SCOOP4C
STAKEHOLDER COMMUNITY FOR ONCE-ONLY PRINCIPLE

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Abstract:	This report documents the results of the study of existing good practices of once-only implementations for citizens in Europe. Thereby, a distinction among once-only cases and once-only enablers is made. At the beginning of the document, definitions and methodical grounds are explained, followed by an overview of the 44 OOP cases and 22 OOP enablers studied. Then, the individual OOP cases are described along an agreed structure, providing a brief description of the case, listing the actors involved, and describing the main enablers supporting successful implementation of the OOP case or OOP enabler. A similar structure is used to describe the OOP enablers. Both chapters are grouped into areas of public service provisioning according to EuroVoc. The report concludes with insights into success factors, benefits and impact of the individual OOP cases and enablers as well as with final conclusions of the report.

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ABBREVIATIONS AND ACRONYMS

Abbreviation	Description
A	Interoperability Assets
ARIB	Agricultural Registers and Information Board
BR	Base registers
CA	Catalogue
CERTH	Centre for Research and Technology Hellas, Greece
CP	Citizen portal
CS	Centralized solutions
EC	European Commission
EGA	E-Governance Academy EGA, Estonia
eID	Electronic identification
EN	Enablers
EuroVoc	Multilingual Thesaurus of the European Union
FE	Front end systems
GP	General practitioner, usually family doctors
H2020	Horizon 2020 funding programme of the European Commission
IG	Interoperability governance
INIT	INIT Aktiengesellschaft für Digitale Kommunikation-Init AG, Germany
IMM	Interoperability Maturity Model
IT-K	IT-Kommunal GmbH, Austria
ISA	EC project "Interoperability solutions for public administrations, businesses and citizens"
MD	Master data from base registers
NET	Network infrastructure
OC	One-click services
OOP	Once-only principle
OOP4C	Once-only principle for citizens
R	Registries
SCOOP4C	Stakeholder Community for once-only principle for citizen
SDE	Secure data exchange
SR	Secondary registers and data warehouses
TS	Trust services
UKL	University of Koblenz-Landau, Germany
WP	Work Package

1 INTRODUCTION

The once-only principle is among the seven driving principles in the eGovernment Action Plan 2016-2020 of the European Commission (EC)[1]. To boost developments towards administrative burden reduction and simplification of procedures, two projects are funded by the EC in its Horizon 2020 programme[2] to investigate once-only principle implementations: SCOOP4C[3] and TOOP[4].

SCOOP4C investigates, discusses and disseminates how the once-only principle (OOP) can be implemented in in contexts of co-creation and co-production of public services for citizens to contribute to significantly reduce administrative burden and simplify administrative procedures for citizens while reusing data among public administration with the control and consent of citizens. Successful implementation of the OOP shall strengthen economic growth, therewith contributing to implement the strategic objectives of the Digital Single Market[5] as well as the eGovernment Action Plan 2016-2020[6] of the European Commission.

SCOOP4C has the following objectives:

- to build up and sustain a stakeholder community for the once-only principle for citizens in order to discuss and share experiences as well as drivers, enablers and barriers
- to identify, collect and share existing good practices of once-only implementations for citizens across Europe and to establish a body of knowledge about the cases
- to discuss challenges, needs and benefits of widely implementing and diffusing the once-only principle in co-creation and co-production contexts involving citizens and governments as data producers and data consumers
- to draw conclusions from comparing existing best practices with needs and challenges, including policy recommendations towards a necessary paradigm change in the public sector and of the citizens to build up trust on data shared among governments while no longer bothering citizens to repeatedly provide the same data in public service provisioning
- to identify relevant stakeholders and to develop a strategic stakeholder engagement plan to ensure sustainable implementations of the once-only principle with a large engagement of stakeholders in various co-creative and co-productive public service provisioning contexts
- to develop a tangible roadmap of future areas of actions to implement, diffuse and sustain concepts and implementations of once-only solutions for citizens

This deliverable reports the findings and results of work performed in work package 1 under task T1.2. The objectives of task 1.2 were to take stock of relevant initiatives in research and practice and to build up a knowledge base of existing good practices of once-only principle implementations for citizens in co-creative and co-productive environments. Accordingly, existing once-only initiatives and good-practice cases were analysed and assessed against the vision as well as key enablers and main barriers of the once-only principle as defined in the complementary deliverable D 1.1[7]. In close collaboration with work package 3[8], a freely accessible digital body of knowledge about once-only principle cases for citizens (OOP4C) was established.

[1] See https://ec.europa.eu/digital-single-market/en/european-egovernment-action-plan-2016-2020

[2] See http://ec.europa.eu/programmes/horizon2020/node/85

[3] www.scoop4c.eu

[4] www.toop.eu

[5] http://ec.europa.eu/priorities/digital-single-market_en

[6] See footnote 1

[7] Deliverable D 1.1: Vision of the once-only principle for citizens, including key enablers and major barriers, 2017, SCOOP4C Consortium

[8] Deliverable D 3.1: Knowledge base (concept and database structure), 2017, SCOOP4C Consortium (internal report)

The task was carried out using a mix of desk research and literature review as well as discussions with, and engagement of stakeholders - involving members of the stakeholder community and steering board members in the identification of good practices via workshops, interviews, surveys and online discussions. This way, a wide coverage and comprehensiveness in the collection of cases was ensured.

This report documents the state of play on existing good practices of OOP implementations for citizens in different European Member States. These cases were analysed through an in-depth study of challenges and barriers as well as key enablers, benefits and crucial factors of successful or not so successful once-only implementations.

In this deliverable, a summary of the main aspects of the OOP cases and enablers is reported, while these cases and enablers are accessible for free (registration is currently required) via the online knowledge base of cases and enablers, which is accessible to the stakeholder community from the project website. The knowledge base of good practice cases of OOP4C implementations serves as a repository to relate to, when it comes to demonstrating how to overcome potential barriers of OOP implementations. It contributes to knowledge sharing across the EU.

The remainder of the document is as follows: Chapter 2 defines the terminology used throughout the deliverable as well as the methodology for data collection and analysis of cases and enablers. Chapter 3 provides an overview of the cases and enablers, which were investigated in work package 1. Furthermore, some statistics regarding the cases and enablers are provided, such as the number of cases and enablers in different domains and in different countries. Chapter 4 provides a summary of the OOP cases studied along a categorisation of the case, a summary, a list of the involved actors, key enablers in place to realise the OOP case, and crucial factors or lessons from studying the case. In a similar way, OOP enablers are documented in chapter 5, and these are referenced in the previous chapter 4 along the indication of key enablers. In chapter 6, success factors as well as benefits and impact of OOP cases and enablers are elaborated and synthesised against the enablers listed in Deliverable 1.1. The last chapter reflects on the results of this deliverable and puts forward some lessons learned and recommendations for subsequent work in work packages 2 and 4.

2 Terminology and methodology for the OOP case analysis

2.1 Terminology used in SCOOP4C

In order to avoid a conflict with the definition of 'use case' as used in the Unified Modelling Language[9], SCOOP4C defines OOP cases as follows:

> **OOP cases** are solutions, approaches, and concepts that implement the once-only principle in public service provisioning by processing, sharing and re-using citizen related data, while the citizen does not need to repeatedly provide the same data.

Since the implementation of the OOP in many countries is supported by enabling infrastructure or other enablers, the state of play report distinguishes OOP cases and OOP enablers. SCOOP4C defines OOP enablers as:

> **OOP enablers** are supporting the implementation of OOP cases through e.g. central infrastructure components or solutions building blocks, as well as semantic, organisational, legal or political enablers. The enablers reach a wider scope than cases as one enabler may support the implementation of many different OOP cases (public services) in different policy domains.

[9] See e.g. https://www.tutorialspoint.com/uml/uml_use_case_diagram.htm

2.2 Methodology

The basis for this state of play report was an in-depth study of existing once-only principle implementations for citizens. The study was carried out through a collaborative effort of the project partners using desk research and literature study. The identification and collection of cases was complemented by involving the SCOOP4C stakeholder community and steering board as well as experts from Member States through individual skype calls and interviews as well as by organising two workshops with the stakeholder community:

- SCOOP4C 1st Stakeholder Workshop on Good Practice Cases, Brussels, 14th March 2017[10]
- SCOOP4C 2nd Stakeholder Workshop on Good Practice Cases, Tallinn, 31st May 2017[11]

The analysis also encompasses the review of the following existing strategic documents and studies:

- EU eGovernment Action Plan 2016-2020. Accelerating the digital transformation of government[12]
- EU Digital Single Market strategy[13]
- European Interoperability Framework[14]
- EU General Data Protection Regulation[15]
- Study on eGovernment and the Reduction of Administrative Burden[16]
- Study on 'EU-wide digital Once-Only Principle for citizens and businesses - Policy options and their impacts'[17]

For identifying and describing existing good practices of OOP implementations for citizens and to ensure that (largely) the data collected is comparable, a template was developed and agreed among the partners. The template collects the following information about OOP cases and OOP enablers and is implemented in the online knowledge base through work package 3 (see D 3.1 for more details about the template):

- Title of project
- Focus on target audience (i.e. citizens, businesses, both of them, NGOs, governments)
- Short summary description of the case / enabler
- URL
- Country and scope of case (international, EU, cross-border, national, province, municipal)
- Relevant enablers in place (linking to the enablers collected separately or adding a new enabler)
- Political commitments
- Legal provisions
- Architecture aspects, including
    - Data owner / provider / consumer matrix
    - Data exchange model / logical view of the case
    - Kind of data sharing
- Additional information such as
    - Socio-cultural prerequisites
    - Environmental impacts
    - Lessons learned

[10] https://scoop4c.eu/news/scoop4c-workshop-took-place-14-march-2017-brussels

[11] https://scoop4c.eu/news/scoop4c-tallinn-e-governance-conference-2017

[12] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52016DC0179&from=EN

[13] https://ec.europa.eu/digital-single-market/en/digital-single-market

[14] https://ec.europa.eu/isa2/eif

[15] http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32016R0679

[16] https://ec.europa.eu/digital-single-market/en/news/final-report-study-egovernment-and-reduction-administrative-burden-smart-20120061

[17] https://ec.europa.eu/digital-single-market/en/news/final-report-study-eu-wide-digital-once-only-principle-citizens-and-businesses-policy-options

For the analysis of the cases, the European Interoperability Framework (EIF)[18] [19], the ISA maturity model[20], and the European Interoperability Reference Architecture[21] represent major sources to group enablers along the interoperability levels and along crucial factors fostering interoperability in public service provisioning. In particular, the conceptual model of public service provisioning (see Figure 1) as described in the EIF (Version 2[22] and Version 3[23]) guides in determining different types of enablers. Crucial soft 'enabling factors', which will be investigated in the cases are e.g. motivators, benefits, public value, data protection and privacy, trust and transparency, socio-cultural influence factors, citizen-centred design or data quality.

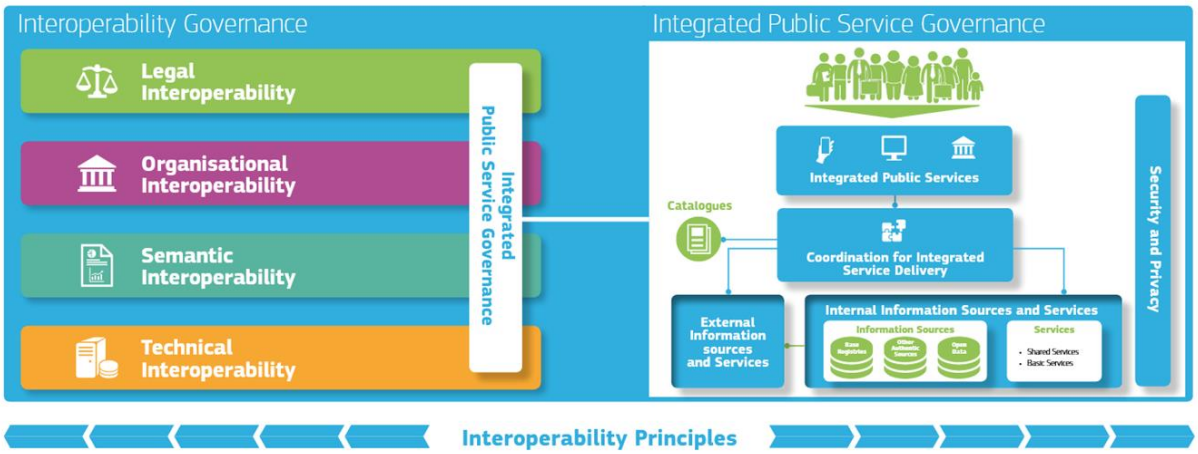

Figure 1: Conceptual model for public service provisioning as described in the new EIF[24]

The OOP cases and enablers studied in work package 1 were described by project partners and involved SCOOP4C community members. The further analysis focused on defining the key enablers, major barriers and specific characteristics of successful / limited OOP implementations across Europe and in the Member States. This includes the potential for cross-border application. However, while to date not many cross-border OOP cases are operational, in this report, we assess the potential of OOP cases to become cross-border.

Along the analysis, different categorisations and assessments were applied as follows, which are described in the subsequent sections:

- Types of OOP cases and OOP enablers (subsection •)
- OOP cases (subsection 2.2.2)
- Maturity stages for cases and enablers (subsection 2.2.3).

2.2.1 Types of OOP cases and OOP enablers

On the basis of the EIF conceptual model of public service provisioning as introduced in section 0 and in particular Figure 1, SCOOP4C categorises the OOP cases and OOP enablers into the following types:

- OOP cases can be Registries (R), Citizen portals (CP), or Front-end systems (FE)

[18] https://ec.europa.eu/isa2/sites/isa/files/isa_annex_ii_eif_en.pdf (cf. p.14 Figure 3-1)

[19] https://ec.europa.eu/isa2/sites/isa/files/eif_brochure_final.pdf (cf. p. 32 et seq.)

[20] https://ec.europa.eu/isa2/solutions/imm_en

[21] https://ec.europa.eu/isa2/solutions/eira_en

[22] http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf

[23] https://ec.europa.eu/isa2/eif

[24] See EIF: http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF
and EIF presentation http://ec.europa.eu/isa2/sites/isa/files/2017-03-29_eif.pdf

- OOP enablers can be grouped into Interoperability Assets (A), Catalogue (CA), Interoperability Governance (IG), Network infrastructure (NET), Secure Data Exchange (SDE), or Trust Services (TS) in order to support processes, ensure security and interoperability, help coordinate, or manage service delivery processes.

2.2.2 OOP cases in different public service domains

For the analysis of cases, it is essential to look at and compare close cases. SCOOP4C sorted the OOP cases by domains to facilitate comparison of similar cases. Thus, the cases are indexed using the EuroVoc[25] thesaurus. EuroVoc is a multilingual thesaurus that has originally been built up specifically for processing the documentary information of EU institutions. The aim of the thesaurus is to provide information management and dissemination services with a coherent indexing tool. It enables effective management of documentary resources and users to carry out documentary searches using the controlled vocabulary.

Parts of OOP selected cases have a cross-domain character. For example, a portal providing services in different domains are categorised as cross-domain in this document. Every case is indexed with indexes of the second level of EuroVoc, except for cross-domain cases, which receive the code 0000. This approach allows scaling the study to other domains. We do not predefine the list of domains; the list is open for cases from any domains.

2.2.3 Maturity stages for cases and enablers

The five level Interoperability Maturity Model (IMM)[26] was used in SCOOP4C to assess the level of the maturity of selected cases and enablers in two aspects. The first maturity is regarding to the once-only principle vision, the second covers the cross-border maturity of cases and enablers. These two aspects could have different levels of maturity as explained in Table 1 .

Table 1: Maturity of cases and enablers

	Maturity level	Maturity of cases or enablers according to OOP vision	Cross-border maturity of cases and enablers
1	Ad Hoc	Poor OOP – the case has almost no OOP in place	Poor cross-border OOP – the case has almost no cross-border OOP in place or it is not possible to implement the case at a cross-border level
2	Opportunistic	Fair OOP – the case implements some elements of OOP best practices	Fair cross-border OOP – the case implements some elements of cross-border OOP. For example, a citizen can log in by using eID given by another country. Some enablers (for example multilateral or bilateral agreements between countries) are not in place. The case has cross-border potential.
3	Essential	Essential OOP – the case implements the essential best practices for OOP	Essential cross-border OOP – the case implements the essential best practices for cross-border OOP. Enablers are in place
4	Sustainable	Good OOP – all relevant OOP best practices are implemented by the case	Good cross-border OOP – all relevant cross-border OOP best practices are implemented by the case
5	Seamless	OOP leading practice – the case is a leading example for others	Cross-border OOP leading practice – the case is a leading example for others

The above matrix for the assessment of the maturity levels of OOP cases and enablers is complemented with a number of questions, which leads to the assessment of each OOP case or enabler. The questions the work

[25] http://eurovoc.europa.eu/drupal/

[26] https://ec.europa.eu/isa2/solutions/imm_en

package leader has used for the more detailed assessment are as follows:

- Is the level of reuse of existing trustworthy data sources stimulated in order to minimise end user efforts and to reduce the risk for erroneous data entries, i.e. is data taken from other sources and not asked repeatedly from the citizen?
- Is the data referenced from other sites (open for use on demand)?
- Is the data referencing to other sites offering related data so the data consumer can easily retrieve the relevant data?
- Is OOP case description included in the Catalogue of Public Services (including e.g. descriptions of data, services, policies) in order to facilitate the establishment of new OOP cases?
- Is the OOP case supported by enablers like Authentication Service, eSignature Service, Data Validation Service, Machine Translation Service, or Data Exchange Service? Agreements, standard architecture building blocks, and common solutions building blocks are preferred over individual (proprietary) solutions.
- What type of protocol specifications are being used for exchanging structured information between the public service and consumed services? The usage of existing protocol specifications implies a higher interoperability than developing a dedicated protocol.
- Are OOP implementations using an existing network infrastructure or is there a specific (private) network within the case? The reuse of existing enabling network infrastructure rather than setting up a dedicated network for the case indicates higher interoperability.
- Are existing semantic standards and specifications used (e.g. data model standards, standardised XML schemata, metadata standards, standardised reference data)? The use of standards increases interoperability. Open standards have a wider impact than proprietary standards.
- Is the case following certification procedures before making use of the consumed services? The use of agreed (verification, evaluation and certification) procedures to ensure interoperability increases the potential and impact of the OOP.
- Does the case provide services towards the external environment for reuse? Public services that provide digital services for reuse towards other administrations and/or businesses contribute proactively towards higher interoperability in the public domain.
- Is there a third party to monitor and control the OOP implementation in place? Having an effective collaborative governance with distributed roles and responsibility increases the potentials of OOP implementations within the MS as well as cross-border.

The above questions, together with the assessment matrix shown in Table 1, are used to guide the maturity assessment of OOP cases and enablers as presented in the next chapter.

3 Synthesis of OOP cases and OOP enablers

In work package 1, 45 cases and 21 enablers were analysed. All cases and enablers are stored in the online knowledge base available at the project website and they are accessible for free to registered users. The OOP cases and OOP enablers are described using the case description template jointly developed with work package 3 (cf. Deliverable D 3.1). In this chapter, a synthesis of the identified and analysed cases and enablers is provided, grouped into OOP cases, OOP enablers, number of cases in different domains and along different types as well as in different Member States. The reader is alerted that the number of cases does not provide a comprehensive list of OOP cases existing in Europe. Instead, the number results from the availability of information on OOP cases and enablers online and from the access to information provided by current members of the SCOOP4C stakeholder community in the given time frame of the task 1.2. Further, cases are continuously being collected in SCOOP4C and stored in the online knowledge base. These cases will be subject of analysis throughout work packages 2 and 4.

Table 2 provides an overview of the OOP cases collected so far. The cases are listed by their name and classified along the criteria introduced in section 2.23, i.e. domain (using the indexes of the EuroVoc thesaurus, which

were assigned by the work package 1 leader), type, the country where the case has been implemented, and the level of maturity in terms of maturity of OOP implementation as well as cross-border maturity for OOP. The maturity assessment was assigned by the work package leader EGA, and it was measured against the vision of OOP documented in deliverable D 1.1.

Table 2: Synthesis of 45 OOP cases

Name of case	Country	EuroVoc index	Domain	OOP Type	OOP maturity	Cross-border maturity
Bulgarian Guide for Administrative Assistance and Awareness (GAAA)	BG	0000	cross-domain	FE	Essential	Ad Hoc
Estonian State Portal Eesti.ee	EE	0000	cross-domain	CP	Seamless	Sustainable
French e-bourgogne-franche-comté GIP	FR	0000	cross-domain	CP	Sustainable	Opportunistic
Irish Government Portal Gov.ie	IE	0000	cross-domain	FE	Essential	Ad Hoc
Luxemburg's MyGuichet	LU	0000	cross-domain	CP	Essential	Ad Hoc
United Kingdom's Tell Us Once	UK	0000	cross-domain	FE	Seamless	Ad Hoc
Estonian e-File system	EE	1226	organisation of the legal system	FE	Seamless	Opportunistic
Estonian e-Notary	EE	1226	organisation of the legal system	FE	Seamless	Opportunistic
Estonian Elections Information System	EE	0416	electoral procedure and voting	R	Sustainable	Ad Hoc
Estonian Internet Voting	EE	0416	electoral procedure and voting	FE	Seamless	Ad Hoc
Austria's FinanzOnline (FON)	AT	2446	taxation	FF	Essential	Opportunistic
Estonian electronic tax filing system (E-Tax)	EE	2446	taxation	FE	Seamless	Essential
French Electronic tax filing system	FR	2446	taxation	FE	Ad Hoc	Ad Hoc
Hellenic Online Tax System (TAXIS)	GR	2446	taxation	R	Opportunistic	Ad Hoc
United Kingdom's Making Tax Digital (MTD)	UK	2446	taxation	FE	Essential	Ad Hoc
Austrian birth registration and family allowance	AT	2836	social protection	R	Seamless	Opportunistic
Estonian Parental benefit	EE	2836	social protection	FE	Seamless	Ad Hoc
French application of work welfare (Revenu de solidarité actice)	FR	2836	social protection	FE	Ad Hoc	Ad Hoc
Polish Baby bonus (Becikowe)	PL	2836	social protection	FE	Essential	Ad Hoc
Estonian e-Census	EE	2816	demography and population	R	Essential	Ad Hoc
Hellenic Citizens' Registry	GR	2816	demography and population	R	Essential	Ad Hoc

Name of case	Country	EuroVoc index	Domain	OOP Type	OOP maturity	Cross-border maturity
Austrian electronic health records (ELGA)	AT	2841	health	R	Seamless	Opportunistic
Estonian Central Health Information System and Patient Portal	EE	2841	health	FE	Seamless	Essential
Estonian Digital Prescription	EE	2841	health	R	Seamless	Sustainable
Estonian Doctor-doctor-consultation	EE	2841	health	FE	Opportunistic	Ad Hoc
Estonian e-Ambulance and time-critical health data	EE	2841	health	FE	Seamless	Opportunistic
Estonian Medical Certificate	EE	2841	health	R	Opportunistic	Ad Hoc
Estonian Medical Digital Image Bank	EE	2841	health	R	Sustainable	Essential
Slovenian e-Health (eZdravje)	SI	2841	health	FE	Essential	Ad Hoc
Estonian Education Information System (EHIS)	EE	3216	education	R	Sustainable	Sustainable
Estonian Register of Professions	EE	3216	education	R	Essential	Ad Hoc
Estonian Online Application Portal (SisseAstumise InfoSüsteem - SAIS)	EE	3216	education	R	Seamless	Sustainable
Irish Central Application Office	IE	3216	education	FE	Essential	Ad Hoc
Netherland's Studielink project	NL	3216	education	R	Sustainable	Sustainable
Spanish Interoperability node of the Spanish University System	ES	3216	education	R	Essential	Essential
United Kingdom Universities and Colleges Admissions System	UK	3216	education	R	Sustainable	Opportunistic
Estonian Portal of the Agricultural Registers (e-PPRIA)	EE	5631	agricultural activity	FE	Sustainable	Ad Hoc
Estonian Veterinary and Food Board Information System	EE	5631	agricultural activity	FE	Essential	Ad Hoc
Estonian Smart Road (Tark Tee)	EE	4811	organisation of transport	FE	Essential	Ad Hoc
Estonia: Tallinn Public Transport Ticket System	EE	4811	organisation of transport	FE	Seamless	Seamless
French application for a parking vignette	FR	4811	organisation of transport	FE	Ad Hoc	Ad Hoc
Estonian Register of Employment	EE	4411	labour market	R	Sustainable	Ad Hoc
Estonian Sports Registry	EE	2826	social affairs	R	Sustainable	Ad Hoc
Estonian Consumer Service Environment Data System	EE	2026	consumption	FE	Sustainable	Opportunistic
German Refugee Digitisation System	DE	2811	migration	FE	Seamless	Opportunistic

The individual OOP cases are described with more detail in Chapter 4.

Table 3 provides a synthesis of 21 OOP enablers, which were identified and studied along task 1.2, using a similar table structure as for Table 2, i.e. name of enabler, country where the enabler has been implemented, type, and the two levels of OOP maturity, which were again assigned by the work package leader EGA, and it was measured against the vision of OOP documented in deliverable D 1.1.

Table 3: Synthesis of 21 OOP enablers

Name of enabler	Country	Type	OOP Maturity	Cross-border maturity
German xAusländer	DE	A	Sustainable	Opportunistic
Irish Personal Public Service Number	IE	A	Sustainable	Ad Hoc
Estonian Catalogue of Public Sector Information (RIHA)	EE	CA	Seamless	Sustainable
Argentinian Integrability Model	AR	IG	Sustainable	Opportunistic
Greek Interoperabilty Centre	GR	IG	Essential	Ad Hoc
Spanish E-Government Platform SEDIPUALB@	ES	IG	Essential	Ad Hoc
Austrian Portal Group (Portalverbund)	AT	NET	Sustainable	Opportunistic
Greek National Network of Public Administration (SYZEFXIS)	GR	NET	Essential	Essential
Irish Government Network	IE	NET	Essential	Opportunistic
Spanish Network Red SARA	ES	NET	Essential	Essential
Belgium Maximum Data Sharing Between Administrations and Agencies (MAGDA)	BE	SDE	Sustainable	Opportunistic
Czech Basic Registers	CZ	SDE	Essential	Ad Hoc
Dutch System of Base Registries	NL	SDE	Sustainable	Opportunistic
Estonian data exchange layer for information systems (X-Road)	EE	SDE	Seamless	Sustainable
Portugal's Interoperabilidade na Administração Pública (iAP)	PT	SDE	Sustainable	Opportunistic
Spanish Intermediate platform for the provision and verification of citizens data (PID - SVD)	ES	SDE	Sustainable	Opportunistic
Estonian Public Key Infrastructure	EE	TS	Seamless	Sustainable
Greek Public Key Infrastructure	GR	TS	Essential	Ad Hoc
Irish Public Service Card (PSC)	IE	TS	Essential	Opportunistic
Irish MyGovID	IE	TS	Essential	Opportunistic
Spanish Shared services of electronic signature (multi-PKI) - Suite @firma	ES	TS	Sustainable	Opportunistic

The individual OOP enablers are described with more detail in Chapter 5.

An overall observation from the synthesis in Table 2 and Table 3 is that the cross-border maturity of cases and enablers is in general less developed compared to the OOP maturity of the cases and enablers. The indication of maturity demonstrates also capacities to improve maturity of cases and enablers regarding to the OOP vision.

In Table 4, the number of OOP cases per domain (cf. section 2.2.2 for explanation) is shown. The most popular domains are health and education with eight and seven of the selected cases in the domains. As administrative burden in the education sector is high, these cases were developed in order to reduce burden for both citizens and governments. The identified cases simplify the process of applying for enrolment to universities and colleges. Health issues, including the communication between patient and doctors as well as the integration of sensible patient data into databases, are ordinary processes that involve the whole society. Cases affecting only specific

parts of the society (such as migration, consumption, etc.) are among the domains with the least number of OOP cases.

Table 4: OOP cases per specific domain

Number of cases	EuroVoc code	Domain name
8	2841	health
7	3216	education
6	0000	cross-domain
5	2446	taxation
4	2836	social protection
3	4811	organisation of transport
2	0416	electoral procedure and voting
2	1226	organisation of the legal system
2	2816	demography and population
2	5631	agricultural activity
1	2026	consumption
1	2811	migration
1	2826	social affairs
1	4411	labour market
45	**Total number of cases**	

All OOP cases and enablers are indexed with codes of corresponding types according to the principles described in Section •. Cases and enabler with characteristics of several types were assigned to the most dominant one. Table 5 contains the distribution of cases and enablers per specific type. As the table shows, front end systems are the most popular type among the identified instances. A possible explanation for that is that portals as front end represent a kind of OOP implementation and thus reduce administrative burden for citizens and governments by combining public services of different domains.

Table 5: OOP cases or enablers per specific case type

Number of cases or enablers	Code of case type	Case Type
25	FE	Front End System
17	R	Registers (including both, base and other registers)
6	SDE	Secure Data Exchange
5	TS	eID and Trust Services
4	NET	Network Infrastructure
3	CP	Citizen Portals
3	IG	Interoperability Governance
2	A	Interoperability Assets
1	CA	Catalogue
66	**Total of OOP cases and enablers**	

The Study on eGovernment and the Reduction of Administrative Burden (EC-2014)[27] revealed that 70% of the countries analysed were implementing projects or programmes related to the once-only principle. Table 6 illustrates the number of selected OOP cases and enablers SCOOP4C identified and studied to date in different EU Member State and other countries.

Table 6: OOP cases and enablers per country

Country	Number of cases	Number of enablers
AR	0	1
AT	3	1
BE	0	1
BG	1	0
CZ	0	1
DE	1	1
EE	24	3
ES	1	4
FR	4	0
GR	2	3
IE	2	4
LU	1	0
NL	1	1
PL	1	0
PT	0	1
SI	1	0
UK	3	0
Total	45	21

In the next chapter, the individual OOP cases are introduced, grouped by the EuroVoc categorisation (see Table 4).

[27] https://ec.europa.eu/digital-single-market/news/final-report-study-egovernment-and-reduction-administrative-burden-smart-201200

4 OOP cases

In the subsequent subsections, the 45 OOP cases are described. The cases are grouped along the domains according to the EuroVoc vocabulary (see section 2.2.2 as well as Table 2 and Table 4).

4.1 Health

4.1.1 Austrian electronic health records (ELGA)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	AT	R	Seamless	Opportunistic	2015

4.1.1.1 Summary of case

ELGA stands for electronic health records (elektronische Gesundheitsakte). ELGA is an information system that simplifies the process of accessing the health records for the patient and the doctors, as well as other healthcare professionals at hospitals, care facilities and pharmacies. Health data such as a patient's test results are generated by a variety of health institutions. ELGA connects all of them and makes the relevant health data available digitally by means of a link. The doctor as well as the patient can access the records from any location, whenever they want - simply and securely. The aim is to supplement medical treatments and consultation with improved information flows, particularly when several health service providers are working together.

URL**:** https://www.elga.gv.at/index.html

4.1.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Patients	Citizen	X	X	X
Hospitals, doctors, care facilities, pharmacies	NGO		X	X
ELGA GMBH	Government	X		X

4.1.1.3 Enablers of case

Legal provisions

- **ELGA-Law** [28]2013 (electronic health record-law 2013). In this Law the rights of the citizens as well as the data protection and data security are defined.
- **ELGA regulation amendment**[29] Nov. 2015. The purpose of this regulation is the implementation and development of the Electronic health records.
- **The health telematics regulation**[30] took place in 2013 in order to detailed regulations of technical and organisational fundamentals of the health telematics.

[28] http://www.bmgf.gv.at/cms/home/attachments/5/6/5/CH1045/CMS1338460371868/elga_nrbeschluss_bgbla_2012_i_111.pdf

[29] https://www.elga.gv.at/fileadmin/user_upload/Dokumente_PDF_MP4/Recht/BGBLA_2015_II_373.pdf

[30] https://www.elga.gv.at/fileadmin/user_upload/Dokumente_PDF_MP4/Recht/GTelV_2013.pdf

Technical enablers

- Austrian eID (Bürgerkarte): Patients can access their personal ELGA records online via the ELGA portal by registering and using **the digital signature** or **the electronic identification card**. This electronic ID enables the system to verify the patient's identity.

Trust and transparency

- First it will display discharge notifications, as well as laboratory and radiological results provided by hospitals already working with ELGA. As soon as ELGA health data are generated for the patient, the patients will be able to view them themselves online via the ELGA portal. The system also shows who has accessed the patient's ELGA health records, and when.

4.1.1.4 Crucial factors/ Lessons learned

ELGA saves time, provides a better overview of the health status and treatments and avoids unnecessary multiple examinations. It provides access to important diagnostic and therapeutic information of patient for doctors, hospitals and care institutions. This central integrated information repository reduces administrative burden for both patients and health system providers. Moreover, ELGA digital health record system makes a valuable contribution to improved patient security. This leads to increase patient's satisfaction and increased quality of data. The case is a good practice and has a great potential for expansion into a cross-border case.

