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The Once-Only Principle

The TOOP Project

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Preface

The Once-Only Principle (OOP) is part of the seven underlying principles of the eGovernment Action Plan 2016–2020. Its importance is highlighted by the Tallinn Declaration on eGovernment, signed on October 6, 2017, and the Berlin Declaration on Digital Society and Value-Based Digital Government, signed on December 8, 2020. OOP aims to make the government more effective and more superficial and to reduce administrative burdens by asking citizens and companies to provide certain (standard) information to the public authorities only once.

Thus, the goal of this TOOP book is to describe and document the developments and results of the Once-Only Principle Project (TOOP). TOOP was not a typical example of the type of large-scale pilot usually funded by the EU Framework Programme for Research and Innovation. It was a horizontal project that was policy-driven, with the aim of showing that the implementation of OOP in a cross-border and cross-sector setting is feasible. More than 50 partners from more than 20 Member States and associated countries of the EU participated in the TOOP project. Several things happened during the project, such as the outbreak of the COVID-19 pandemic, but the most essential "game-changing" event was the establishment of the Single Digital Gateway Regulation (SDGR). With the TOOP book, we wanted to summarize the results of the TOOP project from different points of view, from policy, organizational, architectural, and, last but not least, technical perspectives.

We would like to express our gratitude to the European Commission, DGs CONNECT, GROW, and DIGIT, as well as REA, for the support and good collaboration. Moreover, we want to thank the external reviewers of the project for their valuable input. Special thanks go to the national governments of the beneficiaries and the other organizations that have participated in the project for their active contribution. Moreover, the project would not have been possible without the enduring, productive, cheerful crowd working on the TOOP. Thank you all for making our project a reality!

Finally, we are also thankful for the financial support received through the European Union's Horizon 2020 research and innovation program under grant agreement no. 737460.

June 2021

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Introduction
The Once-Only Principle (TOOP)

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Over the past two decades, digital tools and the internet have been at the heart of the transformation of our industries but more widely of our society. Behavior of citizens and consumers has significantly changed. Things that have long been thought too complex to implement are possible today. Information is at the end of our fingertips. Expectations from citizens have, however, also changed. When Amazon brought the concept of 'one click' to order goods on the internet, people wanted to see the same ease of service delivery from any service provider, including from the public sector.

The public sector, the heavily paper-based administration, has been shaken. The pressure on administrations to evolve has grown to the brink of risking them becoming obsolete. Many in the younger generation in particular see them as just a burden, slow and inefficient.

In Europe, public sector organizations and procedures are not the responsibility of the European Union. Still, the European Commission and the Member States have been working together to jointly prepare the public sector for its digital transformation since as early as 2001, which was was indeed the year when setting up cross-border digital public services, allowing citizens and businesses from a Member State to interact with a public service in another Member State electronically, was first declared a priority for Europe (European Commission 2003).

As a first step, through work in the eGovernment group, Member States and the Commission identified a few key domains where common solutions had to be developed at a European level. In 2005, three topics were identified: eID, eProcurement, and eHealth. With the financial support of the Information and Communication Technologies Policy Support Programme (ICT-PSP)[1], the Commission launched the STORK, PEPPOL, and EPSOS projects. Quickly, the idea of launching projects together gained momentum with the eventual launch of the eSENS project. This family of projects[2] led to a paradigm shift. To deliver user-friendly, burden-free digital public services, a change of practice was needed between the different corners of the administration. Administrations needed to reuse, as far as possible, common services, common building blocks.

Thus, the holy grail in public service delivery is the application of the 'Once-Only Principle', eliminating the need for citizens and businesses to provide over and over

[1] https://ec.europa.eu/cip/ict-psp/index_en.htm.

[2] STORK, PEPPOL, EPSOS, SPOCS, eCODEX, eSENS.

again the same information for receiving a public service. Some Member States have demonstrated the operational feasibility of the principle. Still, for many it was considered too complex, either for legal reasons or for legacy system problems. So, applying the principle at European level was considered non-achievable for the coming decades. Implementing the Once-Only Principle will bring time-savings, lower administrative burdens, reduce costs, and accelerate the fulfillment of legal obligations through reduced information requirements, less frequent reporting from businesses, and, eventually, even pre-filled forms. Administrations will benefit through improved service quality and administrative efficiency. The shared data between public administrations remain under the control and the consent of the businesses or citizens involved; personal data is now in the hands of the citizen, who is in control of whom to share that data with.

Nonetheless, with the help of these preparatory activities and the political commitment of the Commission and in particular of Vice President Andrus Ansip, the Commission adopted in 2015 in the "eGovernment Action Plan 2016–2020[3]" the Once-Only Principle, and in regulation (EU) 2018/1724[4] established a single digital gateway in respect of the General Data Protection Regulation (GDPR), with the objective of seeing it implemented within a few years. This achievement was possible thanks to the commitment of Member States, of key, highly passionate people. The outcome will European demonstrate how the Union can reduce borders and the burden for businesses and citizens.

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

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.295.01.0001.01.ENG&toc=OJ:L:2018:295:TOC.

Contents

The Once-Only Principle: A Matter of Trust

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Abstract. The Single Market is one of the cornerstones of the European Union. The idea to transform it into a Digital Single Market (DSM) was outlined several years ago. The EU has started different initiatives to support this transformation process. One of them is the program Horizon 2020 to support the process from a technical point of view. In parallel to this, initiatives were started to set up a sound legal framework for the DSM. The Single Digital Gateway Regulation (SDGR) is an outcome of these initiatives. The key aspect of the SDGR is the underlying Once-Only Principle (OOP), outlining that businesses and citizens in contact with public administrations have to provide data only once. "The Once-Only Principle Project (TOOP)" is the EU-funded project initiated for research, testing, and implementation of the OOP in Europe. The authors give an overview of the research questions of the different parts of TOOP. Besides that, they introduce the other chapters of this book and what the reader can expect as the content of them.

Keywords: Once-only Principle · Single digital gateway · SDGR · Digital single market · TOOP · Building blocks · e-Delivery

1 Introduction

The TOOP Book aims to describe and document the developments and results of the Once-Only Principle Project (TOOP). The once-only principle (OOP) is a concept in the broader context of e-government that aims to ensure that business, citizens, and other organisations have to provide specific information to administrations and governmental authorities only once. The principle was defined as one of the key enablers for e-Government in Europe by the Tallinn Declaration on e-Government at the ministerial meeting during the Estonian Presidency of the Council of the EU on 6 October 2017.

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However, these exchanges require public administrations to have a certain degree of trust in each other, which is built on a shared legal basis. Together with the organisational and technical concepts of the OOP, the first time in the history of the EU, a specific horizontal, non-sector legal framework for the direct exchange of digital evidence between public administrations in different Member States and associated countries was created. This legal basis for the EU is the Single Digital Gateway Regulation.

TOOP was launched by the European Commission in January 2017 within Horizon 2020 research and innovation programme. The approach of the EC, Member States and associated countries was to introduce TOOP as the large-scale project for research, testing and implementation of the OOP in Europe.

The main objective of TOOP was to explore and demonstrate the OOP across borders, focusing on data from businesses. The OOP is one of the underlying principles stated in the European Union's eGovernment Action Plan 2016–2020, as well as the Single Digital Gateway Regulation. The application of the OOP is the prerequisite for building modern and user-friendly digital services. An important concept to realize the OOP is from a technical point of view the interconnection of base registries. Such registries are defined as being the consolidated source of information for specific domains, such as business, properties, persons, etc. The concept of OOP then means using base registries as information sources that always keep the latest version, and that can provide information on request or subscription. To explore and demonstrate the functionality of OOP, multiple pilots have been selected, and a set of guiding concepts as well as appropriate methodologies are developed. The TOOP project ran pilots in three different domains, General Business Mobility (GBM), Maritime, and eProcurement, in fifteen Member States:

In the GBM pilot, it is considered that a Legal or Natural Person requires data about their company to use in a service, e.g., to issue a certificate for their company
In the Maritime pilot, it is considered that a Legal or Natural Person requires a certificate for their or their company's ship and crew
In the eProcurement pilot, the objective is to get qualification evidence from a data provider for economic operators that are submitting a tender

To support the active or interested partners in piloting, a generic reference architecture for TOOP (TOOPRA) was developed. A reference architecture is a set of standardized enterprise Architectures that provides a frame of reference for a particular domain, sector, or field of interest [1]. The TOOPRA is offered to be used by architects responsible for the design of cross-border solution architectures.

During the lifetime of the project more than 50 organisations from more than 20 EU Member States and associated countries were part of the TOOP consortium, including a number of academic and research institutions.[1]

Caused by the number of partners in the project, a specific structure was developed to ensure on the one side the participation and involvement and on the other side to keep the administration simple and manageable. The partners of the TOOP consortium participated in the project as so-called national consortia via a lead beneficiary. The

[1] The number of participating countries and partners has changed over the duration of the project.

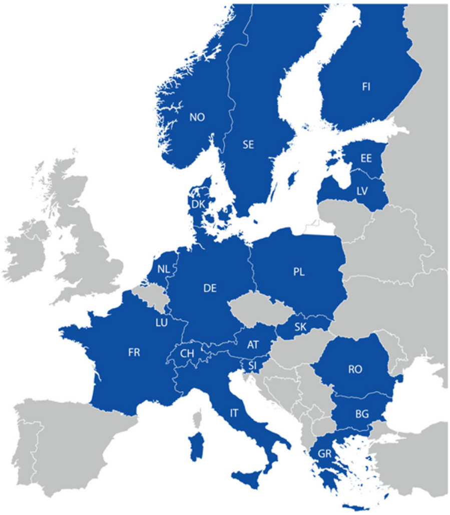

Fig. 1. Map of Countries Participating in TOOP (at the end of the project)

ultimate decision-making body of the project was the General Assembly. Each consortium/beneficiary had one vote in the assembly. The decisions were prepared inside the national consortia based on the rules given to them. The outcomes of this process set the guidelines for the Management Board responsible for the execution of the decision and the maintenance of the daily business of the project. The Management Board consisted of the leaders of the different work packages and the Project Director, as representative of the Project Coordinator.

The participation of different European countries has enabled the exchange of national experiences, and best practices followed intensive discussions on the interoperability issues. The testing activities demonstrated the feasibility of cross-border application and revealed room for further research. Taking into consideration the experience gathered in the field of OOP, the TOOP partners developed several scientific papers covering various aspects of the project. The articles discuss findings from over 4 years of research in the OOP area and are based on the lessons learned in the project.

2 Overview of Large-Scale Piloting in Europe

TOOP has not started from scratch. As already stated in the preface of the book, the TOOP project was another project in the long row of so-called "Large-Scale Pilot Projects" (LSPs) initiated by the European Commission with the support of the Member States and associated countries. The large-scale piloting and the preparation of the corresponding setting were initiated at the beginning of the 21st century. A dialog was commenced on the European level between the European Commission (EC) and the Member States. As the outcome of this fruitful collaboration, the preparations for the LSPs took place in 2005. During these groundworks, the main areas were identified as worthwhile for further investigation; eID, eProcurement, and eHealth. They got financial contributions based on the ICT Policy Support Programme (ICT PSP), one of the three specific programmes of The Competitiveness and Innovation Framework Programme (CIP) of the EU. Inspired by the success of these initial LSPs, further projects were initiated. As the first step, some additional vertical (sector-specific) projects were kicked off. The focus of these projects was set on the support of the Points of Single Contact in the EU and the area of e-Justice. As a second step within the EU horizontal (cross-sector) projects were introduced, one of the projects (e-SENS) focussed on the technical aspects of a generic cross-border data exchange, and the other project (TOOP) concentrated additionally on the policy aspects of the data exchange.

Some of the previous LSPs had a strong influence on the TOOP project. TOOP used the outcomes of these projects as a foundation for its own work and developments. Especially the following existing LSPs supported by the European Commission produced – mainly technical results – that were re-used for the purpose of the TOOP project. These solutions were developed for different domains, STORK/STORK2.0 for the eID domain; PEPPOL for the eProcurement domain; SPOCS for the Business start-up domain; epSOS for the eHealth domain; and e-CODEX for the e-Justice domain, as well as by the e-SENS project, which aimed to consolidate and align results of the five LSPs.

- The STORK and STORK 2.0 have developed and piloted an interoperability infrastructure for electronic identities.
- The PEPPOL Project would facilitate EU-wide interoperable public eProcurement.
- The overarching goal of the SPOCS Project was to establish a next-generation Point of Single Contact (PSC).
- The epSOS Project was an Open eHealth initiative for piloting patient summary and electronic prescription services
- The e-CODEX Project aimed to provide cross-border interoperable e-Justice infrastructure for the Member States.
- The e-SENS Projects objective was to strengthen the Single Market by facilitating and promoting interoperable public services across borders based on the existing and previous Large-Scale Projects results. This objective comprised planning and design of sustainability and long-term governance of the LSP building blocks, such as e-ID, e-Signatures, e-Documents, and e-Delivery.

3 Overview of the TOOP Book

During the lifetime of the TOOP project it become clear that there is not much literature about the OOP aside of the papers that are produced by the members of the project [2–8].

Therefore, it was the main motivation for this book to provide information from the context of the TOOP project to enable or deepen the discourse amongst policymakers, researchers, administrators, and vendors so that understanding, cooperation, future research, and development can emerge. As such, this book consists of 12 chapters that cover the following topics:

3.1 Implementation of the 'Once-Only' Principle in Europe

The implementation of OOP on the national level is one of the corner stones of the initiatives around OOP and the SDGR. This article presents the OOP definition and discusses the most important EU initiatives to make it a reality in Europe. Furthermore, the chapter of *Szymon Mamrot* and *Katarzyna Rzyszczak* provides an overview of national OOP implementations of EU Member States and European Economic Area countries and the related aspects. The analysis focuses on the different stages and different kinds of implementation of the OOP in Europe. It will highlight the states of play in different countries and the (first) outcomes of implementing the OOP.

3.2 Drivers, Barriers, and Opportunities

Drivers and barriers are playing an essential role for the implementation of the OOP in Europe. To support the ongoing transition of the SDGR into reality in the different countries, an analysis within several Member States and associated countries based on the experiences and findings within the TOOP project was initiated. This chapter focuses on the identification of influencing factors that are more prevalent in one area than another. The authors *Nele Leosk, Irma Põder, Carsten Schmidt, Tarmo Kalvet,* and *Robert Krimmer* furthermore investigated the institutional factors to be the most influential on the OOP implementation. In general, the most important drivers, barriers, and also opportunities that are identified discovered in the TOOP project are summarized here.

3.3 Good Practices of OOP Across Europe

Besides the more theoretical approaches of other chapters, it is also essential to give practical information and to highlight good practices related to the OOP in Europe. *Maria Wimmer* sums up the findings from the OOP good practice analysis, good practice cases, and enablers in different countries. Besides that, an examination of the strategic policies in Europe, the OOP visions, top-down implementation of digitalization, and the bottom-up engagement of stakeholders will be given. On top, there is a look into further projects that are dealing with the OOP, like the DE4A project and the SCOOP4C project.

3.4 Impact of the Once Only Principle for Businesses Across Borders

An essential part of the analysis around the once-only principle is especially its impact during and after the implementation. As the OOP is relatively new, the information about the impact of the OOP on businesses, and in particular on its cross-border impact is limited. In this chapter, *Tjerk Timan, Anne Fleur van Veenstra* and *Kristina Karanikolova* explore an impact assessment framework for measuring the impact of the OOP on cross-border services for businesses. The outcomes of the measurement for business but also other related actors, e.g., governments will be displayed. Besides that, the validation of this framework with members from the TOOP project will be described. The authors also provide an insight into the preparation and execution of the validation process.

3.5 The Single Digital Gateway Regulation and Other Legal Aspects

As the OOP is strongly related to its legal bases, it is crucial to look at the legal framework for the OOP on a national and supranational level. *Hans Graux* provides a specific chapter with an insight into the Single Digital Gateway Regulation as the common legal basis for the EU, its Member States, and the EFTA countries. As part of the description, the requirements for public administrations are highlighted and how especially which role the trust in each other for the success of the OOP plays.

To complement the picture drawn from the European level, a specific focus on the national legal framework is set by *Francesco Gorgerino*. This study presents how the OOP is related to the constitutional and institutional principles concerning the good performance and impartiality of public authorities and the protection of citizens' rights against the action of public administration, with special regard to the Italian regulatory framework and an additional look into the legal impact of the OOP for development of the European digital single market and in public procurement.

3.6 Architecture

A stabile technical architecture is a core pillar for the success of developing and piloting the technical solutions of each project. As TOOP has not started from scratch and is re-using the outcomes of previous LSPs and technical building blocks provided by the EC it is even more critical and difficult to provide an architecture that covers the need of all interested parties. Part of the activities was to assist the members of TOOP and further partners that are concerned in the cross-border implementation of the OOP. The chapter of *Jaak Tepandi, Carmen Rotuna, Giovanni Paolo Sellitto, Sander Fieten,* and *Andriana Prentza* outlines the TOOP Reference Architecture (TOOPRA) users, principles, and requirements presents an overview of the architecture development, describes the main views of TOOPRA, discusses architecture profiling, and analyses the TOOPRA sustainability issues.

All kinds of information need to be secured. The level of security needed is directly related to the sensitivity of the data exchanged. As for the OOP, the very sensitive data from base registries are provided, the success of the project is directly bound to the trust in the data. As follow-up, in the chapter of *Jaak Tepandi, Luca Boldrin,* and *Giovanni Paolo Sellitto*, the TOOP trust architecture is presented, starting from a simple abstract model of interaction between two agents down to the detailed end-to-end trust establishment architecture, modeled onto the TOOP Reference Architecture.

3.7 Testing Methodology for the TOOP Pilots

Testing is vital for the development of a sound technical basis for the OOP. Therefore, already in an early stage, the members of the TOOP project have agreed on the approach for the piloting of the OOP and the area where the piloting is taking place. The goal is to uncover errors and gaps in program function, behaviour, and performance. *Andriana Prentza, Marie-Laure Watrinet,* and *Lefteris Leontaridis* describing how the testing methodology was developed and implemented. Besides that, an overview of the set of testing tools created to facilitate testing between the different parties in the three different piloting domains is given.

Furthermore, the generic definition and adaption of the testing methodology for each of the pilot is described. This includes the whole process, how it is started from a low level, and how it finishes at a higher level by a particular approach by testing the connections between the different partners within the same piloting domain.

3.8 Pilot Experiences: Challenges and Achievements in Implementing Once-Only

Piloting is the proof of the pudding for each project. On the other side,, piloting is a complex endeavor where a number of actors and related stakeholders cooperate and interrelate to implement technical solutions that facilitate business processes in new ways. TOOP, as an LSP, required a set of work processes to be defined and a number of procedures and tools to be used by the participating entities to implement the planned activities in ways that achieve results of maximum value that fulfill the objectives of the project. In order to explore and demonstrate the functionality of OOP, multiple pilots have been selected, and a set of guiding concepts as well as appropriate methodologies were developed. *Andriana Prentza, David Mitzman, Madis Ehastu,* and *Lefteris Leontaridis* present in the chapter the three different pilot workgroups, General Business Mobility, e-Procurement, and Maritime, that are selected for the demonstration. The advances that are attained are highlighted and also details about the lessons learned are provided.

3.9 Future of the Once-Only Principle in Europe

The sustainability of the results of a project like TOOP is of utmost importance. Therefore, after a decent and detailed overview of the developments in and along the lines of the TOOP project is given, to complete the picture, an outlook into the future of the OOP is provided by *Robert Krimmer, Andriana Prentza, Szymon Mamrot, Aleksandrs Cepilovs,* and *Carsten Schmidt*. Part of the outlook is a summary of the conclusions of the main parts of this book. It includes an overview of the results of TOOP as a project and the different chapters, e.g., drivers and barriers, impacts, legal and technical aspects, piloting methods and outcomes, and the gaps that are discovered by the project members. This compendium is the basis for the outlook into the future of the OOP and the suggestions for the next steps on the EU- and national level.

4 The Once-Only Principle and the Further Development of the Single Digital Gateway

This book with its multidisciplinary chapters published by summer 2021 at the end of TOOP is ideally suited to provide foundation for the further developing of Europe's Single Digital Gateway as outlined before. With the Implementing Act just to be published for the technical system in line with Article 14 SDGR, it sets the scene for an incredible next step in the digital transformation of Europe: Providing seamless cross-border digital public services in just some 2,5 years. May these following chapters provide you with the insights needed for the intense work to come!

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Implementation of the ‘Once-Only’ Principle in Europe – National Approach

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Abstract. The ‘once-only’ principle (OOP) in the context of the public sector means that citizens and businesses supply data only once to a public administration. The role of public administrations is to internally share these data also across borders so that no additional burden falls on citizens and businesses. This paper presents what steps are taken to implement the OOP both on the European and national level. The national approach in European countries towards implementing the OOP is analysed and compared in terms of legislation, strategies and infrastructure. The most important benefits of the OOP are described as well. One of the most important initiatives in Europe to explore and demonstrate the OOP in practice is the TOOP project. The paper presents how TOOP technical solution is practically implemented within three pilot areas: general business mobility, e-procurement, maritime domain.

Keywords: The once-only principle · Public administration · e-government · Digital public services · Digital government

1 Introduction

The ‘once-only’ principle (OOP) is a crucial element in the delivery of the user-friendly digital public services and modernisation of public administration. Providing the same data over and over again is troublesome and time-consuming both for citizens and businesses. It is also not reasonable since most of the data is already stored in authoritative sources. The key is to enable public administration to retrieve it in an efficient and safe way.

EU-wide implementation of the OOP is one of the priorities of the European Commission, which is reflected in the strategic documents. The principle appeared for the first time in 2009, when the Member States committed themselves to, among others, jointly investigate how public administrations can reduce the frequency with which citizens and businesses have to resubmit information, by signing the Malmö Ministerial Declaration on eGovernment [38]. Reduction of administrative burdens by applying the principle of "once-only" registration of data for citizens was one of the actions of the eGovernment Action Plan 2011 – 2015 [25]. Furthermore, the principle has been highlighted in the European Council Conclusions in October 2013 [29] by stating that “efforts should

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be made to apply the principle that information is collected from citizens only once, in due respect of data protection rules”. Another the OOP milestone was signing the ’eGovernement Declaration’ in Tallinn on 6 October 2017 [28], in which 32 countries of the European Union and the European Free Trade Area made a political commitment to implement the principle for key public services. Furthermore, in the EU eGovernment Action Plan 2016–2020 [26] the OOP is listed among other principles for effective eGovernment such as digital by default, inclusiveness and accessibility, openness and transparency, cross-border by default, interoperability by default, trustworthiness and security. According to the Plan, “public administrations should ensure that citizens and businesses supply the same information only once to a public administration. Public administration offices take action if permitted to internally re-use this data, in due respect of data protection rules, so that no additional burden falls on citizens and businesses”. Additionally, a recommendation to “as far as possible under the legislation in force, ask users of European public services once-only and relevant-only information” is provided in the new European Interoperability Framework [27] within the user-centricity principle for establishing interoperable European public services. Finally, the Single Digital Gateway Regulation [30] provided legal basis for the cross-border application of the OOP, that should result in citizens and businesses not having to supply the same data to public authorities more than once, the possibility to use those data at the request of the user to complete cross-border online procedures involving cross-border users. According to the Regulation, by December 2022 a dedicated technical system will connect the 21 online procedures, key for citizens and businesses, established in each Member State with the data sources across Europe.

Even there is no one concrete definition of the OOP, based on the EU level documents mentioned above, the following elements of the OOP can be identified:

1. collecting only necessary information,
2. exchanging data so the citizen or entrepreneur is never asked again,
3. respecting data protection rules when re-using data.

2 National Approaches Towards Implementing the OOP

Although the OOP is relatively new in the actions of the European Commission, it seems that the Member States realized its benefits a long time ago. In many countries, this has been a natural reaction on isolation of databases. The existence of numerous registries not linked with each other caused low quality of the data, redundancy of data collected, work duplication of administrative workers, and dissatisfaction of the citizens and businesses due to the growing red tape. Although most countries face similar challenges, understanding and the way of application of the OOP may vary. National differences such as different administrative structures, IT systems, database models affect the deployment of the EU-wide OOP.

The table presented in Appendix provides an overview of national OOP implementations of EU Member States and European Economic Area countries (Norway, Island, Lichtenstein). The table was developed based on the available online sources (Digital Government Factsheets of 2019 published by the European Commission’s National Interoperability Framework Observatory, collection of Joinup cases, national sources) as well as information gathered from the TOOP partners and representatives of Member States. The table includes information on the legal basis of the OOP, national programs/actions supporting the OOP and the solutions enabling realization of the principle. The information in the table, especially related to the solutions enabling the OOP, refers to the business data exchange (among other data). Therefore, the OOP applications in sectors such as health, justice, social security etc., which are often supported by a dedicated infrastructure are intentionally not presented (Fig. 1).

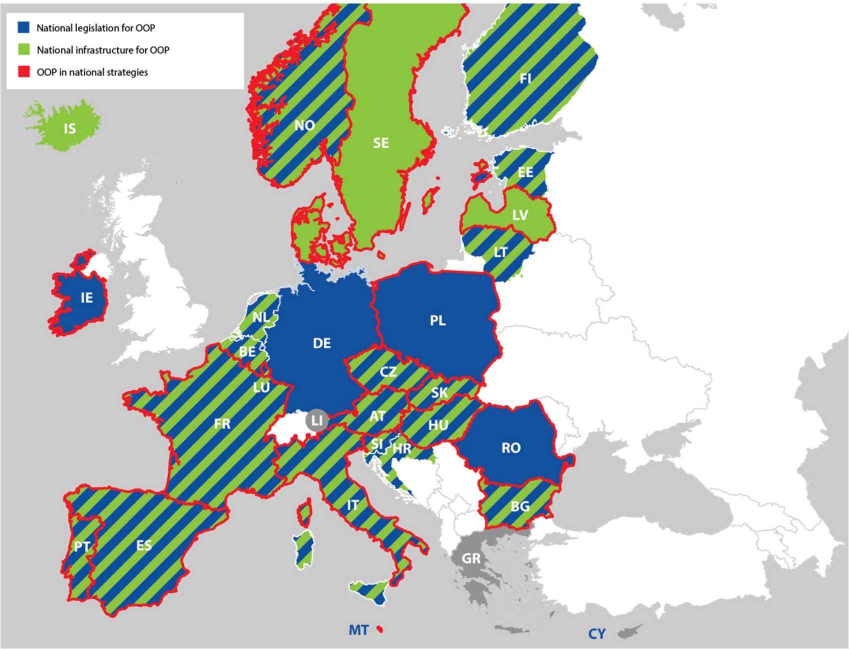
🟦 National legislation for OOP
🟩 National infrastructure for OOP
🟥 OOP in national strategies
IS
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Fig. 1. Legislation, strategies and infrastructure for OOP in the EU Member States and EEA countries

Legislation can be an important driver for the application of the principle. Most of the countries (22 out of 30) have national legislation for OOP in place. Not all regulations directly prohibit requesting data more than once. Legislation obliging authorities to obtain and reuse data stored in public administration databases as well as introduction of meta/base registries are also treated as OOP enabling regulation (e.g. case of Slovakia, Norway, Finland, Croatia, Czech Republic). Base registries provide authentic sources of data for public administrations, and therefore, are the key to making the OOP a reality [23]. In some EU countries, law does not only prevent the collection of data more than once but also ensures that data are stored only in one place. For example, the Estonian law prohibits the creation of separate databases for the collection of the same data [46]. Public institutions exchange information between each via a system called X-Road. Information, stored in decentralized registers can be securely accessed through a data exchange layer. Additionally, in the case of Estonia, the legislation is used to force the use of the X-road solution, which is a recommended good practice [23], facilitating the broad uptake. In the Netherlands, the common rules for the base registries [22] do not permit to collect data that is already stored in any of the registers. Sharing and exchange of data are enabled by four system services Digikoppeling, Digilevering, Digimelding and the Stelselcatalogus [18]. Duplication of data held in the central business registries (the Business Registry and the Private Entrepreneur Registry) is also not allowed in Hungary. Public administration bodies are obliged to retrieve data from the registries via secure data exchange. The legal obligation for OOP does not exist in Denmark, Greece, Iceland and Sweden. Lack of the OOP legal basis in Sweden may be justified by the "Swedish tradition" that common infrastructure is governed through guidelines and recommendations. Therefore, the OOP is underlined in the national digitization plans but not dedicated legislation. No data was found for Cyprus, Latvia, Lichtenstein and Malta. It must be however remembered that the Single Digital Gateway Regulation, which mandates the use of the principle from 12 December 2023, became immediately enforceable as law in all Member States when it entered into force in 2018. In this way, each EU country has legal basis to enable at least key OOP based digital services.

The OOP is often seen as a part of a global plan of public services modernization and cutting red-tape and therefore is part of national programs and strategies related to digital government. 18 (out of 30 countries have highlighted the principle in the documents such as digitalisation strategies, interoperability strategies, or programs dedicated to reducing administrative burden. For example, The Dites-le-nous une fois (Tell us once) is part of a global plan to modernise public services in France and is one of a range of actions being taken to digitalise processes and improve collaboration between ministries and public services [35]. In Luxembourg, the OOP is one of the five eGovernment principles, approved within "Digital Luxembourg". OOP is the core goal of the "Mapping Tomorrow", which is a strategic plan for the public administration for 2019–2021 in Malta, aiming at internal sharing and re-use of data and information that has been previously provided by a citizen or organisation. 5 countries have not highlighted the OOP in any strategic documents. No data was collected from 7 countries.

The infrastructure enabling the OOP is in place in 22 (out of 30) countries. The solutions are at various maturity levels and cover different scope of information.

The MAGDA platform (Maximum Data Sharing between Agencies) of Belgium is connected with base registries at the federal level through the relevant service integrators. In France, where the OOP principle was implemented along with a wide range of base registry initiatives, public administrations can access this information through APIs (Apientreprisesl) that provide information from different base registries. In Hungary, the Central Governmental Service Bus, the technical interoperability platform, which is online since 1 January 2018, enables automatic information exchange from 27 base registers indicated in the e-Administration Act. Others can also connect to provide their services over the central data exchange platform voluntarily. Furthermore, the Public Connectivity System [51], one of the Italian OOP solutions, is a network that connects Italy's government agencies, allowing them to share and exchange data from six base registries based on Domain Gateways (Data Providers and Consumers). Another OOP solution in Italy is the National Digital Data Platform (PDND). The X-Road system, which is the backbone of the OOP in Estonia, enables multiple databases to communicate. Apart from Estonia, the solution is already implemented in Finland and Iceland. Not all Member States realize the OOP by the deployment of the data exchange infrastructure. In Denmark for example, Data Distribution Platform, an authoritative data source infrastructure makes basic data from several authorities accessible in the same place. In this way, the Platform ensures that authorities are provided with easy and safe access to basic data in one collective system.

The OOP solutions are often interconnected with the Points of Single Contacts (PSC) for businesses operated in each Member States, following the implementation of the Directive 2006/123/EC on services in the internal market [49]. The business portals facilitate access to information and the completion of administrative procedures online. Luxembourg has implemented the OOP by making it a component of the Guichet.lu whilst in Norway, the exchange of information from business registries at the Altinn system (PSC) is possible thanks to the Central Coordinating Register for Legal Entities. In Sweden, the Composite Service of Basic Information on Companies, which supports the exchange of business-related data, collects and forwards replies from the PSC - verksamt.se portal, (as well as municipalities, government authorities) to data sources (Swedish Tax Agency, Statistics Sweden, Swedish Companies Registration Office). In Estonia the X-Road system is the basis for the core-functionality of eesti.ee among other portals.

No central infrastructure supporting the OOP is currently available in Germany, Greece, Poland and Romania, although for selected services the automatic data exchange is gradually being enabled (e.g. business registration service in Poland). No information was found for 3 countries.

Looking from the European perspective of the once-only, different maturity levels as well as fragmentation of the OOP applications significantly hamper extending the principle to the cross-border level. Still, in some Member States, the OOP is not applied horizontally but has a limited – service-oriented character. Exchange of data in selected processes or a single database is an indisputable added value for a business but does not realize the OOP in general. This quite low level in the OOP advancement is reported in countries such as Poland and Greece, although a more holistic approach is envisaged in national plans and strategies.

3 Benefits of the OOP

The once-only principle puts the public services user in the centre. Public administration eliminates burdens in access to public services by reorganizing internal processes and enabling cooperation between public bodies. Implementation of the OOP is not only about exploiting the advantages of new technologies but overcoming organizational as well as legal challenges. Thanks to this effort, handling administrative matters becomes more efficient and friendly. The principle refers both to retrieving documents required as attachments to the form as well as filling the form with necessary information. The time required to prepare a form to be submitted to the public office is limited to the minimum as only data and documents that the administration is unable to obtain on its own are requested. Keeping data up-to-date, which is citizens and business responsibility imposed by law, also becomes less cumbersome. In the case of dispersed and not interconnected registries, there is a risk that citizens or businesses might lose control over data submitted in various databases. The interconnection of databases enables swift notification of respective sources in case of change submitted to the one place. Furthermore, the OOP has a great potential of minimizing administrative burden for businesses in meeting the reporting obligations. The businesses during its operation need to submit numerous reports related to taxes, employment, working conditions, fixed assets, financial information and many others. The research conducted in 2019 Poland reviled [32] that an average Polish entrepreneur in a medium-size company needs to submit 208 reports. The authors of the report say the data submitted to the different bodies (up to 14) are often duplicated or unnecessary. This area has been the case of OOP application in some countries. The Register of the Reporting Obligations of Enterprises in Norway is responsible for a constant overview of the reporting obligations of enterprises to central authorities and finding ways to coordinate and simplify these obligations. In the Netherlands, Standard Business Reporting was introduced. It provides governments and businesses with a secure method for the exchange of business information between organisations in a reporting chain [18].

The OOP is expected to bring savings to businesses in terms of time devoted to multiple submissions of the same data and in turn complying with administrative requirements. According to an OECD Survey [35], 3 companies out of 4 consider that reducing repeat requests for information should be a government priority. As an example, it is estimated that data related to revenues and the workforce is, on average, requested from companies by public services between 10 and 15 times, which generates the cost between 3% and 5% of GDP a year.

