concluding the assessment of the specific service or further processing by answering C3.

- Consumed manually (assessment concludes for this service; the maturity level is opportunistic – level 2)
- Consumed digitally (question C3 has to be answered)

For the Lite version of the IMM C2 is answered for the aggregate of the services being consumed and the question is re-phrased to "How does the public service currently consume the services (manually versus digitally)?". The following are valid answers for the Lite version of C2.

- Fully manually
- Mainly manually, some digitally
- Mix of manual and digital consumption

Business Registration Service

The answer is provided in Table 4.

Table 4: Manual or Digital consumption for the Business Registration service

CONSUMED SERVICE	MANUALLY OR DIGITALLY
1. e-Payment Service	Digitally
2. Authentication Service	Digitally
3. Base registry information source (Tax clearance)	Digitally

4.	Base registry information source (Insurance clearance)	Digitally
5.	Base registry information source (Legal Person Tax Registration)	Digitally
6.	Base registry information source (Legal person Social Security Registration)	Digitally
7.	Base registry information source (Registration in local chamber)	Digitally
8.	Base registry information source (Check the Company Name Availability)	Digitally

e-Fee Service

The answer is provided in Table 5.

Table 5: Manual or Digital consumption for the e-Fee service

CONSUMED SERVICE		MANUALLY OR DIGITALLY
1.	e-Payment Service	Digitally
2.	Authentication service	Digitally
3.	Access Management Service	Digitally
4.	Tax Registry	Digitally
5.	Data from Banks	Digitally
6.	Data from other Public Organizations	Digitally

For the Lite version of the IMM the answer to C2 for the e-Fee Public Service should be "Fully Digitally" which is considered the most advanced one among the possible answers

7.3.3 Question C3: Reusing or producing of services (Technical interoperability – weight: varies depending on the answer)

Does the public service reuse or self-produce consumed services? (Reuse of relevant existing services vs Self Production of services)?

This question addresses the main concern regarding the reusability of digitally consumed services. Producing a service, while it is already available externally for reuse is considered less interoperable as it implies that the public service has "reinvented the wheel". C3 is only answered for digitally consumed services, while the contribution of this answer to the maturity scoring is either derived from the answer provided in this question or from the answers provided in questions C4-C11 as listed in Table 6.

Table 6: Question C3 valid answers, contributions and next steps.

ANSWER	MATURITY SCORING	NEXT STEP
Self-produce the service, while relevant services are available for reuse	Ad-hoc	Assess next consumed service or go to section D.
Self-produce the service, because there is no fit-for-purpose service to reuse	This service is not taken into account for the maturity scoring of the public service	Assess next consumed service or go to section D.
Reuse of an existing service	Deduced from C4-C11	Answer questions C4-C11

For the Lite version of the IMM, C3 is answered for the aggregate of the services being consumed and the question is re-phrased to "Does the public service reuse or self-produce consumed services?". The following are valid answers for the Lite version of C3.

- Most consumed services are self produced, while relevant services are available for reuse
- A selection of consumed services are reused
- (Nearly) all consumed services are reused

Business Registration Service

The answer to C3 for the services the Business Registration Public Service consumes, is provided in Table 7. In the same table, the required next action is also defined for each consumed service, based on its status.

Table 7: Consumed services status for the Business Registration Public Service

CONSUMED SERVICE	MANUALLY OR DIGITALLY	REUSE OR PRODUCE	NEXT STEP
1. e-Payment Service	Digitally	Reuse of an existing service	Answer questions C4-C11
2. Authentication Service	Digitally	Reuse of an existing service	Answer questions C4-C11
3. Base registry information source (Tax clearance)	Digitally	Reuse of an existing service	Answer questions C4-C11
4. Base registry	Digitally	Reuse of an	Answer questions C4-C11

	information source (Insurance clearance)		existing service	
5.	Base registry information source (Legal Person Tax Registration)	Digitally	Reuse of an existing service	Answer questions C4-C11
6.	Base registry information source (Legal person Social Security Registration)	Digitally	Reuse of an existing service	Answer questions C4-C11
7.	Base registry information source (Registration in local chamber)	Digitally	Reuse of an existing service	Answer questions C4-C11
8.	Base registry information source (Check the Company Name Availability)	Digitally	Reuse of an existing service	Answer questions C4-C11

e-Fee Service

The answers to C3 for the services consumed by the e-Fee Public Service is provided in **Error! Not a valid bookmark self-reference.**.

Table 8: Consumed services status for the e-Fee Public Service

CONSUMED SERVICE	MANUALLY OR DIGITALLY	REUSE OR PRODUCE	NEXT STEP
1. e-Payment Service	Digitally	Reuse of an existing service	Answer questions C4-C11
2. Authentication service	Digitally	Reuse of an existing service	Answer questions C4-C11
3. Access Management Service	Digitally	Self-produce the service, because there is no fit-for-purpose	Assess next consumed service (this one is not taken into account)

			service to reuse	
4.	Tax Registry	Digitally	Reuse of an existing service	Answer questions C4-C11
5.	Data from Banks	Digitally	Reuse of an existing service	Answer questions C4-C11
6.	Data from other Public Organizations	Digitally	Reuse of an existing service	Answer questions C4-C11

For the Lite version of the IMM C3 is answered for the aggregate of the services being consumed and the answer should be "(Nearly) all consumed services are reused"

7.3.4 Question C4: Processing mode (Technical interoperability – weight: 10%)

What is the processing mode of the consumed service?

This question attempts to distinguish the consumed services between those that are processed in batches and those that are real-time processed.