4.1.2 Estonian Central Health Information System and Patient Portal

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	EE	FE	Seamless	Opportunistic	2008

4.1.2.1 Summary of case

The Central Health Information System (so called Personal Digital History www.digilugu.ee – as EHR service) started in Estonia in 2008. The central system is a patient-oriented system (according to the personal ID – code). In the EHR central system *epicrises* about every case (short overview about visit, anamnesis, diagnoses, treatment, examinations and recommendations) are collected, which are visible to all clinicians who treat patients. The doctors' access to the central database is allowed only via the personal ID-card because of security reasons. All accesses are logged and are allowed only to licensed health care providers. In addition to this database, all the collected epicrises are linked to the Medical Images Bank, the Prescription Centre and health care provider systems via the Estonian data exchange layer for information systems (X-Road enabler, see section 5.5.4). Estonian EHR has a specific service portal for patients – the Patient Portal. Every person has access to the portal via her/his ID-card and can have a look at his/her personal data. However, a patient can also look up information about the children (up to 18 years) or other ordinated data. There are several services possible for a patient:

- to see their own data from various service providers in one place
- make declarations (ordinate the donation, distribution of the rights for family to open or to close the data, data closure for doctors) all over Estonia
- look at their treatment bills, prescriptions, and the loggings (who have had a look at their data)

URL: **www.digilugu.ee**

4.1.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Health Information System (TEHIK)	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Universities	Government			X
Universities	Business			X
Scientists	Citizen			X
Address Data System	Government	X	X	
Health Care providers (GP, Hospital, Emergency service, Dentists IS)	Government/Business	X	X	X
Medicines Coding Centre (State Agency of Medicine)	Government	X	X	
Register of Handlers of medicines – Licences of Pharmacies and pharmacists (State Agency of Medicine)	Government	X	X	
Health Insurance Status Register (Health Insurance Foundation)	Government	X	X	
Health care providers Register (Health care Board)	Government	X	X	
Health professionals Register (Health care Board)	Government	X	X	
Statistics Portal	Government			X
HIS X-Road MISP – Portal for GP	Business	X	X	X
HIS X-Road MISP – portal for Emergency Mobile Stations	Government	X	X	X
Prescription Centre (Health Insurance Foundation)	Government	X	X	
Medical Images Repository	Government	X	X	
Patient Portal	Citizen	X	X	X
Road Administration Board	Government			X
Social Security Board	Government			X
Health Insurance Foundation	Government			X
Medical Registries (Cancer Register) – National Health Development Institute	Government			X
Medical Registries (Infection Diseases register) – Health Care Board	Government			X
State Information Board (X-road, eID, Mobile-ID, ID-card)	Government	X	X	
Patient	Citizen	X	X	X

4.1.2.3 Architecture of case

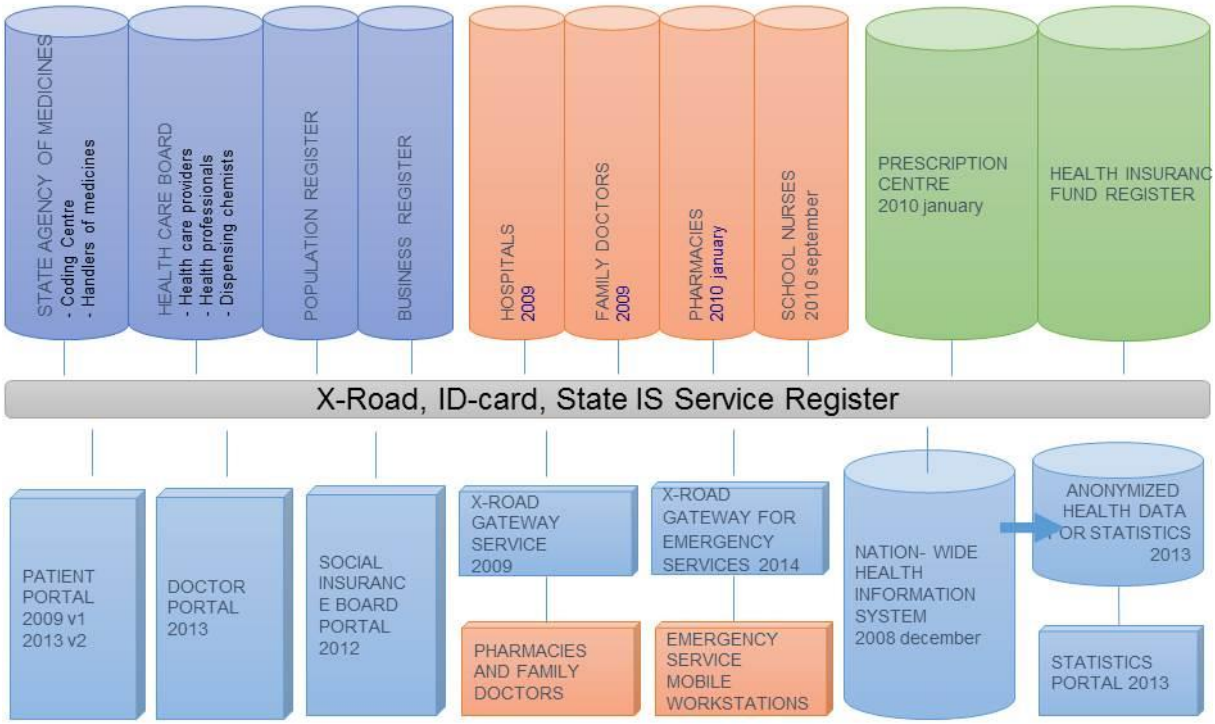

Figure 2: Architecture of Estonian Central Health Information System and Patient Portal[31]

4.1.2.4 Enablers of case

Political commitment

- The Data security guidelines of Estonian Data Protection Inspectorate (http://www.aki.ee/et/juhised) must be followed by all counterparts.

Legal provision

- All e-health classificators are regulated by a government act and published at the publishing centre https://pub.e-tervis.ee/ identified by the OID register.

Organisational Commitments and collaborative business processes

- Harmonised and agreed workflows, standards, classificatory and data models among the health professionals
- All health care providers have a contract with the TEHIK (former E-health Foundation, processor of the HIS)

Technical interoperability / technical enablers

- 5.4.8 X-Road: is used to provide the secure data exchange layer for confidential and legally binding data exchange.

[31] Source of figure are internal documents of the Estonian eHealth Foundation

- 5.6.1 Estonian Public Key Infrastructure and **eID** infrastructure needed. Citizen, Doctors and nurses can use for login **IDcard**, **mobileID** or **digiID**

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- The **unique personal identification code** provides an opportunity to merge personal data from different registers.
- The **unique company commercial registry code** provides an opportunity to merge business data from different registers.

Trust and transparency

- Persons can view their prescriptions, summary reports, test results (except images) and the details of their children, and they can also see who else has viewed their data in the systems; they can make their data accessible or inaccessible, issue expressions of will (regarding organ donations, powers of attorney) and order electronic medical certificates
- Central eHealth system meets very high security requirements for trust reasons (Baseline security system ISKE)

Citizen-centred Design

- According to personal ID-code, the central health information system is a patient-oriented system. The access to the central database is allowed only via the personal ID-card.

4.1.2.5 Crucial factors/ Lessons learned

According to the OOP vision (cf. D 1.1), this case significantly diminishes administrative burden from citizen and health system. As all document and information regarding to individuals and their health history is available, the quality of medical service and consequently level of citizen satisfaction will improve. Moreover, scientists can conduct research based on different linked databases, subject to a permission of the ethics committee.
In addition, there are some potential barriers regarding to this case including high level of cost for develop and standardisation of the system and furthermore, changing paradigms between global market, entrepreneurs, patient awareness, technological possibilities and insurance market – lack of clear vision (where to invest). Other challenges could be lack of organisational interoperability and stakeholders' motivation.
All existing data is taken from base registers. Case has good practice and prerequisites for the cross-border case.

4.1.3 Estonian Digital Prescription

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	EE	R	Seamless	Sustainable	2010

4.1.3.1 Summary of case

The Digital Prescription Centre in Estonia has been working since 2010. The Prescription Centre is a centralised database with necessary services and provides access for doctors and pharmacies. The Prescription Centre is linked to the Health Information System (EHR), Estonian Insurance Fund and different Health Care Providers via the X-Road. All digital prescriptions are collected in the Central Prescription Centre in Estonia. The main goal of the Centre is to make the access available to all prescriptions prescribed in Estonia so that medicine would be able to be bought from any pharmacy in Estonia. A doctor prescribes medicine in their information system for a patient (everybody in Estonia has their personal ID-code) and sends it to the Prescription Centre via the X-Road. When a person goes to the pharmacy, a pharmacist detects the person's identity card and sells the

medicine. When the medicine has been provided at a preferential rate, the person pays only a preferential price and the pharmacy will return the remaining amount of the price from the Estonian Insurance Fund on the bases of automatically generated reports. There is also a securely working solution available when buying medications to family members.

The Prescription Information Centre displays the data to patient's EHR Patient Portal where all prescriptions can be seen by a person him/herself. Also, the doctors can see the data if the patient has purchased the medicine. It is very important to doctors to see all currently ordinated prescriptions to the same patient for evaluating dangerous interactions.

All the prescriptions end up at the central database: 97% of prescriptions are digitally prescribed and paper-prescriptions are digitalized by the pharmacists.

URL:**https://www.eesti.ee/portaal/portaal.sisene?level=30&loc=%2Feng%2Fservices%2Fcitizen%2Ftervis_ja_tervisekaitse%2Fretseptid_1**

4.1.3.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Prescription Register (Health Insurance Foundation)	Government	X	X	X
Health Information System (TEHIK)	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Citizen as Patient (via www.eesti.ee or www.digilugu.ee)	Citizen	X		X
Address Data System	Government	X	X	
Pharmacists	Business		X	X
Health Care providers (GP, Hospital, Emergency service, Dentists, nurses)	Government/Business		X	X
Medicines Coding Centre – ATC code and Medicines (State Agency of Medicine)	Government	X	X	
Register of Handlers of medicines – Licences of Pharmacies and pharmacists (State Agency of Medicine)	Government	X	X	
Medical devices Registry (Health Care Board)	Government	X	X	
Health Insurance Status Register (Health Insurance Foundation)	Government	X	X	
Health care providers Register (Health care Board)	Government	X	X	
Health professionals Register (Health care Board)	Government	X	X	
HIS X-Road MISP – Portal for GP	Business	X	X	X
HIS X-Road MISP – Portal for Pharmacies	Business	X	X	X
HIS X-Road MISP – portal for Emergency Mobile Stations	Government	X	X	X
State Information Board (X-road, eID, Mobile-ID, ID-card, www.Eesti.ee)	Government	X	X	

4.1.3.3 Architecture of case

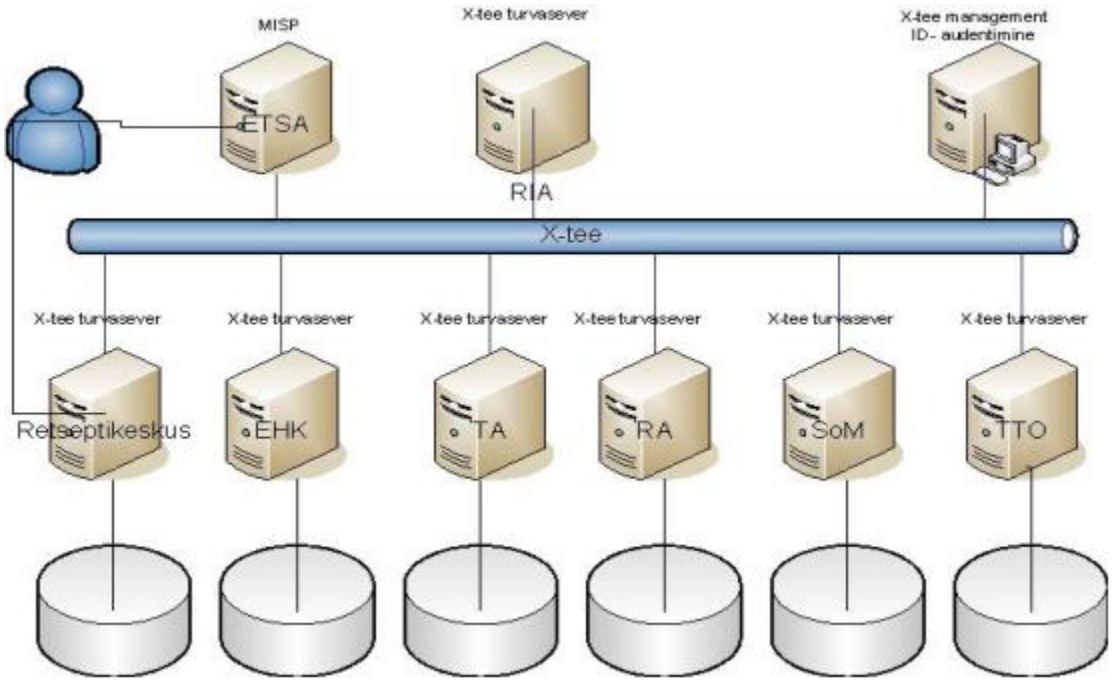

Figure 3: Architecture of Estonian Digital Prescription[32]

Scheme

Health Insurance Foundation Prescription Centre: Retseptikeskus (Prescription Centre), EHK (Health Insurance Fund), TA (Health care Board), RA (Medicine Agency), SoM (Ministry of Social Affairs), TTO (Health care Provider), ETSA (TEHIK, Health and wellness Infosystems centre), RIA (State Information Board and X-road)

4.1.3.4 Enablers of case

Legal provisions

- **Medicinal Products Act**[33].
- The Data security guidelines of **Estonian Data Protection Inspectorate**[34] must be followed by all counterparts.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure**:** is used to facilitate secure mechanism for citizen, doctors, pharmacists and nurses' login by using IDcard, mobileID or digiID.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- **The unique personal identification code** provides opportunity to merge personal data from different registers.

[32] Source of figure are internal documents of the Estonian eHealth Foundation

[33] https://www.riigiteataja.ee/en/eli/516052016002/consolide

[34] http://www.aki.ee/et/juhised

- **The unique company commercial registry code** provides opportunity to merge business data from different registers.

4.1.3.5 Crucial factors/ Lessons learned

This case enables patients to buy a prescription medicine from any pharmacy in Estonia for themselves or for their relatives as well. Each attending doctor is able to see whether a patient has bought the prescribed medicine or not.

Furthermore, a physical visit to the doctor is not required for issuing a recurrent prescription for chronic patients, as the attending doctor can simply renew the digital prescription. Also, attending doctors are able to see which prescriptions (both historical and current) a patient has from other doctors in order to assess pharmaceutical interactions. Moreover, by digital prescription, pharmacists enter lesser data into system, has easier invoicing and less illegible paper prescriptions. This case provides good statistics and an efficient tool for policy changes for state.

All existing data is taken from base registers. Case is good practice and potential for a cross-border case.

4.1.4 Estonian doctor-doctor-consultation

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	EE	FE	Opportunistic	Ad Hoc	2012

4.1.4.1 Summary of case

This is the doctor-doctor consultation (not the doctor-patient) by using digital form according specific standards depending on the doctors' area (cardiology, endocrinology, etc.). Generally, a general practitioner (GP), usually family doctor, consults other doctors (cardiology, urology, oncology, etc.). The GP sends a standardised epicrises and patient values with electronic ordination to a specialist who estimates the patient`s situation and decides on the priority of a specialist visit (very urgent, urgent, regular order or not needed). If there is a need to plan an urgent visit to a specialist, a reception time for the patient will be arranged. Often patients are directed to further examination as appropriate. There are also cases where a patient does not need to visit a specialist and the GP can manage him/herself with specialist recommendations. Eliminating pointless visits saves doctors' time.

4.1.4.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Health Information System services – e-consultation (TEHIK)	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Address Data System	Government	X	X	
Health Care providers (GP, Hospital, specialists)	Government/Business		X	X
Health Insurance Status Register (Health Insurance Foundation)	Government	X	X	
Health care providers Register (Health care Board)	Government	X	X	
Health professionals Register (Health care Board)	Government	X	X	
HIS X-Road MISP – Portal for GP	Business	X	X	X
State Information Board (X-road, eID, Mobile-ID, ID-card)	Government	X	X	

4.1.4.3 Architecture of case

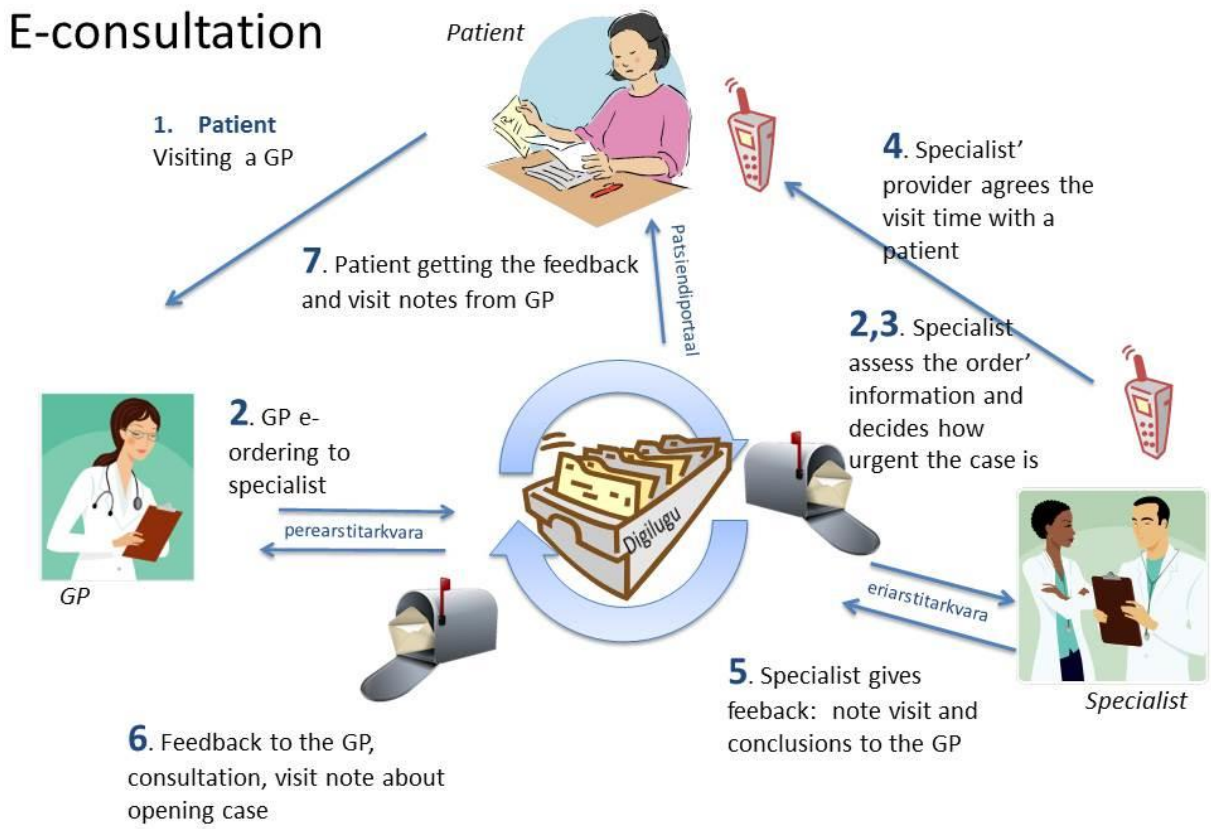

Figure 4: Architecture of Estonian doctor-doctor consultation[35]

4.1.4.4 Enablers of case

Legal provisions

- Data guidelines of **Estonian Data Protection Inspectorate**[36] must be followed.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road: is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.
- All participants must be implemented three-level IT baseline security system ISKE (https://www.ria.ee/en/iske-en.html). The goal of implementing ISKE is to ensure a security level sufficient for the data processed in IT systems. The necessary security level achieved by implementing the standard organisational, infrastructural/physical and technical security measures.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

[35] Source of figure are internal documents of the Estonian eHealth Foundation

36 http://www.aki.ee/et/juhised

- Agreed standards requirements, data models and working flows among GP and specialists (dermatologists, cardiologists, gynaecologists, urologists and other different specialities).

4.1.4.5 Crucial factors/ Lessons Learned

This service provides possibility of electronic consultation between a family doctor and a specialist doctor to reduce the number of duplicate visits. Moreover, in critical cases this case decreases the waiting time considerably. In addition, according to agreed requirements and analyses by GPs, it helps to increase the quality and outcomes of the specialist' visit.

This case implements some OOP elements but it is not applicable cross-border.

4.1.5 Estonian e-Ambulance and time-critical health data

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	EE	FE	Seamless	Opportunistic	2015

4.1.5.1 Summary of case

In emergencies (ambulance or emergency service), it is very helpful to have quick background information for patient review, especially if the patient often is unconscious. When a person is identified (personal ID – code is identified), time-critical data (allergies, past acute submissions and visits, the main diagnoses, major surgeries, medications, etc.) can be quickly served from the Central database. The time–critical data includes allergies, last visits, the main diagnoses, major surgeries, medications, etc. The speed and quality of this service depends on the integrated solutions of the specific health care provider's system.

4.1.5.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Health Information System services – time-critical data and e-Ambulance (TEHIK)	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Health Care providers (Emergency service, GP, Hospitals, Dentists)	Government/Business	X	X	X
Health Insurance Status Register (Health Insurance Foundation)	Government	X	X	
Health care providers Register (Health care Board)	Government	X	X	
Health professionals Register (Health care Board)	Government	X	X	
HIS X-Road MISP – portal for Emergency Mobile Stations	Government	X	X	X
State Information Board (X-road, eID, Mobile-ID, ID-card)	Government	X	X	

4.1.5.3 Architecture of case

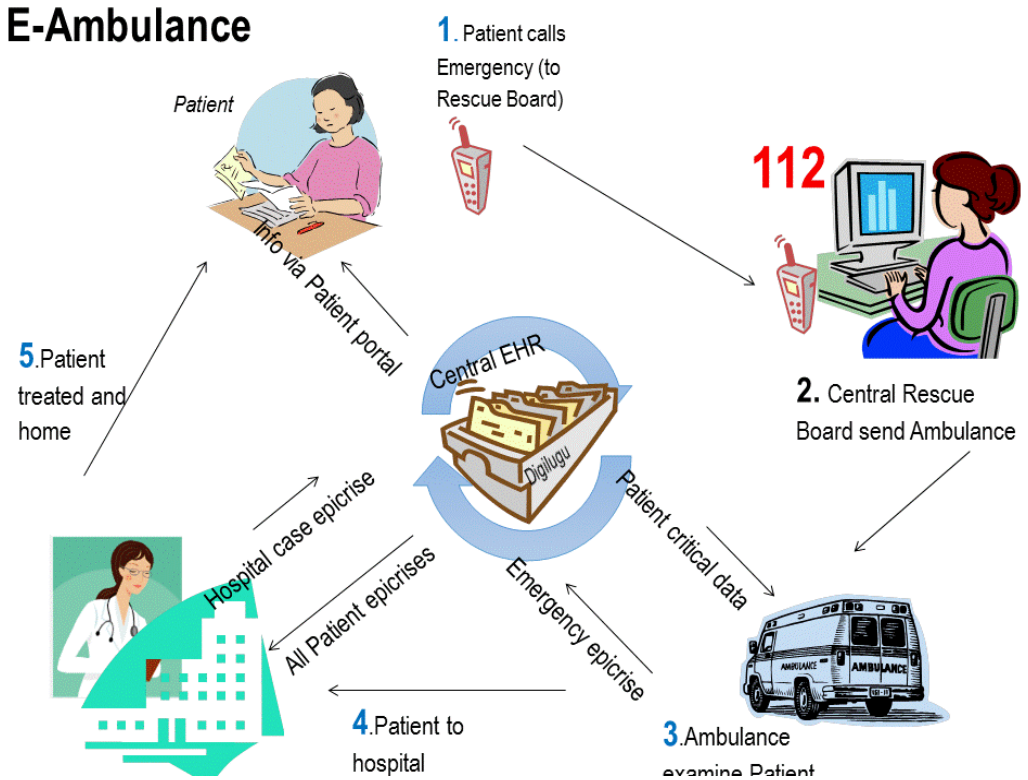

Figure 5: Architecture of Estonian e-Ambulance[37]

4.1.5.4 Enablers of case

Organisational commitments and collaborative business processes

- Good cooperation with rescue administration, police and the Ministries of Interior and Communication and Economy
- Optimised workflows

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road: is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.
- Wireless secure access to the data from anywhere, as a technical enabler used for this case

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

Motivators, benefits, and public values

- Data reuse

[37] Source of figure are internal documents of the Estonian eHealth Foundation

4.1.5.5 Crucial factors/ Lessons learned

This service provides a brief general overview of patient's critical data without any tests in emergency situations. The collected data can be used already in the ambulance care on the way to the patient when the ID code is detected via the rescue desk. Moreover, patient historical and current data could be reused directly by the ambulance record and sent to the hospital if needed.

All existing data is taken from base registers. The case has good practice and potential for a cross-border case.

4.1.6 Estonian Medical Certificate

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	EE	R	Opportunistic	Ad Hoc	2014

4.1.6.1 Summary of case

Every person needs to have a valid medical certificate for the period of his or her driving license. Generally, the family doctor up to maximum 10 years issues the medical certificate. When a medical certificate expires or the next medical falls due, a new medical certificate must be submitted to the Road Administration. The validity of a medical certificate can be checked via the e-services to the Road Administration.

Since 1 April 2015 doctors have only been issuing e-medical certificates (only in special cases on paper – for instance in the event of a system malfunction at the doctor's surgery, whereby the doctor must digitalise it later). In order to obtain an e-medical certificate, you must fill in a medical declaration online at the National Health Information system regarding your health and then make an appointment with a doctor. Once issued, an e-medical certificate is automatically transmitted to the motor registry. There is no need to come in personally to the Road Administration to submit your medical certificate**.**

URL: **www.digilugu.ee**

4.1.6.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Health Information System services - certificates (TEHIK)	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Citizens needing medical certificates	Citizen	X	X	X
Health Care providers (GP, Hospital, Emergency service, Dentists IS)	Government/Business	X	X	X
Health care providers Register (Health care Board)	Government	X	X	
Health professionals Register (Health care Board)	Government	X	X	
HIS X-Road MISP – Portal for GP	Business	X	X	X
Patient Portal	Citizen	X	X	X
Road Administration Board	Government			X
State Information Board (X-road, eID, Mobile-ID, ID-card)	Government	X	X	

4.1.6.3 Architecture of case

Figure 6 provides an overview of the overall architecture. See also 4.1.2.3 Estonian Central Health Information System and Patient Portal architecture and workflow.

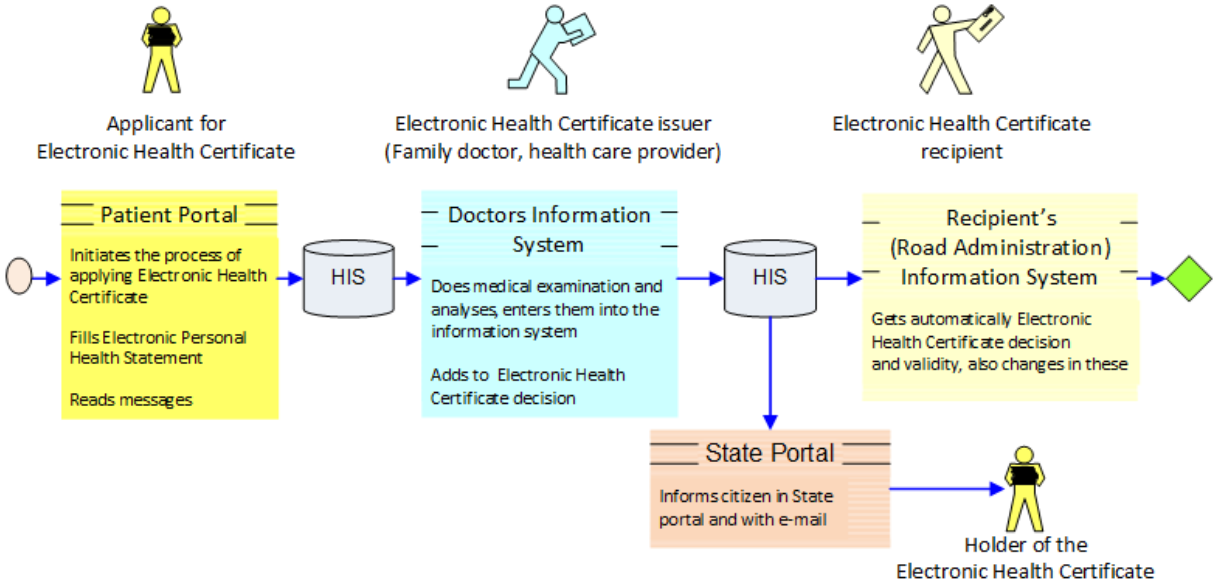

Figure 6: Architecture of Estonian Medical Certificate[38]

4.1.6.4 Enablers of case

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

4.1.6.5 Crucial factors/ Lessons learned

This service facilitates the reuse of already collected data to develop various new services. It can decrease the number of GP visits as well. Moreover, these e-Certificates are available for the Road Administration as well as police. This case implements some OOP elements. It is not applicable cross-border.

4.1.7 Estonian Medical Digital Image Bank

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	EE	R	Sustainable	Essential	2005

4.1.7.1 Summary of case

The Estonian Medical Digital Images data repository was established in 2005. The Medical Digital Images Bank is integrated with the Estonian Health Information System. This central database stores all (90%) the radiological images and films (MRT, CT, EKG, X-ray etc.). The images bank is integrated to the Health Care Providers

[38] Source of figure are internal documents of the Estonian eHealth Foundation

systems via secure channel VPN. Every radiologist and physician can have access to their patients` images by using ID cards. Thus, this system gives the possibility to have the overview and dynamics during a longer period of the patient's history and to compare developments. It also gives the possibility to have a second opinion without making new images (and radiation). Consequently, the doctors can consult each other without additional research and patient movement. The system is a very good tool for distance consultation in Estonia.

The database gives the possibility for each image to have a radiologist's prescribed answer about findings (nearly 40% has radiologists' prescriptions). The same data can also be viewed by the physician or other doctors (via VPN or HIS MISP portal) who have ordinated the patients to have a radiology examination. As the health care provider systems are integrated to the Image Bank, a radiologist has access to the Bank from every secure system and can give answers about the images. If necessary, you can also ask for the second opinion of the same image. This allows radiologists to give answers about the images even outside of Estonia or in any particular medical institution. It allows radiologists to use resources flexibly in smaller hospitals and regions. Digital Images Repository meets international standards as DICOM and HL7.

URL: **http://www.e-tervis.ee/index.php/en/health-information-system/services**

4.1.7.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Medical Digital Images Bank (PACS Repository)	Business/Governmental	X	X	X
Health Information System (TEHIK)	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Citizen	Citizen	X		
Health Care providers (GP, Hospital, Dentists)	Government/Business	X	X	X
Health care providers Register (Health care Board)	Government	X	X	
Health professionals Register (Health care Board)	Government	X	X	
HIS X-Road MISP – Portal for GP	Business	X	X	X
State Information Board (eID, Mobile-ID, ID-card)	Government	X	X	

4.1.7.3 Architecture of case

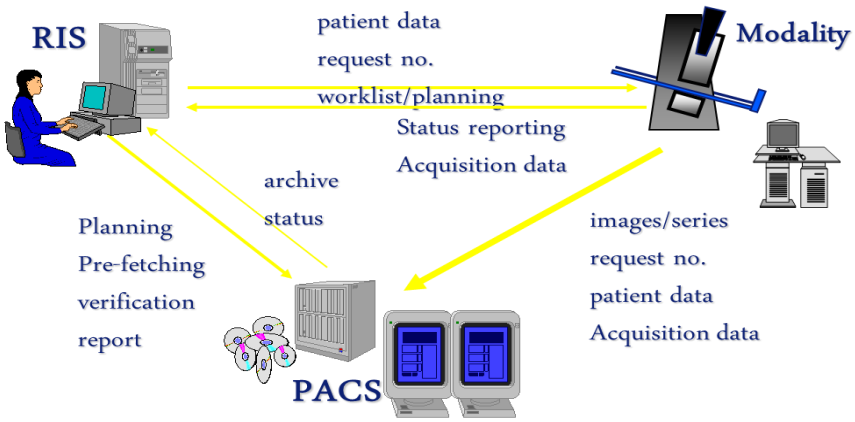

Figure 7: Architecture of Estonian Medical Digital Image Bank [39]

Hospital Information system (RIS and Modality) archiving the images at the Repository (PACS). Doctors have access to the Repository via VPN or via Central Information System Doctors portal. Patients do not have access.

4.1.7.4 Enablers of case

Technical interoperability/ Technical enablers

- **ISKE**, **VPN** and **encrypted data**: are used for secure data exchange
- 5.6.1 Estonian Public Key Infrastructure: facilitates secure digital authentication **by ID card**.

Semantic interoperability

- Used international standards like DICOM[40] and HL7[41] (because of medical devices)

4.1.7.5 Crucial factors/ Lessons learned

By this case, each attending doctor is able to see whether ordered test results are in, even if another provider made the tests. This would lead to decrease number of duplicate testes for same case. It also facilitates the distance consultation without patient movement. Furthermore, radiologists in different geographic locations can make comments on radiological images in the central repository or test results in the HIS, using a secure channel (VPN). In addition, good cooperation and centralised repository provides a commercial effect (competent, hardware, logistics, services, costs).

All existing data is taken from base registers. The case has good practice and potential as a cross-border case.

4.1.8 Slovenian e-Health (eZdravje)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Health	SI	FE	Essential	Ad Hoc	2005

[39] Source of figure are internal documents of the Estonian eHealth Foundation

[40] http://dicom.nema.org/

[41] http://www.hl7.org/implement/standards/

4.1.8.1 Summary of case

The Slovenian eZdravje (eHealth) project was started in 2005. It aims to integrate existing fragmented Health Information Systems into a complete solution that benefits all stakeholders. The main objectives of the eHealth project are to enable high-quality and professional working practices with patients and make available relevant and reliable economic, administrative and medical data, which facilitates better planning, control and management of individual healthcare organisations as well as the national healthcare system in general.

URL: http://www.ezdrav.si/

1.1.1.1. Case actors

Actor name	Actor category	Owner	Provider	Consumer
Federal Ministry of Health	Government	X		X
National Health Informatics Council	Government			X
Health Informatics Standards Board	Government			X
Citizens	Citizen	X	X	

4.1.8.2 Architecture of case

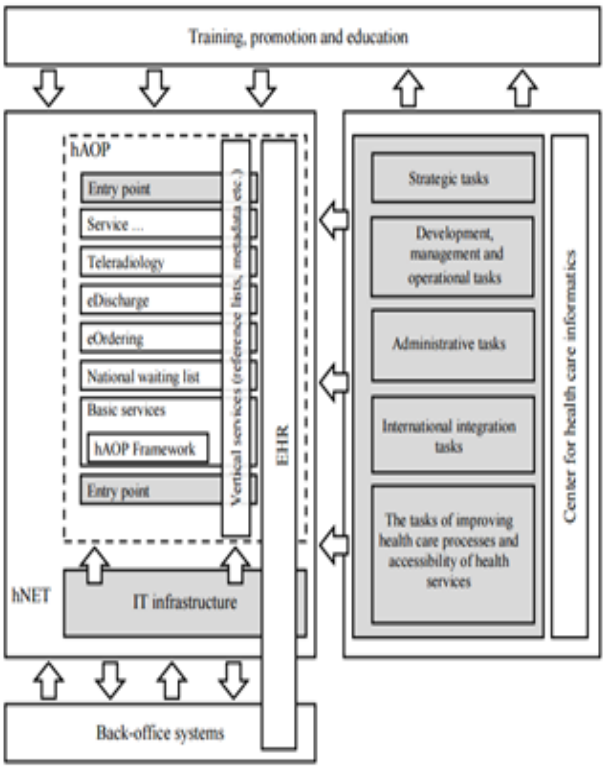

Figure 1: Planned infrastructure of eHealth in Slovenia

Figure 8: Architecture of Slovenian eZdravje (provided by the case owner)

4.1.8.3 Crucial factors/ Lessons learned

One objective of this System is to increase the active role and responsibilities of citizens for their healthcare. Moreover, eHealth improves access to all necessary information and ability of citizens to participate in the development of qualitative healthcare services. In addition, this case facilitates secure and reliable access to all key patient information and other data sets for all healthcare providers, GPs, specialists, pharmacists.

eHealth enables easier planning and management within health organisations or healthcare sector as a whole on the grounds of qualitative and authentic economic, administrative and clinical data. Finally, this system improved access to healthcare services for groups of people, which are usually excluded due to their reduced abilities, age or any other reason.

4.2 Education

4.2.1 Estonian Education Information System (EHIS)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Education	EE	R	Sustainable	Sustainable	2005

4.2.1.1 Summary of case

The Estonian Education Information System is a state register, which unites the databases of the education system into one entity. EHIS creates the possibility for everyone to inspect the performance indicators of preschool childcare institutions, basic schools, upper secondary schools and vocational educational institutions. EHIS is intended for persons acquiring general, vocational, higher or hobby education, as well as teachers and academic staff working at the same level.
URL: http://www.ehis.ee/

4.2.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
EHIS	Government	X	X	X
Citizens (personal data or statistics)	Citizens		X	X
Register of Professions	Government	X	X	
Population Register	Government	X	X	
Examination Information System	Government	X	X	
Address Data System	Government	X	X	
Register of taxable persons	Government	X	X	
Punishment Records Register	Government	X	X	
Register of Business	Government	X	X	
Population Register	Government	X	X	
Public Administrations and other officials	All			X

4.2.1.3 Architecture of case

EHIS consists of six interrelated sub-registers:
1) sub-register of documents certifying education;
2) sub-register of teachers and teaching staff;
3) sub-register of pupils, students and resident physicians;
4) sub-register of educational institutions;
5) sub-register of curricula and education licences;
6) sub-register of educational literature.
EHIS is maintained as a one-level technological database. To keep the register, automated data analysis is used and the register is being preserved digitally.