A breach in the OOP has an impact on creating an administrative burden for citizens but public administrations are negatively affected as well. It fosters building administrative silos and lowers the efficiency of public processes. Ineffective processes related to data management generates extra workload. Additionally, duplication of the same actions by different bodies is costly for governments as extra effort needs to be put on ensuring data quality and reliability.

Investing in solutions related to enabling the OOP pays off. One of the examples is the Basic Data Programme in Denmark which introduced the OOP for many data collected in 10 electronic registries. According to estimations, it is expected to have annual revenues of around € 100 million, since the number of transactions between citizens/businesses is limited and the burden of reporting information is reduced [31]. Another example is the estimation on the application of the OOP, which has been carried out based on the Register of non-residents (RNI) in the Netherlands. RNI allows for data sharing among Ministries and National Agencies, which generates time savings related to the reduced number of transactions related to collecting and managing data. In line with the OOP principle, users registered in the RNI have to communicate their data only once to public authorities. As a result, a 50% decrease in potential transactions between users and public authorities was reported. According to estimation, the RNI generated benefits of €112 million [31].

Bringing the principle to the European level is expected to bring further benefits. For many years, the European Commission is devoted to making the citizens and business life easier by enabling seamless digital public services. Application of the OOP further improves their quality and contributes to the creation of the real Digital Single Market. Furthermore, it is expected that extending the OOP to the EU level could result in significant savings, estimated for as much as €5 billion per year [24]. However, the final benefits, as well as savings, will depend on the scale of the OOP application – the more data from various registries is exchanged the higher savings can be expected. Currently, information about citizens and businesses is reused only in 48% of cases.

4 Implementing the OOP in the TOOP Project

On 1 January 2017, the Once-Only Principle Project (TOOP) was launched with the aim to investigate and demonstrate the practical operation of the "once-only principle" in the field of cross-border public services to businesses in the EU Member States.

The substance of the OOP across borders is shown in the diagram below. It shows the case where a user from country B intends to execute a public e-service in country A. To do so, he starts the service in the service portal of country A (Data Consumer). The one-off principle is fulfilled in such a way that the service portal in country A retrieves the data of the user from country B directly from the system in country B (Data Provider). The aim of the TOOP project was to create an architecture that would enable data exchange as shown in the figure. The architecture developed in the project is federative as it is dispersed and does not create a single central system but enables data exchange between existing public administration systems in different EU Member States and associated countries (Fig. 2).

The technical solution developed in the TOOP project has been tested in three pilot areas: general business mobility, e-procurement and maritime pilot.

4.1 General Business Mobility

The TOOP architecture is used to facilitate the provision of cross-border services related to obtaining licences and permits for companies planning to do business in a Member State associated country other than their home country. The developed IT architecture enables business data to be automatically transferred from one system of a country to another, without the need for the entrepreneur to submit it again. This not only saves costs and time, but also improves data quality and consistency.

An exemplary cross-border implementation of e-services looks based on the TOOP project architecture is following:

1. an entrepreneur from Poland visits the eGovernment portal in Germany in order to obtain the permission necessary to provide the service in Germany;
2. the eGovernment portal in Germany authenticates the Polish entrepreneur through the eIDAS solution[1];

[1] The eIDAS solution allows citizens from Member States to prove and verify their identification when accessing on-line services in other Member States. It allows citizens to authenticate themselves by using their eIDs and connecting with their Identity Provider (IdP) from their country.

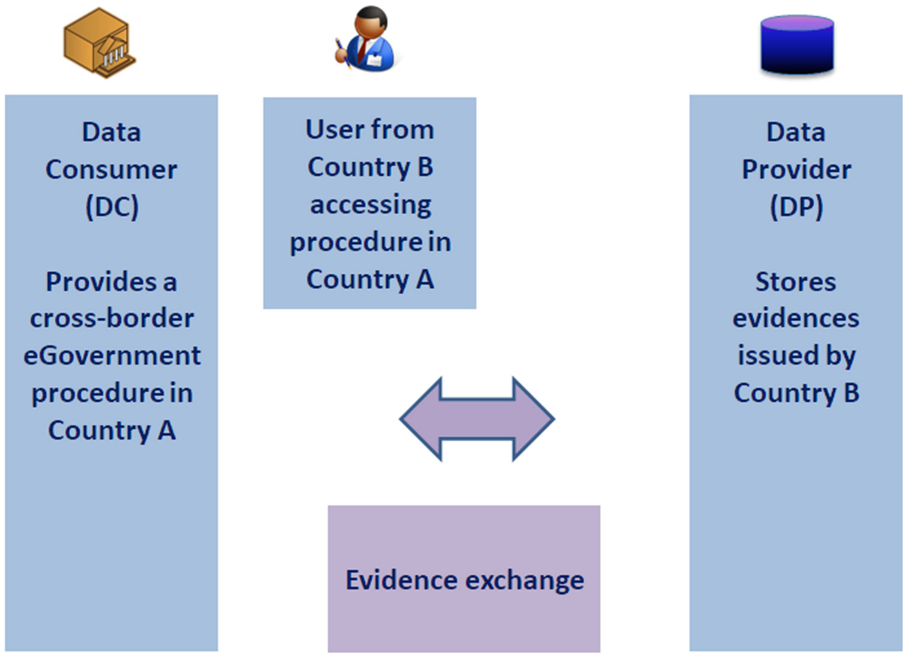
Data Consumer (DC)
Provides a cross-border eGovernment procedure in Country A
User from Country B accessing procedure in Country A
Data Provider (DP)
Stores evidences issued by Country B
Evidence exchange

Fig. 2. The TOOP architecture concept

3. the Polish entrepreneur begins the process to obtain a permit in Germany. The eGovernment Portal in Germany verifies through the TOOP architecture what data is already stored in the Polish register. In case the data is available, it notifies the Polish entrepreneur and asks him/her for consent to download the data directly from the Polish register;
4. if the consent is given, the data is retrieved directly from the Polish register and the Polish entrepreneur completes only data, which are not available but necessary to obtain permission in Germany.

4.2 E-procurement

In the area of public procurement, TOOP solutions will facilitate the implementation of procedures related to the contractors' compliance with the requirements for participation in the tender procedure. The technical solution created in the project enables automatic completion of the European Single Procurement Document (ESPD)[2], which is one of the documents required to be presented by the contractor participating in the tender procedure. Thanks to this, the process of verification of documents submitted by contractors participating in public procurement procedures is faster and easier. The TOOP solution can also support further stages of the procurement process. In the award

[2] European Single Procurement Document is a self-declaration of the business used as a preliminary evidence of fulfilment of the conditions required in public procurement procedures across the EU, created under the EU's 2014 Directive on Procurement.

phase, the contracting authority will retrieve the evidences, which have been declared in the ESPD by the winner of a tender procedure, directly from the competent authority of the country in which the tenderer is registered. To make this automatic data exchange possible the contractor needs to give an appropriate consent so the data can be accessed by the contracting party. The process can be repeated multiple times after awarding a contract.

4.3 Maritime Pilot

The application of the OOP in maritime transport is aimed at eliminating the need to provide ship and crew certificates, which are currently issued and kept in paper form by national maritime authorities. Ship and crew certificates are issued by various organisations such as the Maritime Administration and the Recognised Organisation. According to International Maritime Organisation (IMO) Conventions, these certificates should be "available in its original form on board the ship on which the holder is serving". The shipowner and, in practice, the ship master acts as an intermediary between the issuer of the certificates and the entity that requires them to be presented, i.e. the Port State Control Officers (PSCOs). Thus, an entrepreneur - the shipowner in this case, is burdened with providing information which is already in the possession of the public administration. The purpose of implementing the OOP is to enable PSCOs to access directly the databases of certificate issuers. This would result in automating a largely manual and paper-based procedure, which is used now.

5 Summary

The article presents the definition of the OOP and discusses the most important EU initiatives to make it a reality in Europe. The analysis carried out indicates that in most EU countries, the principle is both embedded in national legislation and indicated in national eGovernment strategies. However, having legislation is not equivalent to the practical functioning of the OOP. Some countries still have only solutions limited to selected group of services or registers and the priority is given to the national level applications. Such an approach already brings tangible benefits of reducing bureaucracy, but much higher savings can be generated at cross-border level and broad application of the OOP. This is the aim of the TOOP project, which has created a generic IT architecture, tested by a number of eGovernment systems in 19 European countries. The solutions developed in the TOOP project will be used in the implementation of the Single Digital Gateway. Its launch in 2023 will be a significant landmark for the OOP in the EU and the EEA countries and the next milestone in the development of seamless cross-border digital services.

Appendix

Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Austria	The Austrian eGovernment Act (§ 17 (2)) stipulates that whenever technically possible, citizens shall not be asked to present proof of data that already exists in an electronic register in the public sector. Instead, public sector organisations need to make requests of data directly to the relevant databases [6]. The legal framework for the system for electronic data exchange between public registers, the Austrian Information Hub, is currently being created and will be embedded in the Austrian Business Service Portal Act	The OOP has been a pivotal part of Austria's digital government efforts in recent years, with a strong focus within the current Austrian government program, as well as the Austrian Digitisation Strategy [6]	The Business Service Portal (Unternehmensserviceportal, USP) is a one-stop-shop for businesses which offers information and transaction services that help businesses fulfil their legal obligations. In combination with the infrastructure of two national once-only core components, the Information Obligation Database ("DLK") and the Information Hub ("RSV"), data exchange with different registers is achieved

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Belgium	The Belgian law requires the federal government’s public administrations to retrieve all available data from official registers with a unique identification feature instead of asking citizens and companies to make this data available more than once The Flemish Public Governance decree introduced the Once Only obligation to use base registries in Flemish administrative processes, with the obligation to notify back any errors found in these base registries [7]	No data	The MAGDA platform (Maximum Data Sharing between Agencies) is the once-only principle implementation supporting electronic delivery of public services, at the federal, regional, and local levels of the government. The platform enables the reuse and sharing of citizens’ and companies’ data between the Flemish government authorities (190 agencies and 13 departments) MAGDA is connected with base registries at federal level through the relevant service integrators. When consuming the data in various formats, it transforms the data to a single format
Bulgaria	According to the eGovernment Act, entered into force on 13 June 2008, administrative bodies, persons charged with public functions and organisations providing public services cannot require citizens and organisations to produce or to prove data which has already been collected or created [8]	One of the priorities of the Governance Programme of the Bulgarian Government is connection of key registers and provision of interoperability for switching to automated/semi-automated exchange of data and electronic documents	The Registry Information Exchange System (RegiX) is an environment for automated interconnections between registries. With RegiX it is possible for the authorised users of information to automatically retrieve data from basic registers such as the National Population Database, BULSTAT Register, Property Register, Commercial Register and other (62 registries in total) [8]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Denmark	There is no legislation for OOP	The Digital Strategy puts forward the ambition that, as far as possible, citizens and businesses should not have to spend time submitting the same information to several public authorities or providing documentation for information that is already in public registries [1]	There is currently no government-wide data exchange infrastructure in Denmark however Data Distribution Platform offers an authoritative data source infrastructure. The Data Distribution Platform is the distribution channel that makes basic data from several authorities accessible in the same place. The Data Distribution Platform replaces a series of public distribution solutions and ensures that authorities and companies are provided with easy and safe access to basic data in one collective system, rather than having many different systems and interfaces
Czech Republic	The Act amending certain acts in connection with adoption of the Act on Base Registries (Act No 227/2009 Coll.) defined the rights and duties related to information editing, publishing and receiving data through the System of Base Registries. Act No. 111/2009 Coll. introduced base Registries into operation in other agendas of public services and created a cooperative network of various agendas around base registries including rules for information interoperability [10]	The Digital Czechia Programme covers the use and upgrade of base registries and their inter-connection [10]	The Registry of Economic Entities is one of 4 Base Registries. The interoperability between these base registries is ensured through the Information System of Base Registries [23]. National public administrations not only have access to the reference data in base registries, of which accuracy and validity is guaranteed by the state, but also to other attributes and data from other public administration information systems, in compliance with national legislation [10]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Cyprus	No data	No data	No data
Croatia	On 15 July 2014, the Croatian Parliament adopted the Law on the State Information Infrastructure, which introduced a meta-register thus ensuring preconditions for the 'Paperless government' and realisation of the "once-only" principle [9]	No data	The Metaregistry is a public register used to control the system of all public registers. It contains detailed information on public registers, the data they hold, as well as how to connect with other systems. The Metaregistry is still not yet fully operational [9]
Estonia	Since 2007, the Public Information Act prohibits the establishment of separate databases for the collection of the same data (§ 43). Also, the General Part of the Economic Activities Code Act (2011), establishing the general conditions and procedures for exercising the freedom of economic activity, states that economic administrative authorities are prohibited to require companies to provide information that is already entered in a public database. The prohibition also applies to information which can be obtained from the relevant register of another Contracting State (§ 13)	No data	X-tee (X-Road) is based on an interoperable ecosystem and a technical ability to exchange data. To exchange data, one member of X-tee describes the shared data and other members are able to use this data based on an agreement

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Finland	The Act on Public Administration Information Management requires government agencies to utilise datasets of other government agencies whenever possible, if they by law have access to such data via electronic interfaces. Regular exchange of data between agencies has to be organised via electronic interfaces. The Act also prescribes to the Ministry of Finance a general coordination task of interoperability of public sector data sets. The act entered into force on 1 January 2020 [11]	No data	Data Exchange Layer Palveluväylä is the Data Exchange Layer, which was based on Estonian X-Road technology. It is connected to Suomi.fi, which provides e-services to citizens, businesses and government organisations [11]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
France	Code des relations entre le public et l'administration which came into force on 1 January 2016 contains, among others, the exchange of information between administration (once-only) rules. Book III of the code deals with the access to administrative documents and re-use of public information [12] Additionally, following the law of 10 August 2018 for a State in the Service of a Company of Trust, a decree published in the Official Journal of 20 January 2019 supplements the principle of "Tell us once", where a user of the administration (individual or company) carrying out an action will no longer be obliged to provide certain information or supporting documents as soon as these elements are already held by the administration's services [12]	The Dites-le-nous une fois (Tell us once) is part of a global plan to modernise public services and is one of a range of actions being taken in France to digitalise such processes and improve collaboration between ministries and public services [35]	The OOP principle was implemented along with a wide range of base registry initiatives introduced through a number of strategies and respective initiatives. The digital tool enabled the pre-filling and digitisation of administrative forms that businesses were required to complete, in particular, to consent the exchange of information between the different departments and agencies. Public administrations can access this information through APIs (Apientreprisesl) that provide information from different base registries. The base registries available through APIs are: INSEE (Administrative information / contact details and identity); Infogreffe (Legal information / legal status); DGFiP (fiscal information / taxation / turnover); ACOSS (social situation / social security contributions); Caisses retraites (pension funds) [12]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Germany	The possibility for Once-Only has been created in the eGovernment Act of the Federal Government and those of some countries (§5 (2) EGovG) which states that the competent authority can electronically obtain necessary evidence originating from a German public body directly from the issuing public body with the consent of the party to the procedure. For this purpose, the requesting authority and the issuing public authority may collect, process and use the necessary personal data	No strategy highlighting the OOP	At the moment there is no infrastructure supporting the OOP. In the future, an online gateway portal network will connect the administrative portals of the countries and enable their exchange of information. Using basic components, the decentralised data sets are exchanged and updated via all portals, so that all service descriptions can be found and online services can be called up via each portal With this decentralized approach, the project Online Gateway Portal Network will address the different development stages, technology approaches and IT strategies of the federal countries. The participation possibilities in the portal network are manifold and will be solved easily and cost-efficiently via standard interfaces[a]
Greece	At the moment the OOP is not regulated[a]	The OOP is not highlighted in any national strategy. At the moment the Ministry of Digital Governance is working on the design and implementation of the government's digital transformation policy	There is no infrastructure supporting the OOP

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Hungary	According to law, a person cannot be obliged to provide any data which is publically known or being stored in any authoritative data sources. At the same time it is not allowed to duplicate the data of base registries by other public administration bodies, they have to retrieve data from the given registries via secure data exchange[b]	The National Infocommunication Strategy 2014–2020 contains the necessity of simplifying administrative processes, reducing the administrative and bureaucratic burdens, and the establishment of interoperability among the major base registries until 2020	The technical infrastructure to support the OOP in Hungary is the Central Governmental Service Bus, the technical interoperability platform which is online since 1 January 2018. It enables automatic information exchange from 27 base registers indicated in the e-Administration Act. Others can also connect to provide their services over the central data exchange platform on a voluntary basis
Iceland	There is no legislation, however it is being analysed what needs to be changed in Icelandic laws to ensure the legitimacy of digital services and data sharing between parties	A new digital strategy is underway for Iceland. In the green book, which is the foundation for the new strategy, it is recommended that the OOP will be a part of it	The infrastructure enabling the OOP is already in place as a working X-Road implementation called Straumurinn,. Icelandic government is working on connecting all governmental organisations to this solution

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Italy	The Italian law (Legislative Decree no. 82 of 2005, the Digital Administration Code (CAD) Articles 50 and 58) states that public administrations should cooperate to obtain information and not as to provide information more than once [14]. Additionally, it establishes that public administrations shall exchange data between each other by default. Article 60 defines the Business Register as one of the Base Registries in Italy of national interest. Additionally, OOP is also explicitly mentioned and supported in the Public Contracts Code (Legislative Decree no. 50 of 2016) [5]	The OOP is one of the principles in the national strategy for digitization and in the three years Plan for digitization of public administrations 2019–2021 [3]	The infrastructure to enable OOP is the so called the Public Connectivity System (SPC) [51], which is a network that connects Italy's government agencies, allowing them to share and exchange data and information resource. The System is an eGovernment Digital service Infrastructure based on Domain Gateways (Data Providers and Consumers), a common format for the Data Request/Response (the so called eGov XML envelope) and Registers to publish the agreements (TOOP register) [48]
Ireland	Data Sharing and Governance Act 2019 provides a generalised legal basis for the sharing of data between public bodies for making public services more seamless by reducing the burden of providing the same information to different public bodies [13]	The Public Service Data Strategy for the period 2019–2023 aims to put in place a series of measures to improve how data is governed, managed and re-used in a secure, efficient and transparent manner, for the benefit of citizens, businesses and policy makers	No data

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Latvia	No data	The OOP is highlighted in the Information Society Development Guidelines 2014–2020 within Action Direction “Advanced and Effective Public administration” (Single Public administration Data Space) [33]	The IVIS is tasked with the unification and central management of the integration of platform-independent standardised data exchange between national registries and information systems. It provides a platform for sharing resources and for the public administration in using electronic services in the creation and delivery. Together with the state portal latvija.lv, it creates a single national electronic service delivery platform. One of the IVIS components is the public administration documents management system integration environment (DIV), which provides safe and secure environment between different record keeping systems of public administration [15] State information system register (SISR) was set up for the registration of State Information Systems (SIS), in which data on the national information systems - their use, technical resources and administrators - is stored. It supplies information to natural and legal entities on the data contained in the registers, as well as to system developers and organisations that integrate SIS. There are 173 registered SIS in the SISR [15]
Lichtenstein	No data	No data	No data

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Lithuania	Article 36 of the Law on Public Administration states that an economic entity shall enjoy the right not to submit documents to a supervising entity, if it has already submitted the same documents to at least one supervising entity. However, when refusing to submit documents, the economic entity must indicate in writing the supervising entity to which it has submitted the said documents [47]	No data	The State Information Resources Interoperability Platform (SIRIP) is the public interoperability platform, which consists of two main parts: Data exchange platform and Central electronic services portal eGovernment gateway [16]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Luxembourg	The Law of 25 June 2013 concerning the digital identification of physical persons forms is the main basis for the OOP by prescribing that authentic data, already contained in the National Register of Natural Persons, have to be reused by public administrations. These administrations are not allowed to ask once more for these data and citizens do not need to provide evidence that the data in the register is correct. Nevertheless the OOP is also applied for other registers or databases not covered by the Law of 25 June 2013 but containing other authentic data: Cadastre, Cars register, Driving licence, VAT balance sheet [36]	The OOP is highlighted in the Digital Luxembourg initiative [50]	Luxembourg has implemented the OOP as efficiently as possible by making it a component of the Guichet.lu One Stop Shop [36]. It is possible to integrate authentic sources within the Guichet.lu back-office to retrieve and/or verify authentic data. The OOP is implemented in three distinct ways: data is reused automatically in the context of procedures at back office level without any explicit intervention of the user; for some cases citizens' or businesses' explicit consent is necessary in order for the administration to retrieve the necessary data from the central registers and databases; the citizen or the business decides to reuse information that he inserted himself in his personal space and that therefore is not information coming from an authentic source, i.e. from a central authoritative register or database
Malta	No data	Mapping Tomorrow is a strategic plan for the public administration for 2019–2021. Once-only is the core goal, aiming at internal sharing and re-use of data and information that has been previously provided by a citizen or organisation	No information about the implementation status. The Maltese Government Common Database (CdB) was enhanced with some minor amendments. An ongoing effort is being done for the simplification of processes by internally sharing data and re-use previously gathered information, in line with the OOP [17]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
The Netherlands	All base registries are anchored in legislation according to 12 agreed common principles [22]. One of them is that the use of basic registries is mandatory for all bodies that perform public tasks. It is not permitted to collect data that is already present within a basic register and citizens and businesses have to provide data once	No data	The System of Base Registries was created to share authentic data provided by citizens and businesses. It is composed of 10 base registries. In order to enable sharing and exchange of data, four system services were developed: Digikoppeling, Digilevering, Digimelding and the Stelselcatalogus [18]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Norway	The Act relating to the Central Coordinating Register for Legal Entities LOV-1994–06-03–15 and the regulation regarding the registration of legal entities in the Central Coordinating Register for Legal Entities mandates public authorities to re-use information from the Central Register. Moreover, the Act regarding the Register of the Reporting Obligations of Enterprises (LOV-1997–06-06–35) obliges public authorities to coordinate reporting obligations in order to reduce multiple reporting[a]	OOP is supported in the Norwegian Digital strategy for the public sector 2019–2025	‘Altinn’ is the governmental system for digital communication between state, businesses and citizens. The exchange of information from business registries at the Altinn system is possible thanks to the Central Coordinating Register for Legal Entities, which identifies legal entities. The Register of the Reporting Obligations of Enterprises takes care of the re-use of data, enables the extracting of data from administrative systems and supplies metadata for electronic reporting solutions. CCR serves as a link between the entities and registries, making key data accessible. Associated registers shall use information registered in the CCR, and submit information they receive to the CCR. This is important in order to pre-fill forms and confirm whether a person is authorized to act on behalf of an entity
Portugal	The Decree-Law no. 135 of 1999, reviewed by the Decree-Law no. 73 of 2014, approved in May 2014, established important administrative modernisation measures, including the OOP, according to which the citizen must not be obliged to give the public administration the same document twice [19]	According to the Portuguese Government’s interoperability strategy, public services should be allowed to exchange data in real time, facilitating the OOP, whereby citizens don’t have to provide information to a public administration that is already in a public administration database [37]	The administration interoperability platform (iAP) connects various services between public entities and digital platforms that accumulate public information. 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 [37]

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Poland	The Polish law (The Code of Administrative Procedure [34]) forbids public bodies to request information that is already stored by any other public body	The OOP is part of the action for the citizens and businesses oriented services in the national Integrated Program for Digitalization [44]	There is no general infrastructure to enable secure exchange of data between public registries. This kind of exchange is enable only for selected services
Romania	The 41/2016 Ordinance, issued in June 2016, introduced the obligation for public authorities, on request from citizens, to accept documents in electronic format and reuse any personal data previously delivered to the public administration. The ordinance stipulated new rules concerning source code for ICT systems developed under an eProcurement contract. The ordinance also established a national CIO in partnership with the Ministry of Communication and Information Society and the rest of government	The OOP is part of the Strategy for enhancing the Public Administration 2014–2020 (with the purpose of establishing the general framework for public administration reform), MDRAP [39]; the Action Plan - Strategy for enhancing the Public Administration 2014–2020 [40]; the Integrated plan for simplifying administrative procedures applicable to citizens, CNCISCAP, 2016 [41]; the Romania's development strategy for the next 20 years, Romanian Academy, 2017 [2]	There is no a national infrastructure enabling the OOP in relation to business data

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Spain	Law 39/2015 of 1 October 2015, on Common Administrative Procedure of Public Administrations, art. 28 and law 40/2015 art. 155 facilitate the OOP. Public administration cannot require data and documents that have been previously delivered. Each administration must facilitate access to data in its possession [4]	The Action Plan for Digital Transformation in the Ministry of Finance includes Initiatives that are proposed for compliance with article 28 of Law 39/2015, related to the 'once-only' principle [21]	The Data Intermediation Platform (PID) is a horizontal service that simplifies administrative procedures, so that citizens or businesses do not have to deliver data or documents already held by public authorities [21]. Using the PID with the SCSP protocol, public bodies in charge of administrative procedures can automatically check the required information. The SCSP protocol is aimed to substitute paper certificates by electronic data exchanges and it defines a common structure for the messages and a governance model that considers four roles as result of two dimensions: data consumer/provider and business/technical actor [21]
Sweden	There is no legal obligation for the OOP	OOP is underlined in the national digitization plans	The Composite Service of Basic Information on Companies - CSBIC supports exchange of business related data in line with the OOP. The CSBIC works as an intermediary and forwards basic data requests from consumers (municipalities, government authorities, verksamt.se business portal) to data sources (Swedish Tax Agency, Statistics Sweden, Swedish Companies Registration Office) and then collects and forwards the replies from the producers to the consumers. The service is based on xml/soap

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Country	Oop – legal basis	Program/strategy	National infrastructure supporting the OOP for business
Slovenia	According to art. 139 of General Administrative Procedure Act [52], the official who conducts the proceeding shall obtain the data on the facts of which the agency competent for deciding, any other State agency, local community agency or statutory authority keeps official records	At the moment only guidelines for information solution development [45] cover the OOP. The new Public Administration Development Strategy, which is under preparation, will highlight the OOP	The TRAY is a central system for electronic data enquires, which enables efficient, reliable and secure collection of data for different clients, from numerous and heterogeneous data sources, by handling electronic data enquiries and electronic answers. It also enables the handling of data sources in a customised and parameterised way. In 2019 an AI based algorithm for data traffic optimization was added to the system, minimizing congestion risks with data collection
Slovakia	Act no. 177/2018, on measures to reduce administrative burden by using public administration information systems and on amendments and supplements to certain acts (Act Against Bureaucracy), came into force on 1 September 2018. According to the provisions of § 1 par. 1 of the Act, in their official activities public authorities were obliged and authorised to obtain and use data recorded in public administration information systems, to make extracts from them, and to provide such data and extracts when necessary [20]	National strategy for public governance informatization (document National Concept of Public Administration Informatization of the Slovak Republic [42]) contains also several OOP mentioning in context of public services improvements. The European scope of OOP is mentioned in document 2030 Digital Transformation Strategy for Slovakia [43]	The digital service OVER SI started in September 2018. Based on the Central Data Integrated Platform, was set up in response to the Government´s Stop to Bureaucracy initiative. In due course, more than 16000 public administration clerks performing duties at different domains were registered in order to provide themselves with the requested evidence (in the first phase evidence came from business registers of companies and self-employed, from cadastre and from criminal register). By the end of 2019, another batch of 11 sources of evidence was expected to be made available via the OVER SI. The portal allows the verification and exchange of four documents between government authorities [20]

[a] Questionnaire with a TOOP partner.

[b] Information obtained from the Ministry of Interior, Hungary.

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Drivers for and Barriers to the Cross-border Implementation of the Once-Only Principle

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Abstract. The once-only principle (OOP) aims to reduce interactions between citizens and governments, but many factors challenge its cross-border implementation. Building on the results of the "The Once-Only Principle Project" (TOOP, 2017–2021), an analysis was undertaken of the factors that either support or hinder implementation of the cross-border OOP. Five domains of factors were examined - technological, organizational, institutional aspects, actors and miscellaneous. This research highlights the importance of awareness of the OOP, and its inherent benefits, as a key driver. Also, the activities of supranational entities are of key significance, as it is establishing a critical legal framework. Co-ordination between different levels of government and different countries remains an important barrier. One specific issue discovered and addressed during the project but uncovered here, relates to identity matching, and this requires EU level intervention to reach an effective and efficient solution.

Keywords: The once-only principle · Drivers · Barriers · Cross-border public services · Interoperability · The once-only principle project

1 Introduction

The once-only principle (OOP) aims to reduce interactions between citizens and governments. It is driven by the goal of designing user-centric public services and reducing administrative burdens for citizens and businesses when fulfilling government-imposed administrative requirements and consuming public services (Gallo et al. 2014). In order to reduce administrative burdens, public administrations seek to minimize instances in which citizens and businesses must provide data to the government. To this end, public administrations seek to replace requesting data from citizens with machine-to-machine data exchange; and reuse of data already stored digitally in public sector databases, hence allowing citizens to provide data to the government "only once" (Meyerhoff Nielsen and Krimmer 2015, Krimmer et al. 2017, Kalvet et al. 2018a, Kalvet et al. 2018b, Olesk 2020).

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Although the OOP is not yet a widespread practice across European countries (Cave et al. 2017; Gallo et al. 2014), the European Commission recently took major policy steps to promote and adopt the OOP on a Europe-wide level, with the aim of developing cross-border e-government services for European citizens and businesses. The European Commission and 21 European countries launched a large-scale European interoperability initiative as a significant milestone – The Once-Only Principle Project (TOOP) – in 2017. TOOP is seeking to facilitate a Europe-wide OOP by developing a federated technical architecture, capable of interconnecting databases and data exchange layers in different countries (see Krimmer et al. 2017 for more details). Since cross-border OOP is an emerging concept, not yet practiced widely or discussed in literature, TOOP provided us valuable empirical information on drivers, barriers and obstacles for the OOP in Europe.

This section of the TOOP Book is structured as follows. After this introductory section, the second section identifies and categorizes, using state of the art for different determinants of the success of OOP initiatives (i.e., aspects identified as drivers or barriers in existing literature). After that, the third section briefly presents the method used to assess the importance of those factors. The following section of the chapter presents the results of data analysis. Finally, a discussion of the main findings, implications and some recommendations to address some aspects we identified, which hinder concretization and success of future OOP initiatives, is presented in section four. The section ends with our conclusions.

2 The Factors Impacting OOP Initiatives in a Cross-border Context

2.1 Factors Generally Impacting OOP Initiatives in a Cross-border Context

The aim of this chapter is to explore the barriers and drivers of cross-border OOP. Despite being fairly common concepts in e-governance literature, we nevertheless find it important, first of all, to clarify the use of the two terms. Said simply, drivers and barriers relate to the respective positive or negative impacts that a certain factor (or variable) presumably has on implementation and execution of OOP initiatives (or any type of undertaking for that matter). Therefore, the same factor, depending on its value, and sometimes even the context (e.g., country, domain), may either be a driver or a barrier for an initiative involving the OOP. Additionally, the effect, and even direction of certain factors could presumably also vary, depending on the stage of implementation of an OOP initiative we have determined.

Research on implementation of the OOP is still scarce – only a few studies on the implementation of the OOP exist, with the most notable studies on the topic being by Gallo et al. (2014) and Cave et al. (2017). However, existing literature on e-government, interoperability, public sector innovation, as well as acceptance of technology, can help us identify the key factors perceived to affect public administrations´ readiness, and ability to adopt the OOP for both national and cross-border transactions. This literature consistently suggests that factors impacting the provision of cross-border digital are plentiful and not related exclusively to technological dimensions (e.g., Gil-Garcia and Pardo 2005; Savoldelli et al. 2014; Cave et al. 2017). Furthermore, it has been postulated that there is no one single factor influencing digitalization, but rather a combination of several determinants instead (Gil-Garcia 2012).

There are several typologies used to classify, and group together different factors affecting digital provision of public services. One early attempt to categorize these factors was made by Gil-Garcia and Pardo (2005). According to the authors, factors affecting ICT projects in the public sector can be grouped into five categories: 1) information and data; 2) information technology; 3) organizational and managerial; 4) legal; and 5) institutional and environmental (Gil-Garcia and Pardo 2005). While the first two concern the availability and quality of data and technology, respectively, the remaining three extend beyond the technological domain, relating to the existence of an organizational, legal and institutional environment that stimulates, or hinders, the provision of digital services. Some examples of these factors are: the size of a project or organizations´ staff, the project alignment with existing goals, the presence of a regulatory framework or incentives; and, finally, pressures from political actors, businesses, or civil society.

Subsequent works followed a similar approach to classify factors affecting e-government and adoption of ICTs. Regarding the development of e-government in the European Union (EU), Germanakos et al. (2007) also identified factors from several categories such as technical, legal, as well as social and institutional environments too. Similarly, Savoldelli et al. (2014) stressed, in addition to technological/operational aspects, the significance that managerial-organizational and political-institutional factors have for the adoption of e-government. Looking at determinants of e-procurement, in two European regions, Gascó et al. (2018) also take the source of the barriers into account, making a distinction between "outer context" and "inner" factors. While the former refers to wider environmental factors, such as economic, social and political factors, as well as the inter-institutional environment and dynamics, inner factors are the ones intrinsically related to the organizations (i.e., organizational, individual and technical). Even though the authors find political aspects to be significant, internal factors seem to be the most weighty determinants. Overall, whether examining the provision of e-services, the adoption of ICTs, or e-government maturity levels, the frameworks, or typologies, developed to identify determinants for these outcomes have remained relatively constant.

Olesk (2020) also found that collaborative digital government initiatives are subject to influences of a number of factors in their context. These factors relate to technology and innovation, stakeholders (characteristics, beliefs and the behavior of public officials and citizens), organizational and institutional contexts, public sector quirks and particularities, and developments in the broader environment. While some of the factors (e.g., championing innovations, political will or favorable regulatory environments) serve as drivers and enablers of innovation, many others (e.g., stakeholders' beliefs, organizational resistance to change, resource limitations) tend to pose constraints and barriers to adoption and institutionalization of innovative public governance practices (Table 1).

