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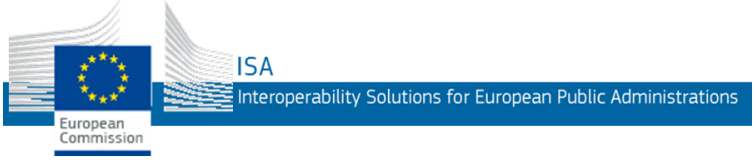

SUBPROJECT 3 «ACTIONS TO IMPRROVE QUALITY OF TRAINING PROGRAMMES »

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Interoperability Maturity Assessment for Public Services

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Interoperability Maturity Assessment For Public Services

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1 INTRODUCTION TO PUBLIC SERVICES AND INTEROPERABILITY

The objective of this section is to assist trainees understanding 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.

1.1 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[1].

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

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.

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.

1.2 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[2]. 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.

1.3 Introduction to Interoperability

Interoperability is often defined as the ability of heterogeneous IT systems to exchange data and share information **Error! Reference source not found.**. 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.

[2]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.

1.4 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[3] 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[4]:

> *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.*

[3] 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'.

[4] 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.

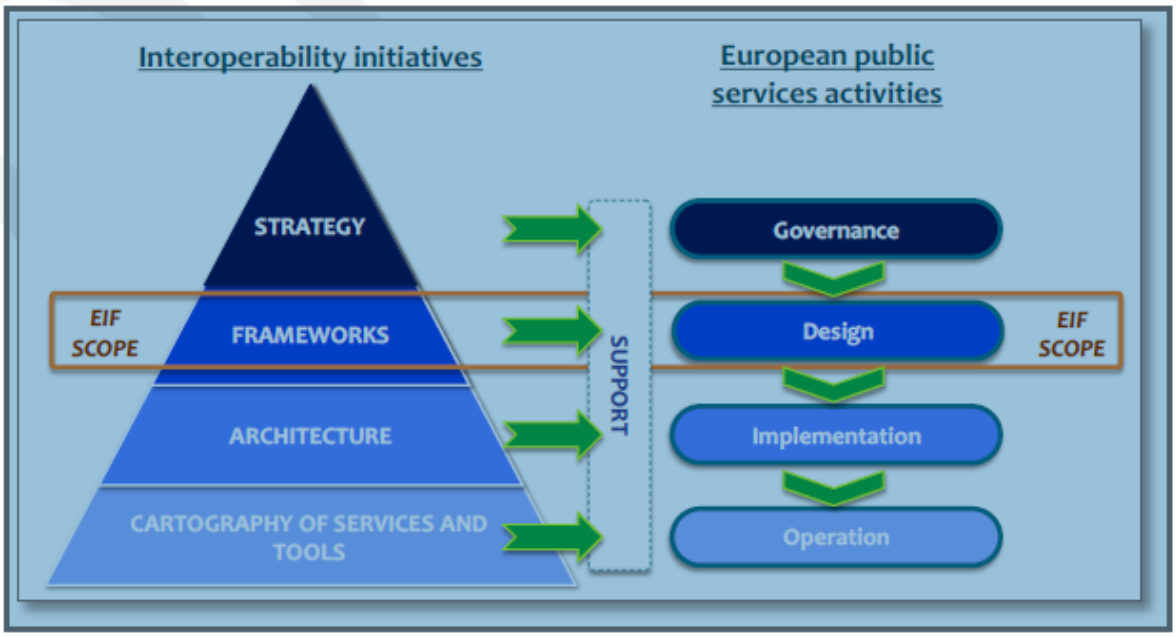


Figure 1: European Interoperability Initiatives

1.4.1 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.

1.4.2 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[5,] 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[6].

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.

[5]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.

[6] 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.

1.4.3 The European Interoperability Reference Architecture (EIRA)

EIRA is an architecture content metamodel defining the most salient Architectural Building Blocks (ABBs)[7] needed to build interoperable e-Government services. The EIRA is a four-

[7] 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-

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[8]), a global framework for Enterprise architecture and the model is expressed in ArchiMate[9]. 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 interoperability levels in the EIF: legal, organizational, semantic and technical interoperability.