Either the resident will log in by using an eID or there is a possibility to access publicly available data without identifying yourself.

Linking registers to this information system are:

1. Register of Professions
2. Population Register
3. Examination Information System
4. Address Data System
5. Register of taxable persons
6. Punishment Records Register

4.2.1.4 Enablers of case

Legal provisions

- Republic of Estonia Education Act RT 1992, 12, 192[42]
- Vocational Educational Institutions Act RT I 1998, 64/65, 1007[43]
- Institutions of Professional Higher Education Act RT I 1998, 61, 980[44]
- Private Schools Act RT I 1998, 57, 859[45]
- Universities Act RT I 1995, 12, 119[46]
- Study Allowances and Study Loans Act RT I 2003, 58, 387[47]
- State Family Benefits Act RT I 2001, 95, 587[48]
- Military Service Act RT I, 10.07.2012, 1[49]
- Preschool Child Care Institutions Act RT I 1999, 27, 387[50]
- State Pension Insurance Act RT I 2001, 100, 648[51]
- EHIS Establishment and Statutes RTI, 12.08.2004, 61, 434[52]

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.
- All participants must implement three-level IT baseline security system **ISKE**.

Semantic interoperability enabler

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

[42] https://www.riigiteataja.ee/en/eli/ee/526082014004/consolide/current
[43] https://www.riigiteataja.ee/akt/130122015025?leiaKehtiv
[44] https://www.riigiteataja.ee/akt/13277158?leiaKehtiv
[45] https://www.riigiteataja.ee/akt/13340306?leiaKehtiv
[46] https://www.riigiteataja.ee/akt/13224418?leiaKehtiv
[47] https://www.riigiteataja.ee/akt/13224397?leiaKehtiv
[48] https://www.riigiteataja.ee/akt/13190867?leiaKehtiv
[49] https://www.riigiteataja.ee/akt/109032016004?leiaKehtiv
[50] https://www.riigiteataja.ee/akt/13336294?leiaKehtiv
[51] https://www.riigiteataja.ee/akt/13335615?leiaKehtiv
[52] https://www.riigiteataja.ee/akt/119022013004?leiaKehtiv

4.2.1.5 Crucial factors/ Lessons learned

The Estonian education information system provides reliable information on the level of education of inhabitants. Moreover, it facilitates reliable repository instead of paper documents. In addition, it provides an overview of the quality of education system in the Estonia.

This case implements good OOP and cross-border elements.

4.2.2 Estonian Register of Professions

Domain	Country	Type	Maturity	Cross-border maturity	Started
Register of Professions	EE	R	Essential	Ad Hoc	2001

4.2.2.1 Summary of case

The register of occupational qualifications systems is a state register, which contains information on sector skills' councils, competence based occupational qualification standards, occupational qualifications and their levels, occupational qualification certificates, the procedures for awarding occupational qualifications, and awarding bodies. The Estonian Register of Professions gives the data about occupational qualification standards, occupational qualification certificates, catalogue of occupational qualifications.

URL: http://www.kutsekoda.ee/en/kutsesysteem

4.2.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Register of Professions (The Ministry of Education and Research)	Government	X	X	X
Population Register (database of citizens ID number and name; authentication of register users with ID-Card)	Government	X	X	
Estonian National Geoportal (addresses of awarding bodies)	Government	X	X	
www.eesti.ee citizen view (all personal professional certificates, incl. expired)	Government	X	X	X
Estonian Sports Register (Licence to provide service)	Government	X	X	X
Register of Economic Activities (Licence to practice)	Government	X	X	X
Estonian Unemployment Insurance Fund (Professional qualification of training provider and trainee)	Government	X	X	X
Statistics Estonia (Rate of qualified population)	Government	X	X	X
Estonian Environment Information Centre (Licence to practice)	Government	X	X	X
Punishment Register (Professional qualification of trainee)	Government	X	X	X
Estonian Education Information System (Professional qualification of VET teacher; Professional standards)	Government	X	X	X
Estonian Agricultural Registers and Information Board (Qualification of service provider or support applicant)	Government	X	X	X
Estonian Rescue Board (Licence to provide service)	Government	X	X	X

Actor name	Actor category	Owner	Provider	Consumer
Citizens (personal data or statistics)	Citizens			X
Public administrations officers (statistics and access if legally allowed)	Government			X

4.2.2.3 Architecture of case

Structure of the Register:

- sub-register of Professional Councils
- sub-register of Awarding Bodies
- sub-register of Professional Standards,
- sub-register of Professional Certificates (and Professional Certificate Supplement)

For example: The register of Professional Standards is an online database with pre-insertion application; automatic termination of disclosure and reports are renewed every night. The Estonian Education Information System uses X-road service for validating and presenting the connection between curricula and professional standards (curricula must be based on professional standards).

4.2.2.4 Enablers of case

Legal provisions

- Professions Act, RT I[53].

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

4.2.2.5 Crucial factors/ Lessons learned

Estonian register of professions provides trustful information for different users including: Estonian qualifications authority, awarding bodies, professional certificate owners, ministries, offices, boards, schools, procurement organisations and applicants.

Case implements good OOP elements.

4.2.3 Estonian Online Application Portal (SisseAstumise InfoSüsteem - SAIS)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Education	EE	R	Seamless	Sustainable	2006

4.2.3.1 Summary of case

SisseAstumise InfoSüsteem (SAIS) provides a Common Admissions Information Portal that enables Estonian school leavers to submit electronic applications to participating universities and colleges securely over the

[53] https://www.riigiteataja.ee/en/eli/501072015005/consolide

Internet. They can log-on to the system through the country's Citizen portal using their Estonian national ID-card or through one of the Estonian internet banks, so the identity of everyone who uses SAIS is fully verified. However, students also have the opportunity to submit admission applications on paper if they want to. In addition, SAIS is connected to educational databases in other countries, so it is not necessary to provide evidence of previous educational achievements, examination grades, or higher education qualifications if that data is already recorded elsewhere. However, even if such data does not yet exist electronically, SAIS can issue a request to the relevant school to corroborate any missing or unverified information, and once this data is confirmed and entered in SAIS it can then be used to support any additional student applications.

URL: **https://www.sais.ee/**

4.2.3.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Applicants (all universities)	Citizen	x	x	x
Official of Universities	Government	x	x	x
The Information Technology Foundation for Education (HITSA)	Government	x		
Estonian Education Information System (EHIS)	Government		x	
Population register (RR)	Government		x	
Examination Information System (EIS)	Government		x	
ÕIS (The study information system in universities and colleges)	Government			x
VVIS (System for applicants from abroad)	Government			x
Ministry of Education	Government			x
Universities (all universities)	Government/Business			x

4.2.3.3 Architecture of case

As shown in Figure 9, the reception staff and the candidate will initiate data collection. The system will regularly update semantic assets via the secure data exchange system X-road. Data will be collected through the X-Road services and the declarations made by candidates. The data for the candidate are collected from the Estonian Education Information System (EHIS), from population registry (RR) and from the Examination Information System (EIS). If the data in the registers does not exist, the employee receiving paper documents shall submit these.

Legend of elements in the figure:

EHIS - Estonian Education Information System (Master data about education)

Rahvastikuregister (RR) – Population register (Master data about applicant)

EIS - Examination Information System (Master data of applicant exam results, needed for competition)

X-tee turvaserver – Security server for secure data Exchange

SAIS – Front End System for submitting and processing applicant's data

PostgreSQL – SAIS database

ÕIS – The study information system in universities and colleges

VVIS- System for applicants from abroad

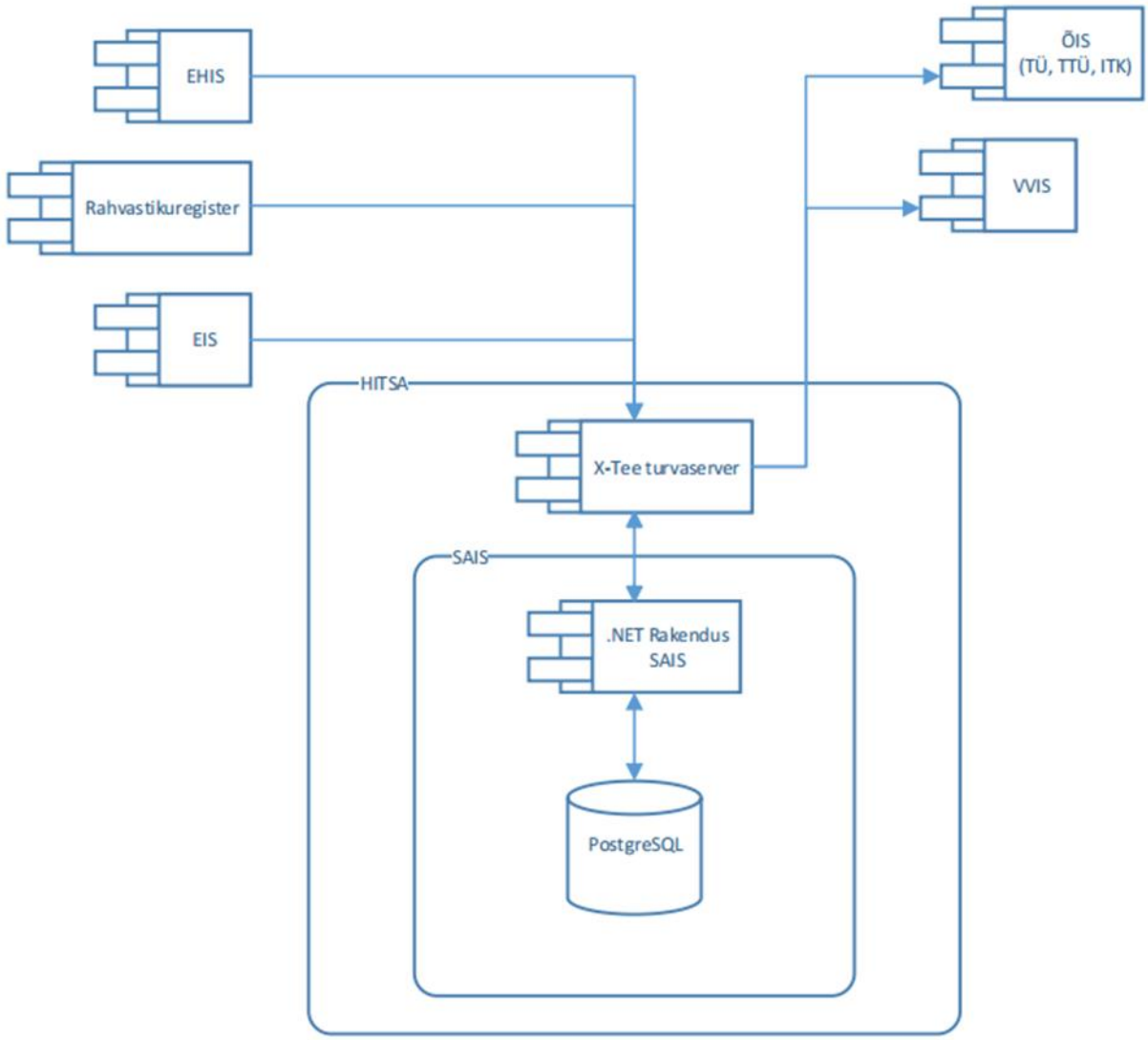

Figure 9: Architecture of Estonian Online Application Portal[54]

4.2.3.4 Enablers of case

Legal provisions

- Professions Act, RT I[55].
- The Estonian Data Protection Inspectorate must be followed as a data guideline.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.

[54] Source of figure are internal documents of Estonian Information Technology Foundation for Education

[55] https://www.riigiteataja.ee/en/eli/501072015005/consolide

- All participants must implement three-level IT baseline security system **ISKE**.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- All registers must be linked by use of commonly accepted keys: **personal code for citizens**, **code of institution**, standardised address presentation.

4.2.3.5 Crucial factors/ Lessons learned

SAIS reduces operational costs – the cost of managing student applications has decreased significantly through the simplification of processes and electronic sharing of data with students and other educational organisations.

On the other hand, this portal increases productivity – has accelerated administrative tasks, saving time and human resources and freeing up university workers for other activities.

Furthermore, student candidates no longer need to submit individual applications or travel to each university and they receive much faster decisions, which causes higher satisfaction of service for students. Moreover, this case provides a secure and scalable platform to support future educational needs.

Since 2009 SAIS is widely used throughout Estonia and most of its higher education, schools have joined the system.

Case implements strong once-only principle elements and has good potential for cross-border.

4.2.4 Irish Central Application Office

Domain	Country	Type	Maturity	Cross-border maturity	Started
Education	IE	FE	Essential	Ad Hoc	1976

4.2.4.1 Summary of case

Online application system, including submission and payment of application fees, confirmation and offers. Higher education institutions have delegated the task of centrally processing applications of their first-year undergraduate courses to the Central Application Office (CAO). The participating institutions retain the function of making decisions on admissions. This service reduces the administrative burden on citizen by providing a central application process instead of several direct applications to different universities and colleges.

The CAO will develop its ICT and system usability to enhance interaction between both the CAO and applicants, and the CAO and admissions officers. At the moment, sending and receiving documents by post service between CAO and applicants is acceptable as well. CAO will communicate with applicants via post and email, and in some instances telephone and SMS text message, at various intervals throughout the application process. Furthermore, some Higher Education Institutes will also contact applicants directly by post, email or SMS text message.

URL: http://www.cao.ie/index.php

4.2.4.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Potential Students	Citizen		X	X
Universities	Government/ Business			X
Colleges	Government/ Business			X
Irish Higher Education Institutions (HEIs)	Government/ Business		X	
Central Application Office	NGO	X		

4.2.4.3 Enablers of case

Political commitments

- **Data Protection Strategy 2014 - 2016**[56], The mission of the strategy is to protect the individual's right to data privacy by enabling people to know, and to exercise control over, how their personal information is used.
- **Data-Sharing and Governance**[57]**,** In October 2013, the Department of Public Expenditure and Reform brought a 'Memorandum to Government', setting out a series of actions to improve data-sharing in the public service. Chief among these was the development of the Heads of a Data-Sharing and Governance Bill.

Legal provisions

- **Data Protection (Amendment) Act (2003)**[58]**,** The Data Protection Act of 1988 was amended in 2003 to ensure full compliance with the EU Data Protection Directive (95/46/EC).The aim of the Directive is to establish common standards of data protection across Member States in order to protect personal privacy and to ensure the smooth operation of the internal market, while ensuring adequate levels of data protection in countries outside the European Economic Area to facilitate and encourage international trade.

4.2.4.4 Crucial factors/ Lessons learned

The CAO represents an excellent example of shared service provision within higher education and has gained a high level of credibility nationally and internationally for its effectiveness and efficiency and for the objectivity and transparency it provides to the admissions processes, in addition to ensuring the provision of a dependable, robust and secure application processing service. Moreover, applicants in CAO benefit greatly from having a one-stop-shop where they can choose from a multitude of courses, offered at various levels, both on a full-time and part-time basis.

This case implements some OOP elements.

4.2.5 Netherland's Studielink project

Domain	Country	Type	Maturity	Cross-border maturity	Started
Education	NL	R	Sustainable	Sustainable	2013

4.2.5.1 Summary of case

Studielink is the common registration and enrolment application for all non-private institutions of higher education in the Netherlands. Studielink arranges the exchange of information between the current or prospective students and the higher educational institution. Applicants can use Studielink to submit a digital enrolment application to an educational institution. Students can enter and check information, which they can then access, and use whenever they need it. This also applies for all bodies involved in the enrolment process, including universities of applied sciences, universities and DUO (Dients Uitovering Onderwijs - Education Executive Agency/Ministry of Education).

Studielink is linked directly to authentic sources, such as the municipal personal records database (GBA), which includes personal data, and the IB-Groep's General Register for Student Numbers (including exam data). The result is a significant reduction in the paper-based bureaucracy for students and institutions. It also enables an increase in the quality of information sharing: since the information need only be entered and checked once,

[56] https://www.dataprotection.ie/docimages/1%20Strategy%20Statement%202014%20-%202016.pdf

[57] https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/eGovernemnt_in_Ireland_March_2017_v2_00.pdf

[58] https://www.dataprotection.ie/documents/legal/act2003.pdf

there is less chance of error than if several bodies enter and check the same information individually. As the staff members of the universities requested the implementation themselves, so they were eager to accept it.
URL: http://www.Studielink.nl

4.2.5.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Dienst Uitvoering Onderwijs (Ministry of Education)	Government	X	X	X
Higher Education Institutions (HEIs)	Government	X	X	X
Applicants	Citizen	X	X	X
Educational organisations	Government	X	X	X

4.2.5.3 Architecture of case

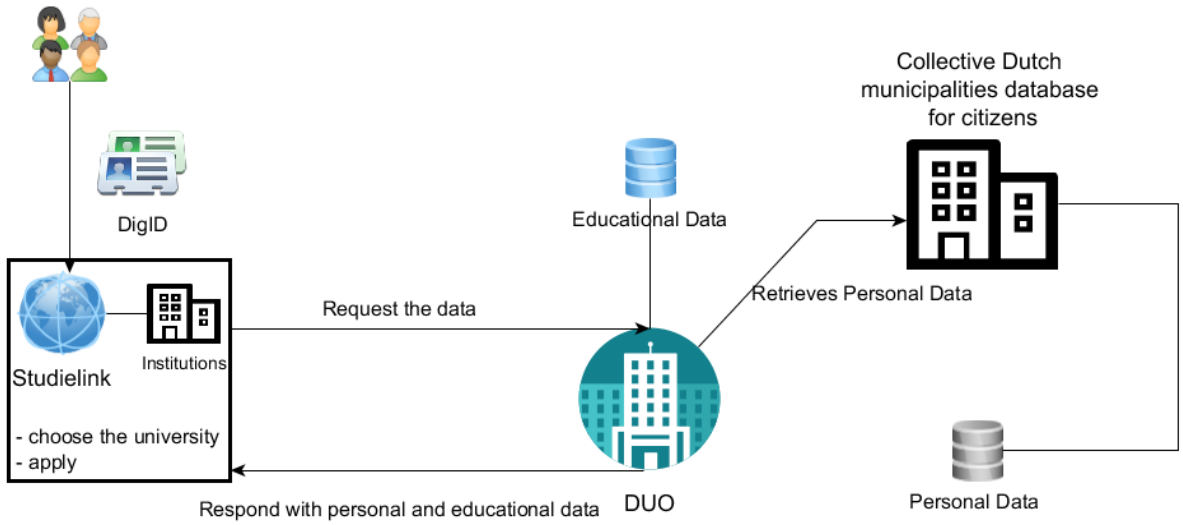

Figure 10: Architecture of Studielink[59]

Students are identified and logged on to the Studielink by using electronic identification service, DigiD. Then students have the possibility to choose their higher education institute and study course. Meanwhile, Studielink requests DUO for personal and educational data. DUO retrieves educational data and sends personal and educational data to Studielink. After student's request for enrolment at specific higher education institute, Studielink request DUO for the amount of student fee and DUO will respond to it.

In a next step, Studielink sends the enrolment request plus personal and educational data and the amount of student fee to the higher education institute and will receive response from higher education institute with the request for student payment.

4.2.5.4 Enablers of case

Political commitments

- In accordance with the **Higher Education Act**[60], educational institutions are required to verify the student's identity.

[59] Figure bases on interviews with responsible from the Dutch Ministry of Education

Legal provisions

- At the request of the higher education institutes, the Ministry of Education added Studielink to the Law on higher education. Before that year, students had to type in the diploma data at the Studielink website and then give permission to Studielink to have the data checked by DUO. That old process was particularly prone to error. Many students forgot to give the permission or made mistakes in typing their diploma data.
- It has been laid down in a contract between Studielink Foundation, the institutions for Higher Education and DUO that Studielink is the processor of the personal data within the meaning of **the Personal Data Protection Act**[61]**.**

4.2.5.5 Crucial factors/ Lessons learned

Studielink has been created for and by higher education itself (initially only for those institutions of higher education that are financed by the Dutch government). Studielink provides institutions of higher education, educational umbrella organisations Mi VSNU (Association of Dutch Universities) and the Netherlands Association of Universities of Applied Science and DUO – with a platform for cooperation and innovation in higher education in terms of Student & Education information and administration. This service removes administrative burden from both students and higher education institutes. Direct link of Studielink to authentic source increased quality of data sharing and decrease the occurrences of error. This also simplifies the process of enrolment for student, which leads to higher satisfaction.

4.2.6 Spanish Interoperability node of the Spanish University System

Domain	Country	Type	Maturity	Cross-border maturity	Started
Education	ES	FE	Essential	Essential	2017

4.2.6.1 Summary of case

The Conference of Principals of Spanish Universities (CRUE), with the collaboration of RedIRIS (the Spanish academic and research network) and MINHAFP (Ministry of Finance and Public Administration of the national government), have launched the Interoperability Node of the Spanish University System (NISUE).

NISUE has been developed for the electronic interchange of academic data among Spanish universities as well as between national and European organisations that use academic data in order to provide better electronic services. Thus, NISUE aims to become the single point for the exchange of information between universities themselves as well as between universities and other agencies or institutions.

NISUE cooperates with other information systems such as STORK 2[62], among others.

URL: https://administracionelectronica.gob.es/ctt/nisue/infoadicional?idioma=en#.WUfFoYVOIcB

4.2.6.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
The Conference of Principals of Spanish Universities (CRUE)	Government	X	X	X
RedIRIS (the spanish academic and research network)	Government	X	X	X

[60] http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=&p_isn=69514&p_country=NLD&p_count=2273&p_classification=09&p_classcount=29

[61] https://www.privacy.nl/uploads/guide_for_controller_ministry_justice.pdf

[62] https://www.eid-stork2.eu/

Actor name	Actor category	Owner	Provider	Consumer
MINHAP (Ministry of Finance and Public Administration of the national government)	Government	X	X	X
• Teachers	Academics		X	X
• Students	Citizen		X	X

4.2.6.3 Architecture of case

The introduction of the Node of interoperability aims mainly the following objectives:

- Facilitating data exchanges between universities and between other organisations.
- The integration with RedSARA (SARA network) and the interconnection with the platform of MINHAP (Ministry of Finance and Public Administration of the national government).
- Facilitating the implementation of the National Scheme of Interoperability (ENI) for universities.

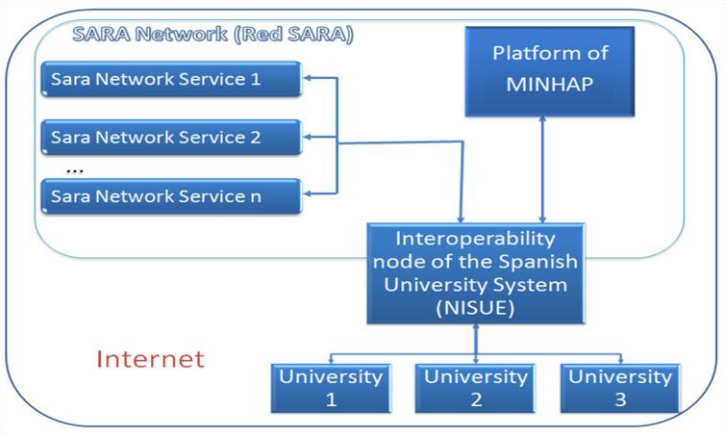

Figure 11: Architecture of Interoperability node of the Spanish University System

4.2.7 United Kingdom Universities and Colleges Admissions System (UCAS)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Education	UK	R	Sustainable	Opportunistic	1961

4.2.7.1 Summary of case

In order to apply to university, students must submit a single application via Universities and Colleges Admissions System (UCAS) online Apply service. Candidate students can apply for up to five university courses by single online application.

URL: https://www.ucas.com/

4.2.7.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
UCAS	NGO	X		
Applicants	Citizens		X	X
Private Universities	Business		X	X

Actor name	Actor category	Owner	Provider	Consumer
Public Universities	Government		X	X

4.2.7.3 Architecture of case

Citizens should apply online in UCAS website.

The web-link is a web-based service used to manage data and institution requirements and contacts. It can be used stand-alone or with any of the other online data transfer services. Providers who do not have any other online methods must use it for updating applications data.

4.2.7.4 Enablers of case

Legal provisions

- **Freedom of Information[63]:**
  - UCAS is a charity, not a government body. The Freedom of Information Act does not apply to UCAS in the way it does to almost all public authorities. It is subject to Freedom of Information from 1 November 2011, but only in relation to some of its functions. These are set out in The Freedom of Information (Designation as Public Authorities) Order 2011. These functions are the provision and maintenance of a central applications and admissions service in relation to:
    - an institution listed in paragraphs 53(1)(a) to (e) and 55(1)(a) and (b) of Part 4 of Schedule 1 to the Freedom of Information Act 2000.
    - an institution listed in Part 5 of Schedule 1 to the Freedom of Information (Scotland) Act 2002.
    - the College of Agriculture, Food and Rural Enterprise.
  - UCAS uses personal information and share it with its partners such as universities in secure manner. This includes maintaining Information Security standards in line with the international standard ISO 27001:2013.
  - In addition, UCAS makes sure that third parties, who use this personal information, are committed to keep them safe and secure. Thought some of services and suppliers of UCAS are based outside of the EU (EEA), they always make sure that all personal information which are handled either inside or outside of EU in a safe manner are consistent with the requirements of the PDA. Under the PDA students have right to ask UCAS for a copy of their information or request to edit, delete or stop the use of their personal information.
  - UCAS provides outstanding data and analysis that are free to use by universities and the government.

4.2.7.5 Crucial factors/ Lessons learned

To support applying students UCAS publishes a growing portfolio of information and advice about needed qualification and subject choices on their website, alongside with information about learning and career opportunities, and specific content for mature learners, care leavers and disabled students.

Moreover, UCAS aims to make sure admission processes minimise any barriers of applying students from less represented groups, and support the efforts of universities and colleges to broaden their intake. For example: it offers a contextual data service, offers an analytical service (STROBE) which enables organisations to evaluate effectiveness of activities intended to widen participation, publishes analysis and insights about progress of closing gaps in applications, releases offers and acceptances between different groups and the UCAS Tariff now includes Access to HE qualifications.

UCAS implements some OOP elements.

[63] http://www.legislation.gov.uk/uksi/2011/2598/pdfs/uksi_20112598_en.pdf

4.3 Cross-domain cases

4.3.1 Bulgarian Guide for Administrative Assistance and Awareness (GAAA)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Cross-domain: Public administration Businesses Social services	BG	FE	Essential	Ad Hoc	2015

4.3.1.1 Summary of case

The Guide for Administrative Assistance and Awareness (GAAA) converts the citizens and businesses from buyers of administrative services into individuals and companies with problems, which can be solved by the administrations with provisioning of administrative services. This is an additional outcome from the realisation of the once-only principle.

The GAAA supports the provision of information about the administrative services in a "problem centred form" (focused on citizens and businesses and events of life) not in a "service centred form" (focused on administration). The problem definition consists of a sequence of necessary activities ensuring the corresponding problem solving. This sequence includes only one service, related exactly to the problem solved and excludes services concerning providing the data from other administrations.

URL: https://www.sofia.bg/

4.3.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Sofia Municipality	Government	X	X	
Citizens	Citizen			X
Businesses	Business			X

4.3.1.3 Crucial factors/ Lessons learned

It turned out that it was very difficult to change the way of thinking of the administration - from services seller to an institution charged with the responsibility for solving the problems of citizens and businesses.

4.3.2 Estonian state portal Eesti.ee

Domain	Country	Type	Maturity	Cross-border maturity	Started
Cross-domain: Businesses Social services	EE	CP	Seamless	Sustainable	1998

4.3.2.1 Summary of case

The Estonian State Portal is a gateway to public information and services. This portal is a secure Internet environment through which Estonian residents can easily access the state's e-services and information. It contains articles on how to resolve important or frequently occurring issues (such as applying for family

benefits), and advice on what to do in certain situations. The Estonian state portal facilitates personal e-mail address and URL for citizens.

URL: https://www.eesti.ee/en/, https://www.ria.ee/en/government-portal.html

4.3.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
The Information System Authority	Government	X	X	X
Individuals	Citizen	X		X
Public sector agencies	Government		X	X
Entrepreneur	Business			X
e-Resident	Citizen			X
Society	Citizen			X
EU Point of Single Contact	Business			X

EU Point of Single Contact (EUGO)[64] is a network of EU state portals that provides points of single contact for entrepreneurs throughout the EU. Through EUGO, information is easily found about which licences, notifications or permits are needed to start a business in any EU country. Eesti.ee is part of the EUGO network. EUGO operates under the Services Directive which aims to fulfil the goal of a digital single market.

4.3.2.3 Enablers of case

Political commitments

- Interoperability of the State Information System, endorsed with the Directive of the Minister of Economic Affairs and Communications 11-0377, 22.12.2011.[65]

Legal provisions

- Public Information Act[66]
- The administration system of state information system[67]
- The data exchange layer of information system[68]
- Personal Data Protection Act[69]

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure**:** is used to facilitate secure mechanism for authentication and environment for secure signing.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

[64] http://ec.europa.eu/internal_market/eu-go/

[65] https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc

[66] https://www.riigiteataja.ee/en/eli/518012016001/consoli

[67] https://www.riigiteataja.ee/akt/1290320160

[68] https://www.riigiteataja.ee/akt/1270920160

[69] https://www.riigiteataja.ee/en/eli/507032016001/consoli

4.3.3 French e-bourgogne-franche-comté GIP

Domain	Country	Type	Maturity	Cross-border maturity	Started
Cross-domain: Trading Businesses Public administration	FR	CP	Sustainable	Opportunistic	2004

4.3.3.1 Summary of case

The objective of the e-bourgogne-franche-comte GIP is to ensure that in a territory with more than 3,500 public entities each organisation has access to digital services. The procedures can be fulfilled digitally in compliance with legal and regulatory provisions including changes. The service also leads to a gain in productivity. The platform is based on PROCURE, a European eTEN project that analysed the possibility of implementing eTEN in Burgundy - responding to its legal, functional and technical requirements. Since the beginning in 2004, 14,000 tenders have been published on e-Bourgogne platform leading to 121,000 downloads of Request for proposals. At the moment, e-bourgogne governance is a Groupement d'Intérêt Public holding gathering 2000 local entities. Citizens are able to receive information about public services and use the platform for certain public services online. E-bourgogne first three operational services are:

1. Procure e-service for electronic procurement.
2. Single entry for companies applying for financial supports and/or requiring support for their business establishment in Burgundy, "J'entreprends en Bourgogne".
3. Digitalisation of legal and accounting documents between local authorities and central administrations.

URL: https://www.e-bourgogne.fr/

4.3.3.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
The Regional Council of Bourgogne-Franche-Comté	Government		X	X
The County Council of Côte d'Or	Government		X	X
The County Council of Saône et Loire	Government		X	X
The County Council of la Nièvre	Government		X	X
The County Council of l'Yonne	Government		X	X
The State, represented through the Mayor of the Region Bourgogne-Franche-Comté	Government		X	X
Enterprises	Business			X
Citizens	Citizen			X

4.3.3.3 Enablers of case

Political commitments

- The French central government created an agency in 2003, called now DGME (Direction générale pour la modernisation de l'Etat) with the objective to reduce and simplify paper-based administrative procedures and to improve productivity and efficiency. DGME rapidly established the interoperability common framework and launched the e-government strategic program ADELE, focusing primarily on state administrations.

Governance model

- A "Holding" of all public entities (GIP) has been created. E-bourgogne-france-compté is organised through this specific governance model of which the regional legal entities (LA's and LLE's) are stakeholders. This governance model warrants the continuity of provided services independent of any political change. The GIP provides the service to all the legal entities, autonomous in terms of procurement (legal authorities, universities, high schools, chambers of commerce, etc.), and represents their individual interests.[70]

4.3.3.4 Crucial factors/ Lessons learned

This portal is developing a shared vision and shared values and contributes to a global approach of solutions and services. GIP gets commitment from the top political executives in the region: e-bourgogne was initiated by an agreement signed between central government (Prime Minister) and the Region (President of Regional Council).

To ensure the success of e-bourgogne-france-compté large efforts have been made in marketing and education, f.e. extensive field meetings with local mayors held by high level politicians have been established. Besides convincing and awareness raising, also a comprehensive education plan for local authorities has been developed. Education is a key ingredient to get a successful deployment of new e-service in the field and its understanding in many instances. Building a large governance structure such as GIP could be helpful.

4.3.4 Irish Government portal - Gov.ie

Domain	Country	Type	Maturity	Cross-border maturity	Started
Cross-domain	IE	FE	Essential	Ad Hoc	2001

4.3.4.1 Summary of case

The Department of Public Expenditure and Reform has complemented the work of individual public bodies by maintaining the www.gov.ie portal. This portal provides easy access to more than 430 online information and transactional services. This new Digital Service Gateway or Portal, launched in 2017 enables the individuals and businesses to easily find and access online public services, to register for transactions as well as targeted information and to ultimately be able to provide information to the Government on a once-only basis, using the existing MyGovID[71] facility.

The Gateway enables the user to find services quite easily and it is closely tied into the MyGovID service.

URL: http://www.gov.ie/

4.3.4.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Citizen	Citizen		X	X
Irish Government News Service	Government		X	
16 different government departments	Government		X	
Citizens Information Board	NGO		X	
The Department of Public Expenditure and Reform	Government	X		

The Gateway has been provisioned for mobile and tablet devices, reflecting the change over the last couple of years in how the internet is primarily accessed.

[70] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:134:0114:0240:fr:PDF

[71] https://www.welfare.ie/en/Pages/MyGovId.aspx

4.3.4.3 Enablers of case

Political commitments

- In October 2013, the Department of Public Expenditure and Reform brought a 'Memorandum to Government', setting out a series of actions to improve data sharing in the public service. Chief among these was the development of the Heads of a Data-Sharing and Governance Bill. On 1 August 2014, the Department of Public Expenditure and Reform published a policy paper entitled, **'Data Sharing and Governance: Policy Proposals'**, which set out key elements of proposed legislation. Interested parties were invited to make submissions responding to the policy proposals. The Department received many constructive submissions. The submissions received have contributed significantly to the development of policy on Data-Sharing. On 24 November 2014, a public information event was held to discuss the outcomes of the consultation. This event allowed a useful discussion of the main policy issues from different perspectives. Having considered the submissions received, the Department prepared a draft General Scheme of the Data-Sharing and Governance Bill, which was submitted to Government for approval to commence drafting of the Bill.

  In July 2015, the Government approved the drafting of the Data-Sharing and Governance Bill 2015, along the lines of the General Scheme, subject to such drafting or technical amendments as may be agreed between the Minister for Public Expenditure and Reform and the Attorney General.
- The **Data Protection Strategy** (2014-2016) developed to protect the individual's right to data privacy by enabling people to know, and to exercise control over how their personal information is used, in accordance with the Data Protection Acts and related legislation.