The research which exists on the OOP produced similar results. According to (Cave et al. 2017), regarding the European context, the key barriers for implementation of the OOP can be grouped into five distinct categories. Those categories are 1) legal; 2) organizational; 3) semantic; 4) technical; and 5) other. The last, less well-defined, category covers aspects such as political will, users' awareness or the existence of bi(multi)lateral

Table 1. Key categories and examples of context factors of collaborative digital public sector innovation

Technology	Innovation characteristics	Public officials	Citizens
Availability of hardware and software Features of specific technologies (e.g. security) Interoperability	Ease of use Cost Compatibility Trustworthiness Relative advantage	Characteristics of individual innovators Attitudes, beliefs Knowledge and competences Trust in citizens Leadership Human error in innovation management	Motivation to engage with government Interests Knowledge and competences Trust in government Time constraints Perceptions (e.g. usefulness of the innovation)
Organizations	Institutions	Public sector context	Broader environment
Capabilities Incentives Financial resources Human resources Organizational structures Organizational cultures Resistance to change Top management support Participation in networks	Regulations and legal constraints Informal norms Institutional histories Legal and administrative culture Coordination and governance mechanisms Existing power relations	Influence of politics and political will Stakeholder complexity, different agendas Multi-rationality Bureaucratic and democratic principles Organizational competition for power and legitimacy Expanding domain of public intervention	Public attention Media attention Mimetic pressures Technological development

Source: Olesk (2020)

agreements. Two points should be emphasized from this exhaustive examination focusing on the OOP. The first is that perspectives of individuals/businesses and public officials diverge in terms of perceived barriers to the OOP. The second stresses the importance of semantic aspects, particularly the need for certified translations and deviation in the content of documents and data (Cave et al. 2017). In this sense, this study places importance on the interoperability dimension and cross-country dynamics, which are, to a great extent, distinctive and crucial aspects of the OOP.

A similar and also enhanced taxonomy has been proposed, based on previous results of the TOOP project (Table 2).

Summing up, literature used fairly consistent models, or similar sets of independent variables, to study modernization of the public sector and adoption of e-government. However, with a few exceptions (e.g., Leosk 2019), the aspect of time has been overlooked in written works examining determinants of e-government. The importance of

Table 2. Barriers to cross-border OOP

Stakeholders	Organizational, institutional	Legal	Technology, interoperability
Lack of awareness of the OOP Unclear perceived benefits of the OOP Unclear motivation to adopt the OOP Hesitancy adopting cross-border data sharing	Organizational silos Complexity of organizational change Resource limitations Cultural resistance Lack of political priority	Legal restrictions on data sharing Data protection and confidentiality requirements Absence of legal basis for cross-border OOP Lack of legal validity of evidence exchanged	Heterogeneous ICT systems Heterogeneous data handling approaches Legacy systems Data fragmentation Differences in data quality Limited availability of digital data

Source: Olesk (2020), based on (Kalvet et al. 2018a)

barriers and drivers of OOP, particularly when discussing perceptions of the main intervening actors, should vary not only between contexts (e.g. countries, area of implementation) but also between different stages of implementation. This problem is addressed in this study, by considering two distinct phases of implementation of OOP projects. This approach allows us, among other things, to explore whether the significance of certain factors, perceived to be important, persists over time.

Overall, the same lenses that were used to focus on our study of determinants for electronic provision of public services, or e-government in general, also prove useful for exploring key barriers and drivers, in the case of the OOP. Nonetheless, we can also identify factors, or variables, that are particularly important in the case of OOP initiatives. The improved framework of technical enactment (Fountain 2001; 2008) is valuable for structuring the array of factors, which we have grouped for this study into 5 dimensions: 1) technological; 2) organizational; 3) institutional; 4) actors; and 5) others (or miscellaneous), largely context specific factors. Each dimension, and respective factor, is detailed in the paragraphs below.

2.2 Technological Factors

Technological factors are particularly relevant in the case of OOP due to its reliance on heterogeneous information and process models. In fact, technical issues, particularly those relating to interoperability, are perceived as the most challenging aspects of modern cross-organizational information systems (Mocan et al. 2011). Interoperability, a key element of the OOP, can be defined as the exchange of data between different organizations and respective ICT systems. It therefore requires organizations have the capacity to interact with each other to achieve mutually beneficial and common goals (Cave et al. 2017). This becomes more important, particularly on a semantic level, in the case of cooperation between different countries. Besides the interoperability aspect, in the case of the cross-border context of the OOP, other relevant factors concern data quality, the particularities of various databases or information systems and, finally, countries' overall e-government architecture/infrastructures (Cave et al. 2017).

The European Commission also acknowledges that, in order to put the OOP into practice, various organizations must collaborate to develop technical and semantic interoperability (European Commission 2017). Ensuring technical interoperability requires adopting common technical specifications and building infrastructures that enable linking systems, in order to secure data exchange between information systems. Ensuring semantic interoperability requires agreement to common data formats and developing vocabularies to allow communicating systems to understand the meaning of the data in the same way. The EC's concept of interoperability extends beyond technical factors, also covering the importance of organizational and legal interoperability; as described in the following sections.

2.3 Organizational Factors

The organizational dimension consists of all factors intrinsically related to organizations. This accounts for the significant changes imposed by the OOP in organizational structures and workflows. The required level of collaboration and coordination between different organizations, one core aspect of the OOP (e.g., Wimmer et al. 2020), is bound to face a number of organizational and administrative barriers affecting organizations' will and capacity to implement OOP. The most common barriers faced during implementation of OOP at a national level have been found to include governmental silos and lack of communication between government departments, the complexity of changes in organizational structures, working practices and cultures, and concerns about high implementation costs (Gallo et al. 2014). A set of constraints that are also very frequently present at a cross-border level (Cave et al. 2017).

The literature confirms the importance of organizations' capacity to adapt, transform and innovate, which in turn depends, to a great extent, on aspects such as organizational structure and culture, the existing networks and the existence/ development of cross-organizational and cross-border knowledge transfer networks (de Vries et al. 2016; Albury 2005; Ferguson et al. 2013). Finally, one cannot overlook the importance that organizations' financial and human resources may naturally convey for the adoption and successful implementation of electronic services or use of ICTs (Drew 2011; Bekkers et al. 2013). The lack of financial, technical and personnel (staffing) capacities in an organization are major obstacles to development of e-government (Moon 2002).

2.4 Institutional Factors

The third dimension of factors affecting the OOP deals with the institutional aspect and concerns the sets of rules, laws and principles that may influence the development of digital governance (Bellamy and Taylor 1996; Fountain 2008; Heeks and Bailur 2007; Luna-Reyes and Gil-García 2011). It is common knowledge that public sector organizations are also heavily affected by variables beyond the power of individual organizations, such as the legal culture and administrative traditions of a state (Bekkers et al. 2013). Even though these factors are exogenous to the organizations, and usually more stable, or slower to change, regulations can be determinants for change, and promote innovation by imposing, for example, legal obligations on administrations to implement innovative solutions (de Vries et al. 2016). The political environment is also another critical aspect, with factors such as political stability having a positive effect on the development of e-government (Rodriguez et al. 2011).

Particularly in the case of the OOP, institutional and legal rules are critical for setting limits on data sharing and personal data protection systems. According to Gallo et al. (2014), resolving any legal obstacles and establishing a sound legal basis is one of the most important strategic issues for implementation of OOP. The role of intergovernmental and supranational institutions is fundamental for the case of the OOP. Although some directives and regulations have been adopted to support interoperability at the EU level (e.g., Single Digital Gateway Regulation – SDGR, regulation on electronic identification and trust services for electronic transactions – eIDAS, Services Directive and the General Data Protection Regulation – GDPR), there is still a need to establish a common legal basis at the EU level to fully support an EU-wide OOP (Cave et al. 2017).

2.5 Actors

The fourth important dimension of factors considered in this study are the actors. This dimension results from a revision of the technology enactment framework and the acknowledgment that technology, organizations and institutions cannot account alone for e-government and public sector's modernization (Dawes 1996; Gil-Garcia 2006; Dunleavy et al. 2006). As they are accountable to a number of public and private stakeholders, public sector organizations are highly dependent on political goals and tensions (Rashman et al. 2009). However, the modernization of services may be highly dependent not only on political will, but also on public and business demands (Heeks 2005; Panopoulou et al. 2010; De Vries et al. 2016).

The public is a pivotal element of e-government and "governments must be careful, in their zeal to modernize, not to unwittingly betray the public interest" (Fountain 2001:203). Here, aspects such as citizens´ level of education, one important predictor of internet usage according to Chinn and Fairlie (2007), may influence individuals' demand for digital solutions. In the case of OOP, the support of political actors, business and civil society, both at national and supranational level, is perceived as a crucial aspect (Cave et al. 2017). This support, however, seems to depend on previous experience with OOP and on its benefits having been clearly demonstrated to individuals, businesses and public administrations (Cave et al. 2017).

Overall, different types of actors are important for the adoption of OOP. Previous experience with this principle is likely to bolster different actors' support and the will for it. However, if certain groups also benefit from the inefficiency or complexity of a service, the organizations and political actors might encounter some resistance for the implementation of OOP. Moreover, as Akkaya and Krcmar (2018) highlight, some concerns regarding privacy and data-protection may also ease the demand, or support, for the OOP.

This takes us to the expected or anticipated benefits of OOP which different actors have attached to the OOP, and which serve as one of the main drivers of the OOP. The most essential ones are brought to the fore here. The main benefit associated with OOP relates to the increased efficiency of government apparatus and, generally, to better governance (Cave et al. 2017; van Veestra et al. 2017; Wimmer and Marinov 2017; Wimmer et al. 2020). Scholars agree that sharing data across organizations, as well as across national boundaries, reduces administrative burdens and simplifies administrative processes which, in turn, leads to a reduction in time and financial resources required to support those administrative processes. In the same way, the OOP is seen as a contributor to increased user-friendliness and efficiency of digital service provision, but is also expected to leverage service quality across organizations or countries involved in providing these services (Bekkers et al. 2013; van Veenstra et al. 2013). There is an extended analysis of perceived benefits of the OOP in the chapter "Measuring the Impact of the Once Only Principle for Businesses Across Borders" in this book.

2.6 Other Factors

There are also other factors, which do not fit, or are transverse to the dimensions previously discussed. Factors which may, nevertheless, have an important impact on implementation and success of OOP initiatives. Variables such as gender, age, level of education, experience with a specific or related technology, and degree of voluntary use are considered to influence the adoption process (Carrizales 2008; Morris and Venkatesh 2000). The issue of ICT skills and the digital divide in society was also emphasized by Cave et al. (2017). In their review of literature, Van Veenstra et al. (2011) similarly conclude that a deficiency in or lack of IT skills presents hurdles for adoption of new technologies by public administrations. Furthermore, this category also accounts for unexpected, or extraordinary, factors that could account for the implementation, or smooth and efficient functioning of a particular OOP project (for example, the continued existence of supranational projects of a similar nature). It is crucial that these factors, which are difficult to specify a priori, are also taken into consideration in any study of OOP.

3 Methodology

This study builds on a multi-method approach, including several qualitative research methods such as semi-structured interviews, focus groups and surveys. The most informative collection of empirical data was completed via qualitative methods. A qualitative approach is broadly considered suitable for tackling research problems that are not clear-cut and require investigative processes and interactions in their natural, 'messy' context (Yin 2003).

By and large, the empirical data was collected in two waves. The first wave of data collection took place at the beginning of the TOOP Project in 2017, when project pilot activities had not yet commenced. This means the data collected then largely reflects TOOP Project participants' perceptions and expectations of the OOP cross-border determinants. The second wave of data collection took place towards the end of TOOP Project, in 2019 and in 2020, i.e., after implementation of TOOP pilot projects. These data reflect TOOP Project participants' real-life experiences when planning and testing the cross-border OOP. This allowed us to understand whether the perceptions of the OOP determinants, both drivers and barriers that were identified at the beginning of the Project played a role in TOOP pilot projects' progress and in implementation of the OOP.

To begin with, a thorough review of existing literature was completed; first, to understand the expected benefits of the OOP and; secondly, to understand the determinants, either supportive or otherwise, for implementation of the OOP. As a result of the review of the literature, the benefits associated with the OOP, but also with the OOP drivers and barriers, were identified and used as an input for developing the first survey questionnaire.

Based on the results of the first survey (but also the first focus groups), the inventory of perceived factors was updated and served as an input for refining the codebook. The final codebook used to analyze the data collected at the end of TOOP project includes 5 main dimensions: technology, institutions, organizations, actors, and other factors - overall comprising an exhaustive list which was further whittled down. More detailed information on the collection of empirical data is provided in a sequential order below.

First of all, at the outset of TOOP Project, a survey was conducted amongst TOOP Project participants in May to July 2017 in order to fathom and understand TOOP participants' perceptions of barriers and drivers for the OOP. The survey was sent out via e-mail to a total of 18 countries, and 15 country responses were returned.

As a second step, we organized focus groups. The first focus group was held on April 19, 2017 in The Hague, Netherlands over three sessions, one for each pilot area, each with 3–5 participants. The second focus group was held on May 23–24, 2017 in Rome, in Italy over two different sessions and included all pilot area participants. During these two focus group meetings, the expected OOP determinants of TOOP Project participants were identified, as described above. For a more detailed analysis of their results, see the publications by Kalvet and colleagues (Kalvet et al. 2018a and 2018b).

The second wave of data collection started in 2019 with the organization of focus groups, which were then held in Ljubljana, Slovenia on April 10, 2019 and in Tallinn, Estonia on June 3–4, 2019. In Ljubljana, two sessions were held with a total of 30 participants, whereas in Tallinn, three sessions were held, one for each pilot area. As already stated above, during the second wave of data collection, the OOP drivers and barriers were collected and analyzed based on the participants' real-life/actual experience in planning and testing cross-border OOP, that they had acquired through progression of TOOP pilot areas. The focus group sessions were organized in cooperation with TOOP Project impact assessment team, thus, the aim was to analyze both determinants and impacts of the OOP. The results of the impact assessment are discussed in detail in the chapter "Measuring the Impact of the Once Only Principle for Businesses Across Borders" of this book.

As part of the second wave of data collection, we also carried out semi structured interviews with TOOP participants from June-September 2020, totaling 11 people from 6 countries, representing all three pilot areas. Lastly, the second survey questionnaire was sent to 15 countries involved in TOOP pilot areas and a total of 16 responses were received from 13 countries.

This study presents a few limitations. The main one relates to comparability of the OOP determinants listed at the beginning and those that were identified towards the end of the TOOP project. As we already mentioned, in 2017, only the participants' perceptions of the OOP were identified whereas in 2019 and in 2020, participants reflected their real-time experiences with the cross-border OOP, acquired during the progress of the three pilot areas. TOOP Project members' experience with the OOP, however, may extend beyond the Project so one could presume that there is a heterogeneity of experiences with OOP among TOOP members. In brief, the OOP level may vary between TOOP members at different points in time, to the extent that some members of TOOP could have reflected their real-time experience with the OOP in 2017 too, and some could still be reflecting theses perceptions in 2019 or 2020. Estonia and Finland, for example, had started preparations for cross-border data exchange between the two countries within the Nordic Institute for Interoperability Solutions (NIIS), to ensure development and strategic management of bilateral data exchange, before the start of TOOP Project which materialized in 2018 and focusing on multilateral data exchange.

4 Results

4.1 Technological Factors

An analysis of implementation of TOOP pilots suggests that implementation of the OOP is largely determined by technological readiness at a country-wide (nationwide) level – higher levels of digitalization are connected to faster progress also in implementation of cross-border OOP. Previous experience at national level with the OOP and with current technological solution for OOP help with the implementation of OOP cross-border. Examples included Estonia, Finland, but also Slovenia, that had launched the national level OOP solution before the TOOP Project, with swift progress in TOOP Pilot areas.

Despite the fact that the level of technological readiness and prior experience with implementation of the OOP at national level serves as an essential precondition for the OOP, the results of both waves of data collection revealed an interesting fact, which to some extent contradicts our initial expectations and the previous result. More concretely, the organizations' and countries´ high levels of digital technology, in certain contexts, could also hinder the progress of cross-border OOP initiatives. This fact results, for example, from concerns for sharing information with organizations and countries with lower levels of technological modernization and advancement, also connected to lower levels of security. As a representative commented during pilot phases "Data protection has a different meaning in different countries. For us it must be very secure, how data exchange proceeds and how people are identified, how do we know that we have not accidentally shared someone else's information or data or even how to gain access to the data".

Besides that, countries with long-term historical national OOP solutions, that are functioning well and widely used, may be less willing to adapt to alternative interoperability solutions used in other countries or/and on an EU/wide level, partly because of technological path dependency but also because of the additional human resources and financial means using that alternative systems may require, especially if the expected benefits are not entirely clear.

While the technical and semantic problems relating to operability initially entailed a crucial barrier to implementation of the OOP, they were also frequently mentioned as factors which TOOP pilots were able to overcome. Concerns for security and connectivity had also been reduced by the end of the pilots. Still, in a few cases, some technological issues relating to semantic interoperability, such as heterogeneity of concepts and meanings of data but also language differences continued to be troublesome issues throughout TOOP pilot projects. A large part of the semantic interoperability cross-border concerns, also identified by interviewees, concerned the matter of data harmonization and the question of documents vs. data. A number of IT solutions have been developed over the years, in attempts to solve the data harmonization process. However, as already identified by the HUMBOLDT project in 2011 (Fichtinger et al. 2011), where the semantics of concepts are too heterogeneous or diverse, such solutions are not sufficient not advanced enough to understand language as well as people do. Therefore, more work between the domain experts themselves is needed to solve for the semantic issues. This was confirmed in many interviews, where the interviewees mentioned the limited work on semantics and lack of collaboration between the domain experts as a barrier to both the project and future implementation of the OOP - the project was directed more towards finding a technical architecture solution. In this case, semantic interoperability means not only that shared data is understood to be shared cross-border, and that language has been correctly translated and interpreted, but that that an understanding of the documents exists, which can be used to authenticate or authorize these same processes. For the sake of successful implementation of the OOP, continuing along the lines of using technological solutions which already exist and are in use in European Union Member States, we would need to solve the semantic questions rather than overwhelm public sector administrations across Europe with every type of document available, especially at a time where more and more Member States are moving away from documents and towards data.

Similarly, requirements and credentials may vary from Member State to Member State, which means that in the case of cross-border data exchange there could be difficulties in proving certain credentials. Digital authentication and signatures continued to be a problem until the end of the pilots and in this regard, the need to harmonize implementation levels of eIDAS across EU Member States remained an issue, slowing progress of the OOP.

4.2 Organizational Factors

Regarding the organizational dimension, the significance seems to have decreased slightly over time. Concerns regarding financial means and human capital, as well as organizations' capacity to implement the necessary technological changes remained of note; nevertheless, these were more salient at the start of the TOOP pilot than at the end. Moreover, factors such as inter-organizational communication and cultural differences, in line with organizations' willingness to share data, were very seldom perceived as important factors. With regard to the results from two waves of questionnaires, more concretely, our study suggests that concerns relating to financial and human resources, or alignment of processes between organizations' structures and processes, remained significant (Figs. 1 and 2).

A reason why these concerns could have been minimized was the legal push from the Single Digital Gateway Regulation (SDGR) that encouraged public administrations to take action to solve the problems regarding their bureaucratic proceedings. Pilot phase participants also identified SDGR as a solution to pushing OOP higher up the list of national political interests, in addition to solving some regulatory gaps in this field.

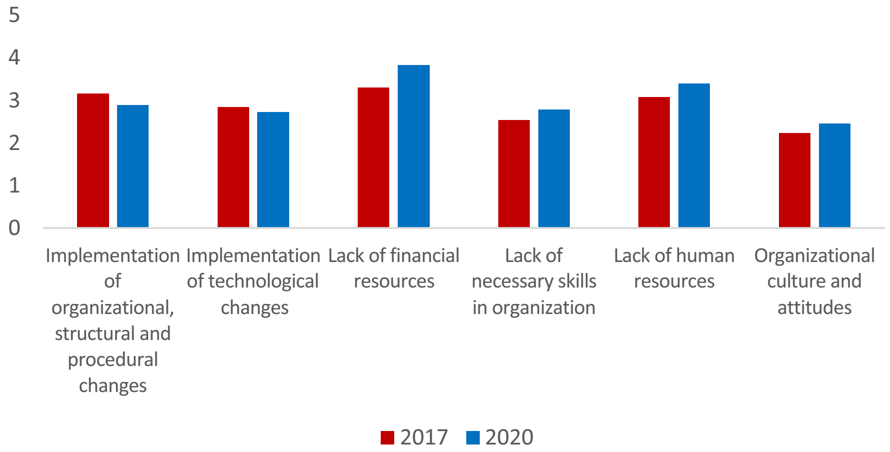

Fig. 1. Factors negatively impacting OOP implementation (scores are the mean value of all answers using a 5 point scale from 1 = very unlikely to 5 = very likely). Source: The Authors, based on survey responses.

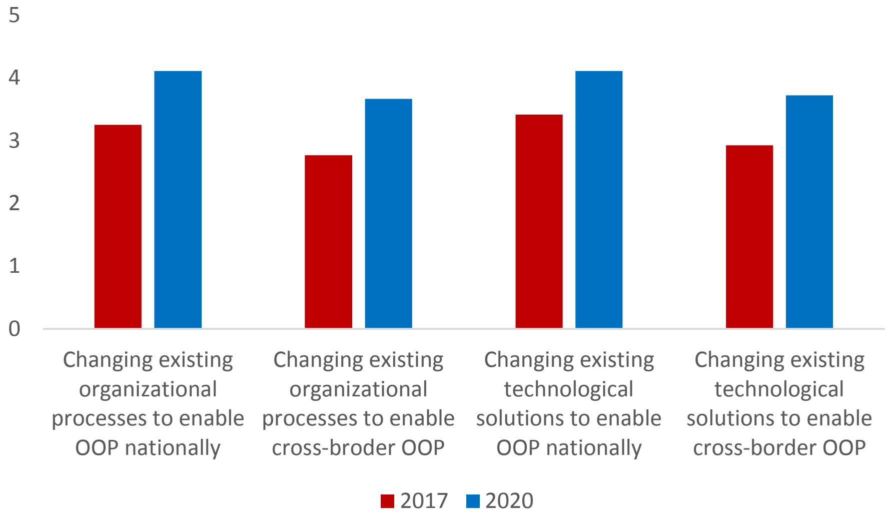

Fig. 2. Willingness to change existing technological solutions and organizational structures (5 = very open, 1 = very cautious) Source: The Authors, based on survey responses.

Even though there is a lower level of willingness to share personal information between countries, the implementing bodies' willingness to share this data with other organizations in the same country is not considerably lower. Furthermore, the results of the interviews and surveys show high levels of willingness to pursue organizational changes, in terms of processes, procedures, structures, as well as to adopt technological solutions, in order to enable OOP, both nationally and cross-border. The results indicate that the benefits of the OOP became evident to most of the participants in TOOP pilots (Fig. 3).

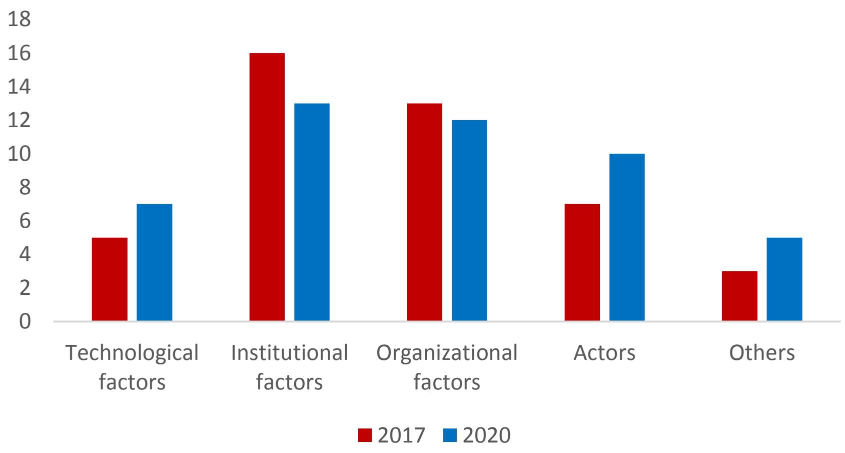

Fig. 3. Comparison of the most named barriers from the two surveys. Source: The Authors, based on survey responses (The number of respondents indicating as a barrier, multiple answers were possible).

One interesting finding uncovered here concerns the organization of IT developments in a given TOOP project partner or country, a factor not identified at the beginning of the Project. Namely, it turned out that TOOP Project partners and/or countries with in-house IT development units progressed faster with implementation of the OOP, compared to those outsourcing their IT developments to the private sector. Still, this organizational aspect might be specific to the TOOP Project as several country level TOOP developments had not been budgeted for, and those with local IT units and capacity, had the option to add TOOP Project related developments to their list of IT developments, whereas those relying on outsourcing were compelled to follow their budget cycle to allocate the financial resources required.

This last finding is in line with research on public procurement of innovation. Research shows that in cases where there are limited administrative capacities to procure innovative solutions, and if the solutions are purchased off-the-shelf (which OOP-related software elements are), there are barriers that slow down such developments and/or increase the risks (see Lember et al. 2014; Kalvet and Lember 2010).

4.3 Institutional Factors

Differently to technology and organizational dimensions, the institutional factors did not lose their importance throughout implementation of TOOP pilots. Our results suggest that two of the most important determinants for implementation of the OOP are both a sound legal basis and a clear political will and vision. In this sense, implementation of the OOP seems to rely heavily on the regulations put in place, but also on the key actors´ will and conviction to pursue or demand that regulation and, at the same time, the ability to also integrate the OOP with rules and institutions already existing and in place. Legal obligation was previously categorized as more of a barrier during the ex-ante assessment due to limited legislation around implementation of the principle. The SDGR in some way filled that gap and was identified by many as the most influential driver for implementing OOP. As we can see, the prioritization to implement OOP on a cross-border scale increased at the central and regional government levels (Fig. 4).

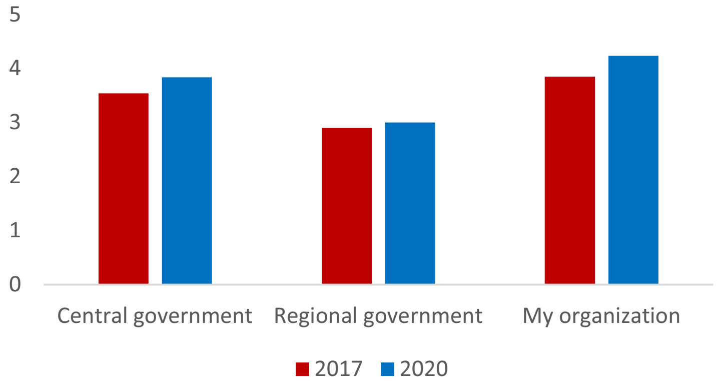

Fig. 4. Prioritization of OOP at different levels of implementation (5 = high priority, 1 = not a priority) Source: The Authors, based on survey responses.

While the SDG was regarded by most of the Member States in the project as a driver making the technological experiment that was TOOP a more purposeful and necessary endeavor, the Maritime pilot study had less impact due to the global nature of the sector. For the OOP to solve problems of efficiency in the maritime sector, it would need to be implemented on a much larger scale than just EU-wide; and the SDGR cannot solve for this.

More so than with the General Business Mobility pilot, the GDPR was mentioned as a factor contributing to the implementation of the OOP within the Maritime pilot. One of the reasons for this is the fact that crew certificates contain more personal information in them than certificates and licenses relating to businesses, which are often public information. The GDPR sets certain requirements for handling personal information, which could be a driver for favoring the TOOP solution for digital checks for crew certificates instead of the centralized system that is currently used by European Maritime Safety Agency (EMSA) to check ships' certificates. Maritime administrations already have the legal authority to store personal information while a centralized database would place the responsibility to securely store this data squarely on the shoulders of EMSA.

When piloting partners were asked to judge the willingness of their organizations towards different aspects of data sharing, the results were on average the same as for the original questionnaire completed in 2017. The only aspect towards which Member States actually became more cautious, if at all, was the sharing of personal data. One reason for this could be that the GDPR did not apply until 2018, which meant that, at the start of the project, no wide-spread practice was in existence yet. At the end of the project, when considerable time in the project was dedicated to discussions on the impact of the GDPR to cross-border OOP, this resulted in higher openness of organizations to change (Fig. 5).

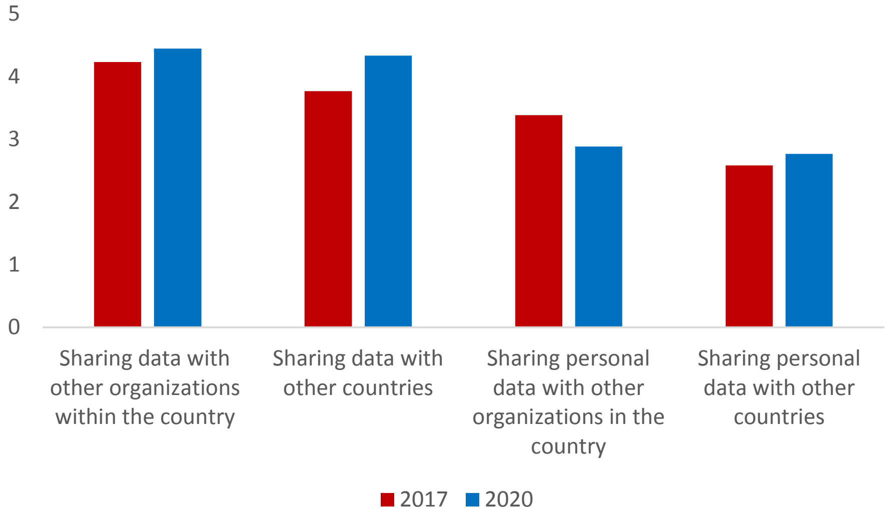

Fig. 5. Openness to sharing data (5 = very open, 1 = very cautious) Source: The Authors, based on survey responses

4.4 Actors

Government officials are critical for implementation of the OOP. Not only are their motivation and skills important, but a positive relationship also seems to exist between previous experience with the EU project, especially with the large-scale pilot project and willingness to drive the push forward and implement the OOP at a country level. TOOP pilot project participants also valued the contribution from their peers highly, in particular from more digitally advanced countries, for planning and implementation of national as well as cross-border OOP. There seems also to be a correlation between a partner implementing TOOP and/or a national coordinator with prior experience of EU Project management and/or involvement and national progress of the OOP, and personnel and staff with greater levels of EU project management experience, constituting more rapid progress of the OOP.

One aspect that was mentioned as a barrier on multiple occasions by interviewees across the pilot areas was the involvement or lack thereof of international regulatory organizations. In the Maritime pilot, this specifically includes regulatory bodies that have a wider scope than just EU such as the International Maritime Organization (IMO) and the Paris Memorandum of Understanding. Similarly, to issues with the SDGR, unless the once-only principle is taken on board by regulatory bodies with a wider scope than just the EC, implementation cannot achieve its full potential.

The importance of both institutional factors and actors is also evident in the barriers and obstacles pilot studies were unable to overcome. The low priority given to OOP, legal harmonization, low appeal to businesses (and therefore also to political agendas) and the existence of a national legal basis were all mentioned by respondents as barriers that persisted over time. Our results support the idea that the most important barriers to cross-border OOP come from external variables, rather that aspects intrinsic to the organization.

4.5 Other Factors

When it comes to implementing parties' perceptions after the end of pilot projects, there were primarily two perceived drivers of the OOP. On the one hand, most implementing bodies mentioned the importance of a legal basis existing, either on a national or supranational level. From the start, until the end of pilots, the institutional dimension continued to be perceived as a key, or perhaps even 'the key', driver for cross border implementation of OOP initiatives.

On the other hand, many participants also perceive the expected outcomes from the OOP as important drivers for implementation (e.g., simplification for citizens, businesses and public officials; reduced administrative barriers and burdens; and increased efficiencies of time and costs). This is an important aspect that implies that implementation and success of OOP projects relies on cost/benefit calculations carried out by their implementing parties. In this way, our results suggest that organizational and technological factors only indirectly drive implementation of the OOP, by affecting implementation costs and making the benefits of implementation easier to achieve. Previous experiences with national OOP implementations facilitate assessing the benefits and costs of cross-border OOP. This complements the findings on technical and operational level as mentioned in Sects. 4.1 and 4.2 (Fig. 6).

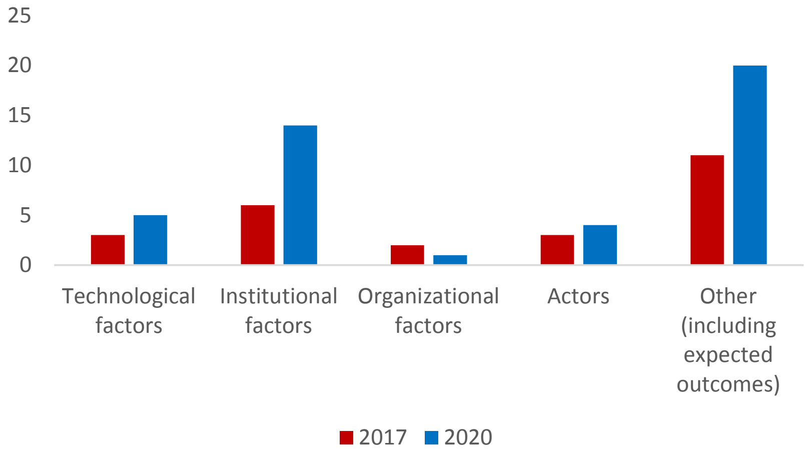

Fig. 6. Comparison of the most named drivers from the two survey results. Source: The Authors, based on survey responses (The number of respondents indicating as a driver, multiple answers were possible).

5 Discussion

The results of the research are clustered into (five) different areas.

Next to the influence of the law to the design of the technology, as laid out in the conceptual framework, it was identified that the **technological factors** further refined the legal framework as well as the organizational set up. The topology for solutions used across Europe is quite heterogeneous and technological path dependencies have emerged. Driven mainly by organizations or countries, different approaches were not, however aligned with one another (interoperability). Furthermore, in the past there was no coherent approach for interconnecting different actors (data providers and data consumers) relating to the OOP. In several cases, interconnections between actors were established just on a point to point / bilateral basis, and this led to optimization between a limited number of systems and caused a lack of interoperability. This situation gave rise to the need for some changes in technical and architectural approaches to create opportunities to exchange information between a wider range of parties. With the decision to create a technical layer permitting a multi connector exchange, a decision for a sound technical basis had been made.