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.

[8] http://www.opengroup.org/subjectareas/enterprise/togaf

[9] http://pubs.opengroup.org/architecture/archimate2-doc/toc.html

1.4.3.1 Key Concepts of Enterprise Architecture and the ArchiMate language

1.4.3.1.1 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.

1.4.3.1.2 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[10] provides instruments to enable

[10] 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

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:

3.0 include elements for modeling the enterprise at a strategic level, such as capability, resource, and outcome.

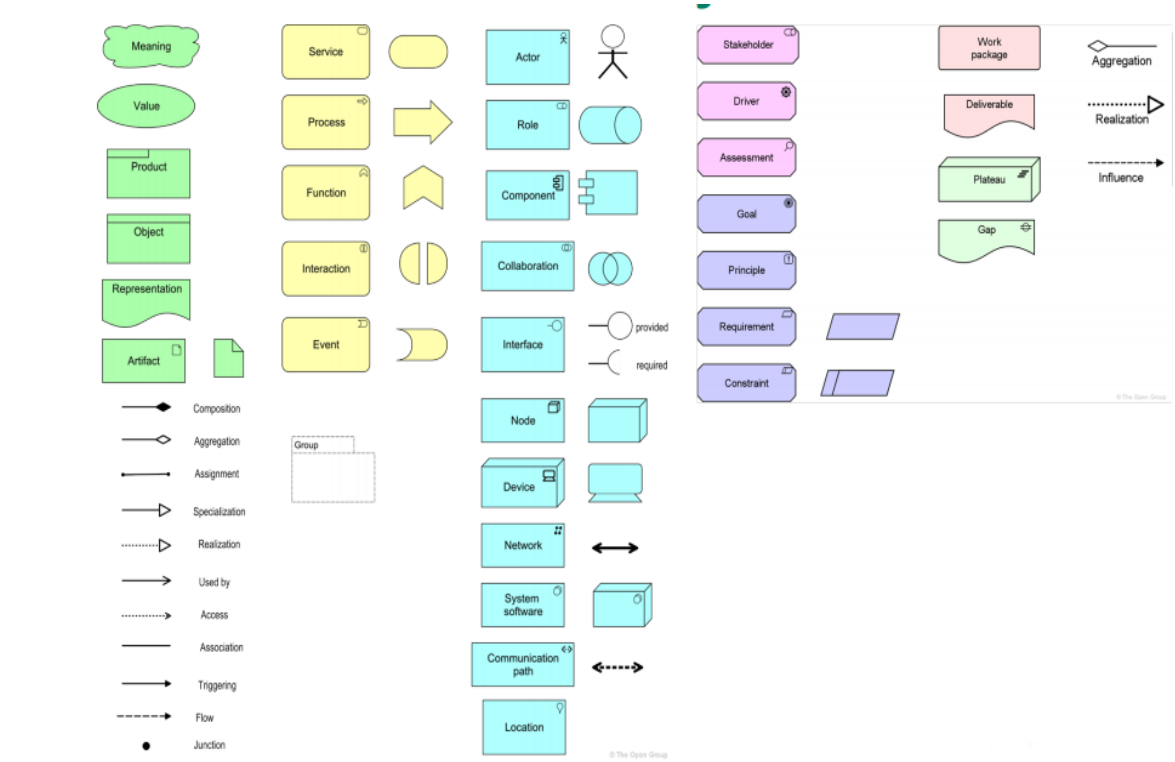


Figure 2: Archimate main elements

1.4.3.1.3 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.

