WP3 INTERLINK Technological Enablers

D3.1 - Identification and specifications of INTERLINKERS

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Glossary

ENTRY	DEFINITION
INTERLINKERS	Common building blocks, provided as software tools or in the form of knowledge offered digitally, that represent interoperable, re-usable, EU-compliant, standardized functionality for the co-production of public services
Public Service	Services that are publicly available and are provided by the government or on behalf of the government's residence in the interest of its citizens. In INTERLINK we focus not only on the software services (i.e., the services delivered digitally) but also the services that rely on digital technologies.

ACRONYMS

ABBREVIATED	EXTENDED
API	Application Programming Interface
CSC	Unified State and Municipal Customer Service Centres
C2G	Citizen to Government
C+G	Citizens and Government
CEF	Connecting Europe Facility
CPSV-AP	Core Public Service Vocabulary Application Profile
DMP	Data Management Plan
EIF	European Interoperability Framework

GDPR	General Data Protection Regulation
G2C	Government to Citizen
G2G	Government to Government
IaaS	Infrastructure as a Service
ISA2	Interoperability solutions for public administrations, businesses and citizens https://ec.europa.eu/isa2/
MEF	Ministry of Economy and Finance - Italy
NGO	Non-Government Organization
PA	Public Administration
PaaS	Platform as a Service
SaaS	Software as a Service
SLA	Service Level Agreement
SME	Small and Medium-sized Enterprises
SOC	Service Offering Canvas
SPID	Italian Public Digital Identity System (Sistema Pubblico di identità Digitale)
VARAM	Ministry of Environmental Protection and Regional Development - Latvia
ZGZ	Zaragoza, capital city of the Zaragoza province - Spain

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Executive summary

Task 3.1. "Analysis and specification of INTERLINKERS" concentrates on the **specification of a set of common building blocks to support the co-production of effective, participatory and sustainable public services**. In order to achieve this, the activities in T3.1 are aimed at exploring, analysing, selecting and specifying a range of enabling resources starting from the requirements emerged from the theoretical framework elaborated in WP2 as well as from the specific platform requirements from WP4 and the needs of the project's use-cases from WP5.

The present deliverable D3.1 describes the outcome of this research activity that will guide the development of significant components of the INTERLINK platform and that will be carried out in complementary tasks T3.2 "Partnership tools and templates" and T3.3 "Core IT enablers for public services".

This deliverable complements deliverable D4.1 that was submitted at M6 of the project development and provides an initial overarching view of the high-level technical and non-technical aspects that should be carefully taken into account in developing the INTERLINK platform. Further technical requirements pertaining to the system platform will be specified in D4.2 together with the reference architecture model and specification (M12).

The first part of D3.1 provides **a formal model for the classification, description, and definition of the INTERLINKER building blocks** to facilitate their usage, implementation and adoption by the INTERLINK platform and by the different pilots that will exploit the platform to co-produce their new digital services. The **notion of Problem Profile is also introduced to model the problems that INTERLINKERs should address**, the required functionalities and features corresponding to problems, and relates them to the existing EU standards, specifications, and implementing acts. **INTERLINKERs are not only software tools but include knowledge assets** (in form of regulation, norms and procedures) as well as good practices. Nevertheless, in accordance with the *once-only* and *digital-by-defaul*t principles, non-technical building blocks will be offered as digital services in order to exploit the transformative impact of new technologies.

The second part of the deliverable describes the **methods that were used to extract the actual list of Problem Profiles** to be addressed by the INTERLINKERs, with particular focus on the selection of the enablers that will be most relevant for the first piloting phase of the project. The **reference catalogue of Problem Profiles** is presented by clustering the specifications for INTERLINKERs according to general categories of problems that might emerge during a co-production process, namely: *organize*, *understand*, define, *build*, *validate*, *sustain*. This is done following the approach elaborated within National and European initiatives for the development of guidelines and kits for the co-production of citizen-centric public services.

The Appendix of the document provides further details on the INTERLINKERs identification and specification process. Appendix 1- Good practices on design of public services, service design, design thinking" summarizes related work that was reviewed by a desk research aiming at identifying good practices and available tools for the co-production of public services, already validated methods and tools for service design, co-design and design thinking, with a particular focus on guidelines and tools developed in other European projects. Appendix 2 - Sample Knowledge INTERLINKERs" and

Appendix 3 - Sample Software INTERLINKERs" provide instead examples of knowledge and software INTERLINKERs as they will be developed and described in deliverables D3.2 and D3.3. Appendix 4 - An example of co-production process and related problems: the Reggio Emilia case study" summarizes the findings of a workshop that was organized in collaboration with the Municipality of Reggio Emilia, which represents a Public Administration external to the project consortium but with a high interest in the project expected outcomes and which has already experienced concrete co-production processes.