Legal provisions

- A new **Freedom of Information Act** [72](FOI) came into force on 14 October 2014. It provides commitments in relation to the freedom of information contained in the Programme for Government by removing the main substantive restrictions in access to official information introduced in 2003, extending FOI to all public bodies unless specifically exempt in whole or in part and providing a framework for the extension of FOI to non-public bodies in receipt of significant funding from the Exchequer. The legislation also provided an opportunity for a necessary consolidation, modernisation and updating of the legislation.
- **The Data Protection Act** [73]of 1988 was amended in 2003 to ensure full compliance with the EU Data Protection Directive (95/46/EC).The aim of the Directive is to establish common standards of data protection across Member States in order to protect personal privacy and to ensure the smooth operation of the internal market, while ensuring adequate levels of data protection in countries outside the European Economic Area to facilitate and encourage international trade (Department of Justice and Law Reform). The Data Protection Commissioner oversees and enforces the Act.
- **The Electronic Commerce Act** [74]2000, which became law on 20 September 2000, implements the EU Directive on a Community framework for electronic signatures (1999/93/EC). The Act provides (with some exceptions) for the legal recognition of electronic signatures, electronic writing and electronic contracts. It authorises the use of encryption and sets the rights and obligations of Certification Service Providers (CSPs).

Technical interoperability/ Technical enablers

- The Irish MyGovID allows citizens and businesses to authenticate themselves through an identification process and will use the information they have already provided to save them the inconvenience of repeated re-keying in the future.

[72] http://www.irishstatutebook.ie/eli/2014/act/30/enacted/en/html

[73] https://www.dataprotection.ie/documents/legal/act2003.p

[74] http://www.irishstatutebook.ie/eli/2000/act/27/enacted/en/html

4.3.4.4 Crucial factors/ Lessons learned

This Gateway facilitates easier and faster access to a wide variety of public services and information for citizens and reduces administrative burden on individuals by the reuse of information they have already provided. Enablers such as political commitments, logical provisions, data protection and privacy, motivators and benefits are supporting this case for better performance.

This case will tie in with the European model for the purposes of cross-border e-government. It will also eventually serve as a portal for GDPR enquiries.

4.3.5 Luxemburg's myGuichet

Domain	Country	Type	Maturity	Cross-border maturity	Started
Cross-domain: Citizens, Businesses Public administration	LU	CP	Essential	Ad Hoc	2008

4.3.5.1 Summary of case

MyGuichet is a secure interactive platform on guichet.lu. It facilitates online administrative procedures in a safe and secure manner via a "LuxTrust certificate".

The user completes his form online, signs it electronically, attaches the supported documents and submits it via MyGuichet. Users should create a secure e-space on MyGuide to be able to carry our online administrative procedures. All completed forms, supporting documents and personal data for each user are collected in a dedicated secure e-space, which provides the possibility to reuse those information and documents in other administrative procedures and prefill further forms.

From a logical point of view, there are two ways to carry out an electronic procedure:

- online via MyGuichet: citizens can complete a form online on MyGuichet, sign it and submit it to the competent administration via the MyGuichet platform;
- offline via MyGuichet: citizens can download and complete a form from guichet.lu on their computer, then go online on MyGuichet to sign it electronically and submit it via the platform.

URL: http://www.guichet.public.lu/myguichet/en/index.html

4.3.5.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Administration des contributions directes	Government			X
The Land Registration and Estates Department	Government			X
The Ministry of Justice	Government		X	
myGuichet users	Citizen		X	
myGuichet users	Government		X	
Administration de l'environment	Government			X

4.3.5.3 Enablers of case

Technical enabler

- LuxTrust certificate [75].

4.3.5.4 Crucial factors/ Lessons learned

MyGuichet allows the user to:

- collect in a dedicated secure e-space all completed forms, supporting documents and personal data which may be reused for another administrative procedure;
- exchange personal data with the competent administration in a safe and secure manner by using the forms. Personal data saved in the private or business e-space is accessible to the holder only and is used to prefill the forms started online;
- have a global overview of all procedures on a dashboard which indicates their level of progress;
- interact with the administration through a messaging tool (for the time being, this feature is limited to certain procedures only);
- manage the rights of the co-workers in the business e-space in order to suit the specific business.

4.3.6 United Kingdom's Tell Us Once project

Domain	Country	Type	Maturity	Cross-border maturity	Started
Cross-domain: Social services Public administration	UK	FE	Seamless	Ad Hoc	2011

4.3.6.1 Summary of case

The Tell Us Once program (TUO) is an example of the implementation of the once-only principle in the United Kingdom. Tell Us Once is the award winning cross-government service that makes it possible for people to inform government just once of a birth or death. It took place in 44 local authorities for 24 services such as the Council Housing service or the Passport service.

The DWP (Department of Work and Pensions) designed, set up and now administers a unique IT infrastructure where all the information is centralised. The relevant information is distributed to all the concerned services in other departments.

URL: https://www.gov.uk/government/news/tell-us-once-bereavement-support-expanded-and-red-tape-cut

4.3.6.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Citizen	Citizen		X	
Department of Work and Pensions	Government	X		X
HM Passport Office	Government			X
HM Revenue and Customs (HMRC)	NGO			X
Driver and Vehicle Licensing Agency (DVLA)	Government			X
The Local Council	Government			X
Armed forces pension schemes	Government			X

[75] https://www.luxtrust.lu/

Three notification channels are available for citizens: IT system, telephone service, face-to-face service.

4.3.6.3 Enablers of case

Political commitments

- In order to enforce a real eGovernance Strategy, the Government published the **Government Digital Strategy** [76]in November 2012.

Legal provisions

- **The Social Security** (Notification of Changes of Circumstances) **Regulation 2010**[77].

4.3.6.4 Crucial factors/ Lesson learned

A customer survey took place in the summer of 2013 to accurately measure the customer experience of those undertaking the service:

- 98% of people felt that their overall experience of the bereavement service was good
- 98% were willing to recommend the service to others suffering a bereavement

The costs and benefits of the Tell Us Once Program were estimated over a 10-year timeline, for three notification channels envisaged: IT system, telephone service, face-to-face service. The analysis found that the total cost of the implementation of the three notification channels is expected to be around £ 111,03 million. Although the TUO proved to originate higher costs than benefits, it has been included among the once-only principle "best practices" anyhow. This choice is supported by the fact that the TUO is part of a broader e-government strategy, aimed at making all communications and transactions between government and users digital. Therefore, the TUO impact should not be considered apart, but within the whole impact of the e-government strategy. From this perspective, from the interviews it emerged that the United Kingdom government considers TUO as one of the relevant tools for the full digitisation of public services because it fosters a gradual shift from offline to online services usage by citizens. Moreover, the application of TUO, and the consequent gradual increase of digital services take-up, entails an enhanced services quality.

4.4 Taxation

4.4.1 Austria's FinanzOnline service

Domain	Country	Type	Maturity	Cross-border maturity	Started
Taxation	AT	FE	Essential	Opportunistic	2003

4.4.1.1 Summary of case

FinanzOnline (FON) is the most used e-government service in Austria and it has received multiple international awards. It is free of charge and available 365 days a year, 24 hours a day. FinanzOnline facilitates the access to the Austrian tax administration for citizens and businesses as well as for the public administration. Using FinanzOnline, Austrian citizens can, for instance, file their tax return electronically from home. The whole process - from filling in the form to the delivery of the notice is fulfilled electronically. Data from the previous year can be transferred automatically. The tax account as well as all process steps can be traced online.

URL: https://english.bmf.gv.at/e-government/portals/fon.html

[76] https://www.gov.uk/government/publications/government-digital-strate

[77] http://www.legislation.gov.uk/uksi/2010/444/regulation/4/made#regulation-4-2

4.4.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Citizens	Citizen	X	X	X
Business	Business	X	X	X
Federal ministry of finance	Government	X	X	X
Public administration	Government	X	X	X

4.4.1.3 Enablers of case

Legal provisions

- **FinanzOnline-regulation** [78]2006 - FonV 2006: is regulation of the federal ministry of finance on the submission of inspection of records and delivery of transactions in an automated form.

4.4.1.4 Crucial factors/ Lessons learned

This service is free of charge and has more than four million users. These online processing tax returns save time for citizens and provide 365 days a year, 24 hours a day service for them. Moreover, citizens usually get their money back faster. Moreover, this service protects the environment by reducing paper work and by decreasing administrative expenses for 330 million euros per year. Data security in this case is guaranteed.

96% of all users rate the applications as" very good ". This case is not applicable cross-border.

4.4.2 Estonian electronic tax filing system (E-Tax)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Taxation	EE	FE	Seamless	Essential	2002

4.4.2.1 Summary of case

Since its introduction in 2000, e-tax has drastically reduced the time spent by individuals and entrepreneurs on filing taxes. In 2002, the system matured tremendously with automated tax declaration forms. Each year, around 95 percent of tax declarations in Estonia are filed electronically.

In 2015, one-click tax filing became available to Estonian citizens. Using a secure ID, a taxpayer logs onto the system, reviews their data in pre-filled forms, makes any necessary changes, and approves the document with a digital signature. The process typically takes three to five minutes. From 2015 one-click tax returns are also available, all known data is displayed to the citizen together with the calculated result, then all they have to do is click on the confirmation button; all this takes less than a minute.

In addition to individual tax returns, other declarations can be made in the system:

- An enterprise's declarations for income tax, social tax, unemployment insurance and contributions to mandatory funded pension
- Value-added tax returns
- Alcohol excise duty, tobacco excise duty, fuel excise duty and packaging excise duty returns
- INF declarations
- Customs declarations

URL: http://www.emta.ee/eng

[78] https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20004639

4.4.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
The electronic tax filing system	Government	X	X	X
Population register	Government	X	X	
Commercial register	Government	X	X	
Register of Employment (TÖR)	Government	X	X	
Register of taxable persons (EMTA)	Government	X	X	
15 other government registers	Government	X	X	
The Estonian tax and customs Board	Government	X		
Citizen	Citizen	X	X	X
Business	Business	X	X	X

4.4.2.3 Enablers of case

Political commitments

- **Interoperability of the State Information System**[79]. Endorsed with the Directive of the Minister of Economic Affairs and Communications 11-0377, 22.12.2011.

Legal provisions

- **Taxation Act**[80]**.** Riigikogu, RT I 2002, 26, 50.
- **"Tax registry"** [81]Establishment and Maintenance of the Register. Riigikogu, RT I, 26.05.2005, 11.

Technical interoperability/Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- A **secure ID** and **digital signature** is used to enable taxpayer to logs onto the system and approve relevant documents.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- The unique personal identification code provides opportunity to merge personal data from different registers.
- The unique company commercial registry code provides opportunity to merge business data from different registers.
- Agreements about semantic interoperability needed: 14 standardised code lists.

4.4.2.4 Crucial factors/ Lessons learned

This service uses available information from variety of registries to fill tax declaration forms automatically. This leads to significant time saving and administrative burden reduction. Moreover, all existing data is taken from base registers, the quality of data is highly increased.

Many countries are interested in reusing the case. The case has cross-border elements: Data exchange between Finland and Estonia.

[79] https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc

[80] https://www.riigiteataja.ee/en/eli/502012017008/consolide

[81] https://www.riigiteataja.ee/akt/186654?leiaKehtiv

4.4.3 French electronic tax filing system

Domain	Country	Type	Maturity	Cross-border maturity	Started
Taxation	FR	FE	Ad Hoc	Ad Hoc	2016

4.4.3.1 Summary of case

The contact with French government organisations or municipalities is a burden for French citizens as they have to fill out the same forms by hand in the same documents to the tax authorities over and over again. As part of the programme "Dites-le-nous une fois" citizens do not have to hand in again certain documents to the tax authorities or any other authorities. The concerned information includes the family situation, the number of dependents, the reference tax income and the number of shares in the household. The programme will start in the cities Paris, Lyon and Marseille, who have information about the family income and situation, as well as with information of the National Education, Higher Education and Research with data about scholarships in schools.

URL: http://simplification.modernisation.gouv.fr/wp-content/uploads/2016/10/DP-simplification_nouvelles-mesures-particuliers-octobre2016.pdf

4.4.4 Hellenic Online Tax System (TAXIS)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Taxation	GR	R	Opportunistic	Ad Hoc	1998

4.4.4.1 Summary of case

TAXIS is the integrated information system of the Hellenic tax system. Right from its initial installation, it has interconnected all tax departments with the central point and the databases of the information system. It is probably the information system with the largest number of users in Greece. It has been productive since about 1998 and it has been constantly updated with new functionalities and new services until today. In 2000, it has been upgraded to TAXISnet aiming to provide online electronic services to citizens and businesses.

TAXISnet offers personalised information to citizens and businesses through its portal, as well as by sending automated emails. Since 2006, M-TAXIS service has been available. The registration to the service is a simple procedure. After the registration, citizens or businesses are informed for the tax that they have to pay by a SMS. Furthermore, they are informed about the deadlines of their payments.

Recently, a set of web services based on TAXIS databases have been created and installed in the Interoperability Centre of the Ministry of Finance, as for example:

- Confirmation of a person's details,
- Tax registration data,
- Certificate that a person or a company do not have any debts relevant to tax,
- Certification for any debts of a person or a company to any public-sector organisation,
- Vehicle owner details at a specific point of time.

URL: http://www.gsis.gr/

4.4.4.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Ministry of Finance	Government	X	X	X
Companies	Business		X	X

Actor name	Actor category	Owner	Provider	Consumer
Citizens	Citizen		X	X
NGOs	NGO		X	X

4.4.4.3 Crucial Factors/ Lesson Learned

TAXIS promotes the once-only principle as it offers a lot of pre-filled forms. It acquires citizen data, such as salary details, from other information systems. Furthermore, it provides data to other governmental informational systems through web-services that have been installed to the Interoperability Centre of the Ministry of Finance, as described above.

4.4.5 United Kingdom's Making Tax Digital (MTD)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Taxation	UK	FE	Essential	Ad Hoc	2015

4.4.5.1 Summary of case

One of four foundations of this project is "Better use of information". It means that individuals will not have to give HM Revenues and Customs (HMRD) information that it already has, or that it is able to get from elsewhere- for instance from employers, banks, building societies and other government departments. This foundation could be considering as kind of OOP as it means individuals do not need to provide the same information which is available in other government authorities, to the HMRC.

URL: https://www.gov.uk/government/publications/making-tax-digital/overview-of-making-tax-digital

4.4.5.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Taxpayer	Citizen		X	X
HM Revenues and Customs (HMRC)	Government	X		X
Employer	Government /Business		X	
Banks	Government / Business		X	
Building Societies	Business		X	
Other Government departments are potential candidates	Government		X	

4.4.5.3 Architecture of case

Customers (and their agents) will be able to interact with HMRC digitally and at times that suit them. Digital record keeping software will be linked directly to HMRC systems, allowing customers to send and receive information directly from their software.

4.4.5.4 Enablers of case

Political commitments

- MTD is a key part of the Government's plan to transform the UK tax system, **Modernizing the Tax System** with the goal of making it easier for individuals and businesses to get their tax right and to keep

their tax affairs current. In time, it will mean the end of the annual tax return for many individuals, partnerships and small businesses.

Legal provisions

- **Finance Bill 2017**, Legislation introduced in Finance Bill 2017 that set out:
  - Digital Record Keeping - how to keep records of trading and transactions digitally, and categorise expenses with help from prompts and guidance in the software.
  - 'End of Year' Activity - how businesses might finalise their taxable profit for a period, including the activity they may need to undertake and how long they should have to do so.

  These changes will provide the legislative framework so that businesses will:
  - keep track of their tax affairs digitally using software or apps (digital tools). Regulations will specify what records must be recorded using digital tools
  - provide summary tax data to HMRC quarterly, using digital tools. The summary tax data will be automatically generated for the business from the electronic records. For VAT, these quarterly updates will effectively replace the VAT return. For Income Tax and CT, these updates will cumulatively build an in-year picture of the business' tax position for them
  - gain a clearer view of their tax position in-year
  - provide a finalised end of year position to HMRC of their tax affairs, again using digital tools. This obligation will apply ten months after the fourth quarter referred to above and will crystallise the taxable profits of that business for the previous year. For many businesses, this will simply be a matter of checking and agreeing the total for that year, based on the information which they have provided in the relevant four quarters. For businesses with more complex affairs, this will provide an opportunity to add and apply annualised reliefs and allowances for the period which would not have been reflected in the summary updates

4.4.5.5 Crucial factors/ Lessons learned

Under Self-Assessment, over 10 million customers fill in a tax return to tell HMRC about their circumstances and income. This is a burden for customers and inefficient for HMRC as well: mistakes can be made or the information can be wrong or submitted too late, meaning the right tax is not collected at the right time and HMRC has to take action. This can lead to penalties and interest charges for the customer which could have been avoided.

More effective use of third party information, that is, information provided to HMRC by someone other than the customer or their agent, will reduce the reporting burden on customers and reduce errors, making it easier to declare the right tax.

4.5 Social protection

4.5.1 Austrian birth registration and family allowance

Domain	Country	Type	Maturity	Cross-border maturity	Started
Social protection	AT	R	Seamless	Opportunistic	2015

4.5.1.1 Summary of case

In the past, parents had to go to six different public agencies to carry out their duties and to be entitled to receive family allowance. Since the 1st of May 2015 the new once-only process is implemented. In this procedure, nine public services are integrated so that the parents have to visit only the Civil Registry Office and have to bring along (standard-case parents) no evidences except their personal identification (passport or personal ID card). In some cases, (lager local authorities), registry offices have even subsidiaries in hospitals so that the parents can do

the whole procedure in the hospital. The personal data are stored in a couple of interacting registers, such as, central civil register (ZPR), central citizenship register (ZSR) and central residence register (ZMR).

Through the service "ALF", which was launched in 2015, it is possible to receive family allowance without having to fill an application upon the birth of a child. Automatic Family Allowances without Application (ALF) is a no-stop-shop solution for parents with which family allowances for new-born children are paid out automatically.

URL: https://english.bmf.gv.at/e-government/projects/alf.html

4.5.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Parents	Citizens	X	X	
Civil Registry Office	Government		X	X
Social Insurance Agency	Government	X	X	X
Federal Ministry of Finance	Government	X	X	X
Hospital	NGO		X	
Federal Ministry of the Interior	Government	X	X	X
Federal Ministry of Families and Youth Affairs	Government			X

4.5.1.3 Architecture of case

Figure 12 shows the overall process of the family allowance: The hospital indicates the birth of a child to the Civil Registry Office or one of the parents visits only the Civil Registry Office. The Civil Registry Office delivers a notification to the Social Insurance. The Social Insurance provides then the Social Security number to the Tax Authority and the Social Security Card (e-card) to the parents of the new born. The Tax Authority delivers the family allowance to the parents.

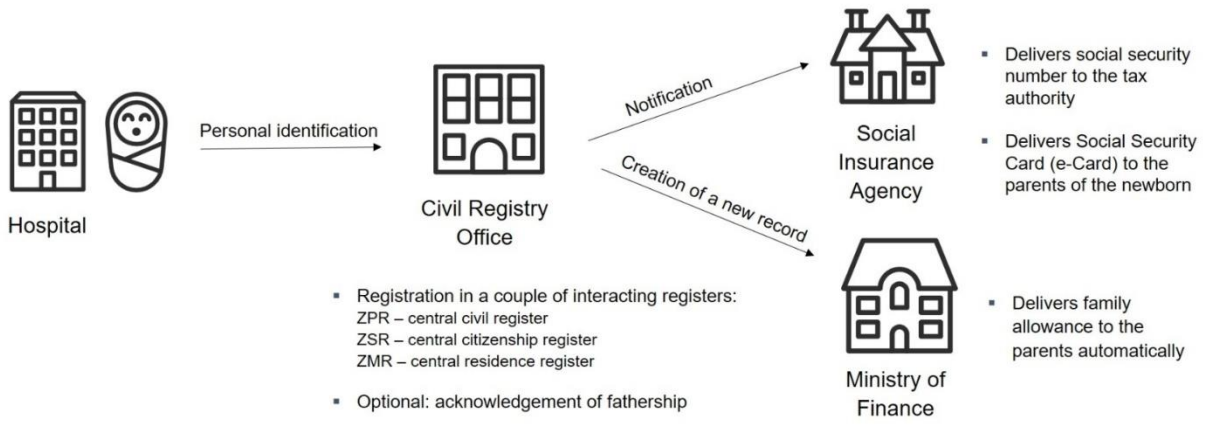

Figure 12: Architecture of Austrian birth registration and family allowance[82]

4.5.1.4 Enablers of case

Legal provisions

- **The Austrian Act for family benefits 1967**[83].

[82] Figure from internal documents of Austrian Federal Ministry of Families and Youth

[83] https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2015_I_50/BGBLA_2015_I_50.pdf

- Change of legal framework concerning the civil registration – allows cross-ministerial processing of personal data.

Technical enabler

- A **central civil register** hosted by Ministry of the Interior facilitates development of this case by integrating information from different registries.

4.5.1.5 Crucial factors/ Lessons learned

This service sharply reduces administrative burden from parents (citizens) since they do not need to provide evidence that the Civil Registry Office has anyway, through the access to ZPR, ZSR and ZMR. Moreover, the process of family allowance is highly simplified. Parents just need to visit the civil registry office, then they forward the parents' and child's data to the social insurance and tax authority and these agencies deliver their respective services to the parents automatically. This simplification and less cumbersome leads to higher satisfaction of parents. Consequently, citizens and authorities, because of the reducing of the administrative burden on both sides, have accepted this service.

This case is not applicable cross-border. The project ALF is the first step of the programme FABIAN (Family allowances new), which is defined to improve the whole service delivery process for the topic family allowance in the next years.

4.5.2 Estonian Parental Benefit

Domain	Country	Type	Maturity	Cross-border maturity	Started
Social protection	EE	FE	Seamless	Ad Hoc	2004

4.5.2.1 Summary of case

To apply for the parental benefit, an application must be submitted via the State Portal or at a regional bureau of the Social Insurance Board. The benefit will start to be paid one day after the period for paying maternity benefit or adoption benefit. Those who do not receive the maternity benefit are paid the parental benefit starting from the birth of the child. The childcare benefit is not paid to parents who receive the parental benefit. Income tax is withheld from the parental benefit.

Citizen can apply for the parental benefit at the Social Insurance Board. The Social Insurance Board officers obtain the data they require from different databases.

The Estonian Parental benefit service is a one click service for parents to apply for the benefit. This service is available via the citizen's portal https://www.eesti.ee/eng/

URL: http://www.sotsiaalkindlustusamet.ee/parental-benefit/

4.5.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Register of Social Insurance Board (STAR)	Government	X	X	X
Population Register (RR)	Government		X	
Information System of Health Insurance Fund (EHK)	Government		X	X
IS of Tax & Customs Board (EMTA)	Government		X	X
Estonian Education Information System (EHIS)	Government		X	
Citizens	Citizen		X	X
Public administrations (aggregated statistics)	Government			X

4.5.2.3 Architecture of case

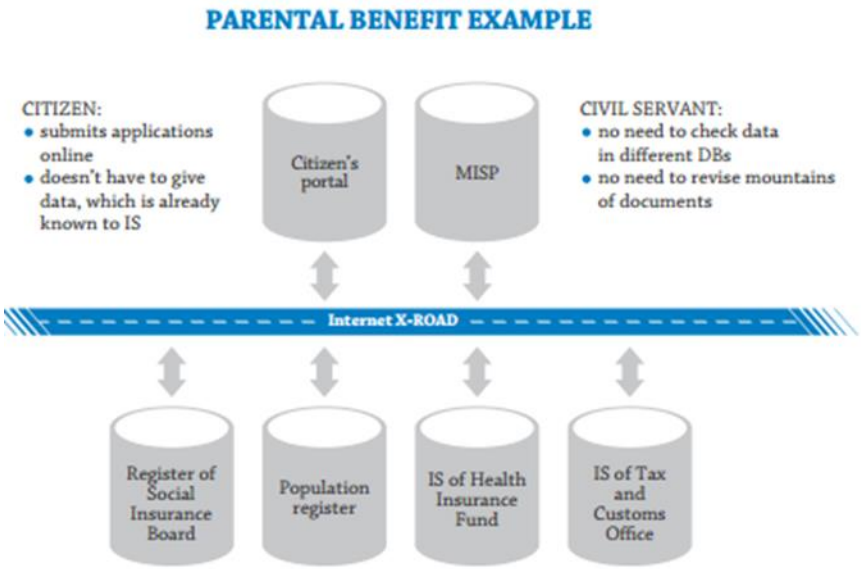

Figure 13: Architecture of Estonian Parental Benefit[84]

4.5.2.4 Enablers of case

Political commitments

- **Interoperability of the State Information System[85].** Endorsed with the Directive of the Minister of Economic Affairs and Communications 11-0377, 22.12.2011.

Legal provisions

- **Parental Benefit Act**[86]. Riigikogu. RT I 2003, 82, 549
- **Health Insurance Act**[87]. Riigikogu. RT I 2002, 62, 377
- **Income Tax Act**[88]. Riigikogu. RT I 1999, 101, 903

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure**:** is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- **The unique personal identification code** provides opportunity to merge personal data from different registers.

[84] The figure is taken from Chapter 2 "The Estonian e-government ecosystem" p. 29 in http://skytte.ut.ee/sites/default/files/skytte/e_voting_in_estonia_vassil_solvak_a5_web.pdf

[85] https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc

[86] https://www.riigiteataja.ee/en/eli/ee/528122016010/consolide/current

[87] https://www.riigiteataja.ee/en/eli/529122016002/consolide

[88] https://www.riigiteataja.ee/en/eli/516012017002/consolide

4.5.2.5 Crucial Factors/ Lessons learned

This service remarkably decreases the waiting time for parents and officials. This case implements strong once-only principle elements but it is not cross-border applicable.

4.5.3 French application of work welfare (Revenu de solidarité actice)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Social protection	FR	FE	Ad Hoc	Ad Hoc	2016

4.5.3.1 Summary of case

The Revenu de solidarité active (RSA) is the French work welfare programme. It gives the unemployed a minimum income and shall encourage them to find work or is supporting low-wage workers by their income. To apply for this programme, individuals have to fill out a form and hand it to a relevant administration - and their physical attendance is obligatory. This could be la Caisse d'allocations familiales (CAF) or la Mutualité sociale agricole (MSA). The person making the demand also has to hand in certain personal documents. This process is highly complex and citizens sometimes do not apply for RSA due to its complex application process.

The French government has decided to include the application of RSA into the "Dites-les-nous une fois" program. In the future, the process will be highly simplified. Citizens can fulfil all the administrative processes which are needed online. Also, citizens do not have to hand in personal documents if they have given them once to any French administration. Instead, this information has to be exchanged between the administrations. The electronic process itself, the application of the once-only principle and the fact that citizens do not have to hand in the forms physically is a big simplification of public processes. This service will also be applied to the CAF and the MSA later.

URL: https://www.nextinpact.com/news/102833-le-programme-dites-le-nous-fois-pour-particuliers-en-piste-pour-printemps.htm

4.5.4 Polish Baby bonus Becikowe

Domain	Country	Type	Maturity	Cross-border maturity	Started
Social protection	PL	FE	Essential	Opportunistic	2017

4.5.4.1 Summary of case

The Polish government will start applying the OOP to the baby bonus – a part of financial aid for families. Parents shall no longer be required to show their birth certificate and/or to give standard information to the authorities when they apply for financial support. They will just have to apply online and the government will complete and cross-check the applications with records it already has. These services have been added to the information portal Emp@tia. Citizens have only the option of online application.

URL: https://mc.gov.pl/aktualnosci/oswiadczenia-zamiast-zaswiadczen-kolejny-krok-w-strone-urzad24

4.5.4.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Parents	Citizen		X	
Ministry of Working Family and Social Policy	Government	X		X
Ministry of administration	Government	X		
Banks	Government /Business		X	

4.5.4.3 Enablers of case

Political commitments

- Strategy for Responsible Development[89].

Legal provisions

- Act on the Computerisation of the Operations of the Entities Performing Public Tasks (2005)
- Act on the Protection of Personal Data (1997)

4.5.4.4 Crucial factors/ Lessons learned

This new service will save about half a million parents several trips to government offices per year. The most important change is that the state finally begins to trust its citizens making declarations instead of certificates. The ministry of working family and social policy is working with three large banks to allow citizens to use online banking solutions for authentication and identification for e-government services. Similar services from two other banks are expected and are currently being tested. This will provide access to e-government services to about 55% of all citizens, the ministry says.

By applying once-only principle to more services and by offering services online, Poland is modernising its government.

This case implements good OOP elements but it is not applicable cross-border.

4.6 Organisation of transport

4.6.1 Estonian Smart Road System (Tark Tee)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Organisation of transport	EE	FE	Essential	Ad Hoc	2012

4.6.1.1 Summary of case

Traffic information system (Tark Tee) provides information about road conditions, restrictions and road works. Tark Tee helps to plan a safe journey. Traffic Information centre is available through a toll free number.
The system has modernised and integrated with apps like Waze. During the last years, a close cooperation with the Estonian capital city Tallinn has been created.
URL: http://tarktee.mnt.ee/?lang=en

89 https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/eGovernment_in_Poland_April_2017_v4_00.pdf

4.6.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Road Administration	Government	X	X	X
Citizens	Citizens			X
Public Administrations (Local municipalities)	Government	X	X	
State Road Register (Tee register)	Government	X	X	
Register for Agencies of State and Municipalities	Government	X	X	
Apps	Business			X

4.6.1.3 Architecture of case

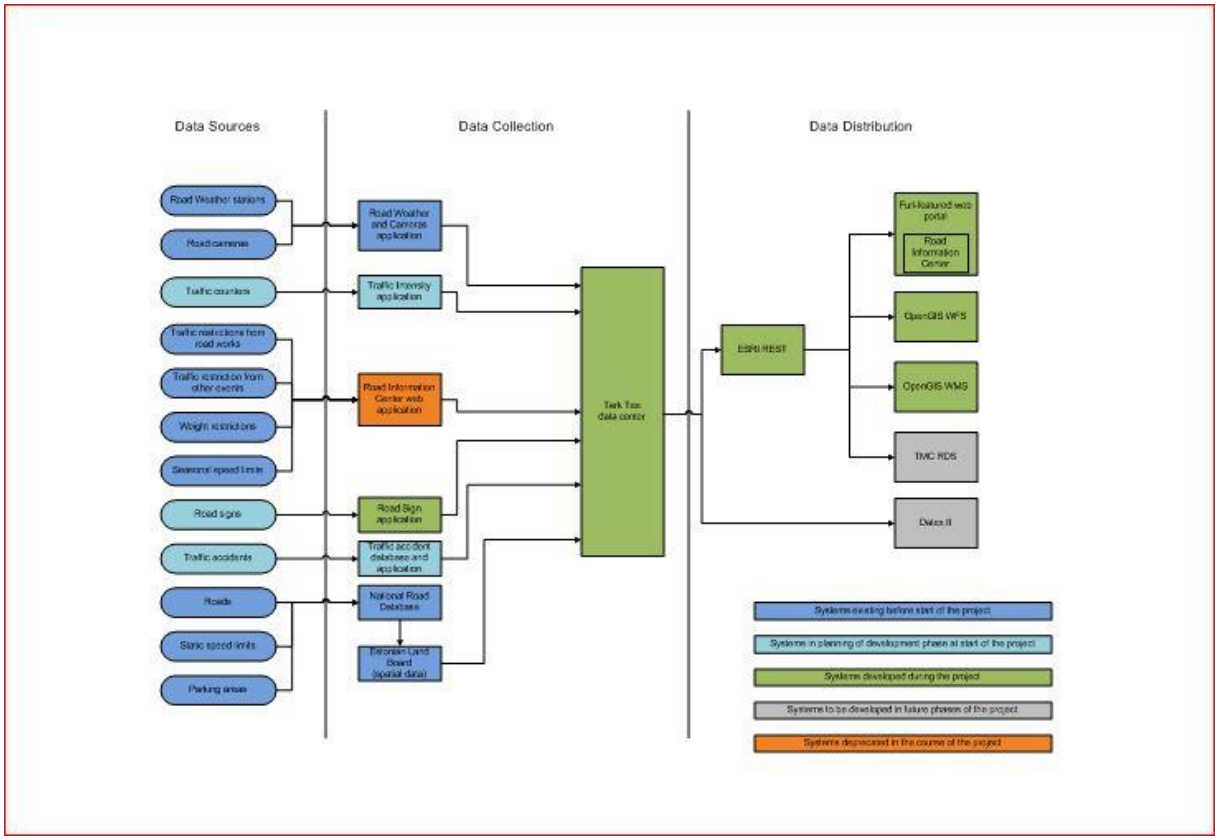

Figure 14: Architecture of Estonian Smart Road System[90]

Data architecture

- Public access allows viewing road information, such as road camera pictures, road weather, road works and speed limits, routing system with special options for heavy and large vehicles.
- Authorized access allows submitting and managing information in the data centre.
- PostGIS and ESRI ArcGIS Server power database.

For example, all traffic signs are tagged with a QR code (containing information about the sign type, material, sign label etc.). When a sign is installed on the road, it will be registered with the Smart road mobile app. The app sends GPS coordinates to the data centre and receives a list of roads nearby. After confirming the correct

[90] Source of figure are internal documents of Estonian Road Administration

road, data from the QR code is sent to the data centre. If the sign is removed, damaged, or temporarily disabled, it is visible through the app.

Linking registers
Data is provided from:

- road cameras
- traffic frequency counters
- road weather stations
- traffic sign management
- road information centre
- accidents
- weight/speed limits
- parking areas

4.6.1.4 Enablers of case

Legal provisions

- Traffic restrictions disclosure and traffic ban area permit and authorisation procedures, RT I, 07.01.2015, 7[91]
- Statute of the Road Administration, RT I, 06.03.2013, 19[92]
- Traffic Act, RT I 2010, 44, 261[93]
- The Estonian Data Protection Inspectorate must be followed as a data guideline.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.
- All participants must implement three-level IT baseline security system **ISKE**.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- All registers must be linked by use of commonly accepted keys: **personal code for citizens**, **code of institution**, standardised address presentation.

4.6.1.5 Crucial factors/ Lessons learned

Smart Road provides better warning system for road users, it facilitates better management for traffic signs and better routing with operative information. By implementation of this system, road conditions and general information and restrictions are available from the same place for different users.

Weather information and traffic frequency counter's information updated every 15 minutes. And also, all restrictions published 48h before.

This case implements good OOP elements.