The maturity levels that can be achieved are the following:

- **Opportunistic**: Batch processing while real-time could be an option
- **Essential**: Batch processing only due to legal, technical or other constraints
- **Sustainable**: Both processing modes are supported
- **Seamless**: Fully real-time processing

For the Lite version of the IMM C4 refers to the aggregate of the services being consumed and the question is re-phrased to "What is the processing mode of the consumed services?". The following are valid answers for the Lite version of C4.

- Mainly batch whilst real-time processing could be implemented
- Mainly batch, due to legal, technical or other constraints
- Both processing modes are supported
- Fully real-time processing

Business Registration Service

The Business Registration Service is considered a very mature example for the processing mode of consumed services as all of them are fully real-time processed. This includes getting all required information from base registries as well as e-payments. The maturity score for all these services is 5, i.e. the maximum value. The e-payment service includes real-time payment with a credit card.

e-Fee Service

The status for the e-Fee Public Service is not considered equally mature as only three consumed services are processed real-time. Communication with banks is accomplished using both batched and real-time modes, depending on the type of payment chosen by the citizen, while data from other organizations are batch processed whilst real-time could be an option.

For the Lite version of the IMM the most suitable answer to C4 for the e-Fee Public Service should be "Both processing modes are supported"

7.3.5 Question C5: Push-pull mechanisms (Technical interoperability – weight: 10%)

What is the interaction mode with the consumed service?

This question addresses the two services interaction to have access to the most accurate and updated information. Push consumption refers to the public service receiving automatic updates (e.g. of data) or triggers (for executing a process for example). Pull consumption refers to the public service having to request updates or triggers. Push consumption or having both mechanisms in place are considered more mature as these demonstrate that the public service seamlessly interconnects with the services it is consuming.

The maturity levels that can be achieved are the following:

- Opportunistic: Pull only, whilst push could be added
- Essential: Pull only, due to legal, or other constraints
- Sustainable: Push only whilst pull could be added
- Seamless: Push only due to legal or other constraints
- Seamless: Both mechanisms (push and pull) are being used

For the Lite version of the IMM C5 refers to the aggregate of the services being consumed and the question is re-phrased to "What is the typical interaction mode with the consumed services?". The following are valid answers for the Lite version of C5.

- Mainly pull, whilst push could be added
- Mainly pull, due to legal or other constraints
- Mainly push, whilst pull could be added
- Mainly push due to legal or other constraints

Business Registration Service

The Business Registration Service utilizes both push and pull techniques for the e-payment service, and either pull or push for the rest of the services. For some services only push method is implemented due to legal or other constraints, which makes them equally mature to the e-payment service. More specifically, the techniques being utilized for the corresponding consumed services are listed in Table 9

Table 9: Business Registration service – interaction mode

CONSUMED SERVICE	INTERACTION MODE	MATURITY SCORE
1. e-Payment Service	Both mechanisms (push and pull) are being used	5
2. Authentication Service	Pull only, due to legal, or other constraints	3
3. Base registry information source (Tax clearance)	Pull only, due to legal, or other constraints	3
4. Base registry information source (Insurance clearance)	Pull only, due to legal, or other constraints	3
5. Base registry information source (Legal Person Tax Registration)	Push only due to legal or other constraints	5
6. Base registry information source (Legal person Social Security Registration)	Push only due to legal or other constraints	5
7. Base registry information source (Registration in local chamber)	Push only due to legal or other constraints	5
8. Base registry information source (Check the Company Name Availability)	Pull only, due to legal, or other constraints	3

Considering the above, one can claim that the Business Registration Service reaches a very good maturity score with regards to the interaction mode with the consumed services.

e-Fee Service

The e-Fee service also uses both push and pull methods for the aggregate of the consumed services, yet only the exchange with the banks service supports both of them. Similarly to the Business Registration Service, the e-Fee service performs well on the interaction mode mechanisms, as shown in Table 10.

Table 10: e-Fee service – interaction mode

CONSUMED SERVICE	INTERACTION MODE	MATURITY SCORE
1. e-Payment Service	Pull only, due to legal, or other constraints	3
2. Authentication service	Pull only, due to legal, or other constraints	3
3. Access Management Service	-	-
4. Tax Registry	Push only due to legal or other constraints	5
5. Data from Banks	Both mechanisms (push and pull) are being used	5
6. Data from other Public Organizations	Push only due to legal or other constraints	5

Note that for some of the above interaction modes pull or push is not applicable, hence the chosen answer is push (or pull respectively) “due to legal, or other constraints”. An example is the Authentication Service which is only called by the e-Fee service whenever there is a need to authenticate a user. In this case the push method is not applicable.

For the Lite version of the IMM C5 is answered for the aggregate of the services being consumed and the answer to C5 for the e-Fee Public Service should be “Mainly push due to legal or other constraints”.

7.3.6 Question C6: Common protocol usage (Technical interoperability – weight 20%)

What type of protocol specification is being used for exchanging information?

The aim of this question is to identify whether existing protocol specifications are used, an approach that implies higher interoperability.

There are only two maturity levels for this question which are related to either conforming or not to existing protocol specifications:

- **Essential**: Proprietary protocol specification
- **Seamless**: Common protocol specification

For the Lite version of the IMM C6 refers to the aggregate of the services being consumed and the question is re-phrased to "What type of protocol specifications are being used for exchanging structured information between the public service and consumed services?". The following are valid answers for the Lite version of C6.