1 INTERLINKER Specification Model

The aim of this document is to provide a model for the classification, description, and definition of the INTERLINKER building blocks (hereafter INTERLINKERs) to facilitate their usage, implementation and adoption by the INTERLINK platform and by different pilots that will exploit the INTERLINK platform to co-produce their new digital services.

The following specification aims at integrating different views emerged through the preliminary analysis of the various use cases, mapped onto the overall platform architecture and onto the preliminary model of the co-production process defined in WP2 (Misikangas et al. 2021). Furthermore, the proposed vision aims also at adopting the existing EU initiatives to facilitate the cross-boundary service re-use and adoption, including, in particular:

- Connecting Europe Facility (CEF)[1]
- Service Offering Canvas (SOC)[2]
- ITIL (IT Infrastructure Library)
- EU eGovernment Action Plan 2016-2020[3]
- EIF Conceptual Model[4] (Interoperability obligations of services[5])

1.1 Definitions

The core entity that is being addressed by the INTERLINK project is the one of **Public Service**. With this notion we intend the services that are publicly available and are provided by the government or on behalf of the government's authority in the interest of its citizens. It is important to note that in INTERLINK we focus not only on the software services (i.e., the services delivered digitally) but also the **services that rely on digital technologies**. The INTERLINK Co-production process white paper defines the phases, stakeholders, and the benefits of the realization and delivery of such services, relying on the INTERLINK vision and methodology (Misikangas et al. 2021).

To be able to effectively implement, adopt and re-use such public services, the project introduces the concept of **INTERLINKERs**, i.e., **digital building blocks that standardize the basic functionalities needed to empower the involved actors to cooperate in the production and delivery of a public service**. In other words, these are the re-usable elements that are employed for the implementation and delivery of a new public service. This notion **follows the definition of the CEF building blocks as reusable basic capabilities that can be employed in any European project to facilitate the delivery of digital public services across borders**.

More precisely, we define the INTERLINKERs as follows:

[1] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/CEF+Digital+Home

[2] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/Service+Offering+Canvas+Playbook

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

[4] https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf

[5] https://www.eff.org/deeplinks/2020/06/our-eu-policy-principles-interoperability

INTERLINKERs are common building blocks, provided as software tools or in the form of knowledge offered digitally, that offer interoperable, re-usable, EU-compliant, standardized functionality for the public service co-production management.

Specifically, we distinguish between the following forms of the INTERLINKERs:

- **Co-production INTERLINKERs**, i.e., the digital solutions necessary to support and carry out a particular co-production activity (e.g., engagement, design, delivery, etc.). These solutions are not part of the public service itself, but are used to support (organize and manage) its co-production, delivery, and sustainability.
- **Implementation INTERLINKERs**, i.e., the digital solutions that are adopted by the co-production teams to be part of the public service implementation and operation.

It is important to note that in some cases the INTERLINKERs of these two categories may be implemented on top of the same digital solution. They, however, may have different requirements with respect to the integration with the INTERLINK platform. For example, the *Co-production INTERLINKERs* should be seamlessly accessible and usable directly from the collaboration environment implemented by the platform.

Please note also that the INTERLINKERs should be distinguished from the platform tools, i.e., the digital solutions used by the INTERLINK platform to implement its core elements, such as collaboration environment, re-use portal, etc. Such digital solutions may include, for example, user authentication facilities, team management and organization tools or document and documentation management tools to access the knowledge INTERLINKERs, among several others. The platform tools, however, should, when applicable, smartly leverage, interoperate, and integrate with the INTERLINKERs.

Following the vision proposed in (Misikangas et al. 2021), hereafter we will refer to the process of co-production of a new public service following the INTERLINK project methodology as **INTERLINK co-production process**.

1.1.1. Service Offering Canvas

To facilitate the definition and promotion of its building blocks, CEF introduces the Service Offering Canvas[6] (SOC)– a tool for the standardized description and definition of important digital solutions (**themes**), providing a comprehensive vision of the purpose of a solution, for whom it is intended, and how it is realized.