[91] https://www.riigiteataja.ee/akt/107012015007

[92] https://www.riigiteataja.ee/akt/106032013019?leiaKehtiv

[93] https://www.riigiteataja.ee/akt/103012017018?leiaKehtiv

4.6.2 Estonia: Tallinn Public Transport Ticket System

Domain	Country	Type	Maturity	Cross-border maturity	Started
Organisation of transport	EE	FE	Seamless	Seamless	2012

4.6.2.1 Summary of case

Ticket system used to:

- sell tickets
- travel discount
- check the validity of ticket
- determine the travel demand and optimizing route network (non-personal data)
- balance inter-municipal revenue and expenditure

Ticket system is used in Tallinn city and inter-municipalities as well as Cross Border-Municipal (Tallinn-Helsinki)

URL: https://www.pilet.ee/viipe/uhiskaart/persod/perso/?lang=en

4.6.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Ticket system	Government	X	X	X
Population Register	Government	X	X	
Estonian Education Information System (EHIS). (Ministry of Education and Research)	Government	X	X	
National pension insurance registers (PIKAS). (Social Insurance Board)	Government	X	X	
National public transport register (Ütris). (Ministry of Economic Affairs and Communications)	Government	X	X	
Social Security Information System (SKAIS). (Ministry of Social Affairs)	Government	X	X	
Register of Residence and Work Permits (ETR). (Ministry of the Interior)	Government	X	X	
Citizens	Citizens	X	X	X
Public Administrations (Local Municipalities)	Government	X	X	X
Business register	Government	X	X	

4.6.2.3 Architecture of case

Translation of terms in Figure 15 from Estonian into English:

- Välised registrid - external registers
- RR, SKAIS, EHIS, ÜTRIS, PIKAS – names of registers
- X-tee – X-road
- Soodustused- discounts
- Piletid – tickets
- Liinid - lines
- Sõidukaardid – travel cards
- Sündmused – events

- Kasutajad - Users

Other resources:

- Population register (RR). Database owner: Ministry of the Interior
- Register of Residence and Work Permits (ETR). Database Owner: Ministry of the Interior
- Social Security Information System (SKAIS). Database Owner: Ministry of Social Affairs
- Estonian Education Information System (EHIS). Database Owner: Ministry of Education and Research
- National public transport register (Ütris). Database Owner: Ministry of Economic Affairs and Communications
- National pension insurance register (PIKAS). Database Owner: Social Insurance Board

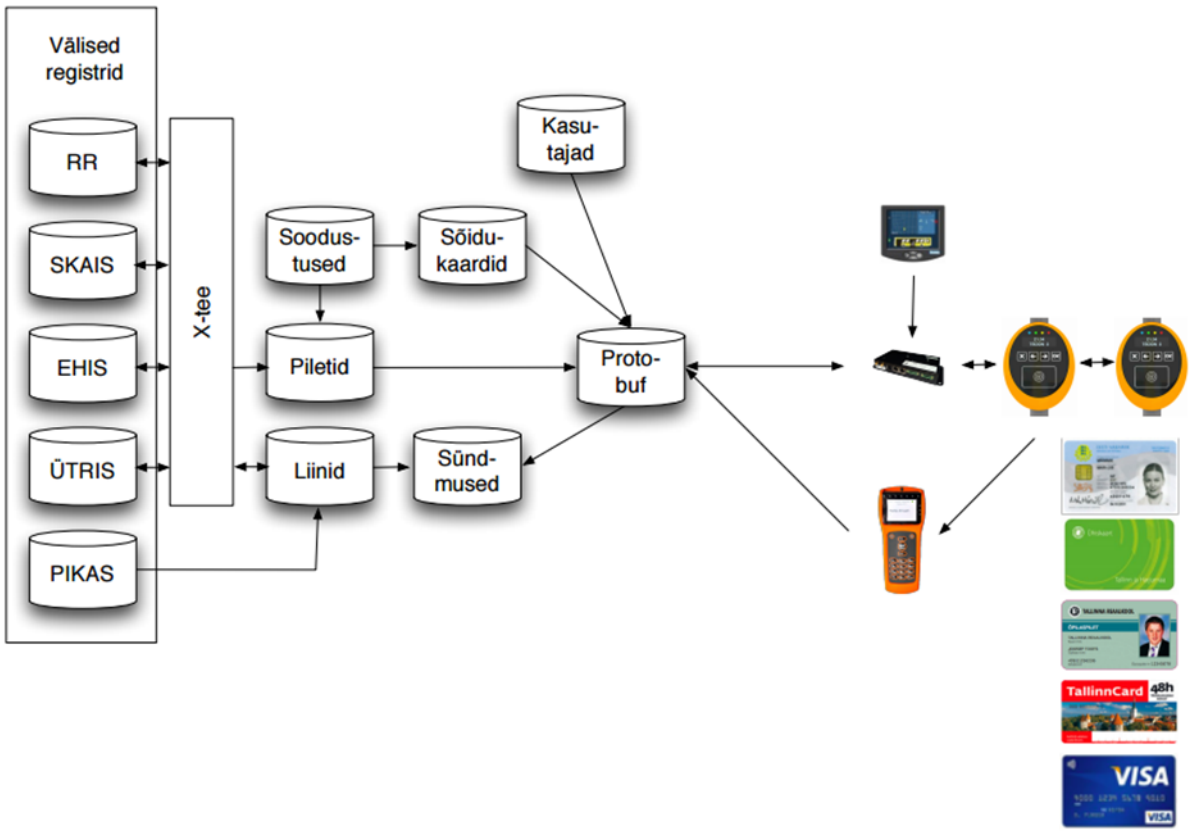

Figure 15: Architecture of Tallinn Public Transport Ticket System[94]

4.6.2.4 Enablers of case

Political commitments

- Tallinn City Council Regulation No. 43 09.12.2004[95]
- Interoperability of the State Information System. Endorsed with the Directive of the Minister of Economic Affairs and Communications 11-0377, 22.12.2011[96].

[94] Source of figure below: internal documents of Tallinn City Government

[95] https://oigusaktid.tallinn.ee/?id=3001&aktid=98828&fd=1&leht=1&q_sort=elex_akt.akt_vkp

[96] https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc

Legal provisions

- Tallinn ticketing system database statutes[97]
- The Local Government Organisation Act. Riigikogu. RT I 30.12.2011[98]
- Public Transport. Riigikogu. RT I 28.06.2012, 17[99]
- Public Information Act. Riigikogu, RT I 2000, 92, 597[100]

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.
- All participants must implement three-level IT baseline security system **ISKE**.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

4.6.2.5 Crucial factors/ Lessons learned

Ticket system removed the need for paper tickets printing, selling, buying and administration (for different discounts, price, transportation types and citizen target groups). And consequently, reduced operational costs. It also facilitates easy statistics and management. This system maximised flexibility and simplified launching (management from one system point).

This case implements strong OOP elements and it has real cross-border practice.

4.6.3 French application for a parking vignette

Domain	Country	Type	Maturity	Cross-border maturity	Started
Organisation of transport	FR	R	Ad Hoc	Ad Hoc	2018

4.6.3.1 Summary of case

The application for a parking vignette in France mostly takes weeks to receive it. Furthermore, applicants have to verify all the information and documents they are handing in, e.g. their revenue information or car registration. This often delays the delivery of the document.

Starting in Paris, Lyon and Marseille in 2018, there will be an easier way to apply for the parking vignette. As part of the French programme “Dites-le-nous une fois”, car drivers can apply for it online without handing in any documents concerning their domicile, their income or their car registration. This information will be exchanged between the administrative bodies of the cities. This simplification can lead to faster processes. It can be easily applied to the 800 communes using parking vignettes.

URL: http://simplification.modernisation.gouv.fr/wp-content/uploads/2016/10/DP-simplification_nouvelles-mesures-particuliers-octobre2016.pdf

[97] https://www.riigiteataja.ee/akt/421012014034

[98] https://www.riigiteataja.ee/akt/130122011056

[99] https://www.riigiteataja.ee/akt/128062012017

[100] https://www.riigiteataja.ee/en/eli/518012016001/consolide

4.7 Organisation of the legal system

4.7.1 Estonian e-File system

Domain	Country	Type	Maturity	Cross-border maturity	Started
Organisation of the legal system	EE	FE	Seamless	Opportunistic	2008

4.7.1.1 Summary of case

The e-File is an online information system, which allows procedural parties and their representatives to submit procedural documents electronically to courts and to observe the progress of the proceedings related to them. For example, a single parent can apply for alimony without making a trip to the courthouse.

URL: https://www.e-toimik.ee/01_home.html

4.7.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
e-File	Government	X	X	X
Population Register	Government	X	X	
System of address data	Government	X	X	
Register of taxable persons	Government	X	X	

4.7.1.3 Architecture of case

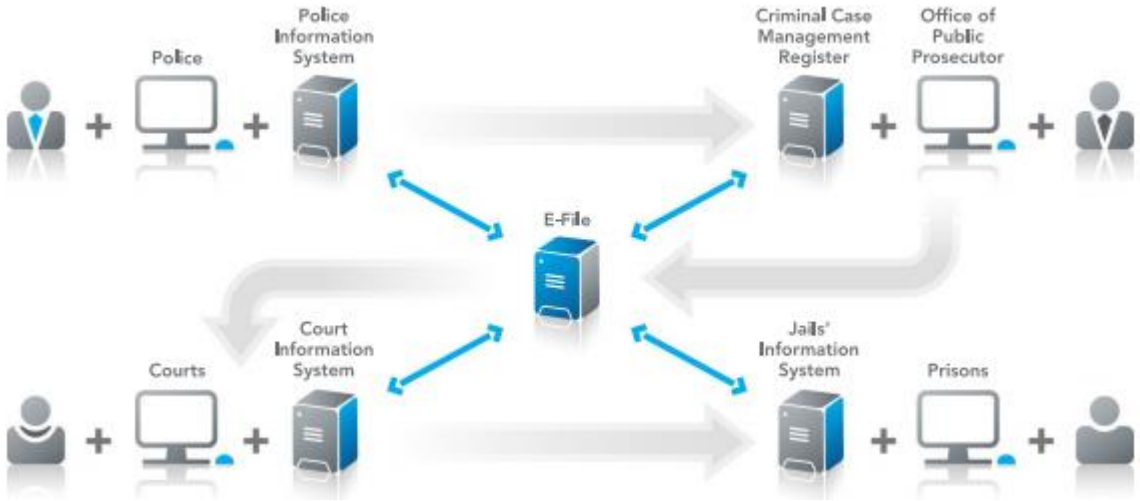

Figure 16: Architecture of Estonian e-File system[101]

[101] The figure is taken from http://www.rik.ee/en/international/e-file

4.7.1.4 Enablers of case

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange. The use of X-Road guarantees that the information is inviolate from the moment of inserting it until the moment when it is stored in e-File.
- Registers and metadata of registers must be properly described.
- **Digital Court File** is a future development of e-File that has already been initiated. It is part of the fully paper-free court proceeding project started in the end of 2013. While the Court Information System is a system for inserting data, collecting information and conducting the proceedings, Digital Court File will be an everyday tool for judges and court staff that will replace entirely the court file on paper.

4.7.1.5 Crucial factors/ Lessons learned

Technically, the e-File is a central storage of electronic documents and metadata that is inserted by the users of the information systems of different authorities in the justice system. The storage of metadata related to all electronic documents, procedural operations and communication between information systems is the key of the simple electronic information exchange. The information exchange between these information systems and the e-File is based on the X-Road.

Information from the e-File pertaining to oneself can be queried without limitations and free-of-charge. Furthermore, parents can make free-of-charge queries about their minor children.

Making a query about someone else requires the forename, surname and personal ID code of that natural person or the name and Business Registry code of that legal person. A query made about another person without that person's authorisation is for a fee (the price of a query from the e-File is 4 euros). Queries can be made one by one; queries for a fee can be paid for via the same environment by using online banking before ordering the query. Queries are replied to within two business days.

Authorising another natural person (e.g. a representative of the employer) to query for data is possible in this system. By granting this authorisation in the e-File system, the authorised person can make free-of-charge queries about the principal via the e-File. Such an authorisation allows the employer to get more information about the employee than with a paid query.

The e-File project received a special mention at the 2014 European Crystal Scales of Justice Awards.

4.7.2 Estonian e-Notary

Domain	Country	Type	Maturity	Cross-border maturity	Started
Organisation of the legal system	EE	FE	Seamless	Opportunistic	2007

4.7.2.1 Summary of case

The e-Notary system is an online environment, which helps notaries in their everyday work and allows electronic communication between notaries and the state. The environment allows notaries to do everything they need in their work. The system also allows making queries to 16 different registries (for example the Marital Property Register, the Official Announcements, the Estonian Central Registry of Securities, the Register of Constructions, the Land Register, the Traffic Registry, the Land Cadastre, the Succession Register, the Population Register, the Registry of Recreational Craft, the Business Register). The system owned by the Chamber of Notaries and the servers are administrated by the Centre of Registers and Information Systems; the latter also provides user support, trains users and develops the system.

E-Notary is an everyday tool for notaries that helps them acquire information from different databases for drawing up and formulating the wording of contracts, forwarding contracts to various registers and monitoring

the implementation process of contracts. Since the information system offers contract templates and all the necessary data can be requested from different registers with just a few mouse clicks, the preparation of contracts is fast and easy. As a result, the e-Notary system has increased the efficiency of notaries' work. Last but not least, all clients can securely obtain a legally valid electronic copy of their contracts from the citizen portal free of charge.

URL: http://www.rik.ee/en/other-services/e-notary

4.7.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Chamber of Notaries	Business	X	X	X
Centre of Registers and Information Systems	Government	X	X	
Migration Register	Government	X	X	
Estonian Central Register of Securities	Government	X	X	
Consolidated List of Terrorist	Government	X	X	
Population Register	Government	X	X	
Commercial Register	Government	X	X	X
European Network of Registers of Wills	Government	X	X	
Land Cadastre	Government	X	X	X
Citizen	Citizen	X	X	X
Notary	Business	X	X	X
Business	Business	X	X	X
10 other government register	Government		X	X

Ten government registers including Building Register, Monuments Register, Register of founded Pensions, Small Ship Register, Traffic register, Register of Marriage Contracts, Register of State and Local Governments, Land Register, Succession Register and Register of Official Announcements. All of these registers are both data provider and data consumer. Moreover, last three registers are also considered as owner in this case.

4.7.2.3 Architecture of case

Figure 17: Architecture of Estonian e-Notary 1[102]

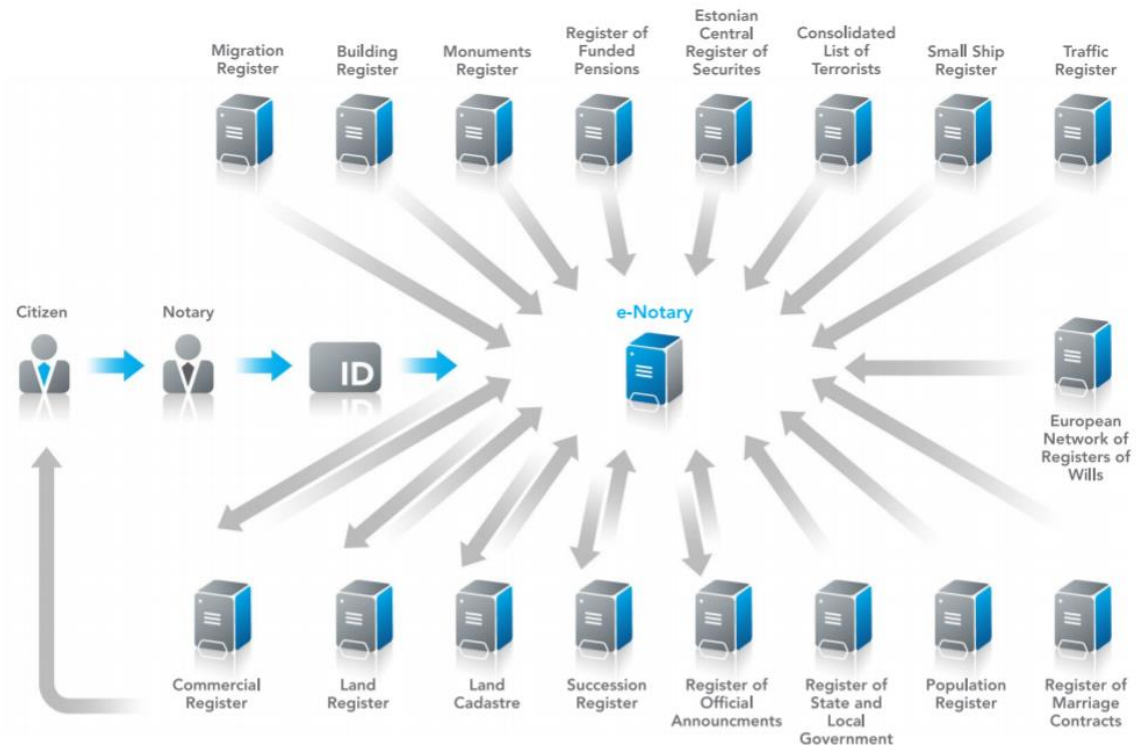

Figure 18: Architecture of Estonian e-Notary 2[103]

[102] The figure is taken from http://www.rik.ee/en/international/e-notary

[103] The figure is taken from http://www.rik.ee/sites/www.rik.ee/files/elfinder/article_files/RIK%20eNotary.pdf

4.7.2.4 Enablers of case

Political commitment

- **Interoperability of the State Information System**[104] Endorsed with the Directive of the Minister of Economic Affairs and Communications, 22.12.2011.

Legal provision

- Notaries Act[105]. Riigikogu, RT I 2000, 104, 684.
- Explanatory memorandum to the statute for keeping the e-notary information system[106].
- Notariaadimäärustik[107]. Riigikogu, RT I, 25.09.2015, 5.
- Statutes of the electronic information system of notaries [108](e-notary).
- Public Information Act[109]. Riigikogu, RT I 2000, 92, 597.
- The classification system[110]. Vabariigi Valitsus, RT I 2008, 4, 27.
- The data exchange layer of information system[111]. Vabariigi Valitsus, RT I 27.09.2016, 4.
- The administration system of state information system[112]. Vabariigi Valitsus, RT I 29.03.2016, 6.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- The **unique personal identification code** provides opportunity to merge personal data from different registers.
- The **unique company commercial registry code** provides opportunity to merge business data from different registers.
- Agreements about semantic interoperability needed: 14 standardised code lists.

4.7.2.5 Crucial factors/ Lessons learned

This case is highly beneficial for the Estonian notaries to compile their notarial needs and speed up their task by acquiring data about the parties to a transaction and the object of a transaction from other registers. This case is facilitated by digital sign and helped the notary to digitally sign notarial deeds. Also, it helps them to calculate notary fees and state fees, register apostilles, stores the transaction with the related data in the digital notarial archive, send data about transactions to other national registers, complies invoices for the payment of notary fees and pre-filled payment orders for the payment of state fees and complies notarial statistics.

This system is supported by political commitment, legal provisions, technical and semantic interoperability enablers which are mentioned earlier.

All existing data is taken from base registers. Other countries are interested in reusing the case, which also has cross-border elements.

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[104] https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc

[105] https://www.riigiteataja.ee/en/eli/511032016002/consolide

[106] https://riha.eesti.ee/riha/main?araTopServiceId=application&araThreadServiceId=j3WXs51v&araTransactionId=override

[107] https://www.riigiteataja.ee/akt/13261784?leiaKehtiv

[108] https://riha.eesti.ee/riha/main?araTopServiceId=application&araThreadServiceId=a5fJ5rvz&araTransactionId=override

[109] https://www.riigiteataja.ee/en/eli/518012016001/consolide

[110] https://www.riigiteataja.ee/akt/12910889

[111] https://www.riigiteataja.ee/akt/127092016004

[112] https://www.riigiteataja.ee/akt/129032016006

4.8 Electoral procedure and voting

4.8.1 Estonian Election Information System

Domain	Country	Type	Maturity	Cross-border maturity	Started
Electoral procedure and voting	EE	R	Sustainable	Ad Hoc	2009

4.8.1.1 Summary of case

The Elections Information System is used for tabulating the voting and election results. The register holds information on polling stations, including data on general advance polling stations and polling stations on Election Day, data on electoral districts, municipalities, voting districts and election authorities, data on candidates (candidate register) data where the electoral district committees and the central election committees submit their results of the elections as they are ready.

4.8.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
State Electoral Office	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Citizen	Citizen	X	X	X
Business	Business	X	X	
Public administration	Government		X	

4.8.1.3 Enablers of case

Legal provisions

- Local Government Election Act.[113]
- European Parliament Election Act.[114]
- Referendum Act.[115]
- Candidates nomination and registration procedures for the election of the Parliament.[116]
- Candidates nomination and registration procedures for the election of the European Parliament.[117]
- Statute of Elections Information system.[118]

Technical interoperability/ Technical enablers

- 5.4.8 X-Road: is used to provide the secure data exchange layer for confidential and legally binding data exchange.

[113] https://www.riigiteataja.ee/akt/13117083?leiaKehtiv

[114] https://www.riigiteataja.ee/akt/13117053?leiaKehtiv

[115] https://www.riigiteataja.ee/akt/13117088?leiaKehtiv

[116] https://www.riigiteataja.ee/akt/13360054?leiaKehtiv

[117] https://www.riigiteataja.ee/akt/13204935?leiaKehtiv

118 https://www.riigiteataja.ee/akt/102072013068

- 5.6.1 Estonian Public Key Infrastructure and **eID:** are used to develop secure authentication, electronic identification and signing.
- Baseline security system ISKE[119]

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

4.8.1.4 Crucial factors/ Lesson learned

This service is mentioned in Estonian catalogues, RIHA to increase its findability and usage. All existing data is taken from base registers. The case is not applicable cross-border.

4.8.2 Estonian Internet voting

Domain	Country	Type	Maturity	Cross-border maturity	Started
Electoral procedure and voting	EE	FE	Seamless	Ad Hoc	2005

4.8.2.1 Summary of Case

The Estonian Internet voting (i-voting) system allows any citizen to vote at their convenience, no matter how far they are from a polling station. As an added benefit, making the process easy and accessible increases voter turnout. The idea of having Internet voting in Estonia gained popularity in 2001. Estonia became the first nation to hold legally binding general elections over the Internet with the municipal elections in 2005. The Estonian parliamentary election in 2007 also used internet voting, another world first.

URL: http://www.vvk.ee/voting-methods-in-estonia/engindex/

4.8.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
State Electoral Office	Government	X	X	X
Population Register	Government	X	X	
Voter	Citizen	X	X	X

[119] https://www.ria.ee/en/iske-en.html

4.8.2.3 Architecture of case

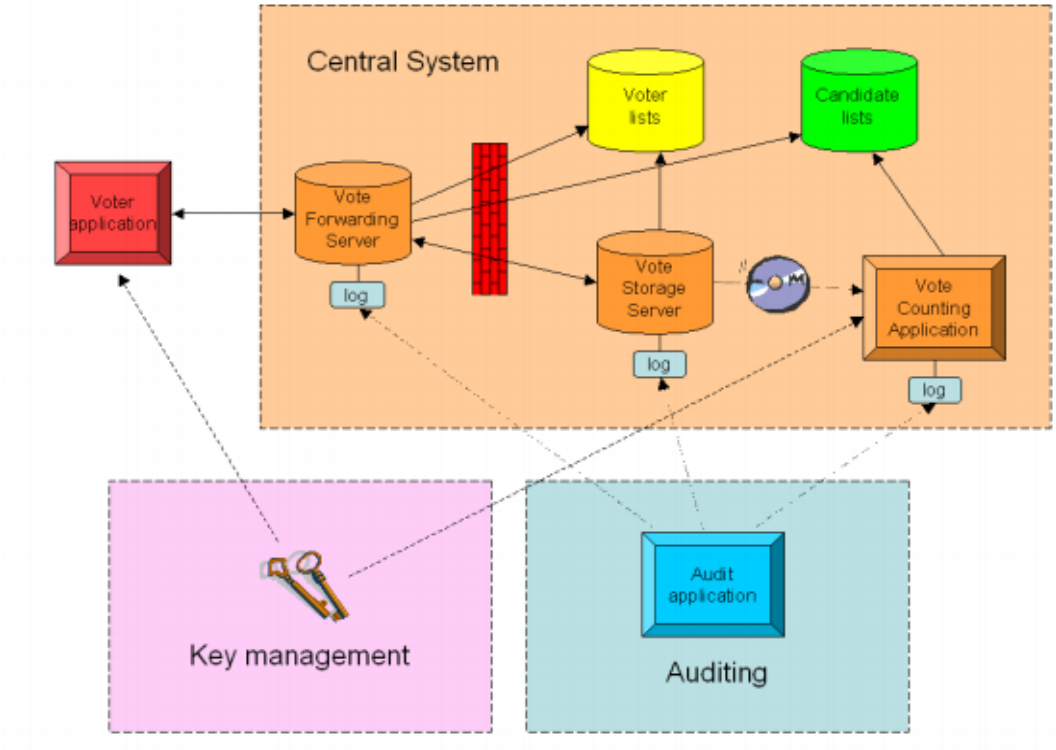

Figure 19: Architecture of Estonian Internet voting[120]

4.8.2.4 Enablers of case

Political commitments

- Interoperability of the State Information System[121]. Endorsed with the Directive of the Minister of Economic Affairs and Communications 11-0377, 22.12.2011.

Legal provisions

- Election Act.[122]
- Municipal Council Election Act.[123]
- European Parliament Election Act.[124]
- Referendum Act.[125]
- Personal Data Protection Act.[126]
- Public Information Act.[127]

Technical interoperability/ Technical enablers

[120] The figure is taken from http://www.vvk.ee/public/EH_Overiview_03-11.pdf

[121] https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc

[122] https://www.riigiteataja.ee/en/eli/ee/514112013015/consolide/current

[123] https://www.riigiteataja.ee/en/eli/506112013004/consolide/current

[124] https://www.riigiteataja.ee/en/eli/ee/529012014001/consolide/current

[125] https://www.riigiteataja.ee/en/eli/514112013007/consolide/current

[126] https://www.riigiteataja.ee/en/eli/507032016001/consolide

[127] https://www.riigiteataja.ee/en/eli/518012016001/consolide

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure and eID: are using in this case by citizens in order for secure login by IDcard, mobileID or digiID.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

4.8.2.5 Crucial factors/ Lesson learned

Open source software solutions are used in this case to increase trust to the i-voting system. According to the once-only principle, all existing data is taken from base registers which provides benefits for both individuals and government. Other countries are interested in reusing this case. The case is not applicable cross-border.

4.9 Demography and population

4.9.1 Estonian e-Census

Domain	Country	Type	Maturity	Cross-border maturity	Started
Demography and population	EE	R	Essential	Ad Hoc	2015

4.9.1.1 Summary of case

Statistics Estonia conducts a census every ten years. So far, people have had to take an active part in the census: by answering the questions of an enumerator or by filling in an e-census questionnaire. The questionnaire has been prefilled with data from official registers. The next 2020 Population and Housing Census will be different. Estonia has set the e-census world record: 67% of the population submitted their data via the Internet in the previous census. Estonia is now taking a step forward and conducting a register based census. The census data will be compiled from the data of national registers. About 24 national registers will be included, and they involve data on many fields of life.

In 2015 a combined e-census was piloted in Estonia and for 2020 a full e-census is planned.

- URL: http://www.stat.ee/dokumendid/275734

4.9.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
e-Census database (Estonian Board of Statistics)	Government	X	X	X
Population Register (RR) (Ministry of the Interior)	Government	X	X	
Business Register (ARIREG). (Ministry of Finance)	Government	X	X	
Address Data System (ADS) Land Board	Government	X	X	
17 other government registers	Government	X	X	
Population and Housing Census (REL) (previous data). Board of Statistics Estonia	Government	X	X	
Statistics (anonymous aggregated data) for business, citizens and public administrations	All			X
Estonian Board of Statistics	Government	X		

4.9.1.3 Architecture of case

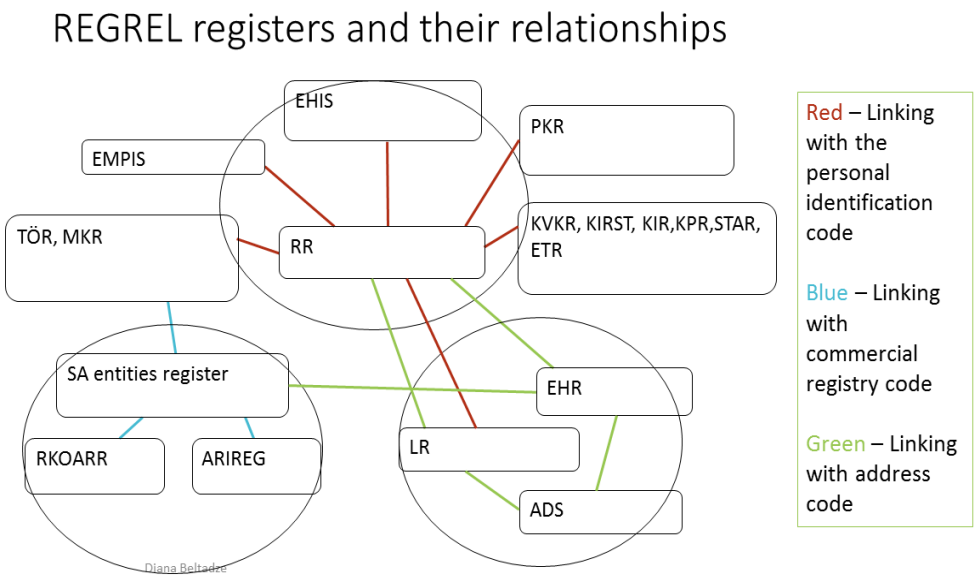

Figure 20: Architecture of Estonian e-Census[128]

Personal code, commercial registry code, ADS code are key elements in the data-exchange architecture for linking registries.

4.9.1.4 Enablers of case

Political commitment

- **Interoperability of the State Information System**[129]. Endorsed with the Directive of the Minister of Economic Affairs and Communications 11-0377, 22.12.2011.
- **European Statistics Code of Practice**. [130]Adopted by the European Statistical System Committee. 28th September 2011.

Legal provisions

- **Official Statistics Act**[131]. Riigikogu, RT I 2010, 41, 241.
- **Personal Data Protection Act**[132]. Riigikogu, RT I 2007, 24, 127.
- **Public Information Act**[133]. Riigikogu, RT I 2000, 92, 597.
- **The classification system**[134]. Vabariigi Valitsus, RT I 2008, 4, 27.
- **The data exchange layer of information system**[135]. Vabariigi Valitsus, RT I 27.09.2016, 4.

[128] The figure is taken from an internal documentation

[129] https://www.mkm.ee/sites/default/files/interoperability-framework_2011.doc

[130] http://ec.europa.eu/eurostat/web/quality/european-statistics-code-of-practice

[131] https://www.riigiteataja.ee/en/eli/506012015002/consolide

[132] https://www.riigiteataja.ee/en/eli/507032016001/consolide

[133] https://www.riigiteataja.ee/en/eli/518012016001/consolide

[134] https://www.riigiteataja.ee/akt/12910889

[135] https://www.riigiteataja.ee/akt/127092016004

- **The administration system of state information system**[136]. Vabariigi Valitsus, RT I 29.03.2016, 6.
- **The system of address details**[137]. Vabariigi Valitsus, RT I 13.10.2015, 2.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure**:** is used to facilitate secure mechanism for authentication and environment for secure signing.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- The **unique personal identification code** provides opportunity to merge personal data from different registers.
- The **unique company commercial registry code** provides opportunity to merge business data from different registers.
- The **unique address data** provides opportunity to merge address data from different registers.

4.9.1.5 Crucial factors/ Lessons learned

The e-census case is a huge amount of manual work for the state. Compared to conventional censuses, this register-based census saves around 280 full-time staff work per year for state, which mean less administrative burden for state. Moreover, this system causes administrative burden reduction for citizens as well. In new census, system there is no administrative burden for citizens at all.

In addition, e-census provides much higher quality census and saves considerable amount of time. Finally yet importantly, e-census has lower costs, because it eliminates the need for census interviews, which is the most cost-intensive, and labour-intensive stage of conventional censuses.

Furthermore, there are some possible barriers in this case which need to be considered for further development of this case. Barriers such as registers legislation must contain provisions to allow the data reuse by Statistics Estonian, the data allowing a person to be identified shall be substituted by a code (coding and the possibility to decode is permitted only for the needs for the need of additional scientific research or official statistic), the system logic controls of data must be applied and finally, the quality of data needs to be improved. All these aspects need to be solved before the full implementation of the project. Data improvement is ongoing and a never-ending process.

This case implements good OOP elements. Though e-census is not cross-border, it has the potential to develop to a cross-border scale.

4.9.2 Hellenic Citizens' Registry

Domain	Country	Type	Maturity	Cross-border maturity	Started
Demography and population	GR	R	Essential	Ad Hoc	2015

4.9.2.1 Summary of case

The national Citizens' Registry is the base registry (authentic source) hosting citizens' civil and municipal status information. It includes the development of a central infrastructure (hardware and software), owned by the

[136] https://www.riigiteataja.ee/akt/129032016006

[137] https://www.riigiteataja.ee/akt/113102015002

Ministry of Interior, and thus the establishment of a base Information System (Citizens' Registry) implementing the following functionality:

1. Through a single web-based application, authorised users of the Ministry of Interior and local government organisations, will have rights to register, search, update/edit, monitor and print any kind of civil and municipal status information. In the first place, all relevant citizens' (life) events will be registered, once-only, by the competent local offices across all the municipalities of the country (1034 distributed offices),
2. Certified public-sector organisations (units/bodies of interoperability) will have automated access to the database of the Citizens' Registry.

URL: http://www.ypes.gr/el/Ministry/Actions/PlhroforiakaSystLixDim/ergo-mitr-pol/

4.9.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Municipalities	Local Government	X	X	X
Ministry of Interior	Government	X	X	X
Public Administration Organisations	Government			X

4.9.2.3 Architecture of case

The various subsystems are shown in the structured block diagrams in **Figure 21** and Figure 22.

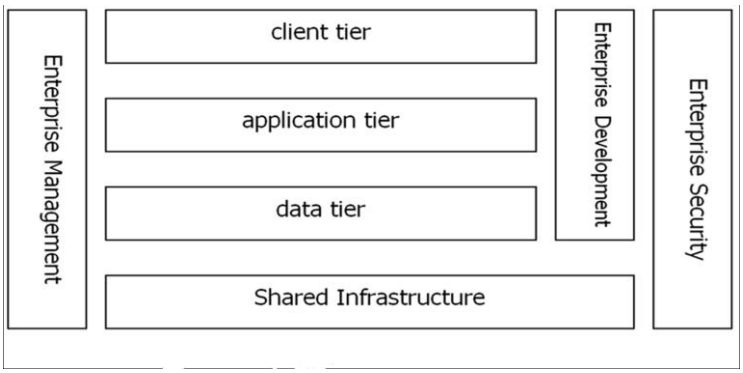

Figure 21: Architecture of Hellenic citizens' registry 1

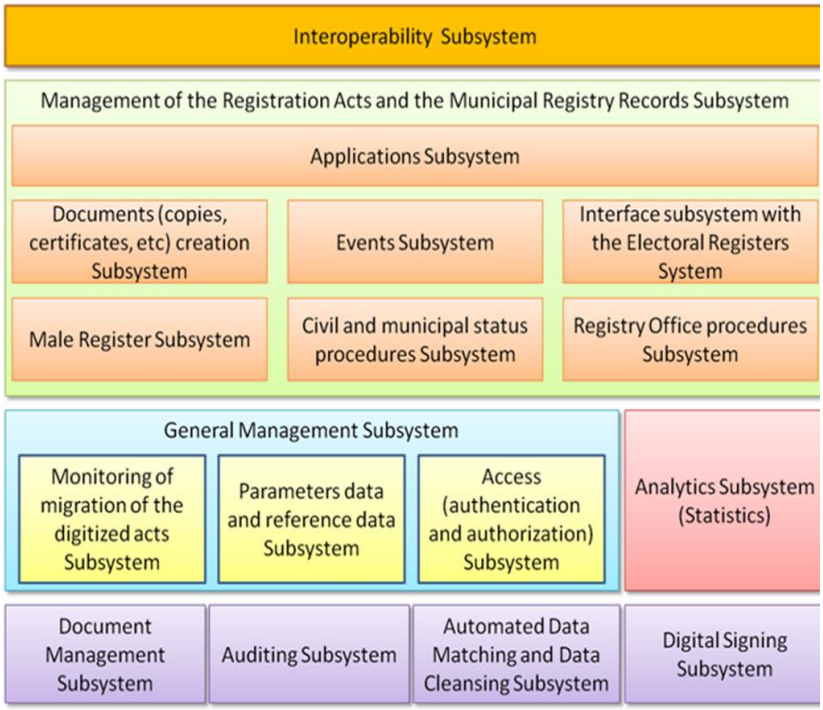

Figure 22: Architecture of Hellenic citizens' registry 2

4.9.2.4 Enablers of case

Legal provisions

- **eGov Law (FEK 3979A/16 JUNE 2011)[138],** In the first paragraph of the nineteenth article of the aforementioned law it is described the sharing of ICT infrastructure and data, excluding personal data.