- Fully proprietary protocol specifications
- Mainly proprietary protocol specifications, some common protocol specifications
- Balanced mix between proprietary and common protocol specifications
- Mainly common protocol specifications, some proprietary protocol specifications
- Fully common protocol specifications

Business Registration Service

The Business Registration Service uses common protocol specifications only for two of the consumed services, i.e. e-payment and authentication services, as shown in Table 11.

Table 11: Business Registration Service – protocol types

CONSUMED SERVICE	TYPE OF PROTOCOL	MATURITY SCORE
1. e-Payment Service	Common protocol specification	5
2. Authentication Service	Common protocol specification	5
3. Base registry information source (Tax clearance)	Proprietary protocol specification	1
4. Base registry information source (Insurance clearance)	Proprietary protocol specification	1
5. Base registry information source (Legal Person Tax Registration)	Proprietary protocol specification	1
6. Base registry information source (Legal person Social Security Registration)	Proprietary protocol specification	1
7. Base registry information source (Registration in local chamber)	Proprietary protocol specification	1
8. Base registry information source (Check the Company Name Availability)	Proprietary protocol specification	1

e-Fee Service

The e-Fee service can be considered as a mature public service with regards to the protocols being used as for all the consumed services it adopts common protocol specifications (e.g. SOAP messages).

Table 12: e-Fee service – protocol types

CONSUMED SERVICE	TYPE OF PROTOCOL	MATURITY SCORE
1. e-Payment Service	Common protocol	5

		specification	
2.	Authentication service	Common protocol specification	5
3.	Access Management Service	-	-
4.	Tax Registry	Common protocol specification	5
5.	Data from Banks	Common protocol specification	5
6.	Data from other Public Organizations	Common protocol specification	5

Examples of the above are the OAuth2.0 protocol for the Authentication Service, and the REST protocol for obtaining data from banks regarding the payment status of e-Fees.

For the Lite version of the IMM C6 is answered for the aggregate of the services being consumed and the answer to C6for the e-Fee Public Service should be “Fully common

7.3.7 Question C7: Reuse of network infrastructure (Technical interoperability – weight: 10%)

Is the service consumed via an existing network infrastructure or a dedicated, private network?

The question aims to bring into light the use of existing private or public network infrastructures for the communications needs. Reuse of existing network infrastructure rather than using a private network indicates higher interoperability.

There are four maturity levels that reflect the answers given to this question, as listed below:

- **Opportunistic**: The service is consumed via a new dedicate private network whilst it could leverage on an existing network infrastructure or the Internet

- **Essential**: The service is consumed via a new dedicated private network due to security or other specific concerns
- **Sustainable**: The service is consumed via an existing private network (e.g. sTesta)
- **Seamless**: The service is consumed using the publicly available Internet

For the Lite version of the IMM C7 refers to the aggregate of the services being consumed and the question is re-phrased to "Are services typically consumed via an existing network infrastructure or a dedicated private network?". The following are valid answers for the Lite version of C7.

- The services are mainly consumed via a dedicated private network whilst they could leverage on an existing network infrastructure or the Internet
- The services are mainly consumed via a dedicated private network due to security or other specific concerns
- The services are mainly consumed via an existing dedicated private network
- The services are mainly consumed using the publicly available Internet

Business Registration Service

The Business Registration Service for some services utilizes the public network while for the rest of them communications take place over an existing private network, as shown in Table 13.

Table 13: Business Registration Service – network infrastructure

CONSUMED SERVICE	NETWORK INFRASTRUCTURE	MATURITY SCORE
1. e-Payment Service	The service is consumed using the publicly available Internet	5
2. Authentication Service	The service is consumed using the publicly available Internet	5
3. Base registry information source (Tax clearance)	The service is consumed via an existing private network (e.g. sTesta)	4
4. Base registry information source (Insurance clearance)	The service is consumed via an existing private network (e.g. sTesta)	4
5. Base registry information source (Legal Person Tax Registration)	The service is consumed via an existing private network (e.g. sTesta)	4
6. Base registry information source (Legal person Social Security Registration)	The service is consumed via an existing private network (e.g. sTesta)	4
7. Base registry information source (Registration in local chamber)	The service is consumed via an existing private network (e.g. sTesta)	4
8. Base registry information source (Check the Company Name Availability)	The service is consumed using the publicly available Internet	5

e-Fee Service

The e-Fee service for two of the consumed services had to introduce new private networks which is not considered the best practice with regards to reusing existing network infrastructures. However, for the rest of the services performs better as shown in Table 14.

Table 14: e-Fee service - – network infrastructure

CONSUMED SERVICE	NETWORK INFRASTRUCTURE	MATURITY SCORE
1. e-Payment Service	The service is consumed using the publicly	5

		available Internet	
2.	Authentication service	The service is consumed via an existing private network (e.g. sTesta)	4
3.	Access Management Service	-	-
4.	Tax Registry	The service is consumed via a new dedicated private network due to security or other specific concerns	3
5.	Data from Banks	The service is consumed via a new dedicated private network due to security or other specific concerns	3
6.	Data from other Public Organizations	The service is consumed via an existing private network (e.g. sTesta)	4

For the Lite version of the IMM C7 is answered for the aggregate of the services being consumed and the answer to C7for the e-Fee Public Service should be “The services are mainly consumed via a dedicated private network whilst they could leverage on an existing network infrastructure or the Internet”.

7.3.8 Question C8: Semantic alignment (Semantic interoperability – weight: 20%)

To what extent are semantic standards and specifications used for data modelling of the data exchange between the public service and consumed services?