On the part of **organizational factors**, the lack of a strong legal basis slowed down the whole process, when - based on the creation of SDGR - opportunities become necessities. These limiting factors are mainly determined by the capacity of the organizations involved. And these limitations are set into different dimensions, e.g. financial, organizational and capacity-wise.

Two different options are quoted to overcome these hurdles. These options were, on the one hand, to increase the resources required internally by organizations (insourcing) and, on the other hand, to buy in resources e.g,. via contracts with other entities (outsourcing).

- Two different options are quoted to overcome these hurdles. These options were, on the one hand, to increase the resources required internally by organizations (insourcing) and, on the other hand, to buy in resources e.g., via contracts with other entities (outsourcing).
- Insourcing on the plus side, ensures flexibility, and human resources in particular can be handled in a dynamic manner, in general reducing the related costs in comparison to costs for outsourcing. Furthermore, on the minus side, the risk for developing a proprietary solution is higher. This often includes the subject of interoperability.
- Outsourcing, on the plus side, reduces the internal workload and ensures that the necessary human and technical resources are available. Besides that, the opportunity to create a fully interoperable solution, complying with all respective standards is higher than with an in-house approach. One disadvantage is that this may lead to higher costs and limit flexibility.

An **institutional factor** was the lack of responsibility and coordination between different actors. Interconnections between different parties, especially in cross-border cases were made more based on needs than based on a structured and coherent approach. In an early stage of setup of the SDGR, the European Commission identified that European businesses criticized the lack of coordination and interoperability in ca. 80% of cross-border cases as a major hurdle for administrative procedures Bieńkowska (2018). This caused additional costs and workloads for administrative procedures.

The different **actors** involved impacted the development of the SDGR in several ways: This first and foremost is the European Commission as a co-legislator of the SDGR that acts on the supra-national level., and then second the Member States, as aside of the EU Parliament, the other co-legislator and associated countries that bring in the national level perspective. With the initiative to set up the SDGR, the European Commission took on the responsibility for the first outline of the new regulation. The EC detected the wishes and needs on the one hand and the criticism that were addressed by businesses and citizens in Europe on the other hand. The main findings of this evaluation of the EC were, that the EU's national level services for information and assistance, and online procedures available now, are highly fragmented, with varying levels of cover and different levels of quality. They are also not user-centric, and are difficult to find and to use, especially for foreign users (European Parliament 2017). Thus, it is difficult for EU citizens and businesses to exercise their Single Market rights. As a co-legislator, the EC has initiated a process to create a regulation harmonizing the legal basis within Member States and associated countries. Those parties involved are at an early stage via representatives of the Points of Single Contact, chambers of commerce and several national and international authorities. Not only were they involved in the process to create the SDGR, but - to ensure the balance between the supra-national level of the EC and the national point of view - are still involved via the so-called SDG Coordination Group in the transition of the SDGR; and with setting up the subsidiary implementing act(s) and the associated technical specifications. It shows that the EC and the countries has chosen a collaborative and iterative approach to set up the legal framework for implementation and transition of the OOP in Europe.

Last but not least, **other factors** must also be taken into account. These are for example other players/stakeholders, e.g. supra national standardization bodies, such as ETSI and OASIS, but also GLEIF carrying its influence on the continued debate on updating the eIDAS regulation. Setting up the eIDAS regulation was a big step forward on the road to creating a common legal basis for the EU. Since the regulation assumed full legal effect in September 2018, implementation of a digital identity even within the eIDAS framework is recognized as being fragmented and not harmonized across Member States. This caused two main issues for interoperability.

Identity Matching Issue

Databases used by different administrations in the Member States are mostly designed for specific cases or services. The underlying structure of registers are often set up before generic rules for exchanging eIDs, such as in the eIDAS regulation have been established. The data schemes are strongly related to the services provided. This causes a gap for attributes permitting automated exchange of information and mapping of identities. Different information is collected about citizens and businesses and may identify people and organizations differently. To make things even more troublesome, some Member States (e.g., Germany) do not have persistent identifiers or only provide such persistent identifiers as optional attributes. This causes a range of problems for matching the identity of a legal or natural entity even at a national but especially at a supranational level.

Record Matching Issue

Identification in Europe occurs via eIDs notified under eIDAS. In this case, there is a record matching issue depending on MS infrastructure. While using notified eIDs under the eIDAS Regulation, for the most part, allows data providers to match an identity with a record (evidence requested), using the attributes of the natural person provided by the eIDAS minimum data set, in some cases additional attributes are required to ensure a match. This is based on a lack of interoperability and the credentials defined in the eID schemes of the Member State.

Finally, for the OOP initiatives to succeed and in order to on-board the key stakeholders, the benefits of cross-border (such as administrative burden reduction, reduced time and costs for administrative processes, better quality data, improved reliability and validity) require further examination, and results of these studies must also be communicated.

6 Conclusions

This chapter offers an original empirical analysis of different factors affecting the adoption and functioning of cross-border initiatives of the Once Only Principle (OOP). We do so using a deductive approach and an exhaustive listing, based on relevant literature, for the different aspects have already been identified as potential barriers (or drivers) for the OOP. Those different factors were tested through interviews, surveys and focus group data.

Even though the readiness for implementation of the OOP varies considerably between countries, and financial/human resources are certainly an important factor for that, there are three aspects that consistently crop up as significant drivers/barriers for implementation of the OOP. The first one concerns the awareness of the OOP and its inherent benefits. The second one is enticements from external/supranational entities to make the cross-border OOP a national political priority. The third relates to establishing a critical legal framework, both at the EU and on a national level. In this sense, the political/decision-makers' will and institutional aspects are perceived as the most important drivers for the start and success of the OOP initiatives. When it comes to perceptions of the participants surveyed regarding implementation of the OOP, the "when" is far more relevant than the "how" can we do it. In this sense, to different degrees, all the countries studied demonstrated having the required technical and organizational conditions to implement the OOP.

When it comes to the OOP barriers, a major concern for the implementing parties is still the dimension of coordination required for implementation of a cross-border OOP project. This involves not only coordination between countries and organizations, but rather coordination at the EU level, including with other EU level projects. According to respondents, this barrier arises from different levels of readiness in countries/organizations, differences in the business models used by them, and also from concerns relating to the circulation of data and personal information. Even though the importance of this barrier decreased slightly during implementation of the project (i.e. there was an improvement in cooperation by the end of the pilot phases implemented), this is still a key factor to address/overcome in future cross-border OOP initiatives. Other barriers frequently mentioned dealt with semantic concerns, namely some level of distrust for translated documents and the differences of national standards on, where these exist.

When looking at key barriers towards implementation of pilot projects analyzed in this study, one could say that there has been some mystification regarding the EU countries' readiness to implement cross-border OOP. Not only are the existing perceived barriers relatively easy to overcome nowadays, but they also seem to have eroded considerably throughout the implementation process of TOOP pilot studies. This study suggests that, in very general terms, there are few factors, other than key actors´ will, hindering implementation of the OOP. However, we have also found some differences between the pilot study phases, regarding their barriers and drivers mentioned. When it comes to the different challenges faced by the TOOP pilot studies analyzed, there is some clear exceptionality in the case of piloting Online Ship and Crew Certificates. The barriers faced in that pilot were very specific to the global scale of that area (meaning that collaboration efforts, to have an impact, cannot be coordinated simply at an EU level. In addition to that, the fact that maritime certificates are produced in paper-based formats proves to be a great challenge to online data exchange. Concerns regarding security and privacy were also more relevant in this pilot).

To solve the issues relating to the problems described of identity matching mostly on the data provider side and record matching mainly on the data consumer side, a further alignment of the schemes and attributes in use is required. It is important to find solutions that cover the needs on national and international levels at the same time. Therefore, a European initiative is the most valuable approach. The recommendation would be to record the outcomes of the ongoing discussions on implementation of the SDGR in Members States, associated countries and on a European level and input them into updates of the eIDAS regulation. Preparation of the amendment of the eIDAS regulation is a great opportunity from a legal and technical point of view, to fix the existing problems.

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Once-Only Principle Good Practices in Europe

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Abstract. Digital transformation has become a recent keyword in the evolution of public sector modernization through the once-only principle (OOP). The once-only principle is among the seven driving principles in the eGovernment Action Plan 2016–2020 of the European Commission (EC). It requires that citizens and businesses need not to provide the same data to governments if that data is already in their hands. The ultimate goal of the principle is to reduce administrative burden and to simplify public service provisioning therewith also reducing costs and improving public service. To boost developments towards administrative burden reduction and simplification in public service provisioning, the SCOOP4C project has investigated good practice solutions across Europe. In this contribution, we provide an overview of good practice OOP cases and OOP enablers studied in the project, followed by a synthesis of the benefits and key enablers to boost the OOP implementation across Europe.

Keywords: Once-only principle · OOP · Good practices · OOP cases · OOP enablers

1 Introduction

The eGovernment Action Plan 2016–2020 of the European Union (EU) commits Member States to modernize public services along seven principles of public sector transformation in order to contribute to economic growth, jobs as well as sustainable and resilient societies [16]. The vision of the EU Member States set in this strategic document is that "by *2020, public administrations and public institutions in the European Union (EU) should be open, efficient and inclusive, providing borderless, personalized, user-friendly, end-to-end digital public services to all citizens and businesses in the EU"* [16]. The Action Plan requires new and innovative concepts to design and deliver improved public services that better meet the needs of citizens and businesses.

The Once Only Principle (OOP) is among the seven underlying principles of this action plan to make government more effective and simpler and to reduce administrative burdens by asking citizens and companies to provide certain (standard) information to the public authorities only once. Public authorities are required to "*take action if permitted to internally re-use this data, in due respect of data protection rules, so that no additional burden falls on citizens and businesses*" [16]. The sharing and re-use of sensitive and non-sensitive data of citizens and businesses demands for broad acceptance of this revolutionary concept by all stakeholders.

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To implement the once-only principle and to spur innovation, the European Commission has funded the SCOOP4C project (the sister project of TOOP) in the Horizon 2020 program [18], which focused OOP public services for citizens. The aims of SCOOP4C were a) to build up a stakeholder community for the once-only principle for citizens and b) to investigate, discuss and disseminate how the once-only principle can be implemented in contexts of co-creation and co-production of public services for citizens in order to contribute to significant administrative burden reduction [50, 58]. Along with the second aim, the project partners have systematically analyzed a number of OOP good practices. This contribution aims to summarize the findings from the good practice study of the SCOOP4C project. The main research questions are:

- What OOP good practice solutions exist in the Member States and across borders in the European Union?
- What enablers do exist in Member States, and what enablers need to be in place to enable OOP implementations at large?

In order to investigate these two research questions, structured qualitative case analysis and scenario technique were used. The remainder of the paper is as follows: The next section summarizes the theoretical and political foundations for the research, i.e. digitalization in the public sector and digital transformation with the OOP as a revolutionary concept. Subsequently, the methodical foundations outline the research design for the case study (Sect. 3). In Sect. 4, an overview of OOP good practice examples is provided and individual examples are briefly outlined. Based on the insights from the good practices, Sect. 5 discusses insights on the benefits for stakeholders as well as necessary enablers to widely implement the OOP across Europe. The conclusions sum up the findings and reflect further research needs.

2 Theoretical and Political Foundations of the OOP

Public sector digitalization is on the agenda of research for several decades. Its focus evolved and changed along the social, economic, political, technical and other challenges the public sector is exposed to over time. Likewise, the readiness of public institutions to transform themselves impacted its characteristics and success [41]. Subsequently, we therefore briefly summarize the evolution of digitalization and of digital transformation in the public sector.

The use of innovative information and communication technologies (ICTs) is an integral part of modernization strategies of governments [30]. Nowadays, digital transformation characterizes this attempt of modernizing government and public service provisioning. Over two decades ago, this concept was coined as electronic government or digital government (both concepts evolved and are used synonymously). Many scholars expect that the use of ICTs in electronic or digital government (i.e. in the modernization of public service provisioning) helps realizing added value such as increased efficiency, effectiveness, openness, transparency and improved quality of service for citizens and businesses [3, 4, 7, 22, 27, 30, 35, 37, 39]. Public value, increased government responsiveness and openness are further value expectations [35].

A customer-centric approach conveys the proposition of creating value for society and economy. As the once-only principle demands that citizens and businesses will only have to provide certain standard information to the public agencies once, public authorities are in need to share and re-use sensitive and personal data to reduce administrative burden for citizens and businesses [16, 33, 34, 58, 59]. However, sharing and re-use of such data must be done with due respect of data protection regulations [19], as otherwise trustworthiness of public service provisioning would be hampered tremendously. Hence, trust is an essential ingredient in implementing the once-only principle. Furthermore, digital transformation is not a smooth process, and digital tools do not per se contribute to before mentioned success factors. Since the digital transformation in government is considered to be a quite complex endeavour, coordination and engagement concepts as well as overarching architectures to enable secure and trustworthy access to data and information in inter-agency information sharing are further success criteria [25, 27, 59].

As argued in the introduction, the implementation of the once-only principle in the European Union is a policy goal settled in the eGovernment Action Plan 2016–2020 [16] and one of the pillars of the Digital Single Market Strategy [17]. It has been reinforced in the “Tallinn Declaration” signed by the European Digital Ministers [20] in 2017. The Single Digital Gateway (SDG) Regulation [21] requires European Member States to build up and connect to a single European portal and infrastructure, through which citizens, businesses and public administrations can execute public services across borders with the OOP as underlying principle. To realize the SDG, a successful implementation of the once-only principle requires transfer and re-use of sensitive or personal data between government agencies across borders involving actors on different levels of a political system. To develop the necessary trustworthy cross-border architecture and organizational frameworks for the SDG, significant effort is put by the European Commission and by the Member States (e.g. the European-wide projects TOOP [53] and DE4ALL [8]). TOOP developed a trust architecture [28, 44].

To implement interoperable data and information sharing, the European Interoperability Framework (EIF) provides a conceptual model for public services and considers data-related services as a basic component for service provision [14]. The SCOOP4C and TOOP projects rely on this EIF to structure their investigations of barriers, enablers and architecture for a comprehensive OOP implementation.

As outlined along the review of academic and policy literature on the OOP implementation, the realization of the once-only principle turns out to be a complex endeavour, where a number of factors need to be aligned and coordinated. To gather insights from existing OOP implementations, the SCOOP4C project investigated good practice cases and enablers of the once-only principle. Before presenting insights into the good practice analysis, the next section outlines the methodical foundations for the analysis.

3 Methodical Foundations

The research design for investigating OOP good practice solutions in the Member States and across borders in the European Union, for eliciting barriers and enablers along such initiatives, and for extracting recommendations to successfully implement the OOP consisted of three steps:

a) Analysis of relevant literature and policy documents as summarized in Sect. 2;
b) Analysis of OOP good practices across Europe (see Sect. 4), separated into OOP cases, and OOP enablers and building blocks;
c) Elicitation of gaps and lessons from the good practice analysis, and formulation of policy recommendations for successful OOP implementation (see Sect. 5).

The review of academic literature depicted the evolution of public sector modernization through ICT towards digital transformation and its added value. Furthermore, policy documents were studied to gather the political dimension of the OOP. A descriptive analysis [40, 43] approach was applied in step 1. The study of strategic documents and studies encompassed the EU eGovernment Action Plan 2016–2020 [16], theEU Digital Single Market strategy [17], the European Interoperability Framework [14], the EU General Data Protection Regulation [19], the study on "eGovernment and the Reduction of Administrative Burden" [24], and the study on "EU-wide digital Once-Only Principle for citizens and businesses" [6].

The OOP good practice analysis in step 2 embarked on case study methodology [23, 61]. Based on initial literature and policy document analysis in step 1, the team developed in an iterative step a template for collecting information on the cases to be studied. Along this step, a distinction between OOP cases and OOP enablers was necessary, which resulted in the definitions as follows:

OOP cases refer to the provision of public services, where the once-only principle is implemented. Processing, sharing and re-using of citizen related data is enabled within a network of services used by public administrations to access the relevant data stored in different registers and applications. Consequently, citizens do not need to repeatedly provide the same data to the authorities. Furthermore, OOP cases can be grouped along particular policy domains such as education, healthcare, moving, social protection, taxation, etc.

The implementation of the OOP in public services (c.f. OOP cases) is supported by a set of enabling components. Therefore, *OOP enablers* are defined as crucial building blocks that support the implementation of OOP cases in different policy domains through e.g. central infrastructure components for sharing and re-using sensitive data, semantic and technical architecture and solutions building blocks, as well as organizational, legal and political enablers. The enablers reach a wider scope than cases as one enabler may support the implementation of many different OOP cases in different policy domains.

Based on this distinction of OOP cases and OOP enablers, two correlating templates evolved in the preparation of the case study analysis to describe each case and enabler in the same way to ensure comparability. Besides demographic data, the template collected information such as a short summary about the project, what the legal and political enablers are/were for the OOP project, what architecture the OOP case or OOP enabler is built upon, which actors are involved and in which role (data owner, data provider, data consumer), what data exchange logics is applied, and what type of data sharing is embodied, what socio-cultural factors and other soft factors might be relevant, and what are the lessons from the project [50]?

The identification of cases and enablers was an iterative process involving the community network of the experts in the project. For example, steering board members were asked to inform the project team about relevant OOP solutions, project members investigated their communities to identify OOP cases or OOP enablers. The next task in this step was to collect the relevant case study descriptions along the developed template. This was done on the one hand by conducting desk research and studying relevant information on the public websites of the projects or institutions. On the other hand, relevant contact persons were identified and these experts were asked to either fill in the data along the provided template themselves (this was provided as an online form over the project's stakeholder community site) or to perform an online interview with project staff that recorded the answers. In a next task, the data was quality-assured by persons of the project team other than those that recorded the data, and reviewed and updated the collected data if necessary. The review and quality-assurance of the data of OOP cases and enablers was in some cases iterated several times between the contact point of the case study and the project team. Finally, the quality-assured project descriptions were published on the project's knowledge base [50].

In a final task of step 2, the OOP cases were analyzed in regards to success factors and OOP enablers involved in the OOP cases. Furthermore, barriers to implement OOP solutions were studied and extracted from the cases. This task applied a systematic analysis of the OOP cases and enablers for which the data was collected. For the analysis of the cases and enablers, the European Interoperability Framework (EIF) [14] and the European Interoperability Reference Architecture [13] represented major sources to group barriers and enablers along the interoperability levels and along crucial factors fostering interoperability in public service provisioning. In particular, the conceptual model of public service provisioning in the EIF guided in determining different types of enablers. From the literature analysis and from initial case studies, crucial soft "enabling factors" for successful OOP implementation were added, such as motivators, benefits, public value, data protection and privacy, trust and transparency, socio-cultural influence factors, citizen-centered design or data quality [37, 58].

The identified barriers and enablers were the input to the third step, where gap analysis was conducted and policy recommendations were formulated. The project team applied scenario technique [31, 32, 36, 38, 48, 55] to develop ideal future cross-border OOP scenarios in the five domains that were selected for the gap analysis, roadmapping and policy recommendations (i.e. education, healthcare, moving, social protection, and taxation). Scenarios are narrative textual descriptions (structured or unstructured), which are complemented with a rich picture to illustrate a perceived view or understanding of a specific topic [5, 31]. The future once-only principle scenarios in the cross-border context described how future interactions between governments and the corresponding stakeholders could look like, which tools, standards, and technologies could be used to share and reuse data, and what further soft enabling factors complemented a comprehensive view on the future OOP implementation.

The five future cross-border OOP scenarios were used in interactive workshops with the stakeholders to deliberate barriers and enablers, to understand the gaps, needs and benefits of implementing the OOP at large, and to formulate policy recommendations for the widest possible OOP implementation. A total of nine workshops were conducted in the period 2018–2019. Each workshop had around 15 to 30 participants and three to five scenarios were deliberated in respective group discussions. The participants came from academia, public administrations, businesses as well as students and NGOs acting as citizen representatives.

The results of the good practice analysis of OOP solutions are presented in the next two sections.

4 OOP Good Practice Examples in Europe

In the SCOOP4C project, 57 OOP cases and 34 OOP enablers were analyzed [50]. The next subsections provide an overview of the OOP cases and OOP enablers studied, along with an outline of examples of OOP cases in the five selected domains and of OOP enablers in the categories ‘secure data exchange’, ‘OOP enabling infrastructure’, as well as ‘eID and trust services’.

4.1 OOP Cases

Table 1 provides an overview of the OOP good practice cases studied in the SCOOP4C project.[1] It is important to point out that the list of OOP good practices is by no means an exhaustive list of existing OOP cases in Europe. Instead and as mentioned in Sect. 3, the cases were identified either by steering board members or project members via searches and own contacts or were recorded by experts from the OOP cases via the online template.

To provide more detailed insights on OOP good practices, the following four OOP cases are exemplified from different domains (more detailed information is provided in [50, 54]):

Austrian Birth Registration and Child Benefit (ALF). Before modernizing the birth registration and child benefit service, parents of a newborn had to interact with six different public agencies to carry out up to nine different public services along the registration of a newborn and application for child benefit. These processes have been streamlined and integrated based on the once-only principle. With the new process of ALF [2], parents visit only the Civil Registry Office (one stop) and they need not to bring along any documents to evidence data that is already in the hands of public administration, except a personal identification (passport or personal ID card). In the Civil Registry Office, all data to record the newborn is collected and entered into the relevant interacting registers, such as the central civil register (ZPR), central citizenship register (ZSR) and central residence register (ZMR). After the recording of data on the newborn by the Civil Registry Office, a notification is sent to the Social Security Institution to trigger the issuance of the healthcare card (e-Card) for the newborn. The Social Security Institution generates the unique healthcare number and issues the e-Card, which is then automatically sent to the parents of the newborn (no stop). Furthermore, the unique healthcare number is sent to the Tax Authority, who also received a notification from the Civil Registry Office about the registration of a newborn. The two notifications trigger the next step, the establishment of a record for child benefit by the Tax Authority. If any data is missing, this is collected from the parents. However, if all data is available,

[1] See detailed descriptions of the OOP cases under https://scoop4c.eu/casetable.

Table 1. Overview of OOP cases studied in SCOOP4C

Domain (# of cases studied)	*Examples of OOP cases studied in SCOOP4C (cases marked in italic are summarized below)*
Citizenship, basic data and registration (18)	Bulgarian guide for administrative assistance and awareness (GAAA), Danish basic data program, several Estonian registration and basic data services (e-Census, Eesti.ee, Election information system, Internet voting, e-PRIA, Employment register, register of professions, Smart road system, Sports registry), French Dites-les-nous une fois, German refugee digitalization system, Hellenic Citizen Registry, Irish government portal Gov.ie, several Spanish registration and basic data services (Address change service, Verification system and data query (EPS), Via Oberta)
Healthcare (10)	Austrian electronic health records (ELGA), Bulgarian national council on prices and reimbursement of medical products, several *Estonian health services (Central health information system and patient portal*, Digital prescription, Doctor-doctor consultation, e-Ambulance and time-critical health data, Medical certificate, Medical digital image bank), Italian online service portal – healthcare booking system, e-Health service eZdravje in Slovenia
Education (8)	*Higher Education Institution Application Systems in the Netherlands (Studielink)*, Estonia (EHIS and SAIS), Ireland (Central Application Office), Portugal (LGDF), Spain (NISUE), UK (UCAS), and the European Student Card (ESC)
Taxation (6)	*Online tax filing systems* in Austria (FinanzOnline), Estonia (E-Tax), France, Germany (pre-filled tax return), *Greece (TAXISnet)* and UK (MTD)
Social protection (5)	*Austrian birth registration and child benefit (ALF)*, Estonian Parental Benefit, French Revenu de sulidarité active, Polish baby bonus Becikowe, Tell us once in UK
Mobility (3)	Austrian-German x-trans.eu, Tallinn public transport ticket system (Estonia), French application for parking vignette

(*continued*)

Table 1. (*continued*)

Domain (# of cases studied)	*Examples of OOP cases studied in SCOOP4C (cases marked in italic are summarized below)*
Others (7)	Several Estonian services (Consumer Service Environment Data System, e-File system, e-Notary, Sports Registry, Veterinary and Food Board), French Attestation Légale, French e-bourgogne-franche-comté GIP

the parents need no interaction with the Tax Authority in order to receive the child benefit on a monthly basis (no stop).

In order to make this OOP case work, the necessary political commitment and legal grounds (revision of the Austrian Act for family benefits, several legal acts on digital public services and basic enablers) have been put in place. Furthermore, the collaborative processes and interactions among the base registers have been standardized. A core enabler is the Portalverbund, an architecture for secured and trusted access to data across different registers and applications based on the secure identification of employees in public service through eID (see brief description in Subsect. 4.2).

Through 'ALF', substantial administrative burden reduction is achieved for parents, as they have only to go once to the Civil Registry Office to register the newborn and change the family status, they have not to bring along a number of evidences for the process, and they can receive the healthcare card and family allowance without having to fill any application upon the birth of a child. Key benefits for the public administrations are streamlined and automated processes, higher quality of data since the data is accessed at the authentic sources, and higher satisfaction of citizens overall through better and faster public services.

Dutch Higher Education Institution Application System (Studielink). Studielink [10] is the common registration and enrollment portal for all non-private higher education institutions (HEIs) in the Netherlands, which supports the exchange of data between the current or prospective students and the HEIs. To enroll to a HEI, the student first identifies him- or herself in Studielink through the Dutch eID (DigID). Subsequently, personal and educational data is retrieved through the application from relevant authentic sources such as the education register (maintained by the Dutch Education Executive Agency/Ministry of Education) and the personal data registers (municipal personal records database (GBA) run by the Dutch municipalities). The student then checks the retrieved information, adds new data on the intended study program, and finally applies to the study program. The HEIs can then retrieve the relevant applications and further process them.

Relevant enablers of the case are the political commitment and issuance of relevant legal regulations such as the Higher Education Act or the Personal Data Protection Act. Furthermore, an overall architecture concept and the Dutch System of Base Registries enables the secure data exchange across registers and domain-specific applications. The Dutch eID service DigID is another enabler to provide secure authentication of users.

Studielink offers significant burden reduction for students and higher education institutions. It also increases the quality of data, since the basic data is retrieved from the authentic sources while only new information is entered by the users.

Estonian Central Health Information System and Patient Portal (EHR). The EHR [11] is a central patient-oriented system in Estonia, where data about a person's health treatments is collected, such as a short overview about the visit, anamnesis, diagnoses, treatment, examinations and recommendations. The data is accessible for all clinicians who treat the patient; for doctors that need to see a patient's data – access is only possible with their personal ID-card; and for patients through the patient portal using their personal ID-cards to see their own data, to make declarations (e.g. organ donations), and to check their treatment bills, prescriptions and the logging of who has accessed the patient's data. The EHR is one of a number of healthcare systems in place in Estonia. It is linked through X-Road (see OOP enabler example outlined in the next subsection) to other patient and medical information systems like the Medical Images Bank, the Prescription Centre and healthcare provider systems.

The success of the OOP case builds on a number of enablers, such as legal acts and regulations to enable the OOP case, including relevant data security guidelines issued by the Estonian Data Protection Inspectorate. The relevant actors have been involved to define and harmonize the collaborative business processes such as agreed workflows in the procedures, standards, classifiers and domain-specific data models among the health professionals. Contractual agreements of all healthcare providers to participate in the OOP case and in the sharing and re-use of the patient data. As already pointed out before, xRoad is the core secure data exchange layer that enables confidential and legally binding data exchange in the OOP case. In addition, the Estonian Public Key Infrastructure and eID infrastructure (ISKE) provides – through IDcard, mobileID or digiID – secure and trusted access to the relevant data for patients, doctors and nurses. Semantic interoperability is ensured through the Estonian Catalogue of Public Sector Information (RIHA), which provides necessary metadata descriptions. To ensure access to the 'right' data, unique personal identification codes and unique company commercial registry codes have been established as well. Trust and transparency are established by enabling persons to view their prescriptions, summary reports, test results (except images) and the details of their children. The users can also see, who else has viewed their data in the systems. And they can decide to make their data accessible or inaccessible to doctors and other healthcare service providers, issue expressions of will (regarding organ donations, powers of attorney) and order electronic medical certificates.

The EHR case significantly reduces administrative burden for patients and the actors in the healthcare system, as all documents and data of a patient and his or her health history are available through the central system. With the central EHR system and its secure and trusted interconnectedness through xRoad, improved quality of medical service is provided, which in turn leads to higher satisfaction of citizens.

Greek Online Tax Filing System (TAXISnet). TAXISnet [29] is the integrated information system of the Hellenic tax system aiming to provide online electronic services to citizens and businesses through pre-filled forms and the collection of citizen data from employers (such as salary details), banks and other administrations to provide these data to other public authorities at a central point. The information system interconnects all tax departments in Greece with the central point and the respective databases, and it has probably the largest number of users of public sector information systems in Greece. TAXISnet offers personalized information to citizens and businesses through its portal, as well as by sending automated emails. The registration to the service is a simple procedure. After the registration to the service, citizens or businesses are informed regularly by SMS on the tax that they have to pay and by when the payments are due. Recent amendments of the TAXISnet solution towards further OOP implementations are the confirmation of a person's details, the tax registration data, certificates that a person or a company do not have any debts relevant to tax (relevant e.g. in public procurement procedures), certification for any debts of a person or a company to any public-sector organization, or the provision of vehicle owner details at a specific point of time.

A crucial enabler is the Interoperability Centre of the Ministry of Finance, which provides a set of web services to public administrations to get access to relevant data of citizens and businesses, which is in the hands of other public administrations in Greece.

The main benefits of this case are for citizens to receive proactive services and notifications on relevant taxes to be paid and other certifications needed in public services. Public administrations are supported in the execution of their tasks by web services to access relevant data from authentic sources.

4.2 OOP Enablers

In Table 2, the OOP good practice enablers studied in SCOOP4C[2] are grouped along six categories. Like for the OOP cases, this list does by no means provide an exhaustive list of existing OOP enablers in Europe. The enablers were either identified in the same way as the OOP cases (see indication at the beginning of Subsect. 4.1) or these were spotted along the data collection on OOP cases.

The following four examples provide more detailed insights into good practice enablers of secure data exchange and enabling infrastructure (more detailed information is provided in [50, 54]):

Dutch Basisregistraties. Basisregistraties [9] were established in the Netherlands to store all vital data about citizens, businesses and institutions in a centralized manner. In total, ten basis registries have been officially instated to implement the once-only principle in public service provisioning (addresses and buildings, geographical information and maps, topography, income registry for taxation, cadasters and real estate property, reference property values, environment and surface, citizens, companies, vehicles). These are mandatory data registration sources for all governmental institutions when executing their public duties. To enable the secure data exchange among these base registries and applications in the Netherlands, several core building blocks were set up as well: a) Digidelivery as the electronic delivery service enables public administrations and businesses to quickly and efficiently exchange data among key register clients in the shape of event messages; b) Digilink offers standards for interfaces, including agreements, for the exchange of data between public authorities. Digilink therewith enables to connect

[2] See detailed descriptions of the OOP enablers under https://scoop4c.eu/enablertable.

Table 2. Overview of examples of OOP enablers studied in SCOOP4C

Category (# of enablers studied)	*Examples of OOP enablers studied in SCOOP4C (enablers marked in italic are summarized below)*
Secure Data Exchange (12)	Belgian MAGDA, Czech Basic Registers, *Dutch Basisregistraties*, *Estonian X-Road*, European-wide ECRN, European-wide ECRIS, European-wide EESSI, European EMREX, European-wide EURCARIS, Spain's PID-SVD, Spain's SIR, Spain's SPD
Enabling Infrastructure (10)	*Network of public authorities in Austria (Portalverbund),* European-wide BRIS, Greek's SYZEFXIS, Irish Government Network, Luxemburg's my Guichet, Portugal's iAP, Spanish SEDIPUALB@, Spanish InSide, Spanish CONSERVATIONISTS, *Spanish Red SARA*
eID and Trust Services (6)	PKI and ISKE in Estonia, PKI in Greece, Irish MyGovID, Irish Public Service Card, Spanish PKI Suite @firma
Interoperability Governance (3)	Greek and Spanish Interoperability Models, Argentinian Interoperability Model
Interoperability Assets (2)	German xAusländer, Irish Personal Public Service Number
Catalogue (1)	Estonian Catalogue of Public Sector Information (RIHA)

nearly all e-government building blocks set up in the Netherlands; c) Diginotification is a notification tool to guarantee the quality of data in the key registries to be up-to-date and reliable; d) NORA as the Netherlands Government Reference Architecture provides an overall framework and existing agreements for the Dutch governmental information management system to ensure smooth cooperation with other services, and optimal re-use of existing solutions; and finally e) a System Catalogue, which make the data in the base registries findable and reachable.

The use of the Basisregistraties in the Netherlands offers a variety of benefits including reduction of administrative burdens for citizens and businesses as they do not need to provide information again that is already in the hands of government. The government can operate more efficiently and improve quality of services that government organizations such as public health services or fire stations deliver.

Estonian X-Road. X-Road [12] is a technical and organizational environment enabling secure data exchange between various information systems in Estonia. Security is provided through authentication, multilevel authorization, a high-level log processing, as well as encrypted and time-stamped data traffic. Public and private sector institutions can connect their decentrally organized information systems with the central component X-Road. X-Road can be considered as a federation with the capability to provide secure Internet-based data exchange across different ecosystems. Every X-Road environment is managed by a competent organization (center) that defines the applied security policy and manages the information of its ecosystem members. The federation agreement entails the description of organizational and legal liabilities between the centers of different ecosystems, which allows databases to interact and make integrated e-services possible, and institutions not to be locked into any one type of database or software provider. Some underlying components of the X-Road enabler are a) the unique personal identification code that is needed to identify the right personal data from different registers; b) the unique company commercial registry code that is needed to identify the right business data from different registers; and c) the catalogue of services and data (RIHA), which provides metadata on registers and services to be findable and usable.

X-Road enables institutions to save resources and implement significantly more efficient services, since a cooperative and secure data exchange layer is provided to all members that have signed the agreement.

Network of Public Authorities in Austria (Portalverbund). The Austrian Portalverbund [1] enables different government portals to team up with each other to simplify the authentication of users that have already been authenticated via another trusted portal in the government network. This way, the portal group building block connects many applications from a single entry point (the starting portal of a user) and realizes the single sign on concept. Communication within the portal group is managed, both technically and organizationally, through 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 authorized to access which applications and define user roles with corresponding access rights.