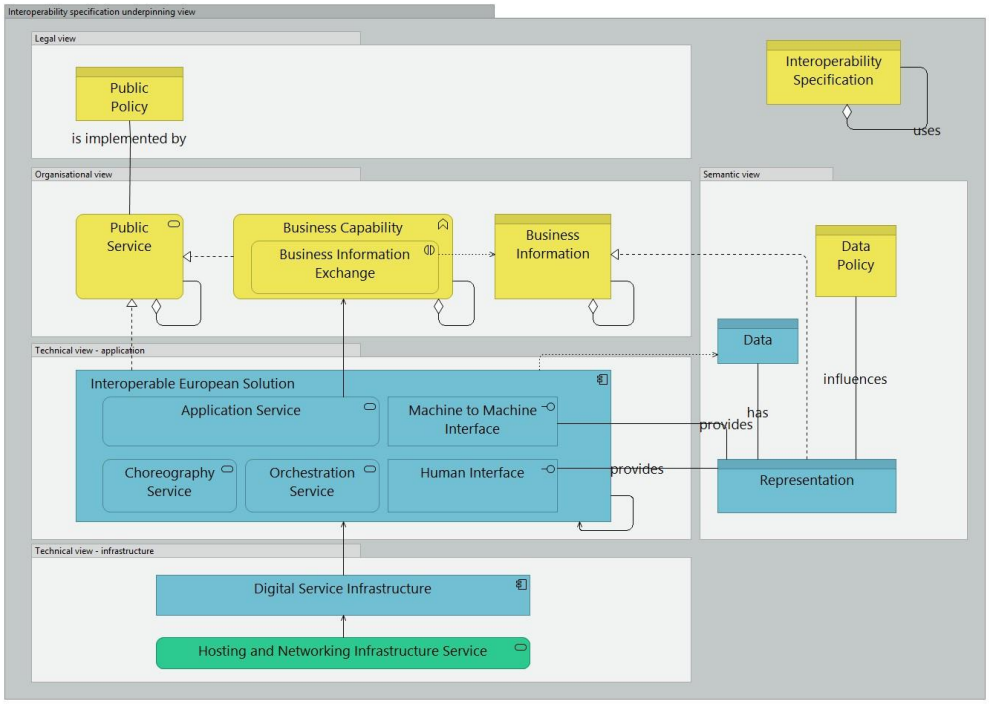
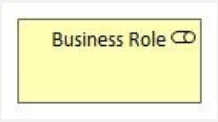
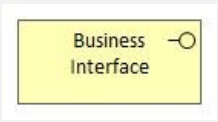


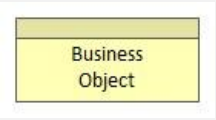
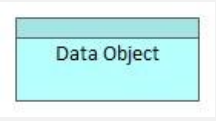
Figure 3: EIRA high-level overview

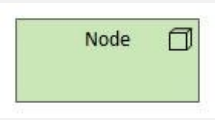
The EIRA uses the following ArchiMate model concepts[11]:

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*.

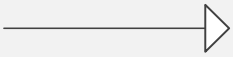
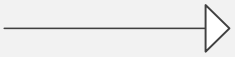
[11] An introduction to the European Interoperability Reference Architecture (EIRA) v1.0.0 (https://joinup.ec.europa.eu/catalogue/distribution/eira_v1_0_0_overviewpdf?lang=en)

	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[12].

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:

[12] 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[13] contains an XML file which contains the ArchiMate model of the EIRA. This file can be opened with **Archi**[14], a free and open source modelling tool to create ArchiMate models and sketches.

1.4.4 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.

[13] https://joinup.ec.europa.eu/catalogue/distribution/eira_v1_0_0zip
[14] 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

2 PUBLIC SERVICE DEFINITION

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

2.1 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.

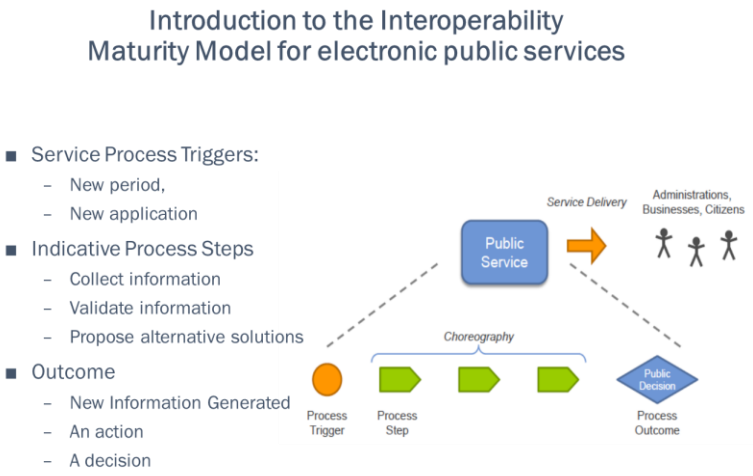


Figure 4: Conceptual model of a public service

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[15].