This question focuses on the use of existing standards that promote semantic interoperability. Use of existing semantic standards and specifications (e.g. data models standards, standardised XML schemata, metadata standards, standardised reference data (e.g. code lists)) is considered more interoperable than developing proprietary standards.

There are three distinct maturity levels for the semantic alignment based on the following answers:

- **Opportunistic:** The data models have been created for the public service without using any existing semantic standards or specifications
- **Essential:** Some proprietary semantic standards and specifications are used for creation of the data model
- **Seamless:** The whole development of the data models are based on existing (open) semantic standards and specifications

For the Lite version of the IMM C8 refers to the aggregate of the services being consumed although the question and possible answers remain the same with the Full version.

Business Registration Service

The Business Registration Service achieves the highest maturity score for the semantic alignment as existing semantic standards were adopted for the data models used for all the consumed services. This gives the highest score for all consumed services, which is 5 (based on the answer "The whole development of the data models are based on existing (open) semantic standards and specifications").

e-Fee Service

The e-Fee service achieves an equally high score, i.e. seamless, for all consumed services, as for these consumed services existing standards and specifications are also adopted.

For the Lite version of the IMM although C8 refers to the aggregate of the consumed services the answer is the same as that given for all the services for the Full version, i.e. "The whole development of the data models are based on existing (open) semantic standards and specifications".

7.3.9 Question C9: Exception handling (Semantic interoperability – weight: 10%)

How are exceptions resolved?

This question raises the issue of the ability to efficiently handle unexpected responses received during service consumption. Received information may be inconsistent with internal information. Initiated transactions may lead to an unexpected response. The way in which these exceptions are handled determine the level of interoperability.

There are three maturity levels for the exception handling, as listed below:

- **Opportunistic:** Fully manually
- **Essential:** Semi-automated
- **Seamless:** Fully automated

For the Lite version of the IMM C9 refers to the aggregate of the services being consumed and the question is re-phrased to "Received information may be inconsistent with internal information. Initiated transactionsmay lead to an unexpected response for example. How are such exceptions typically resolved?". The following are valid answers for the Lite version of C9 (note that these are identical to the Full version, yet they are presented here for completeness).

- Fully manually
- In a semi automated way
- Fully automated

Business Registration Service

With regards to the Business Registration Service half of the consumed services do not implement automated exception handling mechanisms, and as a result, these have to be manually handled by the interested parties. There is only one consumed service that appears to be highly mature, as shown in Table 15.

Table 15: Business Registration Service – exception handling

CONSUMED SERVICE	EXCEPTION HANDLING	MATURITY SCORE
1. e-Payment Service	Fully automated	5
2. Authentication Service	Semi-automated	3
3. Base registry information source (Tax clearance)	Semi-automated	3
4. Base registry information source (Insurance clearance)	Semi-automated	3
5. Base registry information source (Legal Person Tax Registration)	Fully manually	2
6. Base registry information source	Fully manually	2

	(Legal person Social Security Registration)		
7.	Base registry information source (Registration in local chamber)	Fully manually	2
8.	Base registry information source (Check the Company Name Availability)	Fully manually	2

e-Fee Service

The performance of the e-Fee service seems to be more mature compared to the Business Registration service, with three of the consumed service adopting a fully automated exception handling while only one of them handles exceptions manually, as shown in Table 16.

Table 16: e-Fee service –exception handling

CONSUMED SERVICE	EXCPETION HANDLING	MATURITY SCORE
1. e-Payment Service	Semi-automated	3
2. Authentication service	Fully automated	5
3. Access Management Service	-	-
4. Tax Registry	Fully automated	5
5. Data from Banks	Fully automated	5
6. Data from other Public Organizations	Fully manually	2

For the Lite version of the IMM C9 is answered for the aggregate of the services being consumed and the answer to C9 for the e-Fee Public Service should be “In a semi automated way “.

7.3.10 Question C10: Certification (Organisational interoperability – weight: 10%)

Has the public service followed the certification procedure to consume the service?

This question addresses the important issue of formally certifying a public service before making use of it. A public service which applies for formal certification when available is considered more interoperable. Certification is a formal procedure to verify if a constituency meets the prerequisites to connect to a service. Certification may examine areas like: security, governance, technological and semantic interoperability and availability.

There are three maturity levels for this interoperability area, which reflect the following answers:

- **Opportunistic:** No, while a certification procedure is available
- **Essential:** No, there is no certification procedure available
- **Seamless:** Yes

For the Lite version of the IMM C10 refers to the aggregate of the services being consumed and the question is re-phrased to "Has the public service followed certification procedures before making use of theconsumed services?".The following are valid answers for the Lite version of C10.

- Mostly No, while certification procedures are available
- Mostly No, there are no certification procedure available
- Sometimes, certification procedure have been followed for some consumed services

Business Registration Service

With regards to the Business Registration Service a certification procedure has been followed only for one of the consumed services, i.e. the e-payment, while for the rest of consumed services there is no appropriate procedure available, hence the lack of any certification.

Table 17: Business Registration Service – certification procedure

CONSUMED SERVICE	CERTIFICATION PROCEDURE	MATURITY SCORE
1. e-Payment Service	Yes	5
2. Authentication Service	No, there is no certification procedure available	3
3. Base registry information source (Tax clearance)	No, there is no certification procedure available	3
4. Base registry information source (Insurance clearance)	No, there is no certification procedure available	3
5. Base registry information source (Legal Person Tax Registration)	No, there is no certification procedure available	3
6. Base registry information source (Legal person Social Security Registration)	No, there is no certification procedure available	3
7. Base registry information source (Registration in local chamber)	No, there is no certification procedure available	3
8. Base registry information source (Check the Company Name Availability)	No, there is no certification procedure available	3

e-Fee Service

The e-Fee service has followed certification procedures for those services that certification was available.