The Portalverbund targets employees of public administrations and simplifies the access to the various authentic sources and e-government applications in the Austrian e-government applications with the purpose to simplify and enable the benefits of the OOP to be realized for citizens and businesses.

Spanish Red SARA. The Spanish Public Administration telecommunications networks are organized hierarchically based on the Spanish territorial sovereignty (network of municipalities of a certain region, network of regions, network of Ministries). Because governments need to interact and collaborate over the different federal levels, a secure and reliable interchange of information among all levels of government was set up, the Red SARA (or SARA network - System of applications and connections of public administrations) [51]. Red SARA is a set of telecommunications infrastructure and basic common services (such as e-signature validation, verification of identity and residence data, e-notification) that supports the interconnection and the interoperability of all existing Spanish Public Administration networks. It facilitates the sharing of information and services between public administrations over all federal levels in Spain and it interconnects to institutions in Europe and other European Member States through sTESTA [15].

The benefits of Red SARA are the independence of Spanish Public Administrations in their own infrastructure setup, while they can easily connect and interact with other institutions at the different federal levels over the commonly agreed interfaces and interoperability features. This way, the once-only principle can be implemented in public service provisioning, leading to simplification and reduction of administrative burdens for citizens and businesses, while at the same time maintaining the autonomy of government actors in the federal system.

5 Discussion and Recommendations from the Good Practices

The previous section outlined good practices of OOP cases and OOP enablers in European Member States. In order to consider an OOP case or OOP enabler a good practice and a success, the benefits of OOP implementations as well as the barriers and enablers in cross-border OOP public services need to be understood well. Both are synthesized and derived from the case studies and from literature analysis, and described in the following.

5.1 Benefits of OOP Implementation and the Need for OOP Enablers

As already outlined in Sect. 2 and along the description of OOP cases and enablers in the previous section, the once-only principle embodies a number of benefits to the actors involved. These are summarized below along the main benefits identified both in literature (see e.g. [6, 16, 20, 21, 24, 33, 34, 49, 54, 58]) and demonstrated in the OOP examples ALF, EHR, Studielink and TAXISnet outlined in Sect. 4. In addition to the benefits for targeted stakeholders, needed OOP enablers to realize the benefits are spotted.

Reduction of Administrative Burden. The once-only principle contributes to administrative burden reduction in various ways as:

a) citizens and businesses need not to provide the same data repeatedly along public service provisioning. To render the public service providers as data consumers to access data that they need in public service provisioning from data providers, relevant OOP enablers such as secure data exchange mechanisms, interoperability assets and enabling infrastructures need to be in place.
b) public service providers benefit from simplified, less cumbersome and more convenient procedures and pro-active public service offers alike, as they can access and re-use data from the authentic sources through secure enabling infrastructure.

Increased Transparency and Trust. By realizing the concept of consent for sharing and reusing data on respective data subjects (citizens or businesses), the once-only principle contributes to higher trust and transparency in public service, since data subjects can verify (e.g. through a user account and through particular logging mechanisms, etc.) the compliant use of their data and they can have better control over their data. This mechanism is e.g. implemented along the Estonian OOP infrastructure X-Road. In the TOOP project, such mechanism is conceptualized and implemented as well.

Increased Efficiency and Effectiveness. The wide implementation of the OOP contributes to increased efficiency and effectiveness of public administration through co-creation and collaboration between administrations by opening up, sharing and re-using knowledge and resources with the aim to unlock productivity improvements and foster the creation of more public value. Providing access to relevant data also enables public service providers to pro-actively offer public services to citizens as is demonstrated in the ALF OOP case outlined above. Along with the proactive service provisioning, the sharing and re-use of data across public service providers enables governments to fulfill legal obligations faster. Such efficiency gains are clearly recognizable in the OOP cases studied in SCOOP4C [49, 54] and exemplified in the OOP cases in Subsect. 4.1 above.

Higher Quality of Data. Another core benefit for public administrations in the OOP implementation is that enablers such as secure data exchange, eID and trust services as well as enabling infrastructures offer access to quality-assured authentic sources of data. In combination with the reduction of administrative burden and more efficient and effective process execution, public administration are facilitated to save costs and to reduce redundant and error-prone activities of repeated recording of data that is already in the hands of public administration, as the data is retrieved from the quality-assured authentic sources. In addition, the recording of new or revised data is done once. In many cases, this step is even assigned to the data subject (i.e. citizens and businesses) through online service portals.

5.2 Enablers as a Vehicle to Overcome Barriers of OOP Implementations

In order to realize the benefits of the once-only principle for citizens and businesses as well as for public service providers, a number of key enablers have to be in place. In the SCOOP4C project, we argue that barriers and enablers of OOP implementations are two sides of the same coin: while the barriers represent obstacles and hindrances that prevent the realization of the OOP in public service provisioning, the enablers help to overcome these barriers and to guarantee the widest possible success in leveraging the benefits of the once-only principle. In other words, governments need to put in place the respective enablers to ensure the successful and effective implementation of the once-only principle.

Along the good practice analysis and subsequent roadmapping activity in SCOOP4C, the subsequent enablers of OOP implementations have been identified and elaborated. Since barriers of OOP are considered the non-availability of enablers, only the positive side of the coin (i.e. existing enablers) is considered below. The categorization of enablers is on the one hand derived from the interoperability layers of the European Interoperability Framework and the conceptual model of public services in the EIF [14], the European Interoperability Reference Architecture (EIRA) [13]. On the other hand, further soft factors are grouped into relevant categories as outlined in Sect. 3.

The following core enablers of successful OOP implementations have been grouped along the interoperability layers and concepts of the public service conceptual model of the EIF:

Political Commitment. Political commitment is considered a pre-condition for successful OOP implementations and is particularly stressed at European level through strategic documents such as the EU eGovernment Action Plan 2016–2020 [16], the

Single Digital Market Strategy for Europe [17], the Single Digital Gateway Regulation [21] or the EIF [14]. Many EU Member State countries have corresponding digitalization strategies incorporating the once-only principle as a strategic priority. Integrating the implementation of the once-only principle in digitalization strategies at the different levels of Government in Europe is a key enabler. An essential aspect along such political commitments are the will and capacities of governments to finance, coordinate, implement, and monitor the realization of the once-only principle in public service provisioning. To boost innovation and to respect different maturity levels across Europe, the implementation of the OOP in public service may first be based on coalitions of the willing actors and therewith also boost competition in being the first and best practice.

Legal Frameworks. Legal frameworks are required to enable the sharing and reuse of data stored in government's base registries while at the same time ensuring data privacy and protection of citizen's rights. Hence, legal frameworks have to be scrutinized and adjusted to enable the once-only principle to be realized in public service provisioning. Particular areas, where regulations represent key enablers for the sharing and re-use of sensitive data, concern e.g. the many base registries of the public sector, secure data exchange mechanisms, eID and trust services, as well as data protection and data privacy. The European Union has provided such crucial legal enablers such as the General Data Protection Regulation [19] or the Single Digital Gateway Regulation [21]. The same applies to the Member State countries. For example, to enable the OOP solutions ALF, Studielink, EHR and TAXISnet presented in Sect. 4, necessary legislation has been put in place in Austria, Estonia, Greece and the Netherlands.

Organizational Commitment and Collaborative Business Processes. Besides the legal framework, organizational commitment and collaborative business processes have to be in place to enable governments to share citizens' (personal) data among public administrations in secured networks (i.e. sharing and re-using knowledge assets e.g. stored in base registries) and on the basis of standards. The OOP cases outlined in Sect. 4.1 build on such commonly agreed collaborative business processes. Another organizational enabler is multilateral agreements to collaborate as well as to use open standards and open specifications in the public service provisioning implementing the OOP. Such agreements should also be in place regarding the use of common technical infrastructure.

Ensuring Semantic Interoperability Through Common Data Exchange Standards, Common Vocabularies and Taxonomies. Data exchange across different institutions requires semantic enablers to be in place, such as standards for the data exchange, a common terminology, controlled vocabularies and agreed-upon code lists (e.g. as unique identifiers of data sets), or taxonomies to facilitate data exchange between different institutions. The secure data exchange enablers introduced in Sect. 4.2 above present such examples.

Technical Enablers such as Secure Networks and Infrastructure. Commonly used secure networks and infrastructure are key enablers for the interchange and re-use of citizens' data across the governments, including across borders. This includes commonly used services for electronic identification and for trust services (e.g. concept of active consent) as well as commonly used solutions for secure and trusted enabling infrastructure such as e-delivery building block. Examples from the SCOOP4C case study are described in Sect. 4.2.

Collaborative Governance Mechanisms. The implementation of the once-only principle demands different institutional actors to collaborate among different stakeholders. To facilitate the successful implementation of the once-only principle, appropriate collaborative governance models are needed, which clearly define the responsibilities and roles of actors on different levels of governance. Of particular relevance are interoperability governance and public service governance, which both need to be aligned as spotted in [13, 54, 57, 59].

Beyond the key enablers clustered on the basis of the EIF, the following crucial soft enabling factors have been identified and synthesized from the case study analysis:

Motivators, Benefits, and Public Value. Providing incentives, benefits, public value or convenience for citizens, businesses and governments to share and re-use data stored in public administrations' registries is the first soft key enabler to mention. The OOP case examples outlined in Sect. 4.1 demonstrate clearly these motivators and benefits to the relevant stakeholders. This contributes to better acceptance and use of the OOP solution.

Access to Authentic Sources Contributes to Improved Data Quality. The access to authentic data contributes to increased data quality in governmental registries. This enabler can be achieved through the implementation of enablers such as secure data exchange and enabling infrastructure and the necessary interoperability enablers outlined before and some examples provided in Sect. 4.2. Great examples that demonstrate the value-added of improved data quality realized through direct access to authentic sources are the OOP cases presented in Sect. 4.1.

Trust and Transparency. Trust and transparency mechanisms enable citizens to control and monitor by whom, when, and why their data is accessed. Such enabling building blocks are for example the concept of active consent for the sharing and re-use of sensitive or personal data of citizens and businesses or the access to the logging of who has accessed data on the data subject in a particular registry, by when and for what purpose. Such a service is e.g. provided via the X-Road enabler in Estonia (cf. enabler description in Sect. 4.2).

Data Protection and Privacy. The sharing and re-use of citizen data requires to respect privacy and ensure data protection. Hence, mechanisms for data protection need to be in place. Such mechanisms can be on the one hand relevant legislation as is outlined in the respective legal framework enabler above as well as technical building blocks such as eID and trust services such as the concept of the consent (see next enabler) or secure data exchange or infrastructure building blocks.

Socio-cultural Influence Factors. Socio-cultural aspects such as traditions of sharing or not sharing data among governments, ownership of data and citizens' obligations vs. freedom of deciding when and how to provide data to governments are central for gathering acceptance of the once-only principle by citizens and businesses. In some countries, the data stored only for special purposes means that this data is not usable beyond the given constitutional and legal frame, organizational settings and cultural restrictions, thus limiting the OOP implementation to the scope of the service and data. Such factors may vary across countries. However, they play a crucial role in the public service provisioning and in ensuring acceptance and trust of citizens and businesses in the public service.

Citizen-Centered Design. To correspond to the needs and expectations of citizens and other stakeholders in the OOP implementation in the best possible was, the relevant actors need to be involved in co-designing and co-developing of the OOP services, ensuring ease of use, convenience, and good user experience. The more citizen-centered the design of public services is, the more it enables the creation of better quality policy decisions and the offering of better services in the future.

It is important to note that the different enablers outlined above are not mutually exclusive. Instead, the enablers build upon one another and are therefore intertwined and mutually dependent. This means that just implementing one of the enablers is not sufficient for a successful implementation of OOP solutions.

6 Conclusions

This contribution investigated the implementation of the OOP across Europe by studying existing good practice cases and enablers in different Member States. First, an overview of relevant theoretical and political foundations was provided, followed by an outline of the research design, which employed literature analysis and case study research. The presentation of good practices is divided into OOP cases and OOP enablers. In the SCOOP4C project, 57 OOP cases and 34 OOP enablers were analysed. Four examples per group were briefly outlined in the paper to demonstrate how the OOP is realized and provides benefits to citizens and public sector actors.

Subsequently, a synthesis of benefits and key enablers to realize the once-only principle widely was presented. The benefits affiliated with OOP implementations in public service provisioning are a) reduction of administrative burden, b) increased trust and transparency, c) increased efficiency and effectiveness, and higher quality of data. Eleven key enablers of OOP implementations were spotted: 1) political commitment, 2) legal frameworks, 3) organizational commitment and collaborative business processes, 4) semantic interoperability through common data exchange standards, common vocabularies and taxonomies, 5) technical enablers such as secure networks and infrastructure, 6) collaborative governance mechanisms, 7) motivations, benefits, and public value, 8) Access to authentic sources to improve data quality, 9) trust and transparency, 10) data protection and privacy, and 11) citizen-centred design.

The research stressed that barriers and enablers of OOP implementations form linked concepts, i.e. a barrier indicates a lack (or absence) of what is, in the positive formulation, an enabler. For example, a barrier at political level was identified in SCOOP4C as the "*lack of political commitment to enforce and implement fully digital procedures in student exchange across Europe*" while the complementary enabler would be a "*strong political* *commitment to implement the digital procedures in student exchange services across Europe*" [49].

To sum up the findings from the OOP good practice analysis, the investigation has evidenced existing good practice cases and enablers in different Member States. However, the diffusion of OOP solutions is still scarce, especially at cross-border levels of OOP solutions. Further research and efforts from the side of government actors are needed to successfully implement the OOP across borders. The TOOP project provides a great federated architecture [28, 44] for enabling the provision of OOP solutions across borders. This architecture is picked up and further developed in the DE4ALL project [8]. However, as the analysis of good practices has shown, the success of the OOP implementation depends on many different enablers. Putting such enablers in place demands further considerable effort along a holistic perspective on public service design and implementation with the OOP.

Some further general insights from the above research can be summarized as follows:

- While strategic policies in Europe extensively promote digitalization, networked systems and interoperability, digital transformation in practice and with the OOP as underlying paradigm is considerably lagging behind these visions.
- While OOP visions are promoted to create awareness of the potentials and benefits, these activities are not necessarily reaching out to those that in the end have to implement the OOP solutions.
- In particular, top-down implementation of digitalization needs to urgently be complemented with bottom-up engagement of relevant stakeholders by employing e.g. co-creation concepts, stakeholder engagement and similar to involve the relevant stakeholders in such digital transformations.
- Attempts of bottom-up stakeholder engagement to realize interoperable cross-border public services need be complemented with qualitative research to systematically and rigorously understand barriers and challenges of actors in digital public service provisioning and to design OOP solutions that meet the users' expectations.

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The Single Digital Gateway Regulation as an Enabler and Constraint of Once-Only in Europe

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Abstract. The adoption of the Single Digital Gateway Regulation is a gamechanger in European e-government. For the first time, it creates a horizontal, non-sector specific legal framework for the direct exchange of digital evidence between public administrations in different Member States. However, these exchanges require public administrations to have a certain degree of trust in each other, which is built on a shared legal basis. The Single Digital Gateway Regulation achieves its goal of creating a legal basis and establishing trust, but also builds in a number of explicit and implicit legal constraints. These will help make the once-only principle in Europe a reality, but also enshrine limitations that will require revisions and expansions of the Regulation at some point in the future. This paper examines the genesis of the Regulation, its legal choices and priorities, the resulting implications and limitations, and potential challenges for the future.

Keywords: Single Digital Gateway Regulation · Legal framework · Trust

1 Introduction on Once-Only Legislation

1.1 Legal Frameworks for Once-Only at the National Level

The once-only principle is not an entirely new concept, and already has a significant policy background in a number of Member States. In each country where the principle has been adopted at some level, legislation was also introduced in order to provide a clear legal basis and scoping of the principle and its effects. The need for such legislation is obvious: as described elsewhere in this book, the once-only principle fundamentally requires that certain information about a citizen or business can be transferred relatively seamlessly from one administration to another, in order to permit that information to be reused, thus relieving the citizen from a tedious burden while increasing efficiency and reducing errors.

These manifest benefits also imply a risk, however. Should the citizen or company be aware of the information exchange? What happens when the information contains errors? Which administrations are actually entitled to request information, under which conditions, and for which purposes? Which sources should administrations rely upon,

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and to what extent can the information be expected to be accurate? All of these questions are critical, and answers can differ from country to country.

None the less, some characteristics recur quite frequently in Member State legislation. Typical examples of common requirements include notably:

- An explicit designation or description of authoritative sources (e.g. enumerated in the law or identified through subsequent formal decisions);
- An assertion that those sources are deemed the sole source of specific information (in order to avoid multiple and potentially conflicting databases being queried for the same data);
- A qualification of the information in those sources as benefiting from a presumption of legal accuracy;
- An explicit designation or description of public authorities which can request information from the authoritative sources;
- A legal obligation to request information from those sources – and not from the citizen or business concerned – whenever this is feasible;
- A legal obligation to notify the authoritative source if a gap or inaccuracy in the information is identified, so that the quality of data can be maintained and even improved over time, and to avoid misinformation from spreading.

While not universal, such obligations are generally fairly representative of the legal environment in which the once-only principle is implemented at any given administrative level (federal, national, or regional). The ultimate effect is the creation of a circle of trust between the designated public authorities, in which information can be exchanged with relative freedom without necessarily relying on the citizen or business as a carrier of their own data. As will be described in the following sections, recreating such a circle of trust is both the main objective and the main stumbling block for EU level legislation.

1.2 Scaling up the Law to Cross Border Once-Only

The Single Digital Gateway Regulation is a first attempt at building a European legislative framework for cross-border once-only services (among several other topics). The functional objective is described at a high level in recital (44) of the Regulation, which notes that "*The cross-border application of the 'once-only' principle should result in citizens and businesses not having to supply the same data to public authorities more than once, and that it should also be possible to use those data at the request of the user for the purposes of completing cross-border online procedures involving cross-border users.*" In order to achieve this objective, the Regulation calls for the creation of a "*fully operational, safe and secure technical system for the automated cross-border exchange of evidence between the actors involved in the procedure, where this is explicitly requested by citizens and businesses*".

The elaboration of the once-only principle in the Regulation, including its constraints and prerequisites, can be found mainly in Article 14 of the Regulation, which will be discussed in-depth below. However, it can already be noted that the approach of the Regulation differs significantly from the common elements found in national level legislation as summarised above. Notably, the Regulation does not designate authoritative sources, nor does it identify authorities that can request information from these sources. The Regulation also doesn't grant exchanged evidence any particular presumption of legal value, other than by noting that the evidence is "deemed to be authentic" – meaning that it should be considered to be originating from the competent authority, without however addressing whether that implies that it is adequate for the procedure at hand. And perhaps most critically: it emphatically places the users – citizens or businesses – at the centre of the once-only principle: as a general rule, evidence is exchanged using the once-only principle at the explicit request of the user.

All of these choices are the result of a delicate balancing exercise. The European Union has no prima facie competence to legislate administrative procedures horizontally, and it arguably would not be proportional to attempt to do so. Indeed, the formal legal basis of the Regulation is the protection of the free movement of citizens, based on Article 21(2) and Article 114(1) of the Treaty on the Functioning of the European Union (TFEU), as indicated in recital 6 of the Regulation.

The Regulation thus cannot directly envisage an overhaul of national public administration, which is one of the reasons why it would not be capable of designating competent authorities or of regulating the legal value of national evidence. None the less, the implementation of the once-only principle implies the creation of a circle of trust, at least to a sufficient extent to allow public administrations to exchange information without relying exclusively on the citizen or business as an intermediary.

At the national level, administrative proceedings can be directly regulated, and obligations – including the participation in a circle of trust - can be imposed directly on the administrations themselves. At the European level, the citizen or business must be at the centre, and therefore the Regulation is drafted in a user-centric manner: exchanges of evidence under the Regulation are generally driven by a user request, and imply prior verification of the evidence by the user. The user decides which exchanges can occur.

As will be examined in greater detail below, this has significant benefits, but also implies some constraints, both in terms of user friendliness and in terms of functionality. Mainly, the requirement in principle of a request and of verification of the evidence by the user ensures that no evidence can be exchanged under Article 14 without the user's awareness and approval. While the benefits of this approach are obvious, it also implies that the Regulation and its technical system will not be useful as devices for detecting malicious or unlawful behaviour: since the user will typically refuse to approve exchanges of evidence which will have negative consequences (e.g. documents proving that they are not or no longer eligible for a specific procedure or service), the Regulation will not be useful for public administrations as a mechanism for catching persons that attempt to circumvent legal requirements. In that sense, the Regulation serves the individual interests of the users more than the interests of the public administrations, or arguably even the public interest. Examples of these choices will be provided in the sections below.

2 The Single Digital Gateway Regulation – Concept and Choices

2.1 General Model for Trust Between Public Administrations Across Borders

Any implementation of the once-only principle implies the creation of a circle of trust between participation public authorities. After all, the principal operational requirement is that one public administration can request information pertaining to a citizen or business directly from another public administration, rather than from the citizen or business itself. While safeguards can and usually will be built in to avoid unlawful access to or use of the information, a mechanism to establish and maintain trust is necessary.

Within the Single Digital Gateway Regulation, this is done through a combination of elements. Firstly, as already noted above, Article 14 requires that the exchanges of evidence occur via a single technical system, which must be "*established by the Commission in cooperation with the Member States*". The development, availability, maintenance, supervision, monitoring and security management of the technical system is a split responsibility of the Commission and Member States, who are each responsible for their respective parts of the technical system (Article 14.11). Since Member States are also explicitly required to "integrate the fully operational technical system as part of the procedures" covered by the Regulation (Article 14.7), the phrasing of the law strongly suggests a federated or at least strongly decentralized model – although this terminology is not used in the Regulation itself - in which each Member States retains a clear degree of control over their national administrative activities, with the Commission operating a smaller central component of the system that will be responsible for interconnecting the national nodes.

Thus, the technical model which is suggested by the Regulation already ensures that each Member State maintains control over national components of the infrastructure. Of course, in order for once-only exchanges to be viable, a more critical question is the trust in the infrastructure of *other* Member States, and in their compliance with the requirements of the Regulation. To some extent this is addressed by the Regulation's reliance on technical and functional "building blocks", which are already in use across the Member States and which offer basic capabilities such as electronic identification (the eID building block) and exchange of documents (eDelivery building block). As the recitals note, "*those building blocks consist of technical specifications, sample software and supporting services, and aim to ensure interoperability between the existing information and communication technology (ICT) systems in different Member States so that citizens, businesses and administrations, wherever they are in the Union, can benefit from seamless digital public services*". On the basis that Member States could be trusted not to modify these building blocks in a manner that undermines their legal value, this already forms a part of the puzzle.

The building blocks are far from sufficient to bring about the entire technical system, and new components – which can form a Once-Only building block in its own right – can be governed by a new implementing act that sets out the technical and operational specifications of the technical system as a whole, as envisaged by Article 14.9.

However, this approach only touches on the trustworthiness of the technical infrastructure. Apart from this issue, the Regulation also imposes a number of functional and design constraints on the way the once-only principle can operate, including the role of the user, constraints on the use cases and evidences, and procedural safeguards. These will be discussed in the sections below.

2.2 Drawing the Lines: A Closed Model for Once-Only

One of the principal elements to be regulated in any legal framework pertaining to the once-only principle is the scoping of the use cases in which it can or must be applied. At the national level, this is commonly done by identifying the relevant authoritative sources and the public authorities that should rely on them, rather than opting for the definition of specific procedures. At the European level however, that approach would not be feasible, since neither the information sources nor public authorities are organised in a harmonised and homogeneous manner across the EU. In other words, it would not be possible to designate the evidences and the databases covered by the Regulation, or to specify the authorities, since those evidences, databases and authorities may not exist in some Member States, or at least be so incomparably different as to make a regulatory scoping meaningless.

For that reason, the European legislator opted for a different approach. In order to make sure that the Regulation contained appropriate constraints on the cases in which the once-only principle could be applied, even though neither evidences nor authorities can be clearly described, it opted for an exhaustive enumeration of the procedures in which the technical system could be used to support once-only exchanges.

More specifically, article 14 of the SDGR requires that this system supports the exchange of evidence necessary for the completion of the procedures listed in annex II of the SDGR, as well as procedures governed by the Directive on the recognition of professional qualifications, the Directive on services in the internal market, the Directive on public procurement, and the Directive on procurement by entities operating in the water, energy, transport and postal services sectors. Given that the entire list focuses on procedures which are either harmonised through EU level Directives or (in the case of Annex II) which are focused on universal high level “life events” such as birth, changing residence, or retiring, these procedures should indeed exist in all Member States, even if the competent authorities and evidence for each of the procedures might vary significantly.

While the approach has the benefit of feasibility, the downside is the fact that it is a ‘closed list’ approach, which does not allow new use cases or new procedures to be added without an amendment of the Regulation itself. It would of course also be feasible for future legislative initiatives to explicitly reference the use of the technical system envisaged by Article 14, but in the absence of new regulatory interventions, the growth potential of the number of procedures is inherently limited. This is a constraint that directly results from the impossibility to directly regulate authoritative sources and public authorities at the European level, but the unfortunate outcome is a lack of flexibility when new once-only needs will be identified. The TOOP pilot project already encountered this in one of its use cases, focusing on the exchange of evidences in a maritime environment: while this would be a good target for EU level once-only procedures, it is not included in the Regulation’s closed list, and therefore would not be able to make use of the technical system under Article 14.

The scoping of exchanges of evidence is thus limited to specific procedures enumerated in the Regulation. A secondary but related issue is whether, once a public authority has received evidence in accordance with the Regulation through the technical system, they can share it with additional authorities within their own country.

The Regulation does not appear to comprehensively address this question. Article 14 does contain a purpose limitation principle, which notes that "The evidence made available to the requesting competent authority shall be limited to what has been requested and shall only be used by that authority for the purpose of the procedure for which the evidence was exchanged" (Article 14.8).

However, the use of the evidence "for the purpose of the procedure" should arguably also include any use of that evidence which is mandatory under national law as a result of that procedure, and which may also involve further use of that evidence. It is likely that some Member States will have their own once-only principles, governed by national law, under which they share data (including evidence) with other public administrations, or under which they are required to retain evidences after receiving them under the SDGR. There seems to be no prima facie reason why the SDGR would invalidate such national laws.

By way of example: after an exchange of evidence under Article 14, the evidence may need to be kept in an official archive under national archiving laws under national legal frameworks. Such uses however are subject only to national laws, which are not affected by the Regulation. As recital (26) to the SDGR notes, "This Regulation should also not affect the procedural workflows within and between the competent authorities, the 'back office', whether digitalised or not". Otherwise, use of the technical system would make it impossible for receiving competent authorities to respect national laws, or at least require them to create exceptions in existing laws to the effect that evidence may be reused whenever their laws require it, except if it reached their competent authorities through the technical system under the Regulation. That approach would likely be unworkable in practice. Thus, it seems reasonable to argue that the Regulation's requirement to only use evidence for the purpose of the procedure for which the evidence was exchanged should not affect further uses that are mandatory under national law. lease note that the first paragraph of a section or subsection is not indented. The first paragraphs that follows a table, figure, equation etc. does not have an indent, either.

2.3 User Centricity as the Principal Driver

It has already been stressed in the sections above that the Regulation takes a user-oriented perspective on the once-only principle, by introducing a general requirement that the technical system "shall enable the processing of requests for evidence at the explicit request of the user" (14.3 (a)). Moreover, it adds that the "use of the technical system shall not be obligatory for users and shall only be permitted at their explicit request, unless otherwise provided under Union or national law" (14.4). Finally, the Regulation requires that the technical system "shall enable the possibility for the user to preview the evidence to be used by the requesting competent authority and to choose whether or not to proceed with the exchange of evidence" (14.3 (f)). Thus, three clear elements of user centricity are enshrined in the text: the explicit request, the preview, and the optionality of using the system.

The Explicit Request

Requirements for the validity of an explicit request are outlined in the Regulation, which stresses that it must be "an explicit, freely given, specific, informed and unambiguous request of the user concerned", as a result of which consuming authorities must "request evidence directly from competent authorities issuing evidence in other Member States through the technical system" (article 14.7 SDGR). The technical system for the cross-border exchange of evidence must thus support a mechanism for the user to express an explicit request that meets the requirements above.

The phrasing of these requirements for an explicit request is nearly identical to the definition of a 'consent' in the General Data Protection Regulation. None the less, for reasons that will be outlined below, the concepts should not be conflated: the expression 'consent' does not occur in the SDGR, and the notion of 'consent' should not be used as a reference to the explicit request requirement of article 14 of the SDGR.

This approach puts the user in control over the evidence exchange, which has both benefits and downsides. The benefit (and goal of this requirement) is that the user is protected against potentially unlawful exchanges of evidence without their knowledge. The downside is that the user must in principle be involved in authorising an exchange. A transfer that would be beneficial for competent authorities (or for the public interest) may be defensible from a public policy perspective even without the request (or even knowledge) of the user, and it can even be considered an application of a broader interpretation of the once-only principle; but the SDGR does not allow such exchanges in principle, subject to the exceptions discussed below. By way of a practical example: the technical system can be used under the SDGR to allow the user to provide evidence that they are eligible for a particular service or benefit at the time when they apply for it. The system however cannot be used to allow the competent authority to continue to obtain evidence afterwards whether these requirements are still met, unless the user chooses to cooperate.

There are some theories on how the concept of a 'request' could be interpreted to none the less accommodate such models. One might e.g. consider the case where a user explicitly requests that a certain administration obtains certain evidences for a specific procedure, and that it asks that it keeps these up to date (including through future requests) for a specified period of time. In this case too, the exchanges are arguably based on an explicit request, the scoping of which could be clearly approved by the user. While each subsequent exchange (resulting from the initial request) is not the result of an entirely new request, there is no part of the Regulation's phrasing that suggests that individual requests for individual exchanges would be necessary.

None the less, there are some constraints that impede an easy adoption of such models as a part under Article 14. Firstly, there is the consideration that the original request would at any rate need to be particularly clear and explicit on the scoping of the request, and in particular on the possibility of future exchanges, including purpose limitation and temporal limitation. A situation where a competent authority can request evidences without any limitation to specific administrative procedures or for an indeterminate period of time would not be compatible with the SDGR. Secondly, the Regulation also contains a preview requirement as will be examined below: the user must be able to preview each subsequent evidence exchange and be permitted to decide whether to proceed with it.

This latter element inherently requires user involvement, so that automated exchanges without user involvement are unlikely to comply with Article 14.

There are exceptions to the request requirement. As the Regulation notes, the "use of the technical system [...] shall only be permitted at their explicit request, unless otherwise provided under Union or national law" (14.4 SDGR). This exception could be applied to evidences which are publicly available to anyone without any constraints (e.g. via public websites, open web services, etc.). In such cases, it seems reasonable to argue that automated cross-border exchange without a request is also allowed. Secondly, it could also be reasonably applied to evidences which are available to be exchanged between designated competent authorities within the EU (without constraint to one or several specific Member States). Company information that can be exchanged between business registers via the BRIS network seem to be an example, since the BRIS legislation allows competent authorities to exchange information directly in the circumstances covered by that legislation (without the request by the user). In such cases it seems reasonable to argue that automated cross-border exchange without request is allowed via the technical system as well.

It is worth noting that national or European law could also have the inverse impact: rather than just eliminating any need for an explicit request (and permitting exchanges even without users explicitly requesting it), it would also be possible for such laws to mandate use of the technical system – not only eliminating the requirement of a request, but even invalidating the possibility of choosing alternative means of submission of evidence. In other words, future evolutions in European or national law can significantly impact the scoping of the use of the technical system.

The Preview Requirement

According to the Single Digital Gateway Regulation, the envisaged technical system "*shall enable the possibility for the user to preview the evidence to be used by the requesting competent authority and to choose whether or not to proceed with the exchange of evidence*" (14.3 (f) SDGR). Recital 47 clarifies that the user can exercise that right not to proceed *"in cases where the user, after previewing the evidence to be exchanged, discovers that the information is inaccurate, out-of-date, or goes beyond what is necessary for the procedure in question."*

The technical system must thus support a mechanism of preview by the user of the evidence, and a mechanism of approval of the exchange after observing the preview (thus also preventing the exchange by refusing to approve it). However, the wording of the preview mechanism in the SDGR clearly indicates that the preview is only a *possibility* that must be afforded to the user, not that the user has to be required to actually use (observe) the preview.

The preview mechanism aims to support the accuracy and relevance of the data exchanged and strengthens control by the user over data exchanged through the technical system, allowing them to exercise some control over the consequences of their use of the system.

The English language version of the SDGR does not state explicitly when the preview should take place; it merely notes that the technical system should "enable the possibility for the user to preview the evidence to be used by the requesting competent authority and to choose whether or not to proceed with the exchange of evidence". Given this phrasing, the most rational interpretation is that the preview possibility is offered to the user *before* the exchange of evidence to the receiving authority occurs. A broader interpretation, where the receiving authority first receives the evidence and then allows the user to preview it and to block any use of the data, arguably raises compliance challenges with the phrasing of the SDGR. Other language versions of the SDGR are more explicit than the English phrasing in requiring a preview before the exchange occurs. E.g. in German, the Regulation requires the technical system "*dem Nutzer die Möglichkeit bieten, die von der anfordernden zuständigen Behörde zu verwendenden Nachweise vorab einzusehen und zu entscheiden" – vorab* indicating that the preview occurs before the exchange.

From a functional perspective, the principal objective is at any rate that the evidence can only be used for a preview, and not for the actual procedure itself, until the evidence exchange has been approved during the preview (or until the user declines the possibility to preview).

Similar to the explicit request, the SDGR indicates that the possibility of a preview is not required when "automated cross-border data exchange without such preview is allowed under applicable Union or national law" (14.5 SDGR). Again, the exception could plausibly be applied to evidences which are publicly available to anyone without any constraints, and to evidences which are available to be exchanged between designated competent authorities within the EU.

One additional complexity is the issue of which 'national law' determines whether a preview can be omitted or not. The simplest interpretation is that the main relevant question is whether the evidence is publicly available without constraints – and therefore that only the national laws of the data providing Member State govern the preview exception. However, a much stricter interpretation could be applied as well, in which the omission of a preview is governed by any national laws determining the rules behind a specific procedure. In that interpretation, the national laws of the data consuming Member State are equally relevant – i.e. if an evidence is freely available in Member State A, but Member State B does not recognise the free availability of that type of evidences in a specific procedure, Member State B might insist on previews, arguing that its own laws are not complied with if no preview was available. This is an open issue at present.