4.9.2.5 Crucial factors/ Lessons learned

In the framework of the project all databases, where currently civil and municipal status data are stored, will be consolidated (aggregated, migrated) into the new database of the Citizens' Registry. Moreover, considerable effort will have to be done for ensuring data quality (data matching and data cleansing). After the implementation of the project, any Governmental Information System that needs civil and municipal status data will have the ability to acquire them in an automated way from the (National) Citizens' Registry. As a consequence of the once-only principle, citizens do not need to submit repeatedly their personal basic data to the different authorities.

This case implements good OOP elements. But it is not applicable cross-border.

[138] http://www.et.gr/idocs-nph/search/pdfViewerForm.html?args=5C7QrtC22wFYAFdDx4L2G3dtvSoClrL8aRmGcrk2DyZ5MXD0LzQTLWPU9yLzB8V68knBzLCmTXKaO6fpVZ6Lx3UnKl3nP8NxdnJ5r9cmWyJWelDvWS_18kAEhATUkJb0x1LIdQ163nV9K--td6SIuWul0aw7wuQu_zIv4zGsWeDDAhtceLHtRKuKtY2AHivR

4.10 Agricultural activity

4.10.1 Estonian Portal of the Agricultural Registers (e-PRIA)

Domain	Country	Type	Maturity	Cross-border maturity	Started
Agricultural activity	EE	FE	Sustainable	Ad Hoc	2006

4.10.1.1 Summary of case

e-PRIA is the client portal of the Agricultural Registers and Information Board (ARIB), through which clients can submit documents to ARIB and check their details in ARIB's registers. Keepers can use the portal to submit a variety of declarations and also check registry data. It is also possible to use the portal to apply for a range of support.

The register consists of data on identified farm animals, the places in which they are kept, certified abattoirs and animal waste processing companies are recorded in the register of farm animals. Also, recorded in the register of agricultural support and land parcels are the personal, contact and bank details of all those who apply to ARIB for European Union or state support, as well as in applying for the determination of a production quota or national amount, an import or export licence or an export support or inward processing certificate.

URL: https://epria.pria.ee/epria/

4.10.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Applicants	Citizen, Business	X	X	X
PRIA	Government	X	X	X
Population Register	Government	X	X	
Business register	Government	X	X	
Address system	Government	X	X	
Register of agricultural support and agricultural parcels	Government	X	X	
Administration System of School Milk Subsidy	Government	X	X	
Rural development aid system	Government	X	X	
Rural development support administration system	Government	X	X	
Client register of ARIB	Government	X	X	
Estonian Agricultural Geographical Information System (EAGIS)	Government	X	X	
Administration System of National Subsidies	Government	X	X	
Veterinary and Food administration	Government	X	X	

4.10.1.3 Architecture of case

All ARIB clients can use e-PRIA, users can log in using an ID card and an ID card reader or bank user name and passwords.

Linking registers are:

- Register of agricultural support and agricultural parcels

- Administration System of School Milk Subsidy
- Rural development aid system
- Rural development support administration system
- Client registers of ARIB
- Estonian Agricultural Geographical Information System (EAGIS)
- Administration System of National Subsidies

4.10.1.4 Enablers of case

Legal provisions

- **Establishment Act, RT I 2004, 39, 264**[139]
- The **Estonian Data Protection Inspectorate** must be followed as a data guideline.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.
- All participants must implement three-level IT baseline security system **ISKE**.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- All registers must be linked by use of commonly accepted keys: **personal code for citizens**, **code of institution**, standardised address presentation.

4.10.1.5 Crucial factors/ Lessons learned

e-PRIA is intended for a definite group of citizens, mainly located in rural areas and connected to agriculture. It provides detailed overview about applicants, grants, conditions, business plans, trends, dynamics and reporting administration.

Case implements good OOP elements.

4.10.2 Estonian Veterinary and Food Board

Domain	Country	Type	Maturity	Cross-border maturity	Started
Agricultural activity	EE	FE	Essential	Ad Hoc	1999

4.10.2.1 Summary of case

The register controls that the requirements stipulated by the legislation that governs veterinary, food safety, market regulation, animal welfare and farm animal breeding be followed. The Veterinary and Food Board (VFB) Official Control Information System is intended for a definite group of citizens, mainly food or feed business operators.

The Ministry of Agriculture in cooperation with the Veterinary and Food Board exercises the rights of the Information System. Only officials use the system and data. The main purpose of the register is food quality and

[139] https://www.riigiteataja.ee/ert/act.jsp?id=12814753

safety control management over the food handlers. The system includes the licences management, integration with quality laboratories and risk assessment. Client portal is opened for citizens and for entrepreneurs.
URL: http://jvis.agri.ee/

4.10.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
VFB Control System	Government	X	X	X
State Veterinarians register	Government	X	X	X
State Feed and Food Handlers Register	Government	X	X	X
State Food Control Laboratories Database	Government	X	X	X
Population register	Government	X	X	
Business register	Government	X	X	
Address System	Government	X	X	
Citizens (only veterinarians and licenses)	Citizens			X
Entrepreneurs (only veterinarians and licenses)	Business			X
Officials (incl. Ministry control officers) Portal	Government			X

4.10.2.3 Architecture of case

The information system has two sub information systems:

- National Register of Veterinarians, which registers and systematises veterinarians with a valid professional certificate. The register allows supervising veterinary practices and collecting valid data for statistics.
- National Register of Food and Feed Business Operators. The register allows collecting data about people who are authorised food business operators or who are feed business operators.

Users (officials) can log in using an ID card and an ID card reader or bank user name and passwords.
Linking registers are:

- National Register of Veterinarians
- National Register of Food and Feed Business Operators

4.10.2.4 Enablers of case

Legal provisions

- The **Estonian Data Protection Inspectorate** must be followed as a data guideline.
- **Food Act, RT I 1999, 30, 415**
- **Infectious Animal Disease Control Act, RT I 1999, 57, 598**[140]
- **Veterinary Activities Organisation Act, RT I, 29.08.2015, 38**[141]

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.

[140] https://www.riigiteataja.ee/en/eli/522062016003/consolide

141 https://www.riigiteataja.ee/akt/129082015038

- All participants must implement three-level IT baseline security system **ISKE**.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- All registers must be linked by use of commonly accepted keys: **personal code for citizens**, **code of institution**, standardised address presentation.

4.10.2.5 Crucial factors/ Lessons learned

This register provides better food control data, management and quality, reduced paperwork and mistakes; reduce operational costs and human power, increased transparency and quality management.

Case implements a good OOP element for officials.

4.11 Cases of other domains

4.11.1 Estonian Register of Employment

Domain	Country	Type	Maturity	Cross-border maturity	Started
Labour market	EE	R	Sustainable	Ad Hoc	2014

4.11.1.1 Summary of case

All employees with whom an employer has entered into an employment contract must be registered with the Tax and Customs Board in the employment register when starting to work or beginning service.

Start, suspension and termination of employment will be listed in the register and the data regarding workforce medical insurance will be sent to the Health Insurance Board directly from the register.

The Estonian Health Insurance Fund uses the data of the employment register for granting the health insurance benefits;

- the Estonian Unemployment Insurance Fund uses the data of the employment register for registration of persons as unemployed, termination of the persons' registration as unemployed, for granting unemployment allowances and other unemployment insurance benefits prescribed by the Unemployment Insurance Act;
- the Social Insurance Board uses the data of the employment register for verification of the employment status;
- the Police and Border Guard Board uses the data of the employment register for exercising supervisory control over the working conditions of foreigners;
- the Estonian Tax and Customs Board uses the data of the employment register for monitoring the performance of the tax liabilities of taxable persons.

URL: https://www.emta.ee/et/emta_login/nojs

4.11.1.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Employers	All	X	X	X
Population Registry	Government	X	X	
Address System	Government	X	X	
Business Register	Government	X	X	
Register for Agencies of State and Municipalities	Government	X	X	

Actor name	Actor category	Owner	Provider	Consumer
Estonian Health Insurance Fund	Government			X
Estonian Unemployment Insurance Fund	Government			X
Estonian Labour Inspectorate	Government			X
Social Insurance Board	Government			X
Police and Border Guard Board	Government			X
Tax and Customs Board.	Government	X		X
Employees	Citizens			X

4.11.1.3 Architecture of case

The electronic solution eliminates the need for in-person visits to a service bureau for registration. Registration can occur in a variety of ways:

- Web registration through the e-Tax Board/e-Customs websites by entering data manually or uploading a file.
- Registration via a machine-to-machine (M2M) interface, using X-Road technology, the standard for integrating public registers and information systems in Estonia
- Mobile registration via a phone call or SMS message.

Linking registers are:

- Estonian Health Insurance Fund.
- Estonian Unemployment Insurance Fund.
- Labour Inspectorate.
- Social Insurance Board.
- Police and Border Guard Board.
- Tax and Customs Board.

4.11.1.4 Enablers of case

Legal provisions

- **The establishment of the register of employment, RT I, 22.05.2014, 1**[142]
- **Taxation Act, RT I, 16.04.2014, 2**[143]
- **The Estonian Data Protection Inspectorate** must be followed as a data guideline.

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure: is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.
- All participants must implement three-level IT baseline security system **ISKE**.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.
- All registers must be linked by use of commonly accepted keys: **personal code for citizens**, **code of institution**, standardised address presentation.

[142] https://www.riigiteataja.ee/akt/122052014001

[143] https://www.riigiteataja.ee/akt/116042014002

4.11.1.5 Crucial factors/ Lessons learned

This OOP case reduces administration costs for governmental agencies and saves costs (both the tax collection and social benefits agencies). It results in faster and efficient verification of employment and increases tax collections. This register facilitates digital processes and a paper-free procedure. It boosts the social guarantees, social safety environment, and employees´ awareness. Moreover, it decreases illegal employment. This register provides for citizens the clear understanding of tax payment by employee.

In addition, this case allows agencies to share information, which eliminates duplication. Regarding to once-only principles vision, this case eliminates the need for employers to submit employee data to multiple government agencies and increases transparency.

This case has good potential for cross-border implementation.

4.11.2 Estonian Sports Registry

Domain	Country	Type	Maturity	Cross-border maturity	Started
Social affairs	EE	R	Sustainable	Ad Hoc	2011

4.11.2.1 Summary of case

In order to keep an account of Estonian sports organisations, sports schools, sport facilities and coaches with the aim to organise and manage sports activities and enhance participation in sports activities, the Government of the Republic has established a sports database which belongs to the state information system. The Sports Registry is a public database, which collects data on sports organisations, their members and coaches.

URL: http://www.spordiregister.ee/

4.11.2.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Ministry of Culture	Government	X	X	X
Local Organisations of Sports	NGO		X	X
Foundation of Sport Training	NGO		X	X
Citizens	Citizens			X
Public Administrations	Government		X	X
Register of Professions	Government		X	
Address Data System	Government		X	
Population Register	Government		X	
Commercial Register	Government		X	
State Register of State and Local Government Institutions	Government		X	
Estonian Education Information System	Government		X	

4.11.2.3 Architecture of case

- The Sports Registry consists of four interrelated sub-registers:
- Sub-database of sports organisations
- Sub-database of sports schools
- Sub-database of sports objects
- Sub-database of coaches

4.11.2.4 Enablers of case

Legal provisions

- **General regulation for founding and maintaining the Estonian Sports Registry**[144], RT I, 21.02.2014, 19
- **Sport Act**[145], RT I, 30.12.2015, 1

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure**:** is used to facilitate secure mechanism for authentication by eID, IDcard, and digiID.

Semantic interoperability

- 5.2.1 Estonian Catalogue of Public Sector Information (RIHA): master data in registers properly described in this catalogue.

4.11.2.5 Crucial factors/ lessons learned

This registry provides a nation-wide overview about Estonian sports organisations, their members and coaches. Furthermore, this registry can be considering as a useful tool for citizens, parents, and policy-making authorities as well.

This case implements strong once-only principle elements but it is not cross-border applicable.

4.11.3 Estonian Consumer Service Environment Data System

Domain	Country	Type	Maturity	Cross-border maturity	Started
Consumption	EE	R	Sustainable	Opportunistic	2014

4.11.3.1 Summary of case

The Consumer Service Environmental Information System is an information system, where the Estonian Consumer Protection Board officers deal with the appeals from consumers and the scheduled inspection operations. Consumers can submit appeals and complaints through the system and access the archive of their statements.

URL: https://takis.tarbijakaitseamet.ee

4.11.3.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Consumer Service Environmental Information System	Government	X	X	X
Population Register	Government	X	X	
Business Register	Government	X	X	
Citizen	Citizen	X	X	X
Business	Business	X	X	
Public	Citizen			X

[144] https://www.riigiteataja.ee/akt/121022014018?leiaKehtiv

[145] https://www.riigiteataja.ee/en/eli/528122016011/consolide

Actor name	Actor category	Owner	Provider	Consumer
Register of Economic activities	Government			X
Criminal Record Register	Government			X
Address Data System	Government	X	X	

The Estonian Consumer Protection Board exercises the rights of the chief processor of the Consumer Service Environment Data System.

4.11.3.3 Architecture of case

The data entered in the database consists of complaints and appeals from consumers and also relevant operations for resolving complaints, as well as the procedural steps in connection with the administrative and misdemeanour proceedings. Also, people can watch their appeals' archive. Consumers can submit appeals and complaints anonymously or using an ID card.

The database has been integrated with the commercial register; the Population Register; Address Data System; Criminal Records Register and Register of Economic Activities.

The Consumer Service Environmental Information System also acts as a document register, which allows to avoid duplication of data entered into different systems. Data about completed submissions, decisions and procedures are kept in the archives, which are public.

4.11.3.4 Enablers of case

Legal provisions

- **Consumer Protection Act1**[146], RT I 2004, 13, 86

Technical interoperability/ Technical enablers

- 5.5.4 Estonian data exchange layer for information systems (X-Road): is used to provide the secure data exchange layer for confidential and legally binding data exchange.
- 5.6.1 Estonian Public Key Infrastructure**:** is used to facilitate secure mechanism for authentication and environment for secure signing.

Semantic interoperability

- Estonian catalogue of public sector information systems (see section 5.2.1), which contains metadata of this information system.

4.11.3.5 Crucial factors/ Lessons learned

All existing data is taken from base registers. This case has cross-border elements.

[146] https://www.riigiteataja.ee/akt/131122013007

4.11.4 German Refugee Digitisation System

Domain	Country	Type	Maturity	Cross-border maturity	Started
Migration	DE	FE	Seamless	Opportunistic	2016

4.11.4.1 Summary of case

In 2015, about one million refugees arrived in Germany. This situation challenged the state in different respects: There were numerous agencies providing services for refugees and registering incoming people, using different IT systems. Foreigners were registered multiple times due to misunderstandings or deliberate disguise and there were spelling mistakes because of different alphabetical systems or translation errors. Therefore, the asylum procedures were digitised. The data exchange of the system builds on the already established data standard XAusländer and all relevant authorities have access to a single core data system. Instead of the legal name, a fingerprint is used as a unique identifier. The registration is the prerequisite of all public services used by the refugee, e.g. accommodation, food, health services. Refugees receive a paper-based identity document that they have to show to receive the different means.

URL: https://www.bundesregierung.de/Content/DE/Artikel/2015/12/2015-12-09-datenaustauschverbesserungsgesetz-fluechtlingsausweis.html

4.11.4.2 Case actors

Actor name	Actor category	Owner	Provider	Consumer
Foreign citizens	Citizen	X	X	
Local foreign affairs	Government		X	X
Registration offices	Government		X	X
Federal Employment Agency	Government		X	X
Federal Office for Migration and Refugees (BAMF)	Government		X	X
NGOs	NGO			X

4.11.4.3 Enablers of case

Legal provision

- **Data Sharing Improvement Law** [147]**,** 01.02.2016

Technical Interoperability/ Technical enablers

- 5.1.1 German XAusländer**:** is a standardised data exchange format based on XML. It facilitates secure data exchange.

147 https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&start=//*%255B@attr_id=%27bgbl116s0130.pdf%27%255D#__bgbl__%2F%2F*%5B%40attr_id%3D%27bgbl116s0130.pdf%27%5D__1500886821534

5 OOP Enablers

In the subsequent subsections, the 21 OOP enablers are described. The enablers are grouped along the types of OOP enablers (see section • as well as Table 3).

5.1 Interoperability assets

5.1.1 German XAusländer

Country	Type	Maturity	Cross-border maturity	Started
DE	IG	Sustainable	Opportunistic	2007

5.1.1.1 Summary of enabler

The term XAusländer[148] describes a standardised data exchange format based on XML. It includes the data concerning all aspects of foreign nationals exchanged between local foreign affairs offices and communication partners. The modelling of the data and messages takes into account the XÖV [public services] regulations[149] and other standards in Germany.

The XAusländer standard has been used amongst local foreign affairs offices since November 2011 and between local foreign affairs offices and registration offices since November 2012. From November 2013, in its role of a communication partner, the Federal Office for Migration and Refugees (BAMF)[150] will exchange data concerning integration with local foreign affairs offices using the standard and the Federal Office's own InGe (integration transaction file) application. A year later, communication between local foreign affairs offices and the providers of basic social security (the job centre at the Federal Employment Agency and the unemployment benefit II agency) followed, including the expansion of the local foreign affairs offices' communications with the Register of Foreign Nationals. Foreign citizens need to provide their information to a local foreign affairs office once. Organisations like registration offices, registration of foreign nations, administrative courts, federal employment agency and any others who deal with foreign citizens communicate this information among themselves without asking for it again. Both citizens and authorities have accepted these regulations and procedures.

URL: http://www.bamf.de/EN/DasBAMF/ITDienstleistungen/Angebote/Xauslaender/xauslaender.html

5.1.1.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Foreign citizens	Citizen	X	X	
Local foreign affairs	Government		X	X
Registration offices	Government		X	X
Federal Employment Agency	Government		X	X
Federal Office for Migration and Refugees (BAMF)	Government		X	X

[148] http://www1.osci.de/standards/xauslaender-2774

[149] http://www.xoev.de/die_standards-1471

[150] http://www.bamf.de/DE/Startseite/startseite-node.html

5.1.1.3 Crucial factors/ Lessons learned

The establishment of xAuslander ensures that

- all recorded data is made available for federal authorities in a structured, standardised and machine-readable way
- all data provided by citizens conforms to the technical requirements and standards and it is compatible, therefore it can be used in digital procedures and case processing.

xAuslander also supports efficiency improvements and ensures the full exploitation of the data by pubic authorities.

5.1.2 Irish Personal Public Service Number

Country	Type	Maturity	Cross-border maturity	Started
IE	A	Sustainable	Ad Hoc	2000

5.1.2.1 Summary of enabler

The Personal Public Service Number (PPS number) is a unique reference number that helps access social welfare benefits, public services and information in Ireland. Before a PPS number can be allocated, it must be shown that it is needed for a transaction with a specified body. For example, for taking up employment, a PPS number is needed to register with the Revenue Commissioners. However, looking for work is not a transaction with a specified body and employers should not look for a PPS number when recruiting. An employer should only seek a PPS number if a person is actually taking up employment with the organisation.

A list of State agencies that use PPS numbers to identify individuals is provided on the Department of Social Protection's website. The PPS number was known as the Revenue and Social Insurance (RSI) number and certain numbers have to be changed.

A PPS number is always 7 numbers followed by either one or two letters.

URL: http://www.citizensinformation.ie/en/social_welfare/irish_social_welfare_system/personal_public_service_number.html

5.1.2.2 Crucial factors/ Lessons learned

The personal public service number is useful to provide secure access to all social welfare services. It can be use as pupil's ID and for using the free travel pass. Moreover, this unique number is used in public health services such as medical card and drug payment scheme. In addition, this number is used in the theory test for issuing driving licenses. It is used in schemes run by the Revenue Commissioners, such as mortgage interest relief. The PPS number is used in many different programs including child immunisation and housing grants.

5.2 Catalogue

5.2.1 Estonian Catalogue of Public Sector Information (RIHA)

Country	Type	Maturity	Cross-border maturity	Started
EE	CA	Seamless	Sustainable	1998

5.2.1.1 Summary of enabler

RIHA, short for Riigi Infosüsteemi Halduse Infosüsteem, is the Estonian catalogue of public sector information systems. It serves as the national registry of systems, components, services, data models, semantic assets, etc. This enabler facilitates the Estonian information system planning and operation activities.

The main goal of RIHA is to guarantee the transparent, optimal balance and efficient management of public sector information systems. It supports interoperability of databases, the life-cycle management of information systems and the re-use of data by providing complete and up-to-date metadata of Estonian public sector information systems.

RIHA stores metadata of Estonian public sector databases, registers and information systems. Assets are available in human- and machine-readable format (XML, OWL), human-readable only format (PDF), and machine-readable only format (CSV, WSDL). Some figures of RIHA content are shown in Table 7.

URL: https://www.ria.ee/en/administration-system-of-the-state-information-system.html

Table 7: RIHA in figures

48 000	data objects	1 500	institutions (service producers and consumers)
600	information systems	1 600	contact persons (responsible for data and systems)
750	X-Road service providers	650	code lists
4 500	services	10	ontologies, dictionaries

5.2.1.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
The Information System Authority	Government	X	X	X
Owners of registers	Government	X	X	X
Operators of registers	Government		X	X
Front end systems	All categories			X
Coordinators	Government	X	X	X
Developers	All categories			X
Citizens, society	Citizen			X
EU federated catalogue				X

5.2.1.3 Architecture of enabler

RIHA gives information on the following subjects:

- Which are the information systems and databases that make up the state's information system;
- Which data are collected and processed and in which information systems;
- Which services, incl. X-Road services, are provided and who is using them;
- Who are the responsible and authorised processors of the information systems and databases, and who are the contact persons;
- On which legal basis are the databases operated and the data processed;
- The reusable components that ensure the interoperability of information systems (XML assets, classifications, dictionaries and ontologies.
- Procedural and administrative environment

RIHA serves as the procedural and administrative environment for the following actions:

- The use and employment of information systems and databases;
- The registration of services;
- The connection with the X-Road;
- The administration of reusable components (XML assets, classifications, dictionaries and ontologies).
- RIHA provides trustworthy assistance and is a great tool for the developers, administrators and users of the state's information system.

5.2.1.4 Crucial factors/ Lessons learned

Critical requirements to the information systems checked in RIHA are:

- Requirement of legal regulations of information systems.
- Requirement to use of unique personal identification code.
- Requirement to use of unique company business registry code.
- Requirement to describe the master data.
- Requirement to use master data.
- Requirement of open data.
- Requirement of personal data protection.
- Requirement to deploy the national information security system ISKE.
- Requirement of X-Road use.
- Requirement to go through RIHA review and approval process.
- Requirement to describe services and information systems.
- Requirement to use the National Address System
- Requirement to use National System of Classification.

5.3 Interoperability governance

5.3.1 Argentinian Integrability Model

Country	Type	Maturity	Cross-border maturity	Started
AR	SDE	Sustainable	Opportunistic	2009

5.3.1.1 Summary of enabler

The Integrability model is a framework for the digital coexistence of computer applications (various types of interoperability) called "Digital Urbanism". It is based on needs such as:

- Sharing quality data
- Coordinating processes among all
- Creating services that others can use and expand.

Finding and implementing sustainable solutions to these needs is the purpose of the transversal program of the Integrability Model. Achieving a connected government will make it possible to achieve open government on the road to securing public value. This aim will be implemented through the following means:

- By releasing open and extensible services, public value and open government become sustainable
- Co-created processes allow to empower and support multiple existing services
- In Neuquen, more than 150 web services have been published to date, through which data is shared online from authentic sources in a secure and confidential way
- Data sharing from authentic sources simplifies and eliminates processes
- Connecting all actors in the community allows to exchange on-line data achieving the once-only principle.

Figure 23: Overview of the Argentinian Integrability Model

Based on the e-Estonia developments and the macro layers of integration of Ken Orr, the model is operating in the province of Neuquén, Argentina. Security features of the authentic source are implemented with the X-road (OpenSource) security servers.

URL: http://www.integrabilidadnqn.gob.ar/

5.3.1.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Secretaria Gestión Publica de Neuquén	Government	X		
Base registers	All categories		X	
Secondary registers	All categories		X	X
Front end systems	All categories			X
Portals	All categories			X

5.3.1.3 Crucial factors/ Lessons learned

Crucial factors

- Change management is key for projects of this magnitude
- Cynefin framework[151] is used to symbolically navigate steps from chaos to complexity to complicated to the desired simple model -The three needs of (1) sharing data, (2) co-creating processes and (3) liberating services are aligned with these stages
- Participation in Communities of Practice (CoPs) is essential to achieve agreements without imposition. Needs must be clearly defined, for which the Job To Be Done (JTBD) approach[152] is used. The needs

[151] D. Snowden and M. Boone, A Leader's Framework for Decision Making. In: Harward Business Review, November 2007, retrieved from http://www.academia.edu/download/3459515/A_Leader_s_Framework_for_Decision_Making_-_HBR.pdf

are stable and determinant, and from them, the CoPs of "solutions" (legal, technology, thematic) can work and generate alternatives that are easily comparable and selectable

- Different techniques of gamification are used to achieve that the change is dominated by the involved people at all times
- Stafford Beer's techniques of "team syntegrity"[153] are used to get stakeholders to achieve sustainable basic agreements when the conflict of interests is very marked and recurrent
- Much of what is needed to apply the once-only principle is based on the first stage of data sharing.

Lessons learned

- The data must be fresh from its own source. Instead of breaking organisational silos, they must first interconnect, reinforce their natural competencies and be integrated
- The rules that are defined should clarify the needs, facilitate governance and free up both the technological innovation and the business models to implement it.

5.3.2 Greek Interoperability Centre

Country	Type	Maturity	Cross-border maturity	Started
GR	IG	Essential	Ad Hoc	2015

5.3.2.1 Summary of enabler

The Interoperability Centre (IC) of the Ministry of Finance is an Information System that has been developed by the General Secretary of Information Systems and Administrative Support. Its main objective is the interconnection and integration of the electronic public services based on the once-only principle. The core of the IC is an Enterprise Service Bus – ESB, which provides the infrastructure for the installation and reuse of web services. The utilisation of the installed web services facilitates the interchange of data (24 hours/day, 7 days/week) between the Ministry of Finance, where the IC has been installed, and other public administration organisations. Thus, interoperability, the once-only principle, the reuse of data and the reuse of web services are promoted. The IC aspires to become the “hub” of Greek Public Administration. It puts emphasis on data security and thus provides a secure electronic environment for uninterrupted operation. The IC, in order to protect personal or other classified data, does not store operational or administrative data.

The constituents of IC are a module for the management of interoperability requests by public organisations; the electronic platform for the management and support of web services (Enterprise Service Bus-ESB); the common guide for the implementation of web services; and the policy for the correct (legal) usage of web services.

Some examples of web-services installed at the IC that potentially could be utilised for the implementation of a once-only principle case are the following:

- Confirmation of a citizen's details. This web service is provided by the Ministry of Finance.
- Request and receipt of "criminal records". This web-service is provided by the Ministry of Justice.

URL: http://www.gsis.gr/gsis/info/gsis_site/Services/DimosiaDioikisi/ked

5.3.2.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Ministry of Finance	Government	X	X	X
Public Organisations	Government	X	X	X

[152] J. Kaivo-oja. Futures of innovation systems and systemic innovation systems: Towards better innovation quality with new innovation management tools. FFRC eBOOK 8/2011, University of Turku, retrieved from https://www.utu.fi/fi/yksikot/ffrc/julkaisut/e-tutu/Documents/eTutu_2011_8.pdf

[153] S. Beer. Beyond Dispute: The Invention of Team Syntegrity. Wiley, 1994.

Private Firms	Business			X
Citizen	Citizen			X
NGOs	NGO			X

5.3.2.3 Architecture of enabler

Data interchange between public administration organisations could be achieved by one of the following mechanisms:

- sharing of data (access by secure environment for officials only),
- provision of data linkage and orchestration through web service combination when building compound services.

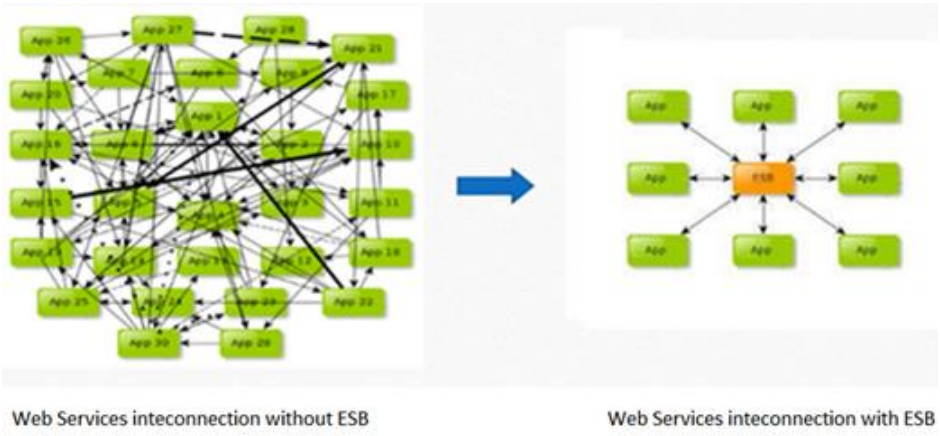

Figure 24: A logical view of the Enterprise Service Bus Architecture of Greek Interoperability Centre

5.3.2.4 Crucial factors/Lessons learned

The project reinforces data reusability, data accessibility based on the adoption of privacy rules as well as high security standards, monitoring of every data operation, monitoring of public administrations applications for data provision and data exchange.

The benefit is that KED (IC) works like a data hub for all members of Greek Public Administration through hosting and provision of web services into a single point. It assures a unified manner of data exchange through all parties of Greek Public Sector as well as other involved parties (such as Banks, Companies etc.).

5.3.3 Spanish E-Government Platform SEDIPUALB@

Country	Type	Maturity	Cross-border maturity	Started
ES	IG	Essential	Ad Hoc	2016

5.3.3.1 Summary of enabler

SEDIPUALB@ is an e-government platform integrating a set of shared services. Its main goal is the digitisation of the administrative management and procedures of a local organisation and thus the provision of better electronic services. It complies with the NTI - ENI (National Technical standards for interoperability - National Schema Interoperability) and the National Security Scheme (ENS).

It can manage more than 3000 concurrent users (local government employees) and is being used by more than 100 local government entities (cities, consortium, association of municipalities, etc.) of the province Albacete. Currently, it serves more than 90% of the citizens of the province Albacete.

A core feature is the reuse of the shared services of the central government as shown below:

- @FIRMA: digital sign of documents
- @TS: timestamping
- Notific@: management of digital notification for citizens and companies
- CLAVE: management of several types of user authentication
- Public Intermediate Service: allows access to citizen information that other governmental organisations save. The main goal is the implementation of the once-only principle
- Archive: fully digital archive of administrative documents and expedients
- INSIDE: creation of compatible electronic expedients (before send to Archive)
- Public Contract Service: uniform and transparent management of public contracts (including electronic tendering)
- FACE: uniform and transparent management of the government invoices

One of the latest goals is a new system for digital signing using biometric devices. The implementation utilises cloud technology and the development was made in Java, .Net and PostgreSQL. All applications are web-based and have adopted responsive web design. Moreover, they are offered free of cost.

URL: http://www.dipualba.es/Main/Sedipualba/default.aspx

https://joinup.ec.europa.eu/node/156207

5.3.3.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Province Albacete	Government	X	X	X
Local public organisations	Government	X	X	X
Citizens	Citizen			X
Private firms	Business			X

5.3.3.3 Crucial factors/ Lessons learned

This platform is free of charge for all users (citizens and local governments). It supports the digitalisation of the government-citizen relation by facilitating digital certificates or biometric devices. This platform manages the digital administrative expedients. Furthermore, the shared services provided by de state (central) government are reused in this portal.

In addition, software of this portal has been developed entirely by own staff, which promotes sustainability of the project. The platform hosts web-based applications operating in cloud mode and implementing responsive web design.

5.4 Network Infrastructure

5.4.1 Austrian Portal Group (Portalverbund)

Country	Type	Maturity	Cross-border maturity	Started
AT	IG	Sustainable	Opportunistic	2001

5.4.1.1 Summary of enabler

E-government can only function efficiently when public authorities work closely together and cooperate inter-administratively. This happens when government portals team up with each other to form a portal group (Portalverbund) and share the existing infrastructure.

The advantage of the portal group concept is that many applications are available from a single entry point. The identity of the user only needs to be verified once on the portal. Users only need to login a single time when they

first log on to the portal in order to access various resources, information sources, or "digital offices". The technical term for only requiring the user to sign in once is called "single sign on".

URL: https://www.digital.austria.gv.at/portal-group;https://www.ref.gv.at/Portalverbund.577.0.html (in German)

5.4.1.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Federal Ministries	Government		X	X
Federal State Authorities	Government		X	X
Local Authorities	Government		X	X

5.4.1.3 Architecture of enabler

Communication within the portal group is managed, both technically and organisationally, by the portal group protocol (PVP) and the use of security classes. Application providers determine which of their applications will be available over which portals. Keeping in accordance with all data protection regulations, they specify which administration units and employees are authorised to access which applications and define user roles with corresponding access rights.

5.4.1.4 Crucial factors/ Lessons learned

For the government users, many e-government applications are available from a single entry point, so-called "single sign on".

5.4.2 Greek National Network of Public Administration (SYZEFXIS)

Country	Type	Maturity	Cross-border maturity	Started
GR	NET	Essential	Essential	2005

5.4.2.1 Summary of enabler

"SYZEFXIS" is the telecommunications infrastructure of the Hellenic Public Administration, interconnecting about 4.485 (as of year 2008) points (buildings). In the framework of SYZEFXIS core and access network for the public organisations have been implemented, aiming to satisfy all their needs for communication through telephony, data and video.

The basic services of SYZEFXIS offered to public organisations are the following:

- Free of cost and safe broadband access to the intranet of the Public Sector and to the internet. Symmetrical access speed (same speed for upload and download to enable IP telephony) between 2 and 34 Mbps is provided.
- Free IP telephony between public organisations (on-net telephony). Low cost telephony between SYZEFXIS and other telecom providers (off-net telephony). Thus, the telecommunication costs of the public sector are reduced.
- Free web hosting and mail hosting.
- Pairing with the European Public Organisations Network (s-TESTA).
- Pairing with Greek Research and Technology Network (https://grnet.gr/en/).
- Implementation of teleconference studios for virtual meetings and eLearning sessions.

URL: http://www.syzefxis.gov.gr/en

5.4.2.2 Architecture of enabler

Figure 25, Figure 26 and Figure 27 provide an overview of the network architecture.