Table 18: e-Fee service – certification procedure

CONSUMED SERVICE	CERTIFICATION PROCEDURE	MATURITY

			SCORE
1.	e-Payment Service	No, there is no certification procedure available	3
2.	Authentication service	No, there is no certification procedure available	3
3.	Access Management Service	-	-
4.	Tax Registry	Yes	5
5.	Data from Banks	Yes	5
6.	Data from other Public Organizations	No, there is no certification procedure available	3

For the Tax Registry and Data from Banks services, the organization providing the services has established sound procedures against which a consumer, such as the e-Fee service, is being evaluated and certified for compliance with them.

For the Lite version of the IMM C10 is answered for the aggregate of the services being consumed and the answer to C10 for the e-Fee Public Service should be "Sometimes, certification procedures have been followed for some consumed services".

7.3.11 Question C11: Specification process (Organisational interoperability – weight: 10%)

Has the public service been involved in establishing the specifications of the consumed functional service?

This question attempts to identify whether an open process has been followed for the establishment of specifications. An open process to establish specifications is likely to yield more interoperable results.

The following are valid maturity levels corresponding to the listed answers:

- **Opportunistic:** No, although this would have been possible
- **Essential:** No, this was not possible
- **Seamless:** Yes

For the Lite version of the IMM C11 refers to the aggregate of the services being consumed and the question is re-phrased to "Has the public service been involved in establishing the specifications of the consumed services?". The following are valid answers for the Lite version of C11.

- Mostly No, although this would have been possible
- Mostly No, this was not possible
- Sometimes, the public service has been involved in the specification process of some consumed services

Business Registration Service

The Business Registration Service has only been involved in establishing the specifications of the e-Payment service, while there was no involvement at all for the rest of the consumed services, as shown in Table 19.

Table 19: Business Registration Service – specification process

CONSUMED SERVICE	SPECIFICATION PROCESS	MATURITY SCORE
1. e-Payment Service	Yes	5
2. Authentication Service	No, this was not possible	3
3. Base registry information source (Tax clearance)	No, this was not possible	3

4.	Base registry information source (Insurance clearance)	No, this was not possible	3
5.	Base registry information source (Legal Person Tax Registration)	No, this was not possible	3
6.	Base registry information source (Legal person Social Security Registration)	No, this was not possible	3
7.	Base registry information source (Registration in local chamber)	No, this was not possible	3
8.	Base registry information source (Check the Company Name Availability)	No, this was not possible	3

e-Fee Service

The e-Fee service had a more active involvement and participated in the establishment of the specifications of three consumed services.

Table 20: e-Fee service – specification process

CONSUMED SERVICE	SPECIFICATION PROCESS	MATURITY SCORE
1. e-Payment Service	No, this was not possible	3
2. Authentication service	No, this was not possible	3
3. Access Management Service	-	-
4. Tax Registry	Yes	5
5. Data from Banks	Yes	5
6. Data from other Public Organizations	Yes	3

For the Lite version of the IMM C11 is answered for the aggregate of the services being consumed and the answer to C11 for the e-Fee Public Service should be “Mostly Yes, the public services has always been involved in establishing specifications”.

7.4 Service Management (Section D of the IMM questionnaire)

This section of the questionnaire aims to assess the Public Service as a part of the holistic e-Government and Interoperability architecture.

7.4.1 Question D1: Cost-Benefit Analysis (Organisational interoperability – weight 10%).

Has the public service been evaluated in terms of its cost and benefits before deciding on whether/how it should be implemented (e.g. through conducting an ex ante Business Case)?

Having a cost benefit analysis for the service implies that the service was carefully designed in order to justify the investment. This facilitates the sustainability of the service. It is important for interoperable services to be sustainable as if they stop working a lot of organization will be affected.

Depending on the answer that can be given to this question the following maturity level can be achieved:

- Ad –hoc: No, cost and benefits of the public service are not identified
- Essential: Yes, cost and benefits of the public service were detailed based on a common business case approach (e.g. cost-benefit analysis, total cost of ownership calculation)
- Seamless: Yes, cost and benefits of the public service were detailed based on a common business case approach. In addition multiple scenarios were compared (inventory of all cost categories)

Given the examples that were presented, the business Registration Service can be regarded as **essential** since many studies have been conducted by the European commission for the importance of electronic procedures in the European growth considering the service directive implementation. Provided that a detailed study has been conducted in a country,

considering every aspect of the service of business registration, the seamless choice can be achieved.

Regarding the service of e-Administration fee, it seems that a detailed study has been conducted in order to verify that this service will not support both conventional and electronic ways of payment. This service has comparatively less cost than the service of issuing a paper based administration fee ticket.

7.4.2 Question D2: Service Provisioning (Organisational interoperability – weight 25%).

Does your public service provide services towards the external environment for reuse?

If the service has been designed in a generic way that can be reused by other systems then it is more interoperable than a service that has been designed only for a specific purpose.