Finally, recital (47) of the SDGR also indicates that "the data included in the preview should not be stored longer than is technically necessary". Given the reference to technical necessity, this constraint seems to target only the storage required for the preview functionality, and not any storage that precedes or follows the preview (e.g. retention in the sending Member State for accountability purposes, or retention in the receiving Member State for the purposes of administrative follow-up of the service requested by the user).

In addition, the reference to "data included in the preview" seems to suggest that it is principally the evidence's content that may not be retained longer than necessary, which is reasonable from a data protection and confidentiality perspective. No part of this provision would seem to suggest that an audit trial is impermissible, provided that the audit trail doesn't include the "data included in the preview". In other words, an audit trail could contain any metadata related to the preview process, as well as e.g. hashed values of the evidence file in order to determine afterwards (in case of disputes) whether a specific file was exchanged, provided that the evidence itself and its contents are not retained.

Based on that understanding, the main implication seems to be that the technical system must include a function that ensures that an automated deletion of the evidence should occur after the user decides whether or not to transfer the evidence. This deletion (from static storage devices or from dynamic memory) should be verifiable through an appropriate log or audit trail. No centralised storage of the evidence is permissible under the SDGR.

Freedom to Choose
As a third pillar to the SDGR's user centricity (in addition to the user request and the preview requirement), Recital 47 of the SDGR indicates that the use of the technical system should be voluntary, and that other means of submitting evidence should remain available to users. This principle is repeated in Article 14.4, which notes that "*The use of the technical system shall not be obligatory for users and shall only be permitted at their explicit request, unless otherwise provided under Union or national law. The users shall be permitted to submit evidence by means other than the technical system and directly to the requesting competent authority*".

In other words, users can never be forced to use the technical system. This does not imply that the use of electronic communications cannot be made compulsory under national law; this is a matter of national sovereignty. However, if users do not wish to use the technical system, they must be provided with alternatives, which may be digital or analogue, as deemed permissible by the national laws governing the procedure.

2.4 Data Protection as a General Consideration Behind the SDGR

Applicability of Data Protection Law
A general concern in relation to the once-only principle is compliance with the EU's fundamental right to data protection, as enshrined in article 8 of the EU Charter of Fundamental Rights, and as governed principally by the General Data Protection Regulation. While not all evidences exchanged via the technical system will by definition qualified as personal data, it is clear that most evidences will contain at least some personal data, and that the requirement of human involvement (through the user) in any evidence exchange implies that at least some personal data processing is required for any application of the once-only principle as envisaged under Article 14. After all, the user will be identified, and information about the time, source and destination of the exchange will need to be generated and logged, as well as the nature of the evidence. Collectively, this already entails a processing of personal data.

Legal Basis for the Processing of Personal Data
The explicit request requirement to some extent helps to support compliance with key data protection principles under EU law, in particular the requirement to have a legal basis for a transfer of evidences containing personal data. The SDGR comments on this relationship explicitly, noting that "Where the exchange of evidence includes personal data, the request should be considered to be explicit if it contains a freely given, specific,

informed and unambiguous indication of the individual's wish to have the relevant personal data exchanged, either by statement or by affirmative action. If the user is not the person concerned by the data, the online procedure should not affect his or her rights under Regulation (EU) 2016/679".

This assertion is short, but contains a few critical pointers for the interpretation of the relationship between request and consent. Notably, it recognises that not all evidences will include personal data. This is of course dependent on the procedure and on the evidences required. Furthermore, the recital's meaning should not be misunderstood as saying that a request under the SDGR is identical to consent under the GDPR. It notes only that, if evidences contain personal data and a consent meeting the requirement of the GDPR is obtained for the exchange, then the consent requirement also satisfies the requirement of the explicit request. It however does not indicate that a consent meeting the requirements of the GDPR is always required, nor that every request under the SDGR satisfies the requirements of a consent under the GDPR.

To understand the exact relationship between the request and a consent, it is important to understand that any exchange (or other form of processing) of personal data through the technical system must comply with the requirements of the GDPR. A central challenge in any SDGR procedure – among other data protection challenges – is ensuring that there is a legal basis for the transfer of evidence, assuming that the evidence indeed contains personal data. It would be tempting to assume that the explicit request of the user to transfer any personal data constitutes a consent under the GDPR, and therefore that it is sufficient as a legal basis in all cases. None the less, this would be incorrect for several reasons.

Firstly, a consent under the GDPR must be given by the data subject, i.e. the person whose data will be processed. This is sometimes not possible in specific procedures, where the user may not be the (only) person whose personal data will be processed – consider e.g. an accounting person using the SDG to transfer personal data relating to the management of a company: the accounting person cannot by definition provide consent on behalf of the management.

Secondly, consent under the GDPR must be freely given. It has been a long standing interpretation of European data protection law – and this point has been recently affirmed in official guidance from European data protection authorities – that freely given consent is not possible when there is a clear imbalance of power between the data controller (the party asking for the consent) and the data subject (the party giving their consent). The aforementioned Guidelines take a very strict approach on this point, and stress that "it is unlikely that public authorities can rely on consent for processing as whenever the controller is a public authority, there is often a clear imbalance of power in the relationship between the controller and the data subject. It is also clear in most cases that the data subject will have no realistic alternatives to accepting the processing (terms) of this controller. The EDPB considers that there are other lawful bases that are, in principle, more appropriate to the activity of public authorities". While this position appears strict, it is not illogical: in the case of e.g. moving one's home to a different Member State, there is hardly any freedom left: a citizen either consents, or is unable to move homes. In these circumstances, there is little choice in reality, and therefore no way to provide a consent satisfying the requirements of the GDPR.

Similarly and perhaps less intuitively, the same Guidelines note that “an imbalance of power also occurs in the employment context. Given the dependency that results from the employer/employee relationship, it is unlikely that the data subject is able to deny his/her employer consent to data processing without experiencing the fear or real risk of detrimental effects as a result of a refusal. It is unlikely that an employee would be able to respond freely to a request for consent from his/her employer to, for example, activate monitoring systems such as camera observation in a workplace, or to fill out assessment forms, without feeling any pressure to consent. Therefore, the EDPB deems it problematic for employers to process personal data of current or future employees on the basis of consent as it is unlikely to be freely given. For the majority of such data processing at work, the lawful basis cannot and should not be the consent of the employees (Article 6(1)(a)) due to the nature of the relationship between employer and employee”.

In both cases – public authorities and employees – consent is not entirely impossible if there is indeed no imbalance of power, but it is generally not the favoured legal basis for the processing of personal data under European data protection law. However, this is not an insurmountable problem in practice, since the GDPR does not require consent by definition, but rather a legal basis, for which consent is only one available option. The SDGR similarly does not mention consent at all – nor any other legal basis under the GDPR – thus leaving multiple justifications open. As the European Data Protection Supervisor also noted in its Opinion 8/2017 on the proposal for the SDGR, “the three most relevant legal grounds for implementing the ‘once-only’ principle are consent, legal obligation and public task/official authority. Depending on the circumstances, one or another of these legal bases could be the most appropriate choice. As a general rule of thumb, for the case of any recurring and structural data sharing, the EDPS recommends - in order to ensure legal certainty- that whenever possible, further processing of personal data based on the once-only principle be specified in a legislative instrument, which provide appropriate safeguards to ensure compliance with data protection law, including the principle of purpose limitation and ensuring data subjects’ rights”.

Thus, it is clear that consent in the sense of the GDPR is not a requirement for the exchange of evidence, and that the procedural prerequisite of the SDGR of an explicit request should not be conflated with a GDPR consent requirement: the explicit request obligation may apply even in cases where there is no personal data involved, and inversely a legal basis for the exchange of evidence must exist even when there is an exception to the explicit request requirement. The two obligations – explicit request and legal basis – exist side by side, and are separate.

In some procedures, the choice for a GDPR consent as a legal basis for the exchange of evidence is plausible, but in many (including those where consent is not possible) a different legal basis will need to be relied upon. While the choice can be different from use case to use case, the legal basis will generally be the legal obligation for the competent authorities to transfer evidences under EU or national law; or the legal obligation for the competent authorities to transfer evidences as a part of the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller. To the extent that the SDGR creates the obligation for competent authorities to cooperate in such exchanges, an appropriate legal basis under the GDPR is thus available.

Once-only and Further Processing of Personal Data

The once-only principle relies essentially on the reuse of data previously created, collected or stored by public administrations in relation to citizens and businesses; indeed, such reuse is even its sole purpose. Where the information exchanged through the application of the once-only principle includes personal data, issues concerning 'further processing' as described under the GDPR must be addressed. The notion of further processing, which is processing of personal data beyond the initial purpose for which it was collected, is tied to the principle of purpose limitation.

Under the GDPR, purpose limitation is a fundamental data protection principle according to which data is collected for specified, explicit and legitimate purposes and may not be further processed in a manner that is incompatible with those purposes (Article 5.1 GDPR). There are exceptions, when the data subjects consented to the further processing or when or when it constitutes a necessary and proportionate measure in a democratic society to safeguards certain of its fundamental elements (such as listed in article 23 of the GDPR). As highlighted by the European Data Protection Board, easing administrative burdens on individuals or organisations is one of the primary aims of the once-only principle, and is undoubtedly of public interest. None the less, processing of personal data for other purposes should be allowed only where the processing is compatible with the purposes for which the personal data were initially collected (Recital (25) GDPR).

The compatibility of purposes must be assessed based on the link between the new purposes, the context of the processing, the nature of the data concerned, the possible consequences of the processing and the existence of appropriate safeguards (Article 6.4 GDPR). In the case of further processing through the technical system set up in compliance with the SDGR, the compatibility of purposes is largely governed by the legislator at EU level: the existence of the SDGR and its explicit requirement to apply the once-only principle in the listed procedures, under the safeguards stated in the SDGR, fundamentally implies that the further processing required by the SDGR is considered as compatible with the original purposes by the legislator. Of course, compliance with the safeguards of the SDGR is critical in this assessment, and notably the obligation in principle to only use the technical system at the explicit request of the user, or when required under Union or national legislation.

On this basis, the further processing of personal data under the SDGR must prima facie be deemed as compatible with the original purposes.

For the avoidance of doubt, it is clear that the SDGR also contains a purpose limitation principle, which notes explicitly that "The evidence made available to the requesting competent authority shall be limited to what has been requested and shall only be used by that authority for the purpose of the procedure for which the evidence was exchanged" (Article 14.8). However, it would appear logical that use of the evidence "for the purpose of the procedure" must include any use that's mandatory under national law as a result of that procedure. Otherwise, use of the SDGR would make it impossible for receiving competent authorities to respect national laws, such as archiving laws, since these too are essentially a form of further processing.

3 Challenges and Ambiguities

3.1 Reliance on Further Implementation

The analysis above has already shown that there are some ambiguities still on the exact interpretation of the SDGR, and the way the technical system will need to be implemented centrally and at the Member State level. Many of these are expected to be resolved through the adoption of one or more implementing acts by the European Commission, which should be in place by 12 June 2021, as required by Article 14.9 of the SDGR. These acts should set out the technical and operational specifications of the technical system.

In the sections below, we will briefly examine some further points of contention, which will likely be at least partially mitigated by the implementing acts.

3.2 Requirements for the User

As has been noted in the introduction above, the Regulation's approach is user centric in principle, since exchanges of evidence must be triggered by an explicit request from the user (subject to certain exceptions). Users can be either natural persons or businesses, since users are defined explicitly in the Regulation as "either a citizen of the Union, a natural person residing in a Member State or a legal person having its registered office in a Member State, and who accesses the information, the procedures, or the assistance or problem-solving services, referred to in Article 2(2), through the gateway".

The scoping is thus relatively broad, and it is worth noting that citizenhood (to be understood as having the nationality of a Member State) is not a prerequisite for eligibility to use the technical system. For a natural person, it is sufficient to have a residence in a Member State. Legal persons on similarly are required to have at least a registered office in a Member State.

While this approach is succinct and pragmatic, it also hides a significant degree of complexities that still need to be resolved, both technically and legally. The complexity stems from the fact that the Regulation envisages that the covered procedures can be completed in a fully online manner (Article 6), meaning that:

(a) *the identification of users, the provision of information and supporting evidence, signature and final submission can all be carried out electronically at a distance, through a service channel which enables users to fulfil the requirements related to the procedure in a user-friendly and structured way;*
(b) *users are provided with an automatic acknowledgement of receipt, unless the output of the procedure is delivered immediately;*
(c) *the output of the procedure is delivered electronically, or where necessary to comply with applicable Union or national law, delivered by physical means; and*
(d) *users are provided with an electronic notification of completion of the procedure.*

Thus, an important legal prerequisite is that users – natural and legal persons – can be identified electronically, that they can obtain the relevant evidence electronically, and that they can submit it electronically. This is not a trivial issue in practice. An important pre-existing input on this topic is the existence of the eIDAS Regulation(EU) No 910/2014, which regulates the recognition of national means of electronic identification by public authorities in cross border transactions, and also provides a legal framework for electronic signatures and electronic seals that may be used to authenticate evidences. However, there are several challenges on this point.

Firstly, the Single Digital Gateway Regulation does not contain a requirement to use means of electronic identification which are subject to the terms of the eIDAS Regulation. Recital (70) does note that "Member States are encouraged to increase the security of transactions and to ensure a sufficient level of confidence in electronic means by using the eIDAS framework laid down by Regulation (EU) No 910/2014 and in particular adequate assurance levels. Member States can take measures in accordance with Union law to safeguard cybersecurity and to prevent identity fraud or other forms of fraud". However, this is merely an encouragement, not an obligation.

While use of electronic identities that are recognised under the eIDAS Regulation – meaning that Member States have completed a notification procedure for these identities – is a partial solution, it does not resolve all challenges. At the time of writing, 14 Member States have a notified eID scheme – which is a substantial but not universal coverage. Furthermore, completing the notification process hardly resolves all legal challenges. The eIDAS Regulation recognises three tiers of quality of eID schemes (referred to as levels of assurance): low, substantial or high. There is no consensus at this stage which level of assurance should be adequate to permit identification within the technical system. While virtually all notified eID schemes achieve a 'high' level of assurance (meaning that they should open all relevant doors), there are some exceptions.

Secondly, even if all Member States would have a notified eID at the high level of assurance, that would still not comprehensively resolve all challenges for identifying users. Specifically for legal persons (i.e. companies or organisations represented by a specific natural person), there is no unambiguous legal framework yet for establishing the right of the natural person in any given procedure to represent the legal person in a given procedure. In simpler terms: neither the legislation nor the available infrastructure is currently capable of creating complete legal certainty on whether a specific person trying to access a procedure on behalf of a company is legally permitted to represent that company, or to obtain evidence for that company, or to submit it on that company's behalf. While pilot level solutions exist for this problem, the legal framework (and notably the eIDAS Regulation) has not yet been revised to create certainty on this point.

Thirdly, in order to resolve this problem, one should also take into account the potential multitude and variety of participants in an evidence exchange under the Single Digital Gateway Regulation. Insofar as a user interacts with a public authority targeted by the eIDAS Regulation, acceptance of a notified means of identification should be legally certain. However, evidences may be obtained from entities that do not normally interact with citizens in e-government procedures, or that may not unambiguously qualify as public authorities who would be obliged to accept notified electronic means of identification under the eIDAS Regulation (e.g. universities, who may need to provide electronic diploma's as a part of an Article 14 procedure). Therefore, even the universal applicability of the eIDAS Regulation would not comprehensively solve the identification and authentication challenge: the evidence providers may not currently support notified means of electronic identification, and moreover their own approach to user identification may not be technically capable of linking users unambiguously to an eIDAS notified eID.

Ultimately, this is largely a question of the extent to which competent authorities are willing to trust each other's procedures for the identification of users. If this trust is low, then a strict application of the eIDAS Regulation may be advisable, e.g. by requiring that evidences must be retrieved based on identification procedures using a high level of assurance under the eIDAS Regulation, and that proof of the use of such means of identification is presented. If trust is high, then other means of electronic identification could be permitted as well. Choices on this point, which are partially political and partially driven by objective risk assessment, will need to be made by the implementing acts.

3.3 Requirements for Competent Authorities

As noted in the introduction, a principal difference between national level once-only legislation and the SDGR is that national legislation can directly target specifically identified competent authorities, for the simple reason that they are known or at least identifiable under national law. The same is not true at the EU level, where administrations can differ widely from Member State to Member State, in terms of their designation, competences and capabilities.

For that reason, the SDGR applies a very open model, which focuses on high level identification of covered procedures, and succinctly notes that competent authorities comprise "any Member State authority or body established at national, regional or local level with specific responsibilities relating to the information, procedures, assistance and problem-solving services covered by this Regulation" (Article 3 (4)).

In other words, the relevant authorities are those entities which are tasked with specific responsibilities in relation to the covered procedures. In practical terms, this approach leaves Member States the greatest possible flexibility (and corresponding responsibility) in identifying entities which are affected by the SDGR. The consequence of this approach is also that a 'competent authority' is not necessarily a traditional public sector body. If a private sector entity is a body charged with these tasks, it will be qualified as a competent authority under the SDGR as well, and Member States will need to take measures to ensure that such entities can also provide evidences or accept them in the covered procedures.

Finally, it is worth underlining that the SDGR's provisions on the once-only principle as such do not require digitization of evidences and the underlying procedures. Article 14.2 notes that "where competent authorities lawfully issue, in their own Member State and in an electronic format that allows automated exchange, evidence that is relevant for the online procedures referred to in paragraph 1, they shall also make such evidence available to requesting competent authorities from other Member States in an electronic format that allows automated exchange".

The phrasing ("where" they issue) indicates that the clause is conditional: the authorities must also make evidence available in the context of the SDGR where it is already issued – if it is not issued in such a format, or if the issued evidence is not relevant to the online procedures, then there is no obligation for a Member State to move to such a format. More simply put: Article 14 does not create a legal obligation to issue electronic evidence at.

For completeness sake however, it should be recognized that Article 6 of the SDGR does contain an obligation for Member States to ensure that some procedures are offered fully online, which may result in evidences becoming available in an electronic format if the procedures require evidences; but the SDGR does not contain a direct legal obligation for Member States to introduce new types of evidences, or to provide electronic versions of them.

3.4 Requirements for Evidence

As noted above, the only evidences that must be made available for exchange within the scope of the SDGR are those which are already issued "in an electronic format that allows automated exchange". If such evidences are available, they must also be made available in the same format.

This raises a key issue: when exactly can evidence be considered to be "in an electronic format that allows automated exchange"? More specifically, does this description imply that the evidence must be formatted in a semantically meaningful way – i.e. must it be structured in a way that allows the evidence to also be interpreted and processed automatically, at least to some extent, by the receiving competent authority? Or from the opposite perspective: does it imply that unstructured evidence, such as a graphic image (a bitmap, JPEG, or PDF scan without a semantic structure), should not be considered to be evidence falling within the scope of Article 14?

The concept of evidence "in an electronic format that allows automated exchange" can be interpreted and scoped in many ways. Generally speaking, "evidence" is a fluid concept, that should not be simply equated to standardised formal documents, comparable to the traditional way of working in an analogue environment (e.g. through standardised birth certificates, statements of domicile, extracts from criminal registers, etc.). In a digital environment, a much more granular approach is possible.

Increasingly, evidences are no longer supplied as static documents. Rather, evidences are nowadays often available as the result of a dynamic process, consisting of a concrete response – sometimes as simple as a yes/no assertion – to a specific question. For instance, to prove that someone has permission to drive a certain type of car, it is not necessary to transfer comprehensive driver's license records. It suffices to query a register whether a specific person is allowed to drive. If the register only answers „yes" or „no", the 'evidence' is a minimal but perfectly suitable assertion, that would optimally preserve privacy.

There is still some discussion at present to what extent fully unstructured electronic evidences would satisfy the requirements of the SDGR. Based on the lack of constraints on this point in the SGDR, it seems that evidence requesting competent authorities cannot reject evidence in an unstructured format. It is the issuing Member State that determines which evidence is lawfully issued and how, in accordance with its own national laws. There is no legal basis for a receiving Member State (or a receiving competent authority) to reject evidence because it does not meet its formatting/structure expectations. For completeness, it can be noted that a receiving Member State may require additional documentation to be provided, such as translations of the evidence.

Since this means that semantic information may be missing from the evidence, it is all the more important for the technical system to ensure that at least sufficient metadata or some other form of semantic context is included during the exchange, to allow the receiving competent authority to interpret the nature and content of the evidence. As a result, the technical system should be designed in a way that allows this metadata or semantic context to be discovered during an evidence exchange, either because the metadata or semantic context is embedded in the evidence itself (which would be the optimal scenario), or because the exchange is accompanied by metadata that contains the relevant semantic context and corresponding information in the evidence.

There is one further layer of complexity relating to evidence in the SDGR. Article 14.8 requires that evidences must be "limited to what has been requested", which raises some concerns on the common practice of providing standardized evidentiary documents that contain substantially more information than required. By way of example, if a competent authority wishes to receive evidence of the date and location of birth, it may receive a birth certificate that contains not only those data points, but also information which is not strictly needed (e.g. identity of the attesting doctor or public official, identity numbers, identity of the parents, etc.). This is of course suboptimal from a data protection perspective, since more data is exposed than would be strictly necessary.

None the less, if such documents are the available and relevant evidences in the issuing country, it seems that they satisfy the requirements of the SDGR, even though they are arguably a practice that's subject to significant improvement.

3.5 Requirements for Data Flows

As an application of the once-only principle, Article 14 requires that the technical system allows the automated exchange of evidence between competent authorities in different Member States – a flow which therefore goes from administration to administration. Similarly, it notes that the authorities must "make such evidence available to requesting competent authorities from other Member States in an electronic format that allows automated exchange". These provisions strongly suggest a direct exchange, where evidence is requested by one competent authority from another, and provided by that competent authority in response.

None the less, as the sections above in relation to request and preview have illustrated, the reality is not so straightforward: while one competent authority may request evidence from another, that request must in principle be preceded by a request from the user. It is presently still an open question whether the evidence issuing authority may insist on proof of the original request from the user, or whether it is simply required to trust that the requesting competent authority has met all applicable requirements. This issue too will presumably be addressed in the implementing acts.

Similarly, the preview requirement indicates that evidence does not simply flow from one competent authority to another upon request: it must be made available for preview to the user, which implies that it is transferred first to the user (possibly merely as a visual representation rather than as a comprehensive file). Since the communication to the user for the purposes of a preview will typically be needed, it also seems defensible that the evidence is not transferred directly from one authority to another, but rather that it passes through the user, e.g. via a controlled end user environment. This approach can be in line with the once-only principle, provided that it is organized in a clear data flow that allows the user to continue his or her administrative procedure seamlessly – in other words, provided that the implementation does not simply result in the user receiving their evidence and then being left to their own devices.

In ideal circumstances, relevant evidence will be immediately available upon request. However, there are situations where evidence will need to be collected or created upon request, e.g. because the relevant evidence is only available on paper and requires digitization. This implies an interrupted procedure, where a user initiates a procedure and evidence is requested, but the procedures is thereafter halted temporarily – potentially for hours or days – while electronic evidence is created. This is a challenge for the vision of the SDGR, due to the preview requirement – evidence that does not yet exist cannot be previewed, meaning that the session will need to be interrupted. This is not legally problematic under the SDGR, since it contains no requirement that evidences must be available instantaneously or that procedures must be completed immediately. However, from an infrastructural perspective it does create problems: since users cannot remain logged into a session for days, such interrupted procedures imply the creation of some form of personal information management system where procedures can be put on hold until all information requirements are met.

As a final challenge in implementing smooth data flows, there is also the problem that some evidence may not be available for free. In SDGR procedures, it is possible that a user has to pay to obtain certain evidences from an issuing authority. By way of examples, an extract from a business register may not be free, or even a birth certificate could in theory require a charge covering the administrative cost born by the authority.

The SDGR does not affect this ability to charge. It contains a section requiring Member States to ensure that electronic payments are possible for the completion of online procedures, namely Article 13.2 (e), which notes that "where the completion of a procedure requires a payment, users are able to pay any fees online through widely available cross-border payment services, without discrimination based on the place of establishment of the payment service provider, the place of issue of the payment instrument or the location of the payment account within the Union". However, this provision clearly is applicable to the payment by the user of a fee to the competent authority requesting evidences for the cost of the administrative process. It does not address the payment of a fee to the competent authority providing evidences (the data provider).

It appears that the SDGR is silent on the issue of payment to evidence providers, and therefore that there is no formal legal obligation for Member States or their authorities to modify or eliminate their charging policies in the context of the SDGR. In other words, if the issuing competent authority already charges a fee to the user for evidences outside of the context of the SDGR, they can also do so for procedures covered by the SDGR.

4 Concluding Notes and a Perspective on the Future

4.1 The SDGR as a First Step into a European Once-Only Framework

As this contribution hopes to illustrate, the SDGR is a milestone achievement for European e-government. It is the first attempt to create a legal framework for cross-border once-only functionality, and successfully defuses many of the inevitable challenges that arise at this scope, such as the need for user control (through the request and preview requirement), the difficulty of identifying competent authorities and relevant evidences (by focusing on enumerated procedures rather than on the entities and documentation behind them), and the freedom of the user to elect *not* to use the system if that is their preference.

None the less, the SDGR is not without its challenges. Its closed list of procedures means that it has limited flexibility to grow without further regulatory intervention. Its insistence on user control ensures that the once-only principle cannot be applied to enable verifications or recurring exchanges without user approval, even when this would be manifestly in the public interest. And there are very many topics – user authentication needs, semantic structure of evidence, interrupted procedures, the right for competent authorities to check each other's work, and payment for evidences, to name but a few – which are left open to further implementation and interpretation.

As such, the SDGR is truly the first step in this evolution: it is ambitious and challenging in its own right, but unlikely to be the conclusion of the once-only model.

4.2 Once-Only as an Evolving Story of Trust

To at least some extent, the constraints built into the SDGR are merely indicative of the current technical state of play, and of the need for Member States to establish a first measure of experience in direct evidence exchanges before engaging in even more ambitious variations on this theme. Even if the implementation of the SDGR as envisaged in Article 14 is fully successful, revisions of the functional model and the legal framework are inevitable.

Beyond extensions of the number of procedures to be covered, it is likely that at least some Member States will want to examine the possibility of direct exchanges of certain data *without* a prior request from the user – as is already permitted under many national once-only laws – including through data subscription models where any changes in the data are automatically communicated. Inversely, some Member States will want to work in an even more user centric manner, where citizens and companies have their own decentralized but protected personal data spaces, in which they can store and reuse evidences as they please, including by providing them to any desired recipients, rather than just those enumerated under European once-only law.

These approaches are neither inevitable, and nor are they necessarily superior to those of the SDGR. Rather, they are indicative of a different trust model, and of an evolving perspective on an ideal e-government or even on an ideal information society. Future trends are hard to predict, but in all likelihood, the SDGR will not prove to be the end station for European once-only legislation.

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Legal Basis and Regulatory Applications of the Once-Only Principle: The Italian Case

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Abstract. This study presents how the OOP is related to the constitutional and institutional principles concerning the good performance and impartiality of public authorities and the protection of citizens' rights against the action of public administration, with special regard to the Italian regulatory framework. The national path towards the implementation of the principle is examined, starting from the obligation of the use of self-certifications in place of certificates and the automatic acquisition of data and documents in administrative procedures down to the digitalization of administrations and the interoperability of public databases. A specific paragraph is devoted to the OOP in public procurement, as crucial for development of the European digital single market.

Keywords: Once-only principle · Interoperability · Public administration

1 Introduction

The once-only principle (OOP), states that "public administrations should collect information from citizens and businesses only once and then, respecting regulations and other constraints, this information may be shared". In other words, the OOP consists in the prohibition or, at least, in the limitation for public administrations to request documents and information that are already in their possession, with the consequent obligation to share data they contain, nowadays through IT systems interoperability [1–3].

Already in 2009, a declaration of this content was signed by the Ministers of the EU Member States: "we will use eGovernment to reduce administrative burdens, partly by redesigning administrative processes in order to make them more efficient. We will exchange experience and jointly investigate how public administrations can reduce the frequency with which citizens and businesses have to resubmit information to appropriate authorities" [4].

In 2015, the once-only principle was indicated as a pillar of the Digital Single Market Strategy for Europe launched by the European Commission, with the decision to undertake a pilot project to explore the possibilities of setting up a secure IT solution to achieve the objective of the widespread application on the continent of the principle, since only in (optimistic!) 48% of the cases "the public administration uses the information on citizens or businesses it already has, avoiding to ask again" [5].

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Although it is recognized that Member States are digitising their public administrations to save time, reduce costs, increase transparency, and improve both data quality and the delivery of public services, the Commission has confirmed that digital public services are not yet a reality in the European Union, therefore a coordinated approach is necessary at all levels, when legislation is prepared, when public administrations organise their business processes, when information is managed and when IT systems are developed to implement public services. Otherwise the existing digital fragmentation will be intensified, which would endanger the offering of connected public services across the EU [6, 7].

In this context, this study will therefore deal with the Italian legal experience of implementing the OOP. First, it will seek to show that the once-only principle is strictly related to the constitutional principles of the Italian legal system in the field of public administration and constitutes a natural development of them.

Secondly, that many regulatory applications of the OOP can already be found in the internal legal system, starting from the non-recent rules concerning self-certifications. In this sector, the Italian legal system has gone from authorizing the use of self-certifications to complete de-certification and ex officio acquisition of data and documents by public entities.

In more recent times, copious legislation has developed regarding the digitization of administrative procedures, with the attempt to make interconnected public databases. It will therefore appear evident that the country is still lacking in terms coordination, the IT governance being divided between central and local authorities.

Finally, particular attention will be dedicated to the area of public procurement, also indicated by the European Commission, at the start of its Communication on the European Interoperability Framework, as the sector which accounts for over a quarter of total employment and contributes to approximately a fifth of the EU's GDP, and therefore plays a key role in the digital single market as a regulator, services provider and employer [6], especially in critical times, as in the current recovery period after the Covid-19 pandemic.

2 The Constitutional Basis of the OOP in Italy, as a Fundamental Rule of Administrative Activity and Organization

In the Italian legal system, the OOP reflects some general principles concerning organization and administrative activity: the rational organization and the correct performance of the administrative function is aimed at the protection of the position of private individuals [8, 9]. It is well known that procedural complications lend themselves to illegal negotiations [10–12] and they could represent a risk for impartiality and thus, organizational measures, in addition to behavioural ones, are indicated as fundamental to prevent corruption in public administrations [13].

Many studies have described the administrative function as constituted by organizational elements (function conceived as competence, office: from the Latin meaning of "officium", "munus") intrinsically connected with dynamic action (function as public purpose and function as carrying out of targeted activity) [14, 15].

The once-only principle can play an essential role in regulating the organization of bodies, as much as the dynamic development of their action from a service perspective [16–19]. OOP is aimed at increasing service levels, reducing costs, simplifying, but also improving the integrity of the administration and more fully satisfying the needs of citizens. It is therefore in close correlation with the institutional principle of functionality of public entities.

A general "right to good administration" is today declared by the Charter of Fundamental Rights of the European Union (having the same legal value as the Treaties: Art. 6 T.E.U.). If the art. 41 of this Charter literally refers to the need for administrative decisions to be taken impartially, fairly and within a reasonable time, many have provided a broad interpretation of it. This includes the duty of loyalty and the spirit of collaboration of the administrations with citizens, according to an approach of "administrative simplicity" which responds to the needs of substantial legality: burdens that are not strictly indispensable for the administration to carry out its service function should not be imposed on the citizen [20–22].

The principle of good administration (more than the right[1], or at least a duty[2]) is included in the Italian Constitution in the cardinal principles of the rule of law, impartiality and good performance (Art. 97 of the Constitution), as well as in the fundamental principles of the democratic State (art. 2 and 3 of the Constitution). In addition, numerous "programmatic rules" place proactive tasks on the Republic (from its highest institutions - the Parliament and the Government, as well as, on the implementation level, its executive institutions - the administrative offices)[3] to favour the implementation of the principle.

The criteria of economy, effectiveness and efficiency, set out in the general law on the administrative procedure are based on these constitutional rules, in addition to the prohibition of unjustified aggravation of the procedure[4]. and they represent an expression

[1] If considered as a right, it would necessarily correspond - in Italian law - to an action that can be brought before a judge. The principle of good administration includes, however, rules substantial and procedural, not all executable, to which administrative activity should conform in a modern democratic system of law [22].

[2] It should also be remembered the theories regarding a duty of good administration, including those operative rules which, although not always expressed, are not less relevant and no less binding for the administration, because imposed by the real and actual need to draw from the goal imposed by law [23]. The authors describe these "extra legem" rules (good administration directives) as flexible elements which represent an immanent necessity in this system, due to the flexibility necessary for administrative action in relation to the purposes to be achieved, and for the ineptitude of the written norm to adequately foresee all the situations that are determined in order for the purposes themselves. The Italian administrative justice traditionally sanctions the violation of this "ius non scriptum" (unwritten law) which guides the action of the public administration through judgment on excess power [24].

[3] Italian scholars refer to the programmatic rules of the Constitution as a "promised revolution", still to be implemented (as directives) with regulatory activity. In this sense, the discipline of public administration cannot be derived from Articles 97 and 98 only, but from the entire Constitution [25–28].

[4] Art. 1, par. 2 of the Law no. 241 of 1990, according to which the public administration cannot aggravate the procedure except for extraordinary and motivated needs imposed by the conduct of the proceeding.

of the institutional principles of proportionality[5] and reasonableness (attributable to the theories of procedural rationality) of public action [29, 30].

According to scholars, the prohibition of aggravation – as one of the principles of the "minimum procedure" [31] – constitutes a fairness or good faith canon, whose normative explanation is to prevent any harassment in contact between public authority and citizens, with the aim of guaranteeing the values of the person safeguarded at the constitutional level (Art. 2 and 3 of the Constitution) and, at the same time, enhance the spirit of collaboration that must connote the activity of the public official (Art. 98 of the Constitution) [32].

The EU legal framework and the Italian constitutional principles therefore represent a solid basis from which to derive the rule of legal civilization, according to which users (citizens and other public offices) must not be repeatedly requested by the administration to provide data already produced to it. In other words, the once-only principle, as a fundamental rule of simplification, responding to a public and private interest of good administration [9, 30], tends to avoid duplication of requests for unnecessary and overabundant documentary mailings, which represent inefficient and uneconomical operations for the administration and which generate intolerance and distrust in citizens, often causing them harm.