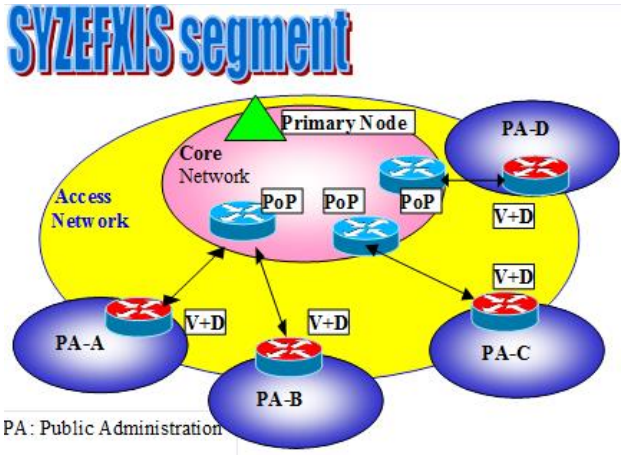

Figure 25: Network architecture of a SYZEFXIS segment

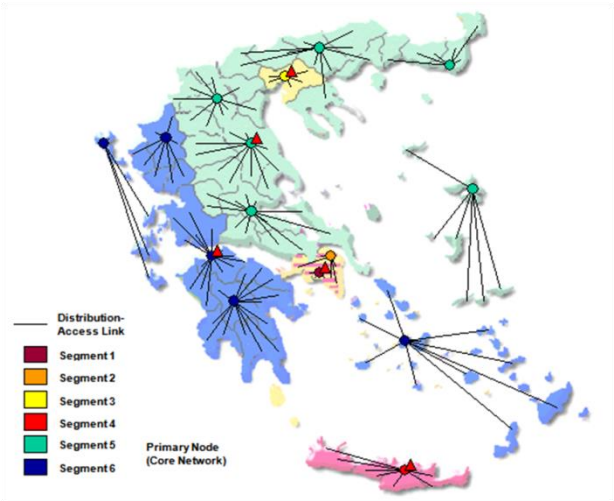

Figure 26: Distribution –Access Network of SYZEFXIS segments

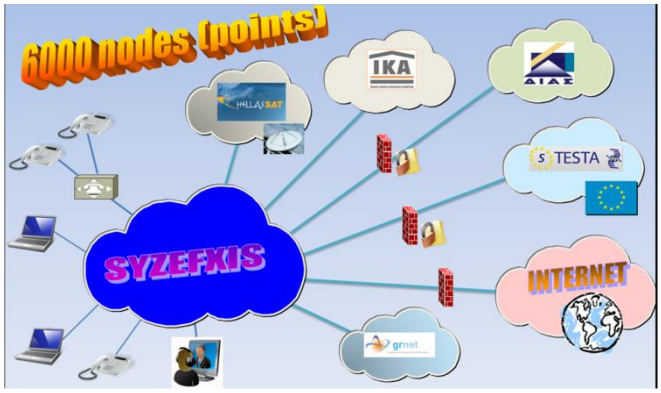

Figure 27: Interconnection with other telecommunication infrastructures

5.4.2.3 Crucial factors/ Lessons learned

A crucial factor for the implementation of SYZEFXIS was the successful project management as it was a large-scale and complex telecommunications project for the public sector.

The case bases on the private network. Reuse of existing network infrastructure indicates higher interoperability.

5.4.3 Irish Government Network

Country	Type	Maturity	Cross-border maturity	Started
IE	SDE	Essential	Opportunistic	2007

5.4.3.1 Summary of enabler

The Department of Public Expenditure & Reform in conjunction with the Government Networks Programme Board has established the Government Networks (GN) on behalf of the non-commercial public sector. Government Networks (GN) is a privately managed wide area network (WAN) connecting public service agencies on a data, voice and video capable network. GN is designed primarily to facilitate secure and reliable communication between Government agencies and to support existing and future Government applications.

For citizens and businesses, data-sharing between public bodies means that they need not provide the same information multiple times to different bodies. The implementation of an “ask-once, use-many” vision will help to significantly reduce the administrative burden on citizens and businesses, and will allow them to avail of higher-quality, more efficient and seamless public services on a cross sectoral basis.

URL: http://ictprocurement.gov.ie/government-networks/

5.4.3.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
The Minister for Public Expenditure and Reform	Government	X		
The Revenue Commissioners	Government		X	
The Department of Education and Skills	Government		X	
the Department of Foreign Affairs	Government		X	
General Register Office	Government		X	
The Department of Social Protection	Government			X
Student Universal Support Ireland (SUSI)	NGO			X

Actor name	Actor category	Owner	Provider	Consumer
The office of the President	Government			X

5.4.3.3 Architecture of enabler

Currently there are seven carriers paired with GN who can provide connectivity to agencies: BT Government Network, Complete Government Network, eircom BIP service, eircom Metro Network, Magnet, Smart Telecom Government Network, UPC Government Network

5.4.3.4 Crucial factors/ Lessons learned

GN offers a number of potential cost and operational benefits to participating agencies and to government as a whole:

- Facilitating inter-agency collaboration and delivery of joined-up government services by providing a secure connectivity environment for data exchange/sharing.
- All agencies regardless of size have access to network capability and products/technology usually available only to large ICT capable agencies.
- Takes care of many standard day-to-day infrastructure services so agencies can focus their resources on providing their core programmes and services.
- Security of government information systems is significantly improved by consolidating expertise and resources at a small number of network connections.
- Internet access costs for government agencies have substantially been incorporated into one highly resilient infrastructure, providing much greater bandwidth to agencies than had been practicable heretofore.
- Offers the commercial advantages of an aggregated procurement approach, resulting in significantly reduced costs and tariffs.

5.4.4 Spanish network Red SARA

Country	Type	Maturity	Cross-border maturity	Started
ES	NET	Essential	Essential	2005

5.4.4.1 Summary of enabler

Spanish Public Administration telecommunications networks are organised hierarchically based on the territorial organisation of Spain. For example, all the municipalities of a certain region are interconnected. Similarly, all the Regions are interconnected and all the Ministries are interconnected. Because of the need of assuring a secure and reliable interchange of information among all levels of government, a network for interconnecting all the Spanish Public Administration telecommunications networks, namely Red SARA (SARA network), was set up.

Red SARA, in short SARA network (System of applications and connections of public administrations), is a set of telecommunications infrastructure and basic common services (such as e-signature validation, verification of identity and residence data, e-notification), for the interconnection and the interoperability of all the Spanish Public Administration networks. Moreover, it facilitates the sharing of information and services between public administrations. Furthermore, it is interconnected to European Institutions through sTESTA network. Red SARA connects all the Regional Governments and more than 3.000 Local Councils, covering 90% of the population.

SARA network is a tool for telecommunications and other costs saving and rationalisation, favouring co-services between Public Administrations. Its main features are: reliability (support 24x7x365), security, capacity bandwidth (10 Gbps in Ministries and 100 Mbps in autonomous communities), Quality of Service (QoS) and interoperability.

URL https://administracionelectronica.gob.es/ctt/redsara?idioma=en

5.4.4.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
MINHAP (Ministry of Finance and Public Administration of the national government)	Government	X	X	X
Regional authorities	Government	X	X	X
Municipalities	Government	X	X	X

5.4.4.3 Architecture of enabler

Since each level of government can define its own network architecture and management policies to allow the interconnection through SARA network, a common addressing scheme is required. This is the goal of the Addressing and Network Interconnection Plan of the Administration, ruled by the Art. 14 of the mentioned National Interoperability Framework, Royal Decree 4/2010, which states:

"Public Administrations will apply the Addressing and Network Interconnection Plan of the Administration, approved by the Higher Council of e-government, for its interconnection through the Communication Networks of Public Administrations."[154]

This plan defines a common private addressing space for Public Administration entities, allowing each entity to set up independently its own addressing plan, based on its network infrastructure or its internal organisation, but at the same time maintaining a coordinated action to prevent the use of duplicated addresses.

Figure 28, Figure 29 and Figure 30 provide an overview of the architecture of the Spanish government networks.

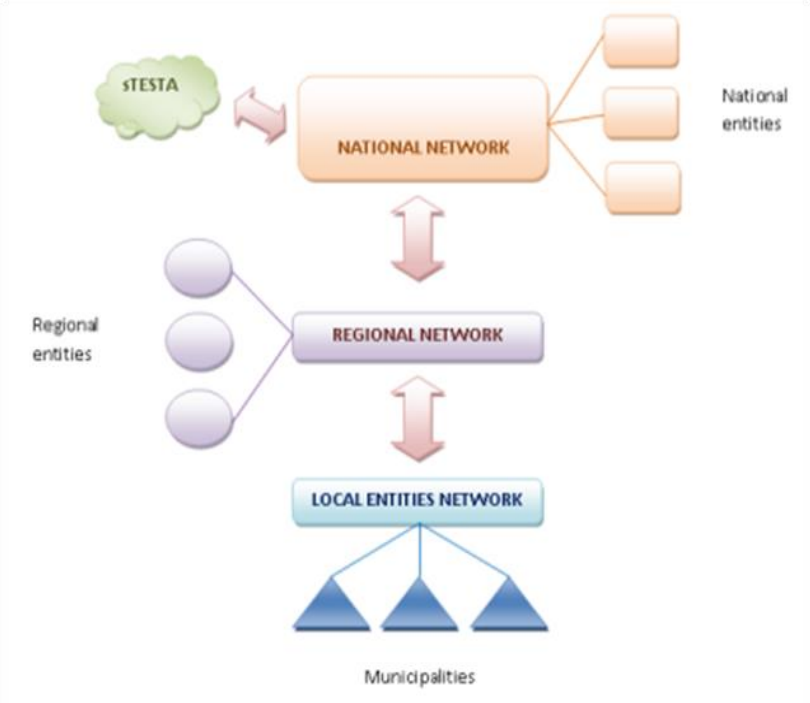

Figure 28: Architecture of Spanish PA networks hierarchy

154 https://administracionelectronica.gob.es/pae_Home/dms/pae_Home/documentos/Documentacion/pae_NORMATIVA_ESTATAL_Leyes/Royal_Decree_4_2010_Interoperability_framework_NIPO_000-10-058-X.pdf

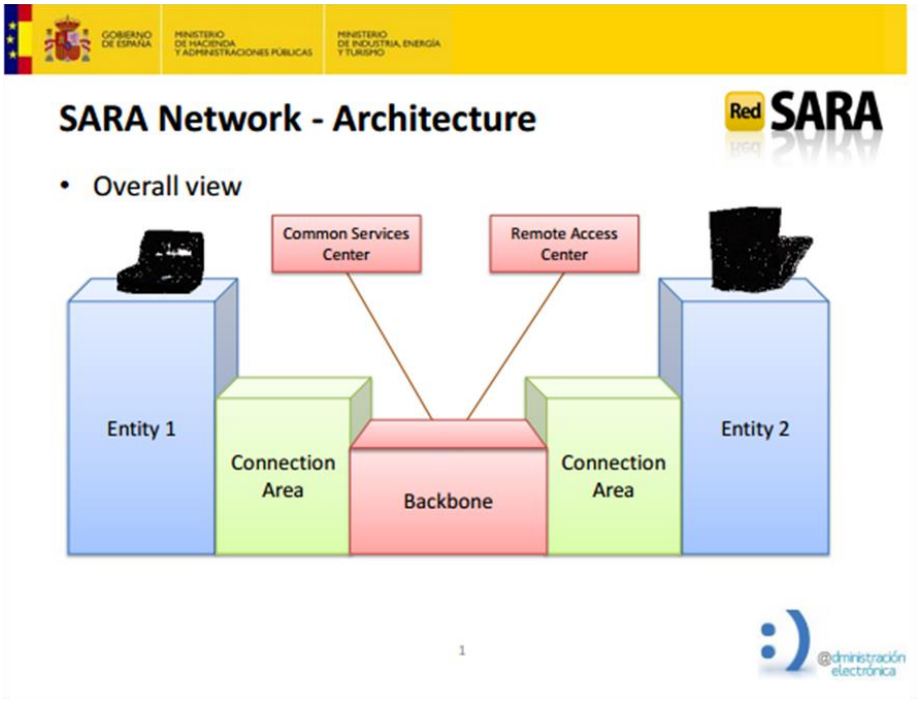

Figure 29: Architecture of the SARA Network overall view

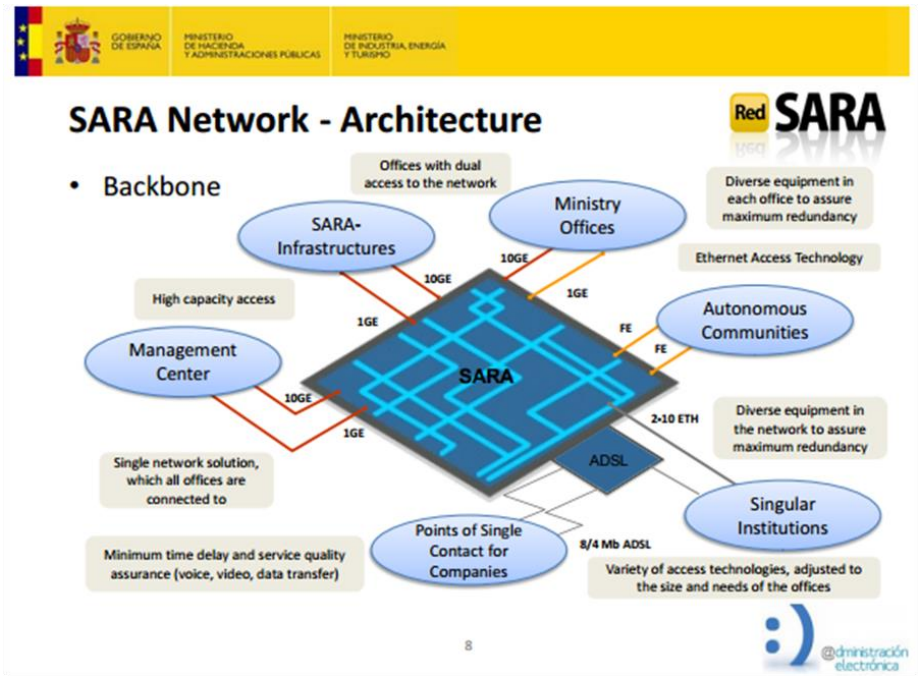

Figure 30: Architecture of the SARA Network backbone

5.4.4.4 Crucial factors/ Lessons learned

The case bases on a private network. Reuse of existing network infrastructure indicates higher interoperability.

5.5 Secure Data Exchange

5.5.1 Belgian Maximum Data Sharing Between Administrations and Agencies (MAGDA)

Country	Type	Maturity	Cross-border maturity	Started
BE	SDE	Sustainable	Opportunistic	2006

5.5.1.1 Summary of enabler

The MAGDA platform provides one common service-oriented data exchange infrastructure for 190 agencies and 13 departments of the Flemish regional Government, and for the 308 local governments. The MAGDA platform provides access to base registries of citizen and enterprise data, harnessing reusable technologies that can be easily adapted to the needs of different government administrations, from the regional to the local level, and increasingly to the federal level.

The MAGDA platform allows for the retrieval of data from base registries (federal and Flemish) and the exchange of data. The platform was built to realise the principle of the once-only collection of data, as well as the multiple (re)use of data. Data entered (for the first time or updated) by citizens and businesses are collected only once. All applications that later want to use these data can retrieve them from the available base registries and so always use the latest information.

URL: https://overheid.vlaanderen.be/magda

5.5.1.2 Crucial factors/ Lessons learned

Through the MAGDA platform base registries (both federal and Flemish) are connected. Despite the different structure of the data sources and the different designs of the applications using them, the following base registries are now interconnected by the platform: the National Register, the CBSS (Crossroads Bank for Social Security), CBE (Crossroads Bank for Enterprises) and LED (Database of certificates of learning and of professional competence). The platform also offers data from other data sources, which can be considered as authoritative sources. The data provided comes from more than 25 other sources, including information on vehicles, work permits, integration of refugees, education information, school attendance.

MAGDA's reusable services allow government organisations to quickly and cost effectively integrate data from these sources into their processes and applications.

The implementation of the platform was instrumental in the change from a "pull" to a "push" government, i.e. from a type of government in which citizens and businesses have to actively ask for services to a type of government that can proactively inform them about the benefits they are entitled to, on the basis of the data the government already has about them.

The use of the MAGDA platform has steadily increased over time, to the point that it currently connects more than 25 data sources and provides more than 75 data services.

5.5.2 Czech Basic Registers

Country	Type	Maturity	Cross-border maturity	Started
CZ	SDE	Essential	Ad Hoc	2013

5.5.2.1 Summary of enabler

Basic Registers are a unique solution to centralise and keep actual most common and widely used information, as a part of e-government and smart administration strategy of Czech government[155]. Base Registers are central, universal databases and, as such, they must provide for an efficient, secure, and transparent exchange of the data they store. In principle, there are a number of systems that form a cohesive whole. The system of base registers consists of the following four registers: Registry of Rights and Duties, Registry of Persons, Registry of Inhabitants and Registry of Territorial Identification, Addresses and Real Estate.

In accordance with current legislation, the system of base registries was deployed into a production environment on 1 July, 2012.

URL: http://www.szrcr.cz/index.php?lang=2

5.5.2.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Citizens	Citizen	X	X	
Companies	Business	X	X	
Federal Ministry of the Interior	Government	X		X
Czech Statistical Office	Government	X		X
Public Authorities	Government			X

5.5.2.3 Architecture of enabler

Base Registry of Inhabitants	Holds the data of inhabitants
Base Registry of persons	Holds the data of companies and governmental agencies
Base Registry of territorial identification, addresses and real estates	Holds the data of buildings
Base Registry of rights and responsibilities	Holds the data about administrative decisions
Converter	Converts the identifiers of subjects

5.5.2.4 Crucial factor/ Lesson learned

- Citizens will no longer repeatedly provide the same data to different authorities
- All authorities will have access to the most accurate and up-to-date data
- The most frequently used data in the public administration will be shared from one source
- Protection of citizen's privacy - authorised access will ensure that only competent authorities will be able to use personal reference data
- Simplified bureaucratic processes - authorities can deal with many tasks themselves without offloading their work onto citizens
- Better public control over state activities and the data it stores and used
- Modernised public administration processes resulting in better public opinions about the way the state works

Introducing the project meant to be the start of a long and sometimes problematic process of modernising a significant part of state-administration processes.

[155] See https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/eGovernment_in_Czech_Republic_March%202017_v3_00.pdf

5.5.3 Dutch System of Base Registries (Basisregistraties)

Country	Type	Maturity	Cross-border maturity	Started
NL	SDE	Sustainable	Opportunistic	2000

5.5.3.1 Summary of enabler

Due to the increasing number of government organisations in Netherlands and the demand of handling business wherever and whenever from people, government decided to digitalise their services. Moreover, by designing the system of base registries, government allows organisations to share and reuse their information. This has a variety of benefits including reduction of administration burden for citizens and businesses as they do not need to provide information that they earlier provided to government. The government can operate more efficiently and improve quality of services that government organisations such as public health services or fire stations deliver.

The Basisregistraties has a wide positive effect on society in terms of safety and security, health, innovation, and convenience, pooling all information about individuals, companies and geography in one storage.

URL: https://www.digitaleoverheid.nl/dossiers/basisregistraties

5.5.3.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Citizens	Citizen		X	
Entrepreneurs	Business			X
Different public organisation	Government		X	X
Dutch government	Government	X		

5.5.3.3 Architecture of enabler

Figure 31 provides an overview of the architecture. The common information services and standards enable secure and efficient data exchange between the base registries are:

- **Digipoort:** Through Digipoort, the electronic post office for businesses, government organisations and businesses can quickly and efficiently exchange structured digital information. Every business that is connected can exchange digital information with the government.
- **Diginetwerk:** Diginetwerk connects (existing) physical government organisation networks to one another. This results in a single closed virtual government network.

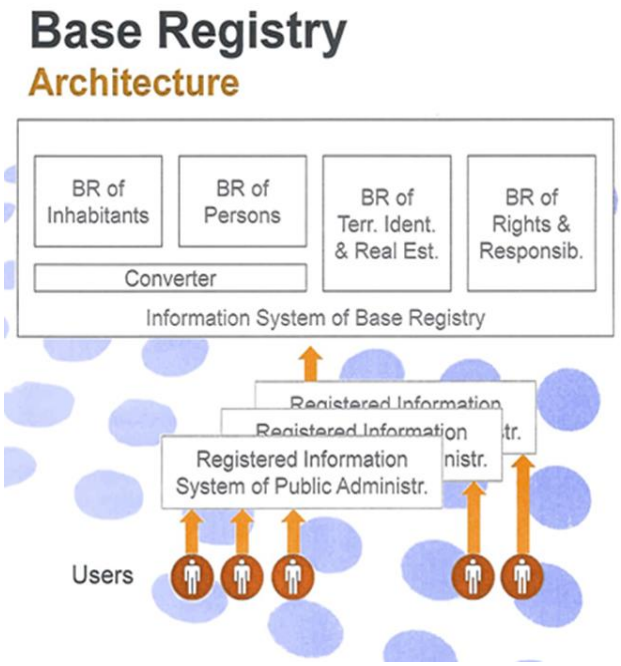

Figure 31: Architecture of Dutch System of Base Registries

5.5.3.4 Crucial factors/Lessons learned

Distribution of information among different government organisations could lead to decrease administrative burden for both citizens and companies and improve the quality and efficiency of public services.

5.5.4 Estonian data exchange layer for information systems (X-Road)

Country	Type	Maturity	Cross-border maturity	Started
EE	SDE	Seamless	Sustainable	2001

5.5.4.1 Summary of enabler

X-Road, the Estonian data exchange layer for information systems, is a technological and organisational environment enabling a secure Internet-based data exchange between information systems. X-Road employs a versatile security solution: authentication, multilevel authorisation, a high-level log processing system, encrypted and time-stamped data traffic.

Public and private sector enterprises and institutions can connect their information system with X-Road. Joining the X-Road enables institutions to save resources, since a cooperative and secure data exchange layer already exists with all the other X-Road members. Data exchange between all the members of the X-Road ecosystem is significantly more efficient.

Indirectly, X-Road also enables citizens and officials to operate via different portals and applications (document management systems, institutional information systems) in a more efficient and flexible manner. For example, it helps checking for relevant information in national databases or securely exchange documents with institutions.

URL: https://www.ria.ee/en/x-road.html

5.5.4.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Ministry of Economic Affairs and Communications	Government	X		
Base registers	Government		X	
Secondary registers	Government		X	X
Front end systems	Government/ Businesses			X
Portals, citizen portal	Government			X

5.5.4.3 Architecture of enabler

One of the key elements of e-Estonia is that its databases are decentralised, which means that

- There is no single owner or controller
- Every government agency or business can choose the product that is right for them
- Services can be added one at a time, as they are ready

X-Road is the crucial connection between these databases, the tool that allows them to work together for maximum impact. All of the Estonian e-solutions that use multiple databases use X-Road. All outgoing data from the X-Road is digitally signed and encrypted. All incoming data is authenticated and logged. During data exchange, X-Road ensures its parties with:

- Autonomy – an X-Road member defines, which data services it wishes to render and who gains access rights to the services;
- Confidentiality – information reaches only the authorised parties;
- Evidential value – using a digital signature enables proving the source of received data;
- Interoperability – all X-Road members speak the same language, regardless of the technology or architecture a member is using.

X-Road consists of:

- legal structure;
- organisational structure;
- protocol stack;
- software realising the protocol stack.

The **X-Road federation** is the capability of X-Road to provide secure Internet-based data exchange across ecosystems (states) to members that belong in different ecosystems. Every X-Road environment is managed by a competent organisation (centre) that defines the applied security policy and manages the information of its ecosystem members.

For cross-border data services to exist, the X-Road centres need to conclude a federation agreement that entails the description of organisational and legal liabilities between the centres of different states.

X-Road members that have joined the X-Road environment in their state (centre) are able to exchange data (cross-border e-services) with the X-Road members in other states.

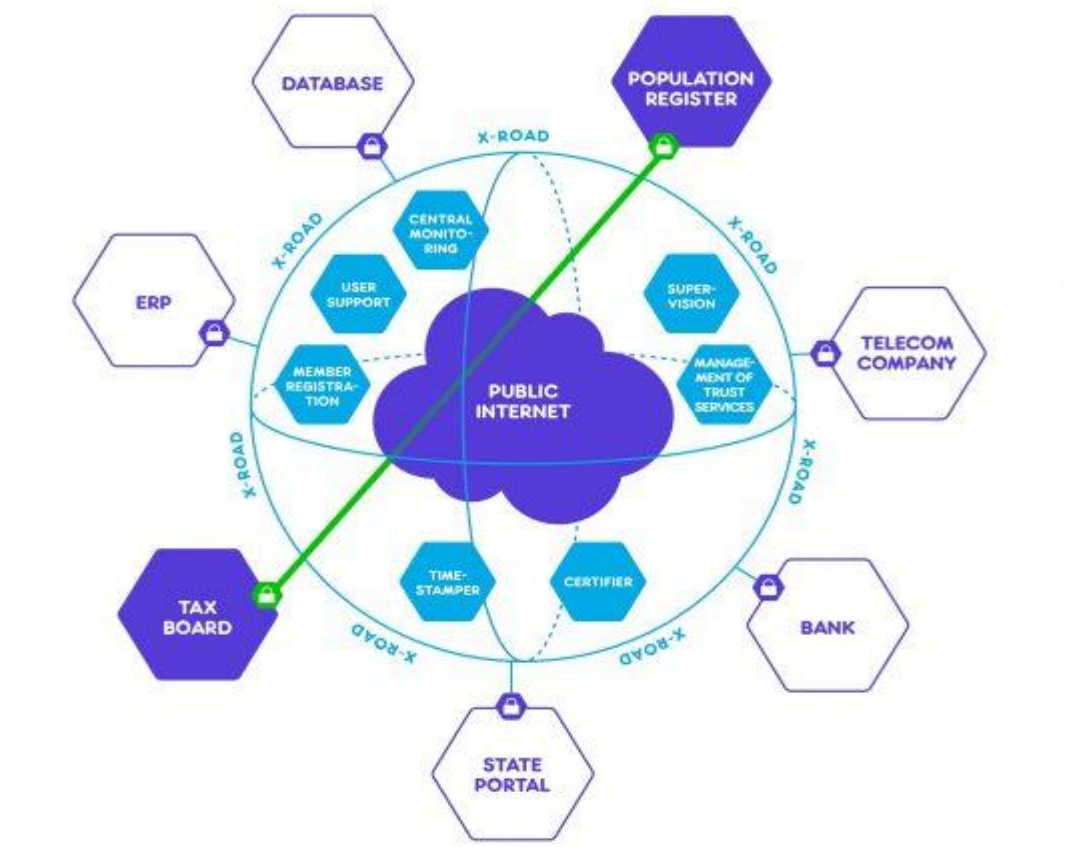

Figure 32: Architecture of X-Road[156]

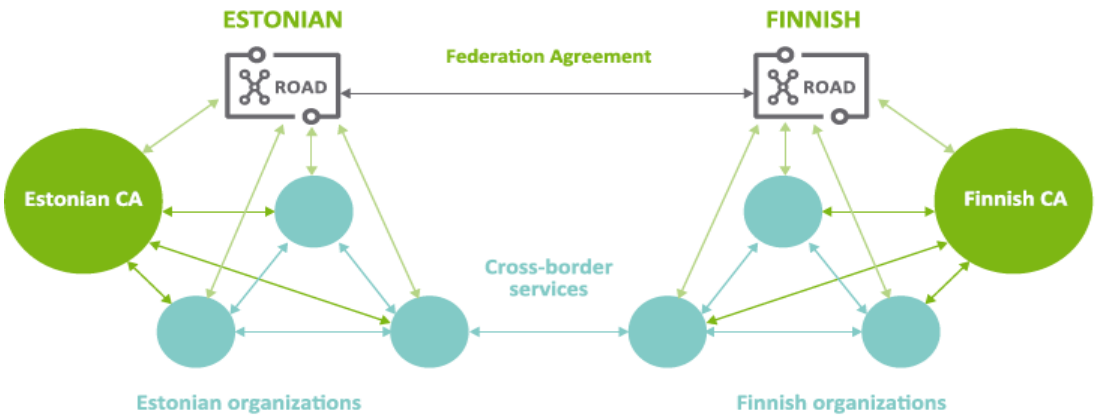

Figure 33: Architecture of X-Road cross-border[157]

[156] Source of figure are internal documents of Estonian Information System Authority
[157] Source of figure are internal documents of Estonian Information System Authority

Data users

- Public sector institutions
- Private sector institution
- Citizens are using X-Road services via front end systems

Benefits

- Allows databases to interact, making integrated e-services possible
- Institutions not locked into any one type of database or software provider
- Factsheets 2016: 246 registers, 975 institutions, 1789 services, about 52000 organisations as indirect users, 575 million queries
- Last year, the X-Road saved 656* years of working time. Assuming that every request saves 15 minutes and 4% of requests submitted via the X-Road involve communication between people, then using e-services helped save 5,745,810 working hours in previous year.

Political and semantic enablers

- Secure data exchange layer X-Road is the well proven component of Estonian IT infrastructure
- The unique personal identification code provide opportunity to merge personal data from different registers.
- The unique company commercial registry code provide opportunity to merge business data from different registers.
- Master data in registers and services must be described in catalogue RIHA (see section 5.2.1).

5.5.5 Portugal's Interoperabilidade na Administração Pública (iAP)

Country	Type	Maturity	Cross-border maturity	Started
PT	SDE	Sustainable	Opportunistic	2015

5.5.5.1 Summary of enabler

iAP is a public administration interoperability platform (iAP), connecting all the dots and services between the multitude of public entities and digital platforms that accumulate public information. The government has realised that to achieve a fully digital public administration, public agencies should be allowed to exchange data in real time along public services, facilitating the only-once principle, whereby citizens do not have to provide information to a public administration that is already in a public administration database. The iAP project addresses all levels of interoperability (legal, organisational, semantic and technical) and promotes governance and the use of shared platforms.

URL: http://www.iap.gov.pt/

5.5.5.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
iAP users	Citizen		X	
Companies	Business		X	
Agency for Administrative Modernisation (AMA)	Government	X		
Public administration entities	Government		X	X

5.5.5.3 Architecture of enablers

iAP is a shared platform, so all entities that use it are part of the project. AMA is in charge of the evolution and corrective maintenance and operation of iAP, using its internal resources, but outsourcing services to private companies, mainly to ensure the technical evolution of the platform.

The technology platform is based on a SOA and open standards, providing real time access to authentic sources of information and an Identity Federation mechanism. Protocols such as Simple Object Access Protocol, Web Services Description Language, Web Services Addressing, Web Services Reliable Messaging, Web Services Security and Web Services Security with Username Token Profile were put into place, and the orchestration module uses Apache ODE.

The benefits gained by the use of open standards were technological independence and reduced investment and operational costs, but also an accelerated integration time, obtained by exposing and reusing web service integration projects that take less time to complete.

Once the technical solution had been selected, AMA also considered the advantages of integrated management of the platform in a single back-office, and the high scalability provided by an asynchronous architecture.

The option of an Identity Federation Mechanism allows data exchange between different information systems without sharing sectorial knowledge and ensures, for example, that justice can send a message using the civil identification number of a citizen to the finance system, which receives the information along with the VAT number, allowing personal data protection within public administration.

In addition to AMA resources, the initial project to develop the platform also involved the collaboration of three private companies - Siemens, Microsoft and Accenture.

5.5.5.4 Crucial factors/Lessons learned

The scope and extent of the iAP project within the Portuguese Public Administration has enormous potential to simplify procedures within public services, guarantying rationalisation and reduction of costs. It also has the potential to significantly improve citizens' and companies' access to services and information provided by different entities from central administration. By addressing several levels of interoperability, iAP promotes better governance and use of shared platforms, simplifying the development of new web services.

Globally the project should also provide the ICT savings that the iAP can achieve for the whole public administration. A study carried out in 2011 by Deloitte Consulting, comprising 76 public entities and 471 integration services, estimates that iAP's adoption by all Public Administration services will result in savings of 34 million euros over 5 years, due to reduced human resource requirements due to the automation of work, concentration of communications, reuse of web services, standardisation and the use of a shared platform.

5.5.6 Spanish Intermediate platform for the provision and verification of citizens data (PID – SVD)

Country	Type	Maturity	Cross-border maturity	Started
ES	SDE	Sustainable	Opportunistic	2007

5.5.6.1 Summary of enabler

A Service Oriented Architecture (SOA) platform provides as services the verification and the provision of citizen's data and certificates, such as identity or the residence data of a citizen. When a citizen requests a public service, he or she does not have to provide all corresponding data, documents and certificates as they can be retrieved through the platform. Thus, citizen's data, documents and certificates have to be created only once and consequently reused when they are required for the completion of an administrative procedure. The web-services of the platform are provided through the Spanish network Red SARA.

Some examples of the data that are made available or verified through the platform are: identity data, residence data, unemployment benefits, official educational titles, payment of social security, payment of taxes, cadastral data, consultation service of public benefits, consultation service of birth, consultation service of marriage, consultation service of death, lack of criminal record.

By 2016, more than 75 services became available through the platform.

URL:https://administracionelectronica.gob.es/ctt/verPestanaGeneral.htm?idIniciativa=svd&idioma=en#.WUVSFoVOLmQ

5.5.6.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
MINHAP (Ministry of Finance and Public Administration of the national government)	Government	X	X	X
Secretariat for Public Administration	Government	X	X	X
General Secretariat for Digital Administration	Government	X	X	X
Citizens	Citizen			X

5.5.6.3 Architecture of enabler

Functional description:

- The functions that have been integrated are the following:
- Authentication: Identification of the users who access the service through electronic certificate.
- Authorisations management: public employees and applications have access only to the subset of data that have the authorisation.

Security: All queries are carried out with full guarantees of security, confidentiality and data protection.

- All requests are signed (XMLDsig) with electronic certificate (X509 v3).
- The system registers all the consultations, identifying that are made by an authorised public servant and / or application (through electronic certificate), the time of such consultation (sealed in time) and the purposes for which have been made.
- The system ensures the integrity of the data registered through the use of electronic signature.
- The system ensures the confidentiality of data exchanged. All communications are made through the SARA network utilizing the SSL protocol.

Traceability: Every request and the corresponding reply is recorded in the system with the consequent electronic signature and time-stamping.

Audit: All requests are identified with a unique identifier, which allows its subsequent recovery before any claims or audits of service.

Delegated administration: To facilitate the management of users the system allows that each agency might have an administrator responsible for the local management.

Technical Description: The platform is defined as a Service Oriented Architecture (SOA) platform based on the following elements:

- Functions through web services expressed in WSDL.
- XML Documents exchanged between web services (Simple Object Access Protocol - SOAP) and signed electronically through XMLDsig
- Establishment of safe channels between participants through SSL protocol.
- Use of electronic certificates issued by certification service providers.
- Sealed in time (TSA) of the logs of queries and answers.

Use of other services: The platform makes use of the following existing services:

- Patterns of exchange of information between administrations, defined in the project for Paper Certificates (SCSP)
- Validation and certification services (@firma – see section 5.6.5)
- Services of time-stamping (TSA)

5.6 eID and Trust services

5.6.1 Estonian Public Key Infrastructure

Country	Type	Maturity	Cross-border maturity	Started
EE	TS	Seamless	Sustainable	2002

5.6.1.1 Summary of enabler

PKI or the public key infrastructure enables secure digital authentication and signing. The infrastructure also allows forwarding data by using an encrypting key pair: a public encryption key and a private decryption key. In Estonia, this technology is used in relation with electronic identity (**ID card, mobile ID, digital ID**).

The public key infrastructure used in Estonia is the national PKI. This means that the state undertakes to assure the existence and functioning of a public key infrastructure. A large part of the services related to the PKI is purchased from the private sector, e.g. the certification, the infrastructure for making enquiries about the validity of the certificate, the infrastructure for distributing the public key (LDAP service), the key creation environment (e.g. ID card chip).