The maturity levels that can be achieved are the following:

- Ad – hoc: The public service makes no services available towards the external environment, while this would be possible
- Essential: The public service makes no services available towards the external environment due to constraints
- Sustainable: The public service makes some services available towards the external environment
- Seamless: The public service makes available all services towards the external environment

In the case of Business Registration Service part of the information that is handled by the service is being reused by other services. For instance, establishing a branch in another country requires information from the business registry of the country of origin. Moreover the requirement for the beneficial owners for money anti laundry purposes also requires

information from the Business Registry. In the light of these evolutions the service can be considered Sustainable i.e. some of the data and functionality of the service is offered to other systems.

The e- Administration Fee service is regarded as Sustainable since some of the information should be transferred to the banks for the execution of the payment and to the public authorities that need to verify that that payment has been made.

7.4.3 Question D3: Procurement criteria (Organisational – Technical interoperability – weight 5%).

Has standardization been a procurement criterion when procuring the service's components?

The potential answer related to the interoperability maturity can be:

- Ad –hoc: No
- Essential: Yes, however not enforced sufficiently
- Seamless: Yes, and enforced to ensure compliance

The Business Registration Service should have taken into account the work that has been done for the Business Registry interconnection, the descriptions that have been defined in the various directives and regulations regarding the business registries. From that point of view the potential answer can be Essential because some of them have been implemented and some of them are still in progress at European level.

The e-Administration Fee service has not taken into account in the procurement procedure any standard related to the payment methods or any administrative standard that has been defined. From that point of view the answer may be no which corresponds to the ad-Hoc maturity.

7.4.4 Question D4: Central point of control (Organisational interoperability – weight 10%).

Does the public service feature a central point of control for choreography of externally consumed and provided services?

It is important from interoperability point of view the service to be part of a generic interoperable architecture. In this case the service should be included in a central point e.g. a service catalogue that facilitates the reuse of the service and coordinates the relation with other services in order to provide other aggregated services.

The typical answers in this question can lead to the following ranking regarding maturity:

- Ad –hoc: No
- Essential: No, this is decentralized or not considered relevant
- Seamless: Yes

In the case of Business Registration service the Central point of control can be the Point of Single Contact that has been established in the context of the services directive. So the service is usually being referred in the point of single contact and is usually part of a licensing procedure that can be applied to a new legal person or company. Therefore typical answers ideally are yes and lead to a seamless service.

The e-Administration fee service is part of payment services and therefore is usually coordinated by a central point of control that acts as a payment gateway.

7.4.5 Question D5: Level of automation of the choreography (Technical interoperability – weight 10%).

To what extent is the choreography automated?

Although fully automated choreography is not always in place ideally from interoperability point of view is a goal that we should try to achieve

The typical answers can have the following options:

- Ad –hoc: Fully manual (all transactions are handled manually) choreography
- Essential: Semi-automated (a part of the service choreography relies on manual interference) choreography
- Seamless: Fully automated (no manual interference is required) choreography

The aggregated services that use the Business Registration service are usually too complex and therefore the typical answers that are expected are either Ad-Hoc i.e. fully manual or Essential i.e. if in some cases there is electronic automation regarding the orchestration of the services.

The e-administration fee service usually is part of other payment services and therefore the use of this service is totally automated and the answer is usually seamless.

7.4.6 Question D6: Status information (Semantic – Technical interoperability – weight 5%).

Does the public service share status information on the cases handled with external services?

The typical answers have the following ranking:

- Ad –hoc: No status information shared
- Essential: Yes, with some services
- Seamless: Yes, systematically with all services

Both the business registration and the e-administration fee services provide the status information since they are successfully implemented. Business registration usually adds a new entry in the business registry that is open to the public. Other services can exploit this information so the potential answers are either Essential or Seamless. The e-administration fee status is necessary for all the other public administration services that use it. The other services need to know if the payment of the fee has been done. In some exceptional case this information cannot be provided real time but it is provided at a later stage. So in this case the potential answers are either Essential or Seamless.

7.4.7 Question D7: Business process definitions and rules (Organisational interoperability – weight **5%).**

Does the service establish business process definitions and/or business process control rules (e.g. rules for process control, validation, quality control, tracking and tracing) jointly with the orchestrated services?

This question tries to identify the quality of the modelled process. In the manual cases the process usually is not modelled in a structured way. From that point of view different flavours in the implementation may arise.

In electronic transactions the type of the modelling is better but in some cases may not be done.

The potential answers are:

- Ad –hoc: No, processes are not modelled
- Opportunistic: No, even though processes are modelled
- Essential: Yes, in some cases
- Seamless: Yes, systematically with all services

The Business Registration service usually has a pre - defined process that aims to cover the requirements of the various European directives that regulate the functions of the Business registries. The expected answers are either Essential or Seamless.

The e-Administration Fee service is modelled in a clear way so other payment services can reuse it. Seamless is the potential answer that is expected.

7.4.8 Question D8: Business Process Management standards (Organisational interoperability – weight 5%).

To what extent are Business Process Management (BPM) standards applied to the orchestration of the public service?

Complex services need to have a specific and detailed description of the process. Usually tools that support different standards can be used for this description and at a later stage can guide the orchestration of the basic services that contribute to the public service that is being assessed. Therefore the use of Business Process Management tools and Standards can facilitate the achievement of interoperability goals.

The potential alternative choices are:

- Ad –hoc: Business processes are not modelled at all
- Essential: Business processes are modelled and executed on a proprietary basis
- Seamless: Business processes are modelled and executed using BPM standards

The Business Registration Service has important cross border dimension and therefore the description of the services is done usually with BPMN notation or UML modelling.

So the expected answer whenever cross border service provision exists is expected to be seamless.

In many cases especially when the services is addressed at national level the Alternative answers may lead to Essential. The e-administration fee belongs to this case.