In literature, the principle recalls the famous novel "The Castle" by Franz Kafka, in which the irrational management of documents by public servants causes an extreme discouragement in citizens who meet them: "The woman opened the cupboard at once, while K. and the mayor watched. It was stuffed with papers, and when it was opened two large bundles of files fell out, tied up as you might tie up bundles of firewood. The woman flinched in alarm. 'Try lower down, lower down,' said the mayor, directing operations from his bed. The woman, gathering up the files in her arms, obediently cleared everything out of the cupboard to get to the papers at the bottom. The room was already half full of papers. […] 'I don't think the files are going to be found,' said K. 'Not found?' cried the mayor. 'Mizzi, please search a little faster! For a start, however, I can tell you the story without files…" [33].

In the Italian experience, the formalism of the procedures is often justified also by the lack of mutual trust that characterizes the relationship between citizens and public administrations. The former are inclined to exploit the shortcomings of the offices to their advantage (for example, the high rate of non-veracity of the self-certifications, which is also favored by the absence of controls); the latter are often not very credible as regards the information provided and inclined to disregard the credit lines generated. The same legislator tends to set rigid and binding rules (for example in terms of conflict of interest) that seem to convey the idea that the public administration cannot be trusted [34].

In fact, the rules on administrative action and organization (such as the prohibition of procedural aggravation and therefore the once-only principle) are set to protect the

[5] The proportionality principle is stated by Art. 5 of the T.E.U. and from its Protocol no. 2 on the application of the principles of subsidiarity and proportionality. Here we can summarize it according to the liberal formula, which in Italy can be traced back to the studies of the early nineteenth century by Gian Domenico Romagnosi, of the "minimum means", that is the pursuit of the public interest with the least possible sacrifice of the interests of citizens.

dignity of the individual and to guarantee his full development (see Art. 3, par. 1 of the Constitution), not only as mechanisms for increasing functionality and administrative efficiency, according to the logic of good performance (Art. 97 of the Constitution) [32]. Thus, they assume a double role, of organizational and functional principles with which the public entity ("ex parte principis") must comply, but also of protection of citizens' rights towards power ("ex parte civis") [22, 35]. Conversely, acts of maladministration constitute a potential violation of the fundamental rights of the individual and the constitutional principle of solidarity (Art. 2 of the Constitution) [36].

3 A First Regulatory Application: Self-certifications and Ex Officio Acquisition of Data and Documents

In Italy, a first, temperate, application of the once-only principle can be found in the self-certification legislation. Since the reform of 1968[6], it has been possible to prove with declarations, also contextual to the application, signed by the interested party in place of the normal certificates, the date and place of birth, residence, citizenship, the enjoyment of political rights, the state of celibate, married or widowed, family status, existence in life, birth of son, death of spouse, ascendant or descendant, position for the purposes of military obligations and registration in registers or lists kept by the public administration[7]. The law also introduced temporarily substitutive declarations, substitutive declarations of the deed of notoriety and proof of date and place of birth, residence, unmarried, married or widowed state and any other state or personal quality by showing identity documents[8] [37]. Previously, the legislation already provided that the requirements of citizenship, good conduct and the absence of criminal records were ascertained ex officio by the administration which must issue the provision. On the other hand, the administration could not request documents or certificates from the private individual concerning facts and circumstances that were attested in documents already in its possession or that it itself was required to certify[9].

From a legal point of view, self-certifications can be associated to the scheme of liberalization from administrative authorizations. In the past, certifications represented the only suitable tool to create legal certainty and, therefore, to legitimize the activities and behaviours that in this declaration found a prerequisite. Through self-certification, the public title is replaced by an act formed independently by the citizen concerned, through a private declaration, which is recognized as having the same validity and effectiveness as the certification act issued by the public authority [38].

Although self-certification does not imply the total exclusion of sending information already held by the administration, nevertheless it has represented a significant simplification and lightening of the burden to present documents [39], especially when the automatic exchange of content between the various "static" archives of public administrations was not yet possible, unlike "dynamic" archives of today's databases [40].

[6] Law of 4 January 1968, no. 15, which states rules on administrative documentation and on the legalization and authentication of signatures.

[7] Art. 2 of the Law no. 15 of 1968.

[8] Respectively, Articles 3, 4, 5 of the Law no. 15 of 1968.

[9] Art. 2 of the Presidential Decree of 2 August 1957, no. 678.

Following further reforms, the legislation was taken up, reordered and expanded by the Consolidated Act of the laws and regulations of 2000 on administrative documentation [41] which provided for the general prohibition for public administrations to issue and request the production of certificates [42] accompanied by the obligation to automatically acquire the information subject to substitute declarations as well as all data and documents that are already in their possession[10]. Especially the original version of Art. 43 of the Act presented a structure very close to the European definition of the once-only principle[11] [43].

The binding force of these rules lies, moreover, in the presence of specific sanctions for officials who do not accept self-certifications or who, on the contrary, request and receive certificates[12], in addition to the limitation of the validity and usability of certificates issued by the public administration only in relations between private subjects[13].

In this regard, however, the consequence of the spontaneous presentation by the citizen of certificates for the initiation of an administrative proceeding is not clear. If the rule on decertification is interpreted rigorously, it could lead to the result - quite contrary to the idea of simplification - of invalidity of the decision adopted by the proceeding administration based on the illegitimately produced certificate. This conclusion has been discarded, since the rules on decertification are primarily aimed at protecting the user who submits the application in order to reduce the bureaucratic burden on him [43].

With the 2005 reform, it was also included in the general law on the administrative procedure the obligation of ex officio acquisition of the documents necessary for the investigation certifying deeds, facts, qualities and subjective states, when they are in the possession of the proceeding administration or which are held, institutionally, by

[10] Art. 43, par. 1 of the Presidential Decree of 28 December 2000, no. 445, as amended by Art. 15 of the Law of 12 November 2011, no. 183, which states that public administrations and managers of public services are required to acquire ex officio the information which is the subject of the substitutive declarations referred to in articles 46 and 47 of the same Decree, as well as all data and documents held by public administrations, upon indication by the interested party, of the essential elements for finding the information or data requested, or to accept the substitute declaration produced by the interested party.

[11] Art. 43, par. 1 of the Presidential Decree no. 445 of 2000, in its original version, stated that public administrations and managers of public services could not request deeds or certificates relating to states, personal qualities and facts listed in art. 46 of the same Decree, or which in any case they were required to certify. In place of these deeds or certificates, the subjects indicated were required to acquire the relevant information ex officio, upon indication, by the interested party, of the competent administration and of the elements essential for the retrieval of the information or of the requested data, or to accept the substitute declaration produced by the interested party.

[12] Art. 74 of the Presidential Decree no. 445 of 2000, which punishes as a violation of official duties the non-acceptance of the substitute declarations of certification or deed of notoriety made pursuant to the provisions of the Decree, the request and acceptance of certificates or notarial deeds; the refusal by the employee in charge of accepting the attestation of states, personal qualities and facts through the presentation of an identification document; the request and production, respectively by civil status officers and health directors, of the certificate of assistance at birth for the purpose of training the birth certificate; the issue of certificates that do not comply with the provisions of Art. 40, par. 2, of the same Decree.

[13] Art. 40, par. 1 of the Presidential Decree no. 445 of 2000.

other public administrations [44]. The law only allows the proceeding administration, collaborating with private citizens, to request from interested parties the elements which are strictly necessary for the search for documents[14]. On the other hand, the law allows the suspension of the deadline for the conclusion of the procedure only for the acquisition of information or certifications relating to facts, states or qualities not attested in documents already in possession of the administration itself or not directly obtainable from other public administrations[15].

The ex officio assessment, expression of the non-aggravation and economy principles, as an ordinary and prevalent method for the acquisition of evidence by the administrations, represents a fundamental instrument, which simplifies to the widest possible extent, up to practically eliminating them, the obligations to provide certain data to the administration, while ensuring that the data acquired are fully reliable [42]. Rare judgments of administrative justice on this subject have underlined the relationship between the rules on the ex officio assessment and the principles of non-aggravation and cost-effectiveness, as well as the principle of "informality", initially present in the draft law on administrative procedure prepared by the Commission chaired by Mario Nigro [45, 46].

If effectively respected, the obligation to acquire ex officio data and documents would represent the overcoming of both certifications and self-certifications and substitute declarations, as perfect applications of the once-only principle, with the further positive effect of the greater degree of certainty for the administration as the certification cycle would be completely exhausted within the public organization [38].

4 The OOP and Public Systems Interoperability

The practical application of self-certification and ex officio document acquisition necessarily requires efficient systems of communication and exchange of information between paper archives and databases [47]. In fact, there are many public and private interests which are compared with reference to administrative data: the interest of the proceeding administration in the safe storage of its documents, the interest of other authorities in acquiring public information quickly and efficiently, the citizen's interest in avoiding providing administrations with duplicate information for different administrative procedures, but to provide data only once for the entire administrative system interconnected on the network [48].

According to the definition given by the European Commission, when we talk about interconnected networks we indicate a (computer) system within which two or more terminals are able to communicate and therefore exchange information between themselves in an automated way, thus allowing access to data stored on a system other than the one requesting the information itself [5].

By applying this paradigm within administrations, a public entity could have access to information held by another one without the need - at least technical - for any interaction between officials. It would be enough for the proceeding office to request, through its own

[14] Art. 18, par. 2 of the Law no. 241 of 1990, as amended by Art. 3 of the Law-Decree of 14 March 2005, no. 35.

[15] Art. 2, par. 7 of the Law no. 241 of 1990.

computer system, the data it needs, and it could automatically retrieve the information requested by the system made available by another public administration [40].

Thus, launching a strategy to implement interoperability, the European Commission proposed it as a key factor in making a digital transformation possible, that allows administrative entities to electronically exchange, amongst themselves and with citizens and businesses, meaningful information in ways that are understood by all parties. It includes the four fundamental aspects that impact the delivery of digital public services: legal issues (legal interoperability), by ensuring that legislation does not impose unjustified barriers to the reuse of data in different policy areas; organisational aspects (organisational interoperability), by requesting formal agreements on the conditions applicable to cross-organisational interactions; data/semantic concerns (semantic interoperability), by ensuring the use of common descriptions of exchanged data; and technical challenges (technical interoperability), by setting up the necessary information systems environment to allow an uninterrupted flow of bits and bytes [6, 7].

In order to reach the effective possibility for citizens, institutions and companies to provide data only once to the administration that needs to have it, also according to the Italian Court of Auditors it is therefore necessary to apply an "organic approach" [49], which involves the creation of information systems able to guarantee interoperability, that is the effective and automated exchange of data and information, both internally between offices of the same administration, and externally between different public entities [50].

The possibility of correlating the collected data multiplying the information capacity of the consultations and the possibility of exchanges between different databases are considered features of the electronic processing systems that bring undeniable advantages for an orderly and efficient performance of administrative activity. The easiest access to information, the reduction of costs and times, the elimination of duplications of data collections, the uniformity of the techniques that can be adopted and the simplification of the controls that the public administration could carry out on a large scale thanks to the existence of the databases, constitute great advantages of any technically organized documentation [51].

Interoperability is defined by the Italian legislator as characteristic of an information system, whose interfaces are public and open, to interact automatically with other information systems for the exchange of information and the provision of services[16]. It constitutes an indispensable prerequisite for promoting and accelerating the circulation of public evidences without resorting to the traditional instrument of certificates [42]. The simplification of the document burdens is therefore closely related to the rules on digitization, starting from the general provision according to which public administrations use in internal relations, in those with other administrations and with private individuals information and communication technology, ensuring the interoperability of the systems and the integration of service processes between the various administrations in compliance with the Guidelines[17] [47].

[16] Art. 1, par. 1, lett. dd of the Legislative Decree of 7 March 2005, no. 82, Digital Administration Code, added by Art. 1, par. 1, lett. g of the Legislative Decree of 26 August 2016, no. 179.

[17] Art. 12, par. 2 of the Legislative Decree no. 82 of 2005.

In organizing their own activity autonomously, the same administrations are required to use information and communication technologies to achieve the objectives of efficiency, effectiveness, economy, impartiality, transparency, simplification and participation in compliance with the principles of equality and non-discrimination, as well as for the effective recognition of the rights of citizens and businesses in accordance with the objectives indicated in the three-year Plan for information technology in the public administration[18]. One of the three fundamental «paradigms» of the 2019–2021 Plan is precisely the once-only principle, according to which public administrations must avoid asking citizens and businesses for information already provided [52]. For public procurement the interoperability of the platforms is indicated as a key factor to guarantee quality, uniqueness and certainty of data [53, 54].

In this context, information technology has moved from a simple tool to support procedures to an enabling factor for innovation and development, with a strategic role in contemporary society: the once-only principle makes it possible to rethink the control and monitoring processes using all the potential offered by ICT technologies [49].

Data governance aimed at guaranteeing uniformity in management through a common system design, is therefore essential for full interoperability, "the key to a holistic approach" (as we said, technical and organizational but, above all, semantic interoperability which requires a common language that allows systems to communicate with each other) [7, 50, 55]. The Italian Constitution, as amended in 2001, takes due consideration of this aspect, entrusting the legislative and IT information coordination of state, regional and local administration data to the exclusive legislative competence of the State[19] [48, 56].

Unfortunately, it must be noted that in the Italian administrative system, characterized by sections of accentuated centralism and sections of strong decentralization [48], this essential function of coordination has so far been carried out in an at least fluctuating manner – so that it has been described as a "harnessed giant" [57]. The evolution of governance in the field of public IT has been widely described, with continuous transformations in terms of the subjects involved and related institutional structures, competences and assigned resources, organizational models adopted. It can provide useful elements to understand the public response to the evolving market of citizens and businesses [49].

Since the nineties, the need for a unitary direction to improve innovation in the public sector was evident. In 1993 an Authority for Information Technology in the Public Administration (AIPA) was established[20], which became in 2003 the National Center for IT in the Public Administration (CNIPA). From 1 January 2004, the CNIPA incorporated the Technical Center for the RUPA (Unitary Network of Public Administration).

In the years 2001–2006 a Minister for Innovation and Technologies was appointed, with authority for the coordination and direction of the Government policy in matters of development of ICT and, at the same time, set up a Department for the Innovation of Public Administration. In the years 2008–2011, the Innovation and Technologies Department was entrusted to the Minister for the Public Administration.

[18] Art. 12, par. 1 of the Legislative Decree no. 82 of 2005.

[19] Art. 117, par. 1, lett. r of the Constitution.

[20] In implementation of the Legislative Decree of 12 February 1993, no. 39.

In 2009 CNIPA was transformed into DigitPA, a public body charged with design, technical and operational functions, and with the mission of contributing to the creation of value for citizens and businesses through the implementation of the digital administration.

Subsequently, within the framework of the strategies outlined by the European Digital Agenda, in 2012 the establishment of a “Control Room” for the implementation of the Italian Digital Agenda[21] was provided. The Agency for Digital Italy (AgID)[22] was also established, to support the implementation of the Digital Agenda and therefore to direct the innovative digital evolution. AgID took over the functions of DigitPA and the Innovation and Technologies Department.

In 2016, the “Control room” was replaced by an Extraordinary Commissioner for the implementation of the Digital Agenda, with operational coordination functions of public entities operating in the field of ICT[23]. The powers of the Extraordinary Commissioner were joined by a “Digital Transformation Team”, composed of selected experts also outside the public administration. The Commissioner and the Team ended their mandate in 2019.

In this long wake of reforms, lastly, a Minister for Innovation and Technologies was appointed to the new Government. At the same time, from 1 January 2020, the Department for Digital Transformation[24] was restored, as a general structure of the Prime Minister’s Office, aimed at ensuring, also through technological-interoperable architectural choices, the necessary operational coordination between the State administrations involved, in various capacities, in the pursuit of the Government’s objectives regarding innovation and digitalisation. The new Department makes use of the experts who already formed the Digital Transformation Team.

Despite the effort of continuous improvement and reorganization, the need to overcome the fragmentation and overlaps of governance in this field remains, given that other institution such as the Department of the Public Function, the Ministry of Economy and Finance, the Ministry for Economic Development, the AgID, the National Anti-Corruption Authority (A.N.AC.), the Guarantors for the protection of personal data continue to maintain relevant data coordination functions in their sectors of activity.

Recent reforms to the Digital Administration Code have required the conclusion of framework agreements in order to share data between certifying bodies, other public administrations and private individuals, in the absence of which the Government can intervene by establishing a deadline within which administrations they make the data available, accessible and usable. Failure to fulfil the obligation to share data is sanctioned as failure to achieve a specific result by the managers responsible for the structures and leads to reductions in the remuneration[25].

[21] Art. 47 of the Law of 4 April 2012, no. 35.

[22] Law-Decree of 22 June 2012, no. 83.

[23] Legislative Decree no. 179 of 2016.

[24] Decree of the Prime Minister (d.P.C.M.) of 19 June 2019.

[25] Art. 50, par. 2-ter, of the Legislative Decree no. 82 of 2005, introduced by the Law-Decree 19 May 2020, no. 34; Art. 50, par. 3-ter, of the Legislative Decree no. 82 of 2005, introduced by the Law-Decree 16 July 2020, no. 76, converted by Law 11 September 2020, no. 120.

For years the legislator has issued numerous tools to try to implement interoperability between public databases. At European level the Commission has established and periodically updates a European Interoperability Framework, as a commonly agreed approach to the delivery of European public services in an interoperable manner, which defines basic interoperability guidelines in the form of common principles, models and recommendations [3]. As it is not possible to review all the tools provided in specific sectors here (a focus on public procurement will be carried out in the following paragraph), we can however identify two main interoperability systems envisaged at a general organization level of public administrations by the Digital Administration Code.

From a technical point of view, the first infrastructure that addressed the interoperability needs was the RUPA, created by AIPA, later replaced by the Public Connectivity System (SPC) which defines both the enterprise architecture of the Italian PA (i.e. the reference system for linking inter-administrative operational processes with the information systems that support them) both the subsidiary, coordination and governance actions[26] [58, 59]. It was further developed in 2016, when it was clarified in the Digital Administration Code that the SPC is established as a set of technological infrastructures and technical rules that ensures interoperability between the information systems of public administrations, allows the information and IT coordination of data between central administrations, regional and local and between them and the systems of the European Union and is open for accession by public service operators and private entities[27] [50].

The SPC is thus a tool aimed at overcoming the barriers between administrations, with a view to full decertification, to make it possible to fully share and acquire data ex officio: the law establishes that exchanges of IT documents carried out within the framework of the SPC, created through the application cooperation and in compliance with the related safety technical procedures and rules, constitute valid documentary transmission for all legal purposes[28].

A further important tool aimed at promoting the knowledge and use of the information assets held, for institutional purposes, by administrations and managers of public services, as well as for the sharing of data between the subjects who have the right to access it for the purpose of simplifying administrative requirements of citizens and businesses, is the National Digital Data Platform (PDND) governed by Art. 50-ter of the Digital Administration Code, recently reformulated by the Law-Decree for simplification and digital innovation[29].

Promoted by the Prime Minister's Office, it consists of a technological infrastructure that makes it possible to interoperate information systems and public databases, through accreditation, identification and management of the authorization levels of the subjects authorized to operate on it, as well as the collection and storage of information relating to

[26] Introduced in the Digital Administration Code (Articles 72 et seq. of the Legislative Decree no. 82 of 2005) by the Legislative Decree of 4 April 2006, no. 159.

[27] Art. 73, par. 1, of the Legislative Decree no. 82 of 2005, as amended by the Legislative Decree no. 179 of 2016.

[28] Art. 76 of the Legislative Decree no. 82 of 2005.

[29] Art. 50-ter, par. 1 of the Legislative Decree no. 82 of 2005, as amended by the Law-Decree no. 76 of 2020.

accesses and transactions made through it[30]. It was first developed by the Digital Transformation Team as Data and Analytics Framework (DAF); since 2019 it was entrusted to the new public company, PagoPA Spa[31]. The Department for Digital Transformation has the task of supervising the strategic objectives of the PagoPA company [60].

The new regulation provides that, in the first application phase, the PDND ensures priority interoperability with the information system of the Indicator of the Equivalent Economic Situation (ISEE), with the National Registry of the Resident Population (ANPR) and with the Revenue Agency databases. The AgID is in charge of adopting guidelines for the definition of technological standards and safety, accessibility, availability and interoperability criteria for platform management[32].

The Law-Decree for simplification and digital innovation of 2020 has also introduced a National Data Strategy, to be adopted with a Decree of the Prime Minister, which identifies the types, limits, purposes and methods of making available aggregated and anonymised public data[33].

5 The OOP in Public Procurement

The Digital Single Market Strategy for Europe launched by the European Commission in 2015 already indicated the need to apply the once-only principle in public procurement, which represents about 19% of the Union's GDP. Given the few and fragmented possibilities of contact between public administration, citizens and businesses, the Commission estimated the economies of scale brought about by the electronic reform of public contracts at 50 billion euros per year. Therefore, the objectives of administrative simplification and efficiency by digitizing public procurement appear immediately closely related: "The Commission will present a new e-Government Action Plan 2016–2020 which will include (i) making the interconnection of business registers a reality by 2017, (ii) launching in 2016 an initiative with the Member States to pilot the 'Once-Only' principle; (iii) extending and integrating European and national portals to work towards a 'Single Digital Gateway' to create a user friendly information system for citizens and business and (iv) accelerating Member States' transition towards full e-procurement and interoperable e-signatures" [5].

In this sense, the potential in terms of economic benefits of digitalisation of public administrations has been highlighted for a long time, if it is conceived not so much as a simple transposition of papery procedures into computerised (which would involve a mere transfer of the criticalities of the former in the latter), but as an opportunity to radically reorganize and simplify the same [34, 53]: in particular the digitalisation of the public procurement sector [61, 62] can play a strategic role for the economic and social increase especially in critical times, for instance capturing the effects of structural renewal of the impact of the Covid-19 emergency [63].

[30] Art. 50-ter, par. 2 of the Legislative Decree no. 82 of 2005.

[31] Law-Decree of 14 December 2018, no. 135.

[32] Art. 50-ter, par. 2 of the Legislative Decree no. 82 of 2005, as amended by the Law-Decree no. 76 of 2020.

[33] Art. 50-ter, par. 4 of the Legislative Decree no. 82 of 2005, as amended by the Law-Decree no. 76 of 2020.

In addition, the OECD has suggested the digitalization of public procurement for numerous other reasons, in terms of improving efficiency, transparency and anti-corruption [64]. In particular, the OECD highlights the purposes of e-procurement to increase "transparency, facilitate access to public tenders, reduce direct interaction between procurement officials and companies, increasing outreach and competition, and allow for easier detection of irregularities and corruption, such as bid rigging schemes. The digitalisation of procurement processes strengthens internal anti-corruption controls and detection of integrity breaches, and it provides audit services trails that may facilitate investigation activities" [65].

With reference to cross-border trade, the once-only principle also appears as one of the main reasons for the European Union's decision to establish a single digital gateway to reduce bureaucratic burdens towards all Member States, with the aim of simplifying administrative procedures for citizens and businesses within the single market [66, 67]. Already the Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement referred at least implicitly to the OOP, providing for the establishment of the single European tender document [67].

With the Union Action Plan for e-Government 2016–2020, the Commission programmed to gradually introduce the 'digital by default' and 'once-only' principles, eInvoicing and eProcurement and to assess the implication of a possible implementation of the 'no legacy' (action no. 6); to launch a pilot on the once-only principle for business (action no. 13); to assess the possibility of applying the once-only principle for citizens in a cross-border context (action no. 18) [68].

At the beginning of 2020, the Italian Government has repeatedly stated that it intends to focus on the once-only principle for a strong simplification of bureaucracy in the post-emergency phase [69].

According to European Commission, "reliable data are essential to prepare appropriate policy responses. The digital transformation, the growing wealth of data in general and the availability of open data standards offer opportunities to create better analytics for needs-driven policy-making and warning systems to signal and tackle corruption in public procurement. […] Access to public procurement data should enable the dialogue with civil society and holds governments more accountable. […] To this end, setting up publicly accessible contract registers is strongly recommended, providing transparency on awarded contracts and their amendments. […] New digital technologies offer great opportunities to streamline and simplify the procurement process through the roll-out of electronic public procurement. […] However, the full benefits of e-procurement will only be captured if the whole public procurement process undergoes digital transformation". Its Communication on public procurement includes among the specific actions: new procurement standard forms to improve the collection of data; publicly accessible contract registers; implementation of the European Single Procurement Document, the once-only principle and electronic invoicing in the Member States [62].

In response to these European requests, the once-only principle was recently introduced in the Italian Public Contracts Code, which defines it as the principle according to which each data is provided only once to a single information system, and cannot be requested by other systems or databases, but is made available by the receiving information system. This principle applies to data relating to the planning of works, services and supplies, as well as to all the procedures for awarding and implementing public contracts subject to the Code, and to those excluded from it, in whole or in part, whenever reporting obligations to a database are imposed by the same Code[34]. From the linguistic point of view, the Council of State made some comments on the draft of this Decree, which initially reported the principle of "univocità" of sending data. It seemed preferable instead to refer to the principle of "unicità" of sending data, since it is a quantitative (one-time sending) and non-qualitative (sending data with unambiguous meaning) requirement for the dispatch [70]. This appears a logical consequence: evidently, in order to have unequivocal data, it is primarily essential to have a unique transmission of them.

The regulatory definition was introduced with the aim of significantly reducing the administrative burden for entities generally subject to the so-called "statistical harassment", or to the uncoordinated request for data by various administrations [71], and therefore primarily to avoid duplication of mailings by the contracting authorities - especially for the officials responsible for the procedure - to whom a considerable amount of information and publication obligations are imposed for each award procedure started (and, for some kinds of contract) concluded and executed.

Unfortunately, today there is no complete and organic recognition of the information obligations imposed on the contracting authorities. The direct channel for sending data to A.N.AC. is SIMOG (Tender Monitoring Identification System) and SmartCIG (simplified channel for low-value contracts) [72]. At the same time, in absence of coordination between these two information systems, the publication of the data is mandatory (in part coinciding with those of SIMOG and SmartCIG) on the websites of the contracting authorities [73]. Other types of data must be transmitted to other central authorities such as the Ministry of Economy and Finance and the Ministry of Infrastructure and Transport. Recently A.N.AC. asked for a complete rationalization of the rules on administrative transparency in public contracts [54].

In order to prevent this principle from remaining a "chimera" [74] it is important, first of all, the complete digitization of the documentation relating to public contracts for the production, from the beginning of each procedure, of digital native data, which feeds the sector databases exhaustively and correctly. Numerous provisions of the Public Contracts Code already lay in this direction (Articles 44, 212 and Art. 213 which we will examine below)[35], although they have not yet been fully implemented, in addition

[34] Art. 3, par. 1, lett. ggggg-bis of the Legislative Decree of 18 April 2016, no. 50, Public Contracts Code, added by Art. 4 of the Legislative Decree of 19 April 2017, no. 56.

[35] Art. 44 of the Legislative Decree no. 50 of 2016 states that within one year from the date of entry into force of the same Decree, by Decree of the Minister for Simplification and Public Administration, in consultation with the Minister of Infrastructure and Transport and the Minister of Economy and Finance, after consulting the Agency for Digital Italy (AGID) as well as the Privacy Authority, the procedures for digitizing the procedures of all public contracts should have been defined, also through the interconnection for interoperability of data of public administrations. Best practices should also be defined regarding organizational and work methodologies, programming and planning methodologies, also referring to the identification of relevant data, their collection, management and processing, IT, telematic and technological support solutions. Art. 212, par. 1, lett. d, of the same Decree orders the creation of a control body in the Prime Minister's Office to promote the creation, in collaboration with the competent subjects, of a national plan on the subject of electronic purchase procedures, in order to spread the use of IT tools and to digitize the stages of the purchase process.

to the recent European Regulation which, starting from 2023, require the adoption of standard digital forms for the above-threshold assignments. The Recital no. 8 of this Regulation states that "notices are electronic files rather than paper documents. In order to comply with the 'once only' principle in e-government, and thus reduce administrative burden and increase data reliability, and to facilitate voluntary publication of notices whose value is below the EU threshold or which are based on framework agreements, such standard forms should be established that can be automatically filled-in with information from previous notices, technical specifications, tenders, contracts, national administrative registries and other sources of data. Ultimately, such forms should no longer need to be filled-in manually, but should be automatically generated by software systems" [75]. The goal, recalled by the National Anti-Corruption Authority, is therefore to achieve an automatic interconnection between all the publication platforms of the documents (European, national and of the individual contracting authorities) and the central databases [54].

Since 2010 the National Public Contracts Database (BDNCP), managed by A.N.AC., was established as a specific tool for interoperability in this sector[36]. The institutional purpose of BDNCP [76] is indicated in the collection of all the data relating to public contracts contained in the existing databases, also at a territorial level, in order to guarantee unified accessibility, transparency, publicity and traceability of the tender procedures and their preparatory and subsequent phases[37].

For public works, the law also provides for the conclusion of agreements between the public entities managing databases on how to collect and exchange information, to ensure compliance with the once-only principle and reducing administrative burdens[38]. In implementation of the Decree, A.N.AC. and the Ministry of Economy and Finance

[36] Art. 62-bis of the Legislative Decree no. 82 of 2005, added by Art. 44 of the Legislative Decree of 30 December 2010, no. 235 introduced the National Public Contracts Database (BDNCP) managed by the National Anti-corruption Authority, to facilitate the reduction of administrative burdens deriving from information obligations and to ensure the effectiveness, transparency and real-time control of administrative action for the allocation of public expenditure on works, services and supplies, also in order to respect legality and the correct action of the public administration and to prevent corruption.

[37] Art. 213, par. 8, of the Legislative Decree no. 50 of 2016.

[38] Art. 213, par. 8, of the Legislative Decree no. 50 of 2016 lays down for public works that A.N.AC., the Ministry of Economy and Finance and the Ministry of Infrastructure and Transport, the Prime Minister's Office and the Regions and Autonomous Provinces as managers of the computerized systems referred to in Art. 29, par. 4 of the same Decree conclude an agreement on the methods for collecting and exchanging information within the National Public Contracts Database and other relevant databases, in order to ensure compliance with the once-only principle and the reduction of administrative burdens for the effective monitoring from planning to construction of the works and the traceability of the related financial flows or the agreement of the fulfilments in terms of preventive transparency. It also states that, without prejudice to the autonomy of the National Database of Economic Operators referred to in Art. 81 of the same Code, A.N.AC. and the Ministry of Infrastructure and Transport agree on the methods for exchanging information to guarantee the function of preventing corruption and protecting the legality of the Authority and at the same time avoid overlapping of competences and optimize the use of data in the interest of the use of the same by businesses and contracting authorities.

concluded a Framework Agreement on 19 December 2018 for the exchange of knowledge, data, analysis methodologies and good practices and for the full deployment of institutional synergies.

Since the establishment of the new National Anti-Corruption Authority in 2014, the management and analysis of the databases it owns has appeared among its most important functions for the prevention and contrast of corruption and the promotion of efficiency [77–80]. On 18 October 2018 the BNDCP won the first prize in the Better Governance through Procurement Digitalization competition, National Contract Register category, having successfully assessed its scope, given that "there are essentially no value thresholds for being included" and its interoperability with other systems: "6 different systems send data to the Italian contract register and 10 systems take data from the contract register and use it elsewhere" [81]. Moreover, some criticisms of the setting up and management of the same database have been raised, especially from the point of view of accessibility to its data, but also of the lack of coordination with other information systems [82].

The Digital Administration Code places the BDNCP among the Databases of National Interest[39], unitary information systems that consider the different institutional and territorial levels and that guarantee the alignment of information and access to the same by public administrations concerned. These information systems must adhere to the minimum characteristics of security, accessibility and interoperability[40]. The information contained therein must be made available by the administrations that manage it according to the safety and management standards and criteria defined in the Guidelines, also through the National Digital Data Platform (PDND)[41]. According to scholars, the organizational rules on Databases of National Interest, although of a sectorial nature and above all referring to the central administration, represent the first and most relevant nucleus of provisions that pertain to the constitutional principle of IT coordination [56].

In this context, the once-only principle refers to the exchange of data especially between administrations, in order to simplify the flow of information that contracting authorities must send to the various agencies responsible for controlling and monitoring public procurement. In the absence of a total centralization of the cognitive function of the State - the Regions and autonomous Provinces, maintain the competence of monitoring the planning, entrusting and execution of contracts of regional importance or territorial entities[42] - as mentioned, coordination is essential and therefore interoperability between local and central databases[43].

[39] Art. 60, par. 3-bis, lett. c of the Legislative Decree no. 82 of 2005.

[40] Art. 60, par. 2 of the Legislative Decree no. 82 of 2005.

[41] Art. 60, par. 2-bis of the Legislative Decree no. 82 of 2005, as amended by the Law-Decree no. 76 of 2020.

[42] Art. 29, par. 3 of the Legislative Decree no. 50 of 2016.

[43] Art. 29, par. 4 of the Legislative Decree no. 50 of 2016, according to which for contracts and public investments of local or regional competence, the contracting authorities provide for the fulfilment of the information and advertising obligations set out in the same Decree, through the regional computerized systems and the e-procurement telematic platforms interconnected to them, ensuring the exchange of information and interoperability, with the databases of A.N.AC., the Ministry of Economy and Finance and the Ministry of Infrastructure and Transport.

For this reason the Public Contracts Code provides that between A.N.AC., the Ministry of Economy and Finance, the Ministry of Infrastructure and Transport and the Conference of Regions and Autonomous Provinces a general protocol is concluded to define the interoperability rules and the methods for exchanging data and documents between the respective databases, in compliance with the once-only principle[44]. The Protocol has not yet been adopted, although the desire to collaborate has been expressed in order to rationalize and simplify the obligations within the Conference of Regions and Autonomous Provinces [83]. The major problems of the system of regional observatories on public contracts have been recently highlighted by A.N.AC [54].

The law entrusts A.N.AC. with the important role of coordinating data: on the one hand, the Authority has to identify information on the public procurement subject to the publication obligation and the related transmission methods pursuant to the anti-corruption legislation[45] and Public Contracts Code[46]; on the other hand, it defines the functioning of the Observatory for public contracts, as well as the mandatory information, terms and forms of communication that contracting authorities and contracting entities are required to transmit[47].