Estonia has a comprehensive system for electronic identification, authentication and digital signing which includes the following elements:

- ID-card
- Digi-ID
- Mobile-ID
- Digital seal
- Residence permit card
- E-residency card

Main activities for building trust service and eID infrastructure in Estonia are:

- Coordination activities for ensuring interoperability of infrastructure
- Legal regulation of identity documents and trust services ecosystem
- Issuing digital means (ID card, mobile ID, etc.) for citizens and resident non-citizens and ensure that they have the qualified certificates issued by the certification service providers
- Ensuring that citizens have a means, through an activation service, to link/activate their eID with the qualified certification service provider's certificates
- Issuing digital seals
- Issuing web certificates
- Supervision over digital trust service providers
- Management of the register of digital trust services
- Providing certification services
- Providing timestamping services
- Digital signing technology and applications;
- Offering validation services;
- Developing and administration of the digital signature infrastructure.

5.6.1.2 Enabler actors

- Ministry of Interior (MoI) is responsible for the legal framework regulating identity documents.
- Police and Border Guard Board responsible for issuance and maintenance of identification documents.
- Ministry of Economic Affairs and Communications (MEAC) is responsible for the legal framework and implementation of infrastructure.
- Information System Authority (ISA) is responsible for functioning, development and management of the TS and eID infrastructure, including cross-border infrastructure.

- Technical Regulatory Authority (TRA) is responsible for register of trust service providers and trusted list of Estonia, which include information about qualified trust services.
- Mobile operators issuing SIM cards with mobile ID capability
- Trust service providers:
  - GuardTime AS
  - SK ID Solutions AS

5.6.1.3 Crucial factors/ Lessons learned

Creating and maintenance of TS and eID infrastructure is carried out in public-private partnership. In Estonia, the identity of a person is based on a permanent individual ID called the Personal Identification Code (PIC) and the identity of legal persons is based on the business register number.
Comprehensive infrastructure supports the development of secure e-services. This infrastructure can be used in any system, public or private, where electronic identification and trust services is needed. Also it is aligned to the EIDAS principles. Qualified certificates from other countries are accepted in this system.

Several infrastructure components accept qualified certificates from other EU countries. For example, it is possible to sign any files by using Estonian, Lithuanian, Latvian and Finnish ID card.

5.6.2 Greek Public Key Infrastructure

Country	Type	Maturity	Cross-border maturity	Started
GR	TS	Essential	Ad Hoc	2001

5.6.2.1 Summary of enabler

The Ministry of Administrative Reconstruction and the Greek Government Certification Authority have implemented an initiative for the promotion of secure communication and electronic transactions between government agencies as well as between citizens / businesses and government agencies via web applications based on the use of digital signatures. The technology that is used is a Public Key Infrastructure (PKI).

The services offered by this infrastructure enable government executives and citizens / businesses to sign electronic communications and transactions by using a Secure Signature Creation Device (SSCD). This digital signature, according to the Presidential Decree 150/2001 (Government Gazette Issue 125/A/2001), is equal to a signature by hand.

The Ministry of Administrative Reconstruction has formulated the organisational and institutional framework and the necessary administrative mechanism so that the relevant procedures are in any case legal and that the needs of all public services in the relevant areas can be met. The Public Key Infrastructure that has been created is based on a hierarchically distributed competence structure. In particular, the organisational structure for the support of the operation of Public Key Infrastructure that was established by the Ministry of Administrative Reconstruction is as follows:

- Root Certification Authority (RCA)
- Underlying Certification Authority (UCA): they are responsible for the issuance and general management of end-user certificates as well as for supervising and controlling the proper and legitimate usage of the PKI
- Registration Authority (RA): The mission of the RAs is to support the relevant certification procedures, in particular electronic registration for the issuance, revocation, retrieval or renewal of digital certificates as well as the approval or rejection of applications.
- Authorised Offices (AO): The AOs are responsible for receiving the requests of individuals and for the authentication of them for the purpose of issuing, revoking, retrieving or renewing their digital certificates.

5.6.2.2 Actors of enabler

1 The Ministry of Administrative Reconstruction formulating the organisational and institutional framework and acting as the Primary Certification Authority and as an Underlying Certification Authority. Furthermore, the Department of Secretariat Support of the Department of Electronic Governance of the Ministry of Administrative Reconstruction has been designated as an Authorised Office only for the case when someone sends a postal request.
2 Infosociety S.A. has been designated as a Registration Authority.
3 The Technical Chamber of Greece (TEE) has been designated as a Registration Authority. Moreover, the local regional sections of TEE have been designated as Authorized Offices.
4 The Athens Law Society has been designated as a Registration Authority and as an Authorized Office.
5 Citizens Service Centres (KEPs) across the country have been designated as Authorized Offices.

Exact information on the roles of these actors is not available; hence the standard actor table could not be completed.

5.6.3 Irish Public Service Card (PSC)

Country	Type	Maturity	Cross-border maturity	Started
IE	TS	Essential	Opportunistic	2012

5.6.3.1 Summary of enabler

The Public Services Card (PSC) helps to access a range of public services easily. The identity is fully authenticated when it is issued so people do not have to give the same information to multiple organisations. It was first introduced in 2012 and was initially rolled out to people getting social welfare payments. It is now being rolled out to other public services. This card holds personal information including person's name, photograph, signature, card number and personal public service number. It also holds a magnetic stripe to enable social welfare payment such as pensions to be collected at post offices.

The PSC ensures that people can access public services across a number of channels, including online, via telephone or in person at a public office, with a minimum of duplication while preserving their privacy to the maximum extent possible.

PSCs will gradually replace cards currently in use, such as the Social Services Card and the Free Travel card.

URL: http://www.welfare.ie/en/Pages/Public-Services-Card_holder.aspx#l0b797

5.6.3.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
Card holders	Citizen		X	
Social welfare	Government			X
Free travel pass issuer	Government			X
Department of Social Protection customers	Government	X		

Face-to-Face registration for a public service card is called SAFE (Standard Authentication Framework Environment).

5.6.4 Irish MyGovID

Country	Type	Maturity	Cross-border maturity	Started
IE	TS	Essential	Opportunistic	2017

5.6.4.1 Summary of enabler

MyGovID is an online identity service that enables clients to access Government provided online services in a safe and secure manner. Each client using MyGovID will require a unique username (a verified email address) and a password - which they themselves will choose.

MyGovID provides a secure, safe online identity that only you can use. To protect the MyGovID account, a two factor authentication is used. This means that each time a user accesses MyGovID, he or she must not only login using his or her own unique username and password. He or she must also input an automatically generated code sent directly to the user's mobile phone to complete the login. As part of the registration process, MyGovID service asks the user to verify the mobile phone number and will use this to send a code when updating the MyGovID account.

Each public body using MyGovID only uses it for identity verification. MyGovID can potentially share the following personal details when you use it.

- Full name
- Date of Birth
- Sex
- Nationality
- Address
- PPS Number or previous PPS Number(s) and
- Contact Information including Phone Number and email addresses

However, MyGovID shares only the specific information required to provide the user with a Government service online. For example, if a Government organisation using MyGovID does not need to know the user's address in order to provide an online service to him or her, then the address information will not be shared.

URL: https://www.mygovid.ie/

5.6.4.2 Enabler actors

Actor name	Actor category	Owner	Provider	Consumer
The Department of Social Protection (DSP)	Government	X		
Bodies providing public services online	Government			X
User of MyGovID	Citizen		X	

Where a body providing public service online uses the MyGovID identity verification service, users will be passed from their website to the www.MyGovID.ie website. If they have registered, then users will enter their username and password. If not, then they will need to register at this point.

5.6.5 Spanish Shared services of electronic signature - Suite @firma

Country	Type	Maturity	Cross-border maturity	Started
ES	TS	Sustainable	Opportunistic	2006

5.6.5.1 Summary of enabler

Suite @firma is a set of components aiming at promoting and facilitating the introduction of electronic signature and authentication in public administration. Each component is offered as a service or as a client application. One of the main components is @firma platform.

@firma is a platform providing services, among others, for the generation and the validation of electronic signature in multiple domains. Electronic signatures, using electronic certificates, are essential elements for the secure operation of information systems in public administration. Thus, many countries have adopted a Public Key Infrastructure scheme for managing electronic signatures. However, it could be quite complex and costly for an information system to support all different kinds of electronic signatures based on various different standards. Therefore, the Ministry of Finance and Public Administration offers the platform @firma that supports a PKI scheme in multiple domains (multi-PKI). @firma is available to public administrations, providing services of authentication and advanced electronic signature quickly and effectively. Furthermore, @firma suite offers additional functionalities and components as for example time stamping, a renderer for signed documents, etc.

Using @firma a public administration has multiple benefits, as for example the generation and validation of electronic signatures in multiple formats.

URL:
https://administracionelectronica.gob.es/pae_Home/pae_Estrategias/Racionaliza_y_Comparte/elementos_comunes/Servicios_Comunes_Firma_Electronica.html?idioma=en#.WUdlXIVOLmT

5.6.5.2 Enabler actors

Exact information on the roles of the subsequent list of actors is not available; hence the following actor table could not be completed in full.

Actor name	Actor category	Owner	Provider	Consumer
MINHAP (Ministry of Finance and Public Administration of the national government)	Government			
Regions	Government			
Municipalities	Government			
Citizens	Citizen			
Businesses	Businesses			

5.6.5.3 Architecture of enabler

Suite @firma includes various services and components as it is shown below:

- Shared services
  - @firma: platform for the validation of certificates and signatures, offered as a service from the Ministry of Finance and Public Administration of the national government.
  - TS@ authority of time-stamping: Authority of time-stamping.
  - Stork: recognition of pan-European electronic identities (it is an EU project).
- Components
  - @firma Model: Province. Offered to be installed in any Public Administration.
  - @firma client: applet for the generation of signatures. It is available in various formats as for example web browsers applet (miniapplet), as a desktop application, as application for mobile devices (mobile @firma client)
  - eVisor: web application for the production of copies and reports for signed documents
  - Port@firmas: component for the integration of the electronic signature mechanisms in an organisational workflow. It is also available in a format to cooperate with mobile applications (mobile port@firma)
  - Integr@: libraries for the integration of @firma in a local server.
- Direct services to citizens (portals)
  - Validate: web application for the validation of signatures and certificates by the end user.

- Signature Portal: web portal for the demonstration of basic concepts and usage of the electronic signature and electronic certificates.

- Cloud solutions
  - Port@firmas by SARA Network: component for the integration of the electronic signature mechanisms in an organisational workflow offered as a service by the network SARA.
- Specifications
  - Specifications for electronic signatures and certificates: guidelines and technical standards applicable to the use of certificates and electronic signatures in the General Administration of the State.

6 Success factors, benefits, and wider impact of OOP cases and enablers

In this chapter, we outline the results and main findings from the analysis of the initiatives and good practice cases along task 1.2. This analysis is based on the enablers of OOP implementations listed in D 1.1. First, the success factors of the OOP cases are presented. Subsequently the resulting benefits and impacts are outlined.

6.1 Success factors of OOP implementations

The study revealed a number of enablers already in place. The following tables provide an overview of enablers established in different countries and deployed in different OOP cases. The last column highlights success factors we could identify along the case analysis based on the guiding vision and enablers of D 1.1. Success factors for the following enablers are derived:

- Table 8: Success factors of OOP implementations in countries along the enabler 'political commitment'
- Table 9: Success factors of OOP implementations in countries along the enabler 'legal interoperability'
- Table 10: Success factors of OOP implementations in countries along the enabler 'organisational commitment and collaborative business processes'
- Table 11: Success factors of OOP implementations in countries along the enabler 'semantic interoperability'
- Table 12: Success factors of OOP implementations in countries along the enabler 'technical interoperability'
- Table 13: Success factors of OOP implementations in countries along the enabler 'interoperability governance'
- Table 14: Success factors of OOP implementations in countries along the enabler 'trust & transparency '

The tables provide a good overview for future OOP implementers to learn about relevant and critical success factors and to consult those that have already implemented successful OOP cases and enablers.

Table 8: Success factors of OOP implementations in countries along the enabler 'political commitment'

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
EU	Digital Single Market Strategy European eGovernment Action Plan 2016-2020 European Interoperability Strategy (EIS) European Interoperability Framework (EIF)	All cases benefit from the European strategies	High-level policy decisions in place at EU and Member State levels for implementing OOP Political will at Member State level for sufficient financing of OOP implementations
Estonia	Directive of the Minister of Economic Affairs and Communications for the Interoperability of the State Information System	State portal Eesti.ee e-Notary Internet voting Electronic tax filing system (E-Tax) Parental Benefit Tallinn Public Transport Ticket System	
France	eGOV strategic program ADELE	e-bourgogne-franche-comté GIP	
Ireland	Data Sharing and Governance	Government portal Gov.ie Central Application Office	
	Data Protection Strategy	Government portal Gov.ie Central Application Office	
Poland	Strategy for Responsible Development	Baby bonus Becikowe	
Spain	'Addressing and Network Interconnection Plan' of the Administration, ruled by Art. 14 of the National Interoperability Framework, Royal Decree 4/2010, which is the basis for the Red SARA network		
UK	Government Digital Strategy	Tell us once	
	Government plan 'Modernising the Tax System'	Making tax digital	

Table 9: Success factors of OOP implementations in countries along the enabler 'legal interoperability'

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
EU	Electronic Identification, Authentication and trust Services (eIDAS regulation) General Data Protection Regulation (GDPR) Single Digital Gateway Regulation (SDGR) (draft status)		The three regulations at European level provide an overarching legal basis for the implementation of OOP at Member State level. Having relevant legislation in place at Member State level, such as on regulating the following: • interoperability, • registries, • open data, • catalogues, • secure data exchange, • eID and trust services, • address data. Among the legal acts, data protection laws play a particular role: they act as an enabler if the regulations allow multiple use of data. If they are constraining the use of data not to be used further than for the only purpose it is collected for or if the act does not allow cross-border sharing, the OOP principle implementation is not possible.
Austria	The Austrian Act for family benefits	Austrian birth registration and family allowance	
	Electronic Health Record-Law Electronic Health Record regulation amendment The Health Telematics Regulation	Austrian electronic health records ELGA	
	FinanzOnline regulation	Austria's FinanzOnline	
Estonia	Public Information Act The administration system of state information system act The data exchange layer of information system act Personal Data Protection Act	Estonian e-Census Estonian e-Notary Estonian Internet voting Estonian state portal Eesti.ee	
	Consumer Protection Act	Estonian Consumer Service Environment Data System	
	Notaries Act Notaries Statute Statutes of the electronic information system of notaries Explanatory memorandum to the statute for keeping the e-notary information system	Estonian e-Notary	

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
Estonia	The classification system act	Estonian e-Notary Estonian e-Census	Legislation related to the governance and duties of ministries, administrative organs and other public and private bodies in the context of e-government and OOP implementations is also relevant as such legislation may clearly define who is responsible for initiating implementation of OOP. At Member State level, the following legislative assets may contribute relevant legal backbones for governance and implementation of OOP: • General regulations about the access to public sector information, basics on the establishment of databases. Existing regulations in MSs are e.g.: e-governance Act, Public Sector Information Act, Interoperability Act, Database Act, Access to Information Act, etc. • Open Data regulation. This regulation may also be merged with general regulations as mentioned above. • Regulations about the governance of information systems and, in particular, about the Catalogue of Interoperability Solutions.
	European Parliament Election Act Estonian Election Act Local Government Election Act Municipal Council Election Act Referendum Act	Estonian Election Information System Estonian Internet voting	
	Statute of Elections Information system Candidates nomination and registration procedures for the election of the Parliament Candidates nomination and registration procedures for the election of the European Parliament	Estonian Election Information System	
	Taxation Act	Electronic tax filing system Veterinary and Food Board Register of Employment	
	Tax registry Act	Electronic tax filing system	
	Official Statistics Act The system of address details Act	Estonian e-Census	
	Parental Benefit Act Health Insurance Act Income Tax Act	Estonian Parental Benefit	
	General regulation for founding and maintaining the Estonian Sports Registry Sport Act	Estonian Sports Registry	

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
Estonia	Government Act	Estonian Central Health Information System and Patient Portal	• Regulations for Secure Data Sharing platforms. • Address System regulation. • Regulation for Electronic Identification and Trust Services.
	Medicinal Products Act	Estonian Digital Prescription	
	Data security guidelines of Estonian Data Protection Inspectorate	Estonian Central Health Information System and Patient Portal Estonian Digital Prescription Estonian doctor-doctor-consultation Estonian Online Application Portal Universities and Colleges Admissions System Estonian Smart Road System	
	Republic of Estonia Education Act Vocational Educational Institutions Act Institutions of Professional Higher Education Act Private Schools Act Universities Act Study Allowances and Study Loans Act State Family Benefits Act Military Service Act Preschool Child Care Institutions Act State Pension Insurance Act Estonian Central Health Information System Establishment and Statutes	Estonian Education Information System	
	Professions Act	Estonian Register of Professions Estonian Online Application Portal	

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
Estonia	Act on the establishment of the register of employment	Estonian Register of Employment	
	Food Act Infectious Animal Disease Control Act Veterinary Activities Organisation Act	Estonian Veterinary and Food Board	
	Traffic restrictions disclosure and traffic ban area permit and authorisation procedures Statute of the Road Administration Traffic Act	Estonian Smart Road System	
	Tallinn ticketing system database statutes The Local Government Organisation Act Public Transport Act Public Information Act Tallinn City Council Regulation No. 43	Tallinn Public Transport Ticket System	
Greece	eGov Law	Hellenic Citizens' Registry	
Germany	Data Sharing Improvement Law	German Refugee Digitisation System	
Netherlands	Personal Data Protection Act Higher Education Act	Studielink	
Poland	Act on the Computerisation of the Operations of the Entities Performing Public Tasks Act on the Protection of Personal Data	Polish Baby bonus	
UK	The Social Security Regulation	UK's Tell Us Once	
	Finance Bill	UK's Making Tax Digital	
	Freedom of Information Act	UK's Universities and Colleges Admissions System	

Table 10: Success factors of OOP implementations in countries along the enabler 'organisational commitment and collaborative business processes'

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
EU	European Interoperability Framework (EIF) European Interoperability Reference Architecture (EIRA)		EIF and EIRA provide essential guidance on the implementation of interoperable public services and in particular how to realise organisational interoperability. Having in place National Interoperability Frameworks (NIFs) and reference architectures as well as architecture repositories for sharing relevant interoperability assents is another success factor.[158] Aligning business processes implies documenting them in an agreed way and with commonly accepted modelling techniques, including the associated information exchanged, so that all public administrations contributing to the delivery of services can understand the overall (end-to-end) business process and their role in it. Sharing these interoperability assets in a catalogue and architecture repository. Clear formalised relationship between service providers and service consumers, if necessary based on joint collaboration agreements. OOP cases following the EIF conceptual model for public services may help implementing the OOP more effectively. Along this, also the relationship between service providers and service consumers must be clearly defined. Multilateral agreements on setting up and using reference data such as taxonomies, controlled vocabularies, thesauri, code lists and standardised data structures/models. Formalising agreements on mutual assistance, joint action and interconnected business processes as part of service provision such as MoUs and SLAs between participating public administrations is another success factor. For cross-border actions, these should preferably be multilateral or global European agreements.
Estonia	Harmonised and agreed workflows and standards Classifications and data models among the health professionals All health care providers have a contract with the Health and Wellness Centre for Information Systems (TEHIK)	Estonian Central Health Information System and Patient Portal	
	Good cooperation with Rescue Administration, Police and the ministries of Interior and Communication and Economy	Estonian e-Ambulance and time-critical health data	

[158] https://joinup.ec.europa.eu/community/nifo/og_page/nifo-factsheets

Table 11: Success factors of OOP implementations in countries along the enabler 'semantic interoperability'

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
EU	EC Semantic Interoperability Catalogue[159] EC e-government Core Vocabularies[160]		EIF argues that data and information are public assets that should be appropriately generated, collected, managed, shared, protected and preserved[161]. Having citizen data appropriately described in the catalogue of registers is key for OOP4C. For cross-border OOP, having in place semantic standardisations of data assets and open specifications will help to overcome problems in correctly and unambiguously understanding data across borders. Having in place appropriately described and effectively using reference and master data in the form of taxonomies, controlled vocabularies, thesauri, code lists and standardised data structures/models - all specified using open standards - in respective catalogues (catalogue of services, catalogue of data, catalogue of standards, catalogue of registries, etc.). Having in place unique and unambiguous identifiers for data objects like personal identification code, unique company code, property unique identifiers, address objects, etc. Base registries can provide such identifiers, which help to differentiate persons with the same name, allows to keep track of the company even if it changes the name, etc. The unique identifier is also machine readable and allows computers to recognise and connect the right person with the right pieces of data, and this facilitates the further use of data, such as for big data analysis. Using linked technologies and other innovative approaches for semantic interoperability, such as the e-Documents and Semantics Building Bocks provided by e-SENS[162].
Estonia	Estonian Catalogue of Public Sector Information - RIHA Unique personal identification code Unique company commercial registry code Unique address data 14 standardised code lists (e.g. code of institutions)	Estonian e-Notary Estonian electronic tax filing system Estonian e-Census Estonian Parental Benefit Estonian Central Health Information System and Patient Portal Estonian Digital Prescription Estonian Online Application Portal Portal of the Agricultural Registers (e-PRIA) Estonian Veterinary and Food Board Estonian Register of Employment Estonian Smart Road System	
	Agreed standards, data models and workflows among actors	Estonian doctor-doctor-consultation Estonian e-Ambulance and time-critical health data	
	Use of international standards like DICOM and HL7	Estonian Medical Digital Image Bank	
Germany	xAusländer	German Refugee Digitisation System	
Ireland	Irish Personal Public Service Number		

[159] https://joinup.ec.europa.eu/catalogue/repository/eu-semantic-interoperability-catalogue
[160] https://joinup.ec.europa.eu/asset/core_vocabularies/asset_release/core-vocabularies-v20
[161] https://ec.europa.eu/isa2/eif
[162] https://www.esens.eu/content/semantics

Table 12: Success factors of OOP implementations in countries along the enabler 'technical interoperability'

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
EU	Interoperability building blocks provided through CEF DSI[163]		Having deployed and use common technical interoperability building blocks such as e-Delivery, eID, Security and Trust Services provided e.g. by the European Commission. Having in place national technical interoperability assets that enable secure data exchange and communication among the different actors in OOP settings. Examples are X-Road, MAGDA, MyGovID, etc. Successful OOP implementation may embark on the integration of services provided by third parties such as payment services provided by financial institutions or connectivity services provided by telecommunication providers.
Austria	Central civil register Portal Group Protocol (Portalverbund)	Austrian birth registration and family allowance	
	Digital signature eID	Austrian electronic health records (ELGA)	
Belgium	MADGA		
Estonia	Baseline security system ISKE	Estonian Election Information System Estonian doctor-doctor-consultation Estonian Medical Digital Image Bank Estonian Education Information System Estonian Online Application Portal Estonian Smart Road System Estonia: Tallinn Public Transport Ticket System	
	Estonian data exchange layer for information systems (X-Road)	Used as basic infrastructure component for different OOP implementations	
	Digital Court File	Estonian e-File system	
	Estonian Public Key Infrastructure		
Greece	Greek PKI National Network of Public Administration SYZEFXIS		

[163] https://ec.europa.eu/digital-single-market/en/news/connecting-europe-facility-cef-digital-service-infrastructures

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
Ireland	Irish Personal Public Service Number MyGovID	Irish Government portal	
Luxemburg	LuxTrust[164]	Luxemburg's myGuichet	
Spain	Spanish network Red SARA Spanish Shared services of electronic signature (Suite @firma) Spanish E-Government Platform SEDIPUALB@		

[164] See https://www.luxtrust.lu/

Table 13: Success factors of OOP implementations in countries along the enabler 'interoperability governance'

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
EU	EIF - Interoperability Governance		The EIF states that "*interoperability governance refers to decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability at national and EU levels.*"[165]. The EC has established supportive instruments to interoperability governance such as the EIF, the EIRA or the Interoperability Action Plan[166], in which different actions of interoperability governance are listed, including timelines and responsibilities of EC and MSs. Effective interoperability governance demands the involvement of responsible actors at different levels of governance (political, strategic, tactical and operational) as well as regarding distinct activities (e.g. political and strategic decision making, supervision, coordination, implementation and service provisioning).[167] This is also crucial in OOP implementations: each actor must have clear roles, mandates and responsibilities on the relevant governance activities. Examples of successful models of interoperability governance are the enablers listed in this table. In building up a collaborative interoperability governance model, some further success factors may be: • Central coordination of the development of relevant OOP policies and standards as well as principles of information policies and supportive legislation, while consulting and engaging relevant stakeholders • Decentralisation of implementations • Ensuring the necessary capacities of the involved decisive, coordinating, implementing and monitoring bodies
Argentina	Argentinian Integrability Model		
Austria	Portal Group (governance part)		
France	Public interest grouping (GIP)	French e-bourgogne-franche-comté	
Greece	Greek Interoperability Centre		

[165] http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF , p. 19

[166] http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_2&format=PDF

[167] See e.g. D04.02 Interoperability collaboration governance models, edited by Wimmer, Bunar, Kruchinina, Zamboni and Boneva under the ISA Action 5.2 European Interoperability Strategy Governance Support, Specific Contract 288 under Framework Contract DI/07172 – ABCIII, 2016 (non-public document)

Table 14: Success factors of OOP implementations in countries along the enabler 'trust & transparency '

Country	OOP enablers	OOP cases building on the OOP enabler	Success factors for OOP implementations
Austria		Austrian electronic health records	The portal first displays discharge notifications, as well as laboratory and radiological results provided by hospitals already working with ELGA. As soon as ELGA health data are generated for a patient, the patient can view these data him- or herself online via the ELGA portal. The system also shows who has accessed the patient's ELGA health records, and when.
Estonia		Estonian Central Health Information System and Patient Portal	Persons can view their prescriptions, summary reports, test results (except images) and the details of their children, and they can also see who else has viewed their data in the systems; they can make their data accessible or inaccessible, issue expressions of will (regarding organ donations, powers of attorney) and order electronic medical certificates
	Baseline security system ISKE		The central eHealth system meets very high security requirements for trust reasons
	Citizen-centred design approach		Proactive involvement of citizens in the design of a service that handles sensitive data of the citizens creates trust and this may particularly act as a motivator for citizens to use the service.

6.2 Benefits and impacts of the once-only principle

The fulfilment of the vision outlined in D 1.1 brings a number of benefits and impacts. Citizens, public administrations, and businesses all benefit from the once-only principle implementation, which result in impacts that improve the services and conditions of the parties involved. The benefits are outlined per target audience in the following subsections.

6.2.1 Benefits and impact for citizens

Moynihan et al[168] identify three administrative burdens for citizens: learning, psychological, and compliance costs. Thereby, learning costs represent the burden when a citizen must learn which tool is needed for a specific service and how to use it. Psychological costs are described as citizens' increased stress level through perceived lack of participation choices during interactions with public administrations as well as "*face stigma of participating in an unpopular program*". The compliance costs refer to the costs of citizens and businesses to collect and complete documents required for a certain service. The reduction of administrative burden through the once-only principle is therefore the main benefit for citizens, as the same data has not to be repeatedly provided at different occasions of public service consumption. Moreover, the re-use of existing data across public administration enable simplified, less cumbersome and more convenient procedures, and pro-active public service offers for citizens.

Relieving citizens from administrative burden, and providing more convenient and simpler procedures may result in wider impacts such as higher satisfaction of citizens when consuming public services and increased trust

[168] Moynihan, D., Herd, P. and Harvey, H., 2014. Administrative burden: Learning, psychological, and compliance costs in citizen-state interactions. Journal of Public Administration Research and Theory, 25(1), pp.43-69.

into the public sector actors.

A transparent handling of data creates another benefit as citizens can verify (e.g. through a service account and through particular logging mechanisms, etc.) the compliant use of their data by governments and, thus, have better control over their data. The resulting impact increases citizens' trust in the government and acceptance towards its services, thereby lowering the inhibition to share sensitive personal data in national and cross-border aspects. Another impact that may follow from the trust benefit is cultural shifting, i.e. citizens may demand government to provide OOP services and citizens may want to use the once-only principle instead of the old practices (see also the vision in D 1.1).

Another benefit from the once-only implementation is the increased national and cross-border mobility of citizens and business, which in turn contributes to the implementation of the Digital Single Market.

The implementation of the once-only principle may also provide foundations for new private sector services aimed at citizens (e.g. banking) through Government as a Service[169] as well as public administrations acting as a trust provider. The corresponding impact is efficient and equitable Single Market functioning, including economic growth and increase of job opportunities.

6.2.2 Benefits and impact for public sector actors

The benefits of the once-only implementation for public administrations are increased efficiency and effectiveness of public administration through co-creation and collaboration between administrations by sharing and re-using data and resources with the aim to unlock productivity improvements and foster the creation of more public value. The main impact therefore is a more efficient and effective public administration with lower costs. Moreover, saved costs like time can be used for improving existing services and creating new ones.

Sharing and re-using data enables government to provide public services to citizens in a pro-active manner, implementing faster fulfilment of legal obligations. These benefits contribute to the impact of eased workflows and communication between the administrations and the citizen, and to higher satisfaction and trust at the side of citizens.

Furthermore, public administrations can retrieve the data from the authentic sources, i.e. receiving quality-assured data.

Above benefits result in positive impacts on the prevention of misuse of the data, of fraud, and of other criminal intentions. Through increased data quality, governments can ultimately make better policies using the same infrastructure, which contributes to better communication between the administrations on national and cross-border levels.

7 Conclusion

The deliverable at hand aimed at documenting existing good practices of OOP implementations for citizens across Europe and at analysing the identified cases in terms of enablers, needs and benefits towards the OOP. Along the work, 66 OOP cases and enablers have been analysed and documented offline (in the chapters 4 and 5) as well as in an online knowledge base of the project, which is freely accessible for all stakeholders via the website of this project[170]. This body of knowledge will be expanded with further cases and enablers along the SCOOP4C project to establish a comprehensive knowledge base for OOP cases and enablers, which serves interested actors in understanding how the OOP can be implemented.

In chapter 6, an initial analysis of the OOP cases and enablers was provided, looking into categories of OOP cases and enablers, types of OOP cases and enablers. Furthermore the maturity of the OOP cases and enablers was assessed by the work package leader EGA in respect to the implementation of the OOP towards the vision (cf. Deliverable 1.1), as well as in regards to the potential for / capacity of cross-border implementation.

[169] http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52016DC0178 and

[170] https://scoop4c.eu/

While the EC study on Administrative burden reduction[171] indicates that most EU Member States have started OOP implementations, this work has studied a constrained set of OOP cases and enablers, and hence does not give a complete picture of available OOP cases and enablers in MSs and in at European level. The reason for this is limitations in access to information as well as the time frame within the project for this deliverable. However, as already mentioned earlier, the collection of OOP cases and enablers will continue throughout the project.

The analysis reveals also that OOP is not implemented between all actors and in all domains. There is a wide variety in maturity of OOP implementation across Europe. In particular, the implementation of OOP in cross-border contexts and at the Pan-European level is still in the early days. On the EU level, the problems have been postponed by implementing sectorial information systems: for example, eu-LISA[172] is operating sectorial-based systems like the Schengen Information System (SIS II), the Visa Information System (VIS) and EURODAC.

Although there is clear political commitment to implement the once-only principle at EU level, legislation at the EU level has to be strengthened and improved in order to reach broader implementation (not only covering a specific sector). Among the most relevant acts at the EU level are the eIDAS[173] regulation on electronic identification and trust services, the PSI directive[174], and General Data Protection Regulation (GDPR[175]). A draft regulation for the Digital Single Gateway[176] is currently under discussion. These regulations provide a good base for implementing the OOP at Member State level, including across border. However, Member States need also to boost OOP implementations towards cross-border enablement in order to support the implementation of the Digital Single Market more effectively.

The analysis of OOP cases and enablers in different Member States shows (cf. section 6.1) that the availability of key enablers on different interoperability layers is crucial. In the countries where we studied OOP cases and enablers, legal provisions, political commitment, organisational structures, and particularly technical enablers such as eID and trust services, secure network infrastructures and secure data exchange infrastructure are key success factors. For instance, most Estonian cases are supported by building blocks of eID and trust services, the secure data exchange system X-Road, the catalogue of interoperability RIHA, a unique address system, and the security system ISKE.

Successful OOP implementation may also require that public administrations to exploit services provided outside the boundaries of public administrations by third parties such as payment services provided by financial institutions or connectivity services provided by telecommunications providers.

In subsequent work of work package 2, the results of this deliverable are used to derive stakeholder maps and a stakeholder engagement plan for successful OOP implementations. This deliverable represents also the basis for further gap analysis and reporting of challenges, needs and benefits of OOP implementations to be carried out in work package 4. The results thereof will inform the roadmap of future areas of action that will also be developed in work package 4. These activities are accompanied with further SCOOP4C stakeholder engagement workshops, which will be organised in collaboration with work package 3.

[171] https://ec.europa.eu/digital-single-market/news/final-report-study-egovernment-and-reduction-administrative-burden-smart-201200

[172] http://www.eulisa.europa.eu/

[173] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.257.01.0073.01.ENG

[174] http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32013L0037

[175] http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32016R0679

[176] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52017PC0256

Annex: Glossary of key terms

Assets are data and information which are perceived as valuable public assets that should be appropriately generated, collected, managed, shared, protected and preserved. Examples of assets are agreements on reference data, in the form of taxonomies, controlled vocabularies, thesauri, code lists and reusable data structures/models.

Base registries. A base registry is a trusted and authoritative source of information, which can and should be digitally reused by others and in which one organisation is responsible and accountable for the collection, correct use, updating and preservation of information. Base registries are reliable sources of basic information on items such as persons, companies, vehicles, licences, buildings, locations and roads. This type of information constitutes the master data for public administration and European Public Service delivery.

"Authoritative" here means that a base registry is considered to be the authentic source of information i.e. which represents the correct status, which is up-to-date and which is of highest possible quality.

Catalogues. Catalogues describe reusable services and other assets to increase their findability and usage. This component allows publishers to document and make available resources with the potential to be reused by others. Various types of catalogues exist, such as catalogues of services, catalogues of data, libraries of software components, catalogues of open data, registry of registries, metadata catalogues and catalogues of standards.

Certification. Certification refers to 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.

Citizen Portal is a special case of FE, where the citizens use the single sign-on property of a portal for gaining access to connected systems and services.

eID and Trust Services represent infrastructure for identification, signing, encryption, sealing, timestamping, and certificate validation in service provisioning.

Front End Systems (FE) are portals for supplying integrated services. Over the FE, users interact with different registries, e.g. submitting data and getting data.

OOP cases are solutions, approaches, and concepts that implement the once-only principle in public service provisioning by processing, sharing and re-using citizen related data, while the citizen does not need to repeatedly provide the same data.

OOP enablers support the implementation of OOP cases through e.g. central infrastructure components or solutions building blocks, as well as semantic, organisational, legal or political enablers. The enablers reach a wider scope than cases as one enabler may support the implementation of many different OOP4C cases (public services) in different policy domains.

Interoperability Governance refers to decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability. This includes bodies responsible e.g. for an e-government strategy, for its coordination and for the implementation may be involved. Also bodies responsible for privacy and security can play a central role.

Secondary registry. A secondary registry can contain its own master data and master data from base registers transferred over a Secure Data Exchange layer. From the data consumer point of view, there are no differences between BR and SR. SR contains data transferred over secure data exchange components from a base register.

Secure Data Exchange aims to ensure that all data exchanges are done in a secure and controlled way.