7.4.9 Questions D9: Architectural Framework (Organisational-Technical interoperability – weight 5%).

Has the public service considered an architecture framework in its design (EU, national level, international (open) standard)?

In this question one should consider the European Interoperability Reference Architecture (EIRA) and similar national policies. Especially when it comes to the use of specific building blocks the Reference architecture becomes more crucial.

- Ad –hoc: No, although relevant frameworks are available
- Essential: No, there are no relevant frameworks available to consider
- Sustainable: Yes, one or multiple architecture frameworks are used
- Seamless: Yes, one or multiple architecture frameworks are used -independent audits

The expected answers for the Business Registration service could be either Sustainable or Seamless provided that the service is functioning following at least the proposed architecture at European Level.

In the case of e-Administration fee there is no specific architecture although the European interoperability architecture could also be applicable, in that case the expected answer can either be Ad-Hoc or Essential.

7.4.10 Questions D10: Architectural flexibility (Technical interoperability – weight 10%).

Has the service's architecture been designed in a way that it is flexible for future upgrades and/or interconnections with other services?

From interoperability point of view the design of the services should be generic enough so that it can be reused by other services. From technical point of view this requirement implies that the service can be easily connected to other services and the architecture can be easily adapted to the evolution of the other services.

The potential answers can be:

- Ad –hoc: No, the architecture cannot be considered flexible
- Essential: The architecture allows for some flexibility
- Seamless: Yes, the architecture is highly flexible

If the EIRA has been taken into consideration then there is a high possibility that the architecture will be flexible enough to be seamless.

Both Business Registration and e-Administration fee services can be flexible enough since they take into consideration EIRA

7.4.11 Questions D11: Specification process (Legal - Organisational interoperability – weight 10%).

Has the public service established an (open) specification process in which administrations and businesses can participate?

In the case of Business Registration service there are a lot of collaborative initiatives that discuss the potential solution such as Business Registry Interconnection[21], Large scale pilots

[21] https://joinup.ec.europa.eu/taxonomy/terms/34442

such as SPOCS[22], eSENS[23] etc . For the e-Administration fee there was no similar process established. So considering the following answers:

- Ad –hoc: No, the specification process is closed
- Essential: Yes, participation upon invitation
- Seamless: Yes, open participation

The Business Registration service falls mainly into Essential and exceptionally to Seamless ranking and the e-Administration fee falls into ad-hoc ranking.

[22] http://www.eu-spocs.eu/
[23]http://www.esens.eu/

8 TRAINNING AND SELF-ASSESSMENT MATERIAL

The objectives of this section are to assist trainees to:

- Identify key objectives of the work to be undertaken,
- Use the tools needed at either the e-learning platform or the questionnaire level,
- Describe and be able to write the structure and deliverables of work
- Choose the service that will be assessed, based on the needs of public bodies and their potential evaluation based on the IMM

8.1 Training Certification material

As part of the IMM training courses that will be implemented by the National Centre of Public Administration and Local Government in Greece, participants are required to submit and present a set of deliverables, working in groups or individually, about the application of the IMM on a specific public service. These deliverables and essays will be used for the assessment of the trainees regarding the practical use of IMM.

The process of preparing deliverables and the essay involves both active participation of working group members using a distance learning platform for asking questions - clarifications or providing answers to other participants or trainers etc. and collaborating with the competent authorities that offer the services to get the information required. The log files of the distance learning platform are taken into account for the evaluation of the participation of each trainee. After the submission of the deliverables and the essay the results are being presented in the class.

The deliverables that will be used for the assessment include the followings:

1. Submission of a final version of the IMM Full questionnaire with the corresponding answers (40%).

The evaluation criteria of the specific deliverable are clarity and completeness regarding the following:

- Provide correct answers based on sources of information used,
- Identify additional resources and information necessary for the proper completion of the questionnaire where it is not possible to provide the answers,
- Identify and justify the questions that are not applicable to this service or were unable to answer.

2. **An essay about the application of the Model on a public Service (40%).**

An essay about the implementation of the IMM model on the specific public service, which should include at least the following parts:

- Description of the service and the service environment (20%).
- Description of the IMM Questionnaire results & key findings (10%)
- Proposal for the improvement of the service interoperability level, proposals to improve the IMM modes, as well as, proposals to adapt the IMM model based on the specific application needs (10%)

An indicative structure for the essay is presented in the following figure, and a template for the essay is included as part of this deliverable.

Table 21: Indicative structure of the Essay.

1	SCOPE OF THIS DOCUMENT
2	DESCRIPTION OF THE SERVICE ENVIRONMENT
	2.1 Description of the Service
	2.2 Legal framework governing the operation of the service
	2.3 Stakeholders and Organizational Units
	2.4 Systems participating in Service Provision
	2.5 Description of data flows
3	IMM QUESTIONNAIRE RESULTS SUMMARY
	3.1 Key Findings
4	SERVICE IMPROVEMENT SUGGESTIONS
5	IMM MODEL IMPROVEMENTS SUGGESTIONS
6	RESOURCES

3. Submission and presentation of the above (20%)

A presentation that will include:

- the description of the Service and the service environment,
- the results from the application of the model
- the key findings

- suggestions for improvement of the interoperability score
- suggestions for improvement of the model itself

8.2 SELF-ASSESMENT QUESTIONS

During the implementation of the program, mainly for trainees' self-assessment purposes, various exercises and tests can be used that are designed to verify the successful understanding of concepts and model. As part of these, an indicative questionnaire has been designed and is included in Appendix 3 of the current document.