In exercising these responsibilities, A.N.AC. asked the legislator, in order to avoid overlapping of information burdens on the contracting authorities and to homogenize the system for acquiring information data from the BDNCP, considering that much of the information relating to the contractual changes referred to in Art. 106 of the Legislative Decree no. 50 of 2016 are already acquired by the Public Contracts Observatory pursuant to Art. 213, par. 9 of the same Code, to replace the precise indications on how to communicate such data and related documents[48]. This is to allow the same Authority to indicate the relevant information and the related transmission methods, in order to better organize the information flows with a view to complete digitalization and to manage the supervision of the variants in a more efficient manner by requiring only the transmission of the data necessary to process certain anomaly indices [84]. Further proposals for simplification and coordination of legislation addressed to Parliament and Government have been formulated by A.N.AC after the Covid-19 emergency [54].

[44] Art. 29, par. 4-bis of the Legislative Decree no. 50 of 2016.

[45] Art. 1, par. 32 of the Law of 6 November 2012, no. 190 states that with reference to every public procurement procedure, the contracting authorities are required to publish on their institutional websites: the proposing structure; the subject of the call; the list of operators invited to submit offers; the contractor; the award amount; the completion times of the work, service or supply; the amount of the amounts paid. Administrations transmit this information in digital format to A.N.AC., which publishes them on its website in a section freely with - available to all citizens, catalogued according to the type of contracting authority and by region. The Authority identifies with its resolution the relevant information and the related transmission methods.

[46] According to the art. 29, par. 1 of Legislative Decree no. 50 of 2016, all the documents of the contracting authorities relating to the planning of works, services and supplies, as well as to the procedures for the award of public service contracts, supplies and works, public planning competitions, ideas and concessions, must be published and updated on the profile of the client, in the "Transparent Administration" section with the application of the provisions of Legislative Decree 14 March 2013, no. 33.

[47] Art. 213, par. 9 of Legislative Decree no. 50 of 2016.

[48] Art. 106, par. 8 and par. 14.

Parallel to the BDNCP, the Public Contracts Code also establishes the National Economic Operators Database (BDOE) as an information tool which, if operational, would constitute a significant concentration of data in order to simplify and significantly reduce the time required to verify the requirements of the economic operators participating in the tender procedures[49]. Since this Code rule has never been implemented, various hypotheses have been put forward for the relaunch of the previous information management system for the documentation relating to the qualification of economic operators (AVCpass, held transiently by A.N.AC.[50]) [85], in order to achieve the automatic acquisition of proof documents with important benefits in terms of speed, efficiency of procedures and once-only principle for companies and contracting authorities [53, 54].

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[49] Art. 81, par. 1 of Legislative Decree no. 50 of 2016 provides that the documentation proving the possession of the general, technical-professional and economic and financial requirements, for participation in the public procurement procedures and for the control during the execution of the contract of the permanence of these requirements, is acquired exclusively through the centralized database managed by the Ministry of Infrastructure and Transport, called the National Economic Operators Database.

[50] Art. 216, par. 13 of Legislative Decree no. 50 of 2016 and Art. 6-bis of the Legislative Decree no. 163 of April 12, 2016 which provided that from 1 July 2014, the documentation proving the possession of the general, technical-organizational and economic-financial requirements for participation in the public procurement procedures has been acquired exclusively through the National Public Contracts Database.

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TOOP Trust Architecture

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Abstract. While information security nowadays represents a core concern for any organization, Trust Management is usually less elaborated and is only important when two or more organizations cooperate towards a common objective. The overall Once-Only Principle Project (TOOP) architecture relies on the concept of trusted sources of information and on the existence of a secure exchange channel between the Data Providers and the Data Consumers in this interaction framework. Trust and information security are two cross-cutting concerns of paramount importance. These two concerns are overlapping, but not identical and they span all of the interoperability layers, from the legal down to the technical, passing through organizational and semantic layers. While information security aims at the preservation of confidentiality, integrity and availability of information, trust establishment guarantees that the origin and the destination of the data and documents are authentic (authenticity) and trustworthy (trustworthiness), and that data and documents are secured against any modification by untrusted parties (integrity). In this chapter, the TOOP Trust Architecture is presented, starting from a simple abstract model of interaction between two agents down to the detailed end-to-end trust establishment architecture, modeled onto the Toop Reference Architecture presented in the previous chapter.

Keywords: Security · Trust · Enterprise Architecture

1 Introduction

In the logic of the "once only principle" there is one single entity which is entitled to provide evidence in support of a specific claim, therefore TOOP significantly relies upon trusted and managed sources of information, which in many cases are also called Base Registries. 'Base registry' refers to a trusted and authentic source of information under the control of a public administration or of an organisation entitled by a law provision. According to the European Interoperability Framework 2.0, base registries are 'reliable sources of basic information on items such as persons, companies, vehicles, licences, buildings, locations and roads' and are 'authentic and authoritative, and form, separately or in combination, the cornerstone of public services' [6]. In the context

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of a cross-border architecture, spanning different policy domains, it is of paramount importance to guarantee trust establishment between the parties that interact to provide the Once-Only Principle (OOP) service. Therefore trust establishment complements the usual information security management concerns. Information security and trust establishment represent two overlapping, but not identical concerns and they span all of the interoperability layers, from the legal down to the technical, passing through organizational and semantic layers.

The standard ISO/IEC 27000:2018 [1] defines information security as preservation of confidentiality, integrity and availability of information; in addition, other properties, such as authenticity, trustworthiness, accountability, non-repudiation, traceability, and reliability can be involved. Trust establishment guarantees that the origin and the destination of the data and documents are authentic (authenticity) and trustworthy (trustworthiness), while security ensures that data and documents are protected against any modification by untrusted parties (integrity) [2–4]. The implementation of trust relies on the Regulation (EU) N°910/2014 on electronic identification and trust services for electronic transactions in the internal market (hereafter the eIDAS Regulation).

As an example of the differences between the concepts of security and trust, security usually does not involve trustworthiness of the data origin (this is not the same as authenticity - property that an entity is what it claims to be). On the other side, trust usually does not involve availability, reliability, and all aspects of confidentiality. Additional constituents of trust management - accountability, non-repudiation, traceability, and confidentiality[1] can be supported by maintaining processing logs and other controls, encrypting data and documents during the transmission, etc. In general, a Security Architecture involves the general approach to security and controls not directly related to trust, while Trust Architecture includes controls and procedures associated with establishment of trust. Privacy, which is one of the main concerns when handling pieces of information about natural personae, can be handled in the context of trust and security, introducing the concept of consent. In addition, trust requires a clear definition of roles and reliable identities of the entities assigned to those roles.

The Trust Architecture as devised in the TOOP Reference Architecture focuses on the trust establishment between the actors involved in an OOP System to provide guarantees on the origin, destination, authenticity (property that the entity providing the data is what it claims to be), trustworthiness (property that the entity providing the data can be relied on as honest or truthful), and integrity of information that is exchanged between the actors. This architecture makes a distinction between the TOOP specific and non-specific requirements, trust relationships, and controls related to trust establishment.

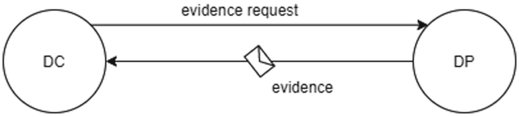
The rest of this Chapter is structured as follows: in Sect. 2 we present an overview of the trust concept and related literature. In Sect. 3 an overview of solutions for establishing trust is presented. The more specific TOOP requirements and solutions are discussed in Sect. 4, which introduces the concept of End-to-End Trust and in Sect. 5, where the TOOP reference Trust Architecture is presented. In the final Sect. 6, we draw some conclusions and discuss the points that are still open.

[1] Here Confidentiality is intended as a component of trust management not as a security related feature.

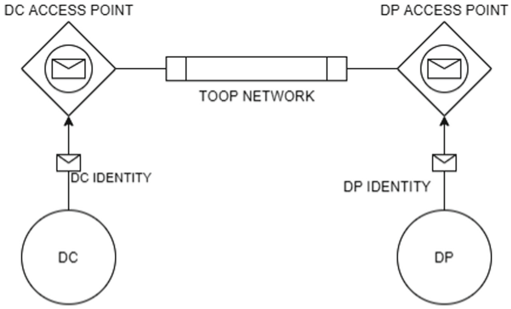
2 Overview of the Trust Concept

Trust in the digital domain has been widely addressed in the literature as a border territory between philosophy, management, law, information technology and sociology (see for example [5] for a literature review). A computational definition of trust was devised by Marsh[2], who gave a formal model for representing trust in mathematical terms.

For our purposes we take a simplified and pragmatic view, which is however consistent with ISO/IEC 27000-series and aligned with the "trust service" concept introduced by EU Regulation [eIDAS]. In this setting, we are dealing with two parties: a sender of data and a recipient of data.



In order to identify the actors involved in trust establishment and the pieces of information that they exchange, which in turn represent the assets to be protected, we can refer to an abstract[3] trust establishment process, considering a simple interaction model between a Data Consumer (DC) and a Data Provider (DP). Taking into account the overall architecture of the EU digital Service infrastructure that connects the Data Provider and the Data Consumer, the interaction can be abstracted as a communication through two access points and therefore we must consider the exchange of information between DP/DC and their respective access points (APs), where the information is the DP/DC identity, the source is respectively DP/DC and the consumer is the Access Point (AP) that must identify DP/DC.



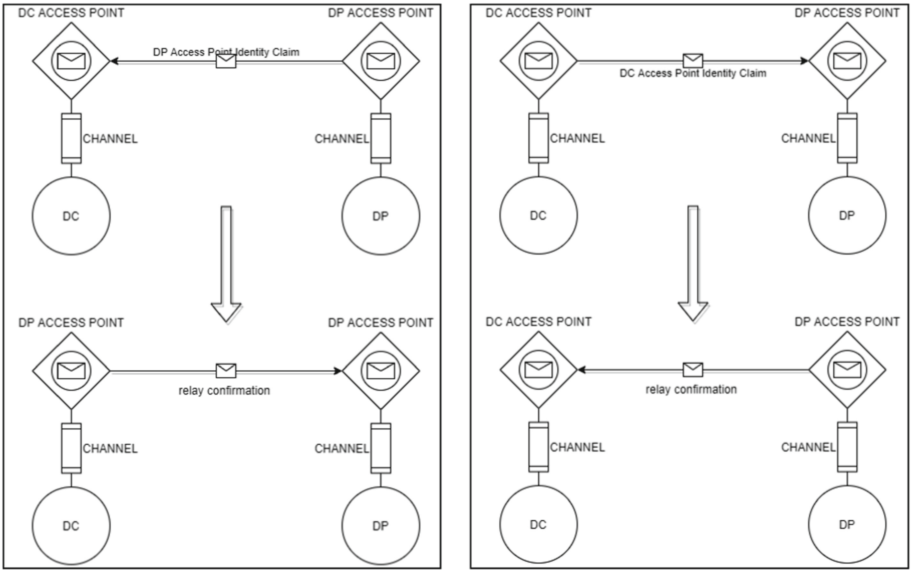
Once the DP and DC have been recognized by their respective Access Points, the Access Points must establish a channel and the communication is between Access Points: the information exchanged is the Access Point Identity Claim and the response relay confirmation.

We have here that AP1 (Source) sends an AP1 Identity Claim (Information) to AP2 (Consumer), AP2 (Source) sends an AP2 Identity Claim (Information) to AP1

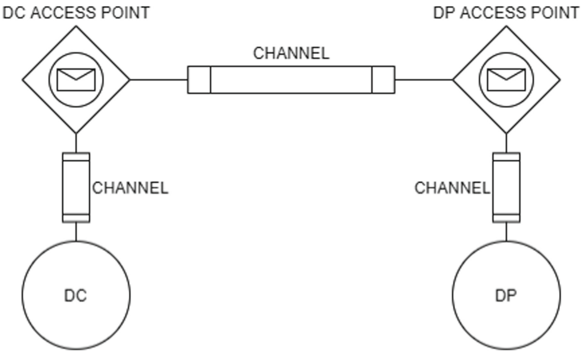
[2] Marsh, Stephen. 1994. "Formalising Trust as a Computational Concept".

[3] In this case, the term "abstract" refers to the absence of any reference in this model to a specific technology or standard to support the trust establishment process. The technical solutions will be examined in the following paragraph.

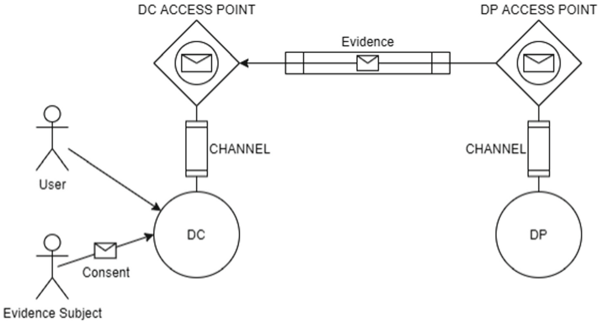
(Consumer) and in response AP2 (Source) sends a relay confirmation (Information) to AP1(Consumer).



These interactions lead to the creation of a secure and trusted channel between the Data Consumer and the Data Provider: the channel will be used by these two nodes to communicate.



After the channel is established, the User (Source), which is the Data Subject or acts on behalf of the Data Subject must send the Consent (Information) to the Data Provider (Consumer). The user Consent (Information) is also sent by the Data Consumer vouching for the user (Source) to the Data Provider (Consumer) that in response, as Source, will send the DP Identity (Information) to the User (Consumer).



It is worth noting that this approach embraces the fundamental issue of "identification of the sender" as a special case of trust establishment. In this case, the original trust question specifies: "how can the recipient assume that the sender is the one he/she claims to be?". The data provided by the sender therefore consists in an "identity claim" i.e., a set of attributes which allows the recipient to have a partial/total knowledge on the real world identity of the sender. The trust establishment process supports the recipient in validating that data, therefore acquiring some confidence on the identity of the sender.

3 Solutions to Establish Trust

The basic trust establishment process is presented here in an abstract and simplified manner, without referencing any specific organizational, legal or technical solution or standard. It is essentially an organizational process, which shall be supported by technical (digital in the XXI century) solutions to establish and maintain security and trust. In the case of the exchange of an evidence from DP to DC, DC needs to trust the evidence provided by DP. While this is certainly an over-simplification, the main approaches to the establishment of digital trust[4] fall into the following classes:

- ***trust by history***: the data is assumed to be true because it comes from a sender which proved honest in previous interactions. This method implies that the recipient has the means to identify the sender through multiple transactions.
- ***trust by reputation***: the data is assumed to be true because the sender's trustworthiness is vouched for by other actors. This method implies that there is a reliable way to collect feedback by (possibly many) other parties.
- ***trust by liability***: the data is assumed to be true because there is a way of enforcing liability on the provided data. This method implies the knowledge of the real-world identity of the issuer of the data (which may differ from the sender) as well as a way to verify who is entitled to provide some type of data (a criminal record certificate can only be attested by the appropriate law enforcement agency).

The main concern of the TOOP Trust Architecture is to ensure that any sociotechnical system compliant with TOOP Reference Architecture (TOOPRA), in addition to the

[4] For a deeper analysis see Luhmann, Niklas. 2000. Familiarity, Confidence, Trust: Problems and Alternatives.

main concern (the Once only Principle), will also preserve trust and the related security features, by default and by design. Ensuring trust by design entails a well-thought mix of the three approaches to guarantee that trust will be preserved over the entire lifecycle of the TOOPRA compliant socio-technical system.

The scenario addressed by TOOPRA can involve organizations that could have had no previous interaction, therefore the preferred choice is trust by liability, possibly in conjunction with trust by reputation, which makes it possible to assume trust in some well-known data providers established or appointed as the trustable data sources by law (a Ministry, etc.). Controls related to trust management not specific to TOOPRA must still be implemented.

Additionally, most of the trust scenarios managed in TOOP rely on trust by liability, supported by some existing general purpose trust-enabling tools:

- **electronic identity (eID)**: this term identifies the digital identities provided by national electronic identity systems which are mutually recognized across EU countries by virtue of eIDAS Regulation [eIDAS] and the associated Implementation Acts (IA 1501/2015, IA 1502/2015, IA 1984/2015]. The eID building block also comprises the technological infrastructure which has been set up in order to support cross-border electronic identity interoperability (the so called “eIDAS network”).
- **electronic delivery (eDelivery)**: this term identifies “a service that makes it possible to transmit data between parties by electronic means and provides evidence relating to the handling of the transmitted data, including proof of sending and receiving the data, and that protects transmitted data against the risk of loss, theft, damage or any unauthorised alterations” [eIDAS art 3 (33)]. Such services are offered by third parties in compliance with eIDAS regulation on Trust Service Providers, and provide legal value as established in [eIDAS art. 43, 44].
- **electronic signature/seal (eSignature/eSeal)**: this term identifies the tools and services to support non-repudiability of data, based on “certificates” issued by a Certification Authority.

These services are provided by Trust Service Providers, and provide legal value as established in [eIDAS art. 25, 35]. While the regulation is technologically neutral, public administrations are bound to accept specific formats for signatures[5], which are defined by the European Telecommunications Standards Institute (ETSI)[6] in the following specifications, namely the baseline specification for Advanced Electronic Signature

[5] Ruled by the Commission implementing Decision (EU) 2015/1506 of 8 September 2015 laying down specifications relating to formats of advanced electronic signatures and advanced seals to be recognised by public sector bodies: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015D1506.

[6] ETSI is an independent, not-for-profit, standardization organization in the information and communications technology industry fulfilling European and global market needs. ETSI supports the development and testing of standards for ICT-enabled systems, applications and services.

of XML[7], CMS[8] and PDF[9] documents and a specification for a digital Container[10], to bind together one or more signed objects with their advanced electronic signatures or time-stamp tokens.

Electronic delivery services (e-Delivery Building Block) are not bound to specific technological implementations. TOOP adopts as much as possible the building blocks provided by the Connecting Europe Facility (CEF) Digital Service Infrastructure (DSI), specifically:

- CEF eSignature building block[11], which provides off-the-shelf components to implement eIDAS compliant advanced/qualified digital signature.
- CEF eID Building Block[12], granting cross-border authentication for TOOP-enabled services through national eIDAS Nodes.
- CEF eDelivery[13] building block, which allows to create a network of nodes for secure digital data exchange and the creation of a safe and interoperable channel to transfer documents and data between organizations ensuring data integrity and confidentiality in every transmission through the use of digital signatures and encryption.

These Building Blocks enable legal assurance and accountability in the exchange of data and documents. As an example, eDelivery mandates that the recipient of a message must send a digitally signed acknowledgement of receipt for every message received.

4 Establishing the End-to-End Trust

The overall Trust and Security architecture of TOOP relies heavily on a set of building blocks which ensure, in the technology layer, the possibility to create a distributed network of trusted partners. This particular architecture enables a community-based approach to digital trust, based on the existence of a network of trusted nodes (Access Points), which provide the capability to establish a secure and trusted channel between different public and private organizations. The Technology layer is complemented by the Organizational layer and the Legal layer, where the governance model is specified respectively in terms of Business Interoperability specifications, which are agreements between the organizations participating in the community, and with regulations or laws that establish the Owners of the Trusted Data Sources, i.e. the organizations in charge of the governance of the Base Registries.

The resulting end-to-end trust view between the DP and DC is specific to the OOP Reference Architecture (TOOPRA). It is depicted on the following diagram, involving the Data Consumer (Competent Authority acting as a Data Consumer) certificate used for sealing the TOOP Data Request.

[7] XML Advanced Electronic Signature (XAdES), specification ETSI TS 103171.

[8] PDF Advanced Electronic SignaturePAdES - ETSI TS 103172.

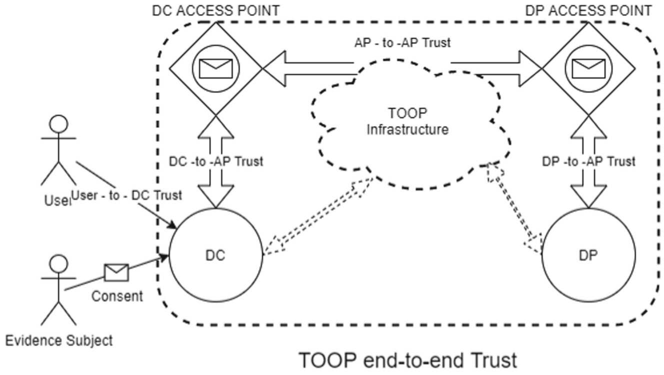
[9] CMS Advanced Electronic Signature CAdES - ETSI TS 103173.

[10] Associate Signature Container (ASiC) Baseline Profile - ETSI TS 103174.

[11] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eSignature.

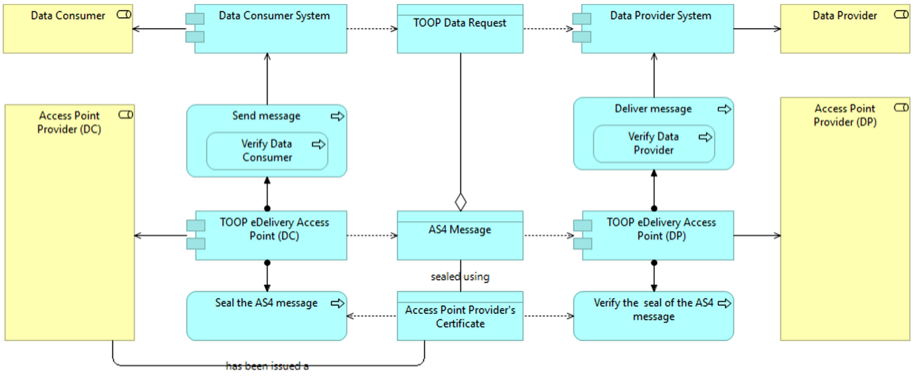
[12] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eID.

[13] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eDelivery.



In addition to the TOOPRA specific trust relationships, an OOP system involves trust relationships not specific to TOOPRA. For example, trusting the Data Consumer to Access Point and Access Point to Data Provider communications, Routing Metadata Discovery data, eIDAS Node data, DNS Server data, AS4 Message Service data, and Central Trust List server data is not dependent on TOOPRA. These relationships are represented in the TOOP Reference Architecture diagrams by pointing to a (cloud) TOOP infrastructure, nevertheless they must be trusted by the stakeholders.

The brokered trust through the Access Point gateways is depicted on the following diagram. It relies on the use of the Access Point Provider certificates from both the Data Provider and the Data Consumer Member States and involves verification of the Data Provider and Data Consumer, sealing the AS4 Message using the Access Point Provider certificate, as well as verification of the seal of the AS4 Message.



All the assets identified above, as well as the relationships (communications involving data belonging to these assets), need to be trusted.

Trusting the Assets

In trusting the assets, the main emphasis is on the authenticity and trustworthiness of the data sources, as well as integrity of data processing within the stakeholders, e.g., data owners, maintaining the assets.

The user identification and authentication data, request data, and consent data are created during the evidence exchange between the Data Consumer and the Data Provider.

The mechanisms for trusting both these assets and their relationships must be provided. Quality of other information assets involved in TOOPRA is the responsibility of the respective data owners and thus outside the TOOPRA scope; this applies also to the authenticity and trustworthiness aspects of data assets. Thus in TOOPRA only mechanisms for trusting the relationships between these assets are provided.

Trusting the Relationships

In trusting the relationships, the main emphasis is on the integrity of data - the stakeholders need to be sure that the assets have not been modified by untrusted parties.

The following table presents a list of main TOOPRA specific trust relationships. The trust establishment relies significantly on the eIDAS Regulation. Taking into account the potentially critical nature of transactions, the general requirement is that the trust services are qualified. Special cases need to be considered on a case by case basis.

Table 1. List of main TOOPRA specific trust relationships

Information asset (data)	Source	Destination
User request to retrieve evidence User consent	User	Data consumer
User identity User consent between DC and DP Evidence Request from DC to DP Evidence retrieved from DP Evidence processed by DP Evidence provided to DC	Data provider/data consumer	Data consumer/data provider
The user identification and authentication	User	Data consumer
DP discovery data, data services directory Identification of public organisations	Data consumer/data services directory	Data services directory/data consumer
Data from the criteria and evidence type rule base required evidence identification data	Data consumer/criteria and evidence type rule base	Criteria and evidence type rule base/data consumer
Semantic mediation data	Data consumer/ontology repository	Ontology repository/data consumer

For all of the information assets exchanged in the interactions reported in Table 1, the trust establishment solutions usually comprise trust services (e.g., qualified electronic signatures, qualified electronic registered delivery services, qualified electronic seals, or transactions secured by qualified certificates for website authentication) according to the eIDAS Regulation as mechanisms that ensure secure and protected data exchange in public services. In addition, we can provide other relevant general and TOOP specific trust and integrity related controls indicated in the next section.

5 The TOOPRA Trust Architecture

Trust establishment guarantees that the origin and the destination of the data and documents are authentic and trustworthy, and that data and documents are secured against any modification by untrusted parties. Trust management can also involve authorization, accountability, non-repudiation, traceability, as well as confidentiality as a component of trust management.

The preceding sections have detailed the methods to set up a secure and trusted channel between a DP and a DC. Based on these considerations, the current section presents the steps needed to establish trust.

From the architecture development point of view, the TOOP security and trust architectures have been designed adopting the ISO/IEC 27000-series of standards. The overview standard of this series, ISO/IEC 27000:2018, proposes the notion of an Information Security Management System (ISMS), consisting of the policies, procedures, guidelines, and associated resources and activities, collectively managed by an organization to protect its information assets.

The following steps are needed to establish, monitor, maintain, and improve an ISMS:

- identify information assets;
- identify associated information security requirements;
- assess and treat information security risks;
- select and implement relevant controls to manage unacceptable risks;
- manage the ISMS - in particular, monitor, maintain and improve its effectiveness.

These steps are detailed below.

Assets

The trust architecture is developed based on information assets subject to trust management. All these assets need to be trusted - for example, the stakeholders need to be sure that the assets have not been modified by untrusted parties.

Based on the Business Architecture, Information System Architecture, and Technology Architecture views, the following information assets are identified.

Various data related to the users must be trusted, such as the User identification and authentication data, the User identity data, the User request data to retrieve evidence, and the User consent data.

To find data providers and retrieve evidence, the data from the Criteria and Evidence Type Rule Base, the required evidence identification data, the data on the request for evidence from DC to DP, the Data Provider Discovery data, data from the Data Services Directory, the identification data of Public Organisations, and the semantic mediation data need to be trusted as well.

Various other kinds of data, such as data about the User consent exchanged between the DC and DP, data of the evidence retrieved from the Data Provider, data of processing the evidence retrieved from the Data Provider, data of the evidence provided to the Data Consumer, and the evidence exchange data are needed and must be trusted.

Finally, various kinds of technical data must be trusted to provide an OOP service: routing Metadata Discovery data, including data in the SMP and BDXL, eIDAS Node data, DNS Server data, and AS4 Message Service data.

Requirements

The following TOOP specific requirements related to trust establishment have been reported.

- The authenticity of the data transmitted by the DP must be trusted by the DC
- The transmission of an Evidence from DP to DC must guarantee the integrity of the exchanged Evidence
- The Data Provider is responsible for transmitting the requested Evidence in accordance with the confidentiality and integrity requirements
- Any exchange of evidence organised under the OOP must be possible to verify by competent authorities in case of disputes (including the identification of the sending and receiving competent authorities, the time of the exchange, and the integrity/authenticity of the exchanged data itself)
- The technical system shall in particular ensure the confidentiality and integrity of the evidence
- A common security and privacy framework must be defined and processes for public services must be established to ensure secure and trustworthy data exchange between public administrations and in interactions with citizens and businesses
- Trust services must be used according to the Regulation on eID and Trust Services as mechanisms that ensure secure and protected data exchange in public services
- A level of security appropriate to the risk, including inter alia as appropriate the ability to ensure the ongoing integrity of processing systems and services, must be ensured by the competent authorities and any other participants in the evidence exchange mechanism
- The user must have the possibility to preview the evidence to be used by the DC, and check the validity of the retrieved information

Risks

Assessment and treating of specific trust related risks deals with the authenticity and trustworthiness aspects of creating and exchanging data.

All the assets identified above, as well as the relationships (communications involving data belonging to these assets), need to be trusted. In trusting the assets, the main emphasis is on the authenticity and trustworthiness of the data sources, as well as integrity of data processing within the stakeholders, e.g., data owners, maintaining the assets.

The user identification and authentication data, request data, and consent data are created during the evidence exchange between the Data Consumer and the Data Provider.

Quality of other information assets involved in TOOPRA is the responsibility of the respective data owners and thus outside the TOOPRA scope.

The highest trust related risks concern data of the evidence (data in transit) in Single Digital Gateway Regulation (SDGR) domain: data related to both citizens and businesses as stated in the SDGR.

Also significant are risks related to the data of the evidence (data in transit) in TOOP domain: information related to business activities and on cross-border sharing of this information.

The User request data, response data, consent data, activity log data need to be trusted as well. Integrity of information assets related to central services and components: the Criterion & Evidence Type Rule Base, Data Services Directory, Ontology Repository, SMP, BDXL must be preserved.

A risk treatment decision must be made with respect to all risks. The stakeholders should establish criteria for determining which risks can be accepted. Options for risk treatment include applying controls to reduce the risks, accepting the risks that satisfy the criteria for risk acceptance, avoiding risks, as well as sharing the risks to other parties, for example to insurers or suppliers. These options depend on the legislation and organisational policies of particular information system stakeholders. Therefore they must be further specified in the system initialization and development processes.

Controls

Establishment of trust depends both on the assets and communications created specifically for a TOOPRA based system, as well as on supporting assets and communications that exist independently of such a system. The following organisational and technical controls must be taken into account to ensure appropriate level of trust related to both TOOPRA specific and non-specific components and relationships, independently of who implements them:

- use of trust services according to the eIDAS Regulation as mechanisms that ensure secure and protected data exchange in public services;
- ensuring that the competent authorities and any other participants in the evidence exchange mechanism implement appropriate technical and organisational measures to ensure a level of security appropriate to the risk, including as appropriate the ability to ensure the ongoing integrity of processing systems and services;
- ensuring that all the information assets identified in the above sections can be trusted.

The relevant general trust and integrity related controls include as appropriate classification of information in terms of integrity, usage of public key cryptography and digital signatures, issuing public key certificates by a recognized certification authority, appropriate handling of public and private keys, suitable authentication processes, using trusted third parties to provide application services, segregation of networks based on trust levels, ensuring trustworthiness of personnel working with the system, use of cryptographic techniques to protect integrity and authenticity of information, providing protection from malware, providing adequate backup facilities, establishing network controls to safeguard integrity of data passing over public networks or over wireless networks, applying appropriate logging and monitoring to enable recording and detection of actions that may affect information security, enforcing formal change control procedures to ensure the integrity of systems, applications and data, introducing incident response measures related to loss of integrity, and other.

A process must be introduced for regularly testing, assessing and evaluating the effectiveness of technical and organisational measures for ensuring the security of the processing.

The technical controls must ensure that the authenticity of the data transmitted by the DP is trusted by the DC, that the transmission of an evidence from DP to DC will guarantee the integrity of the exchanged evidence, and that the Data Provider acknowledges the responsibility for transmitting the requested evidence in accordance with the confidentiality and integrity requirements.

The following building blocks, standards and interfaces need to be supported to achieve the appropriate trust level:

- ETSI ASiC Specifications: Electronic Signatures and Infrastructures (ESI), ASiC Baseline Profile Technical Specification and Electronic Signatures and Infrastructures (ESI); Associated Signature Containers (ASiC) Technical Specification;
- the CEF eSignature and eID Building Blocks;
- the CEF eDelivery AS4 profile for message exchange;
- the CEF eDelivery profile of the BDXL specification;
- the OASIS Service Metadata Publishing 1.0(BDXR SMP) specification;
- the CEF eIDAS Profile.

Management of the ISMS

The stakeholders of an information system based on the Once-Only Principle need to maintain and improve the ISMS. This is done by monitoring and assessing performance against organizational policies and objectives, and reporting the results to management for review. The review evaluates whether the ISMS includes specified controls that are suitable to treat risks within the ISMS scope. Based on the records of these monitored areas, it provides suggestions for corrective, preventive and improvement actions.

All TOOP specific data, as well as associated systems and communications, must be monitored. Regular testing, assessing and evaluating the effectiveness of technical and organisational measures is needed for ensuring the security of the processing.

6 Conclusion

Trust between the users, data subjects, data providers, data consumers, and other stakeholders involved in an OOP system is of vital importance. Without digital trust, the stakeholders will not use services of an OOP system.

Digital trust can be established by liability (there is a way of enforcing liability on the provided data), reputation (the sender's trustworthiness is vouched for by other actors), construction (the system is designed and developed to preserve trust), and /or history (the sender has proved honest in previous interactions). For real-life applications, all these aspects are important.

From the legal and organizational point of view, the OOP is mainly interested in the concept of trust between Organizations and the legal interoperability between different policy domains. The achievement of these two objectives is deeply rooted in the Semantic and Technical layer, where the means to ensure the semantic equivalence for the evidence that are exchanged between DP and DC and their integrity and availability must be ensured.

From a technical point of view, the establishment of trust between organizations, be them public or private, and the possibility for citizens and business to re-use some documents across different contexts, possibly cross-border (as postulated by the OOP) requires a framework for the mutual recognition of key enablers across borders, such as electronic identification, electronic documents, electronic signatures and electronic delivery services, and for interoperable e-government services across the European Union.

Trust by construction also assumes the chain of trust: trusted source, trusted communications, trusted intermediate nodes, and trusted processing in the nodes.

In turn, the technical framework can hold only if some organizational and legal basis for collaboration between different entities exist and if the exchanged information maintains its meaning or can gain some meaning also in a different organizational context.

The diffusion of mutually recognised electronic identification means will facilitate cross-border provision of numerous services in the internal market and enable businesses to operate on a cross-border basis without facing many obstacles in interactions with public authorities, facilitating the adoption of the OOP.

Finally, without a history of successful use of different OOP systems, the users, organisations, and governments will not trust them. The TOOP Reference Architecture gives a tool for more efficient development of such systems and for design of trust as a component in their construction.

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