[15] 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.

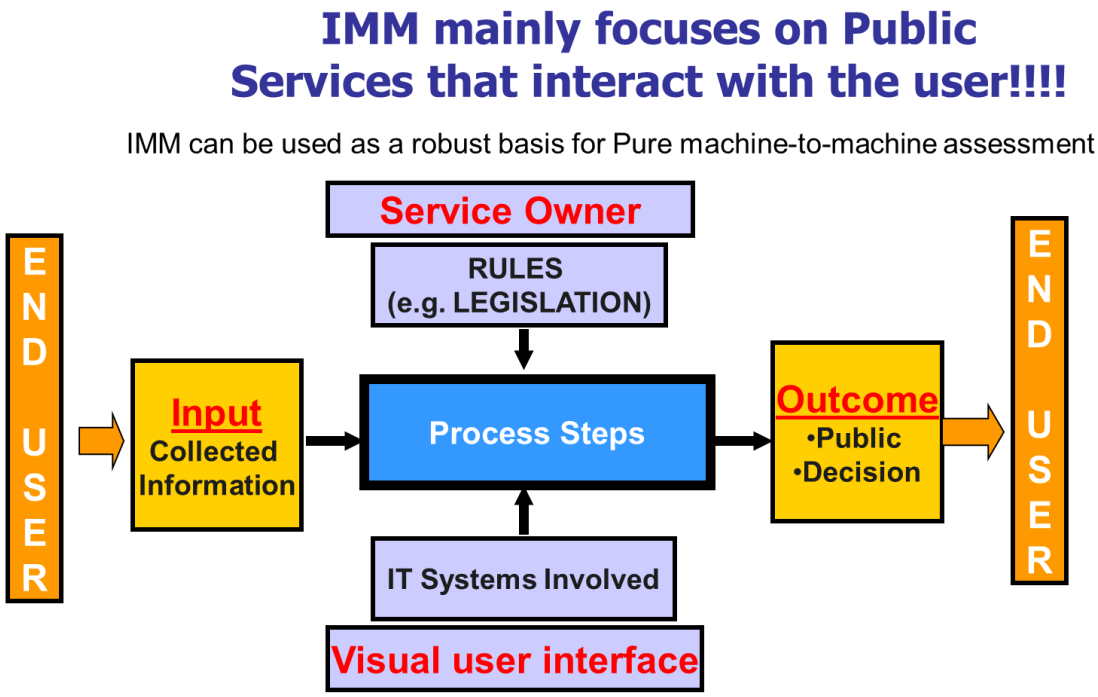


Figure 5: Public Services that interact with the end user

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.

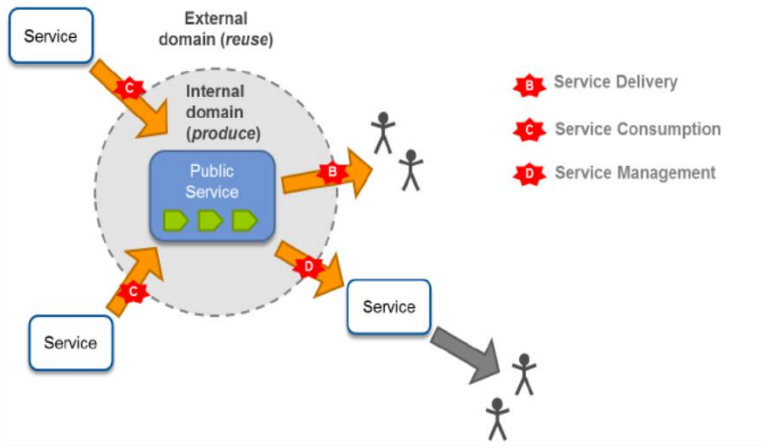


Figure 6: Interoperability areas of the IMM model – Definition of the internal and external domain