9 Conlusions

This document introduced the concepts of public services interoperability, together with the corresponding actions undertaken by EU to promote it, and provided a detailed analysis of two public services, namely the Business Registration Service, and the e-Fee Service, performed in the context of their assessment against the Interoperability Maturity Model (IMM) for Public Services proposed by ISA. The aim of this analysis was to provide public administration additional to the IMM official documentation training material, with detailed examples to thoroughly understand the model and be able to confront challenges faced when they attempt to assess their own services.

This material was developed as part of the training program "Evaluation of electronic public services Interoperability - Interoperability Maturity Model (IMM)" implemented by the Hellenic National Centre of Public Administration and Local Government.

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[10] E-SENS D5.3-4Domain Business Lifecycle: First wave Pilot Scenarios and Plans n° 1 http://www.esens.eu/sites/default/files/esensd534firstwavepilotscenariosbusinesslifecycle.pdf

Appendix 1: e- Administration fee full Questionnaire

Appendix 2: Business Registration Full Questionnaire

Appendix 3: Questions

1. What is the difference between the IMM Full and Lite Questionnaires (please choose one answer only):

a. They share the same set of questions, however IMM Lite refers to Machine-to-machine services

b. IMM Lite is a less detailed version of the IMM Full questionnaire with regards to service consumption

c. IMM Lite covers less topics regarding service management

d. IMM Full focuses more on how the service is delivered to its end-users

2. The term interoperability refers to the ability of diverse organisations to (please choose one answer only):

a. Share and reuse information and knowledge

b. Exchange data between their IT systems

c. Cooperate and interact using their business processes

d. All the above

3. According to the IMM, a public service has (please choose one answer only):

a. One owner

b. A single end-user group

c. A single primary end-user group

d. All the above

4. According to the IMM, Service consumption is:

a. The use of the public service being evaluated, by all potential end-user groups

b. The use of the public service being evaluated, by other public services

c. The use of other services, mainly external to the public domain of the public service being evaluated

d. The use of other services by the public service being evaluated and vice-versa

5. Potential end-user groups in the context of the IMM mainly are:

a. Internal employees of the public administration

b. Employees from other (external) public administrations

c. Internal employees and citizens

d. None of the above

6. Which of the following interoperability maturity levels is considered the most desirable (please choose one answer only)?

a. Essential (3)

b. Sustainable) (4)

c. Seamless (5)

d. It depends on the type of service

7. Which of the following is not considered a public service that can be evaluated by IMM

a. Citizens are offered the service to file an application for unemployment benefits via the competent authority's web site.

b. Public servants working at a public registry office are offered the service to register citizens data via a web application

c. Businesses are offered the service to register and pay for the filling of patents via a website;

d. Administrations are offered the service to obtain European vehicle information via a web portal administered by a European authority.

8. Public services are prevalently delivered to the following end-user groups (please choose one answer only):

a. Citizens, businesses, other public administrations

b. Citizens, internal employees, and businesses

c. Citizens and businesses

d. Businesses and other public administrations

9. The Interoperability Maturity Model aims to (please choose one answer only):

a. Assess the interoperability maturity of a public service

b. Provide Recommendations for improving the maturity level of a public service

c. Identify areas of potential improvement with regards to the interoperability of a public service

d. All the above

10. In the context of public services, "Base Registries" are reliable sources of basic information on items such as citizens, business, vehicles, public organizations and buildings.

a. True

b. False

11. What is the primary scope of section A (Service Context) of the IMM questionnaire?

a. To classify the service according to its interoperability maturity level (e.g. Essential, Sustainable, Seamless)

b. To define the landscape of the service and the process description

c. To define the landscape of the services to be consumed

d. All the above

12. In the service delivery part of the IMM questionnaire we try to identify the dependency of the service in specific

a. Platforms and operating systems

b. Devices

c. Browsers

d. All the above

13. In the context of section 3 of IMM questionnaire (service consumption) we care for:

a. Manual consumption of services

b. Digital consumption of service

c. Both Manual and digital consumption of services

d. Only to machine to machine interaction among two services

14. The processing mode of a consumed service such as "Google Translator" is regarded as:

a. Batch processing

b. Fully real time processing

c. Both of the above mentioned processing modes

d. None of the above mentioned processing modes

15. The reuse of the Core Public Organization Vocabulary of ISA is considered as:

a. Semantic interoperability

b. Technical interoperability

c. Organizational Interoperability

d. Legal interoperability

16. When we design a mature interoperable service we focus on:

a. The user requirements

b. The services that are needed to be consumed

c. How the service will be offered to the external environment for reuse

d. All the above

17. In which section of the IMM questionnaire can the European Interoperability Reference Architecture be assessed? (more than one answer is correct)

a. Section A (Service Context)

b. Section B (Service delivery)

c. Section C (Service consumption)

d. Section D (Service Management)

18. Which are the interoperability patterns that are considered in the assessment of interoperability maturity? (more than one answer is correct)

a. From paper-based information exchange to digital information exchange

b. From manual to automated processing

c. From ad hoc to standard

d. From individual to collaboration

19. In which section of the IMM questionnaire is the prefilled form taken into account?

a. Section A (Service Context)

b. Section B (Service delivery)

c. Section C (Service consumption)

d. Section D (Service Management)

20. Which are the main parameters that IMM can be configured? (more than one answer is correct)

a. Administrative Level

b. Domain specific processes

c. Weights for each question and section of the questionnaire

d. Recommendations