[6] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/Service+Offering+Canvas+Playbook

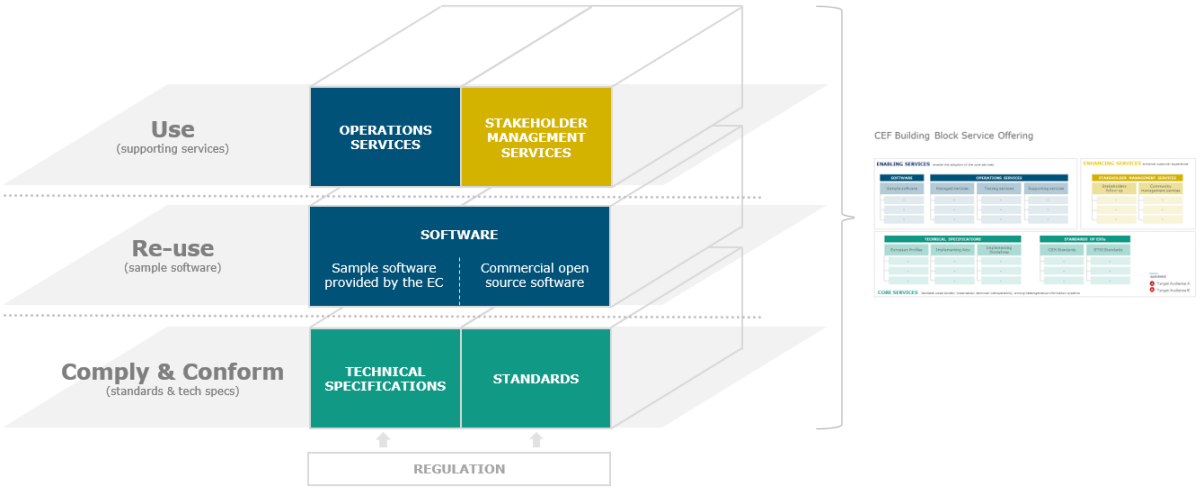

Figure 1. Schema illustrating the Service Offering Canvas

In this vision, the building blocks are defined as a set of services (not necessarily software) across three layers:

- ***Core services***, where technical specifications regarding the functionality, communication, usage of the building block are defined. Also, the relevant standardization efforts are linked at this layer.
- ***Enabling services***, where implemented software is provided. This software may refer both to the specification implementation and to the operation of a service (e.g., management, testing, support, etc). The software may be provided in different ways, such as reference sample implementation or commercial products.
- ***Enhancing services***, which go even beyond the operation aspects and facilitate further adoption, via onboarding, learning, follow-up actions, etc.

The SOC in this model classifies the different elements across these layers further refined into specific sub-areas of these functionalities. Furthermore, the definition of the building blocks may be accompanied with a set of technical and non-technical service definition documentation, with such common elements as master service agreements (e.g., SLAs), component and service offering descriptions, long-term support agreements, and other technical documentation (e.g., user and developer guides).

As we describe later in this document, we will adopt this approach in order to contextualize, describe, and classify different INTERLINKERs, as well as their requirements, functionality and various implementations, in order to guide the co-production process and foster re-use. Specifically, the notion of the Problem Profile introduced in Section 1.2.1 resembles the concept of the digital topic or problem as defined in SOC, while in Section 1.2.3 we use the types of the SOC services in the classification as well as the general modelling flavour.

1.2 Modelling approach

A high-level conceptual model adopted by the INTERLINK project is presented in the following diagram:

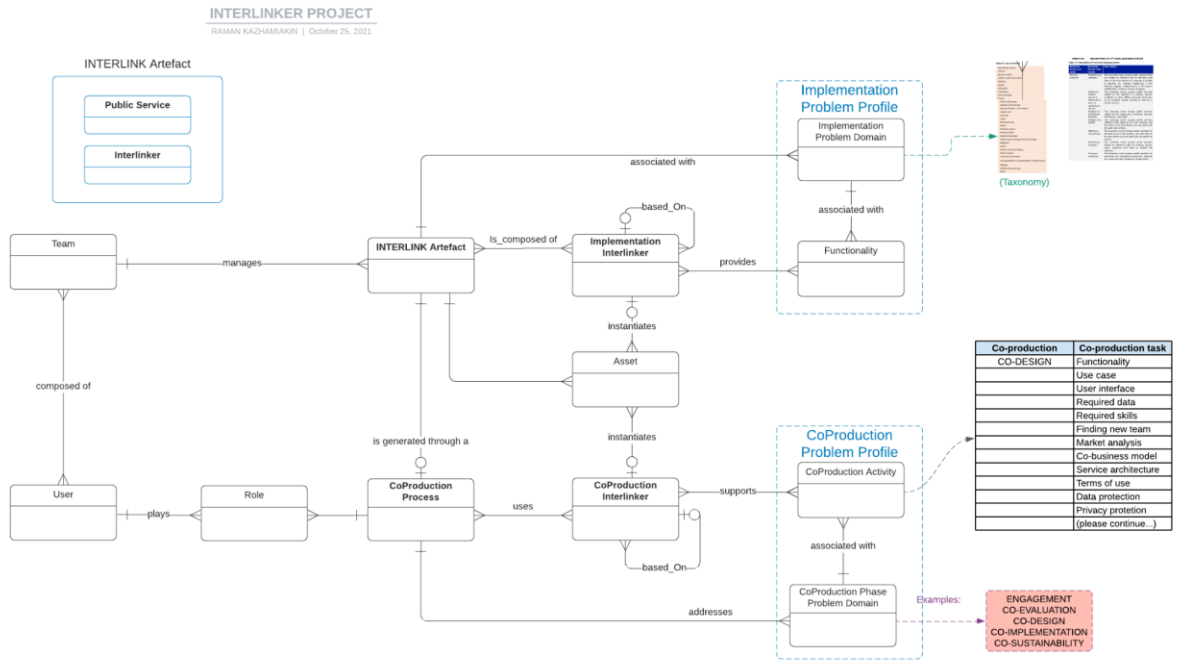

Figure 2. High-level conceptual model of the INTERLINK project

The key element of the diagram is the **INTERLINK Artifact** that may be co-produced and co-managed by a **Team**[7]. The project, therefore, provides a methodological approach for its implementation through the corresponding **Co-production Process**. During the stages of the process, a team may face different co-production problems, performing different corresponding activities. In order to better define and describe the boundaries, the requirements, and the functionality related to these problems, we introduce a notion of **Co-production Process Problem Profile**s, each of which is explicitly associated with one or more **Co-production Activity** listed in the INTERLINK co-production process. Similarly to CEF SOC, the problem domain aims at contextualizing the requirements, policies, and regulations associated with these activities, as well as to link potential solutions for their realization. Indeed, to implement these activities, the teams may engage different **Co-production INTERLINKERs** that support these activities.

On the other hand, the requirements and functionality of the constructed artifact may be explicitly associated with some specific domain (e.g., Primary Education) and/or with some cross-cutting aspects (e.g., Privacy Management, Accessibility). Also in this case, it is possible to define a corresponding canvas for such a problem or aspects, namely **Implementation Problem Profile**, where the relevant regulations, properties, policies, standards are listed together with appropriate list of common **Functionalities**, supported by the suitable **Implementation INTERLINKERs**. It is possible to use EU

[7] In the project, there are two types of the artifacts that can be produced: the public service and the Interlinkers. Without loss of generality, we will focus on the co-production of the Public Services, while similar considerations may apply to the production of new Interlinkers, even if the process may be different for these two types of artifacts.

taxonomies to define the problem domains and cross-cutting aspects. It is important to note that the same functionality or problem may be supported by many different (complementary and/or alternative) INTERLINKERs, while the same INTERLINKER (e.g., the same software tool) may be potentially used to implement different functionalities of different problems.

While co-producing an artifact, a set of **Assets** may be created and associated with the artifact. These assets may be instantiated by the Implementation or by the Co-production INTERLINKERs (e.g., privacy policy document for the public service usage built out of the template document or contract built out of the partnership agreement model, etc.).

So with respect to this model, the two types of INTERLINKERs aim at supporting the functionality of the corresponding "problem domains", being a co-production phase activity, the functionality foreseen within a particular business domain, or a functionality related to some cross-cutting aspect. The notion of the problem profile will characterize the context of the problem across various dimensions (legal, functional, administrative, technical) and will be used by the co-production process and collaboration environment to help the teams to identify the suitable activities and INTERLINKERs.

1.2.1 Problem Profile

Given this notion of a digital problem, our modelling starts from the definition of a **Problem Profile** as a specification that describes a particular topic, the required functionalities and features corresponding to that topic, and relates it to the existing EU standards, specifications, implementing acts, etc. Such a profile may, therefore, provide new or refer to an existing taxonomy of features in this problem domain. Where possible, the EU initiatives should be used for this purpose.

As presented above, we distinguish between co-production process problems and implementation problems. The latter may be further refined into the problems related to specific application domains and cross-cutting problems. Consider, for example, the following problems:

- ***Engage stakeholders.*** This is a typical co-production process problem that is faced in the engagement phase of the process and that applies to the creation of literally any public service. Dealing with this problem, it is necessary to answer various questions (e.g., which stakeholders are involved?, when and how to engage stakeholders?, who are the referenced persons?, how to communicate with them?) and perform various activities (e.g., map stakeholders, their needs, skills, and expectations; prepare an engagement plan; create awareness).
- ***Manage privacy and personal data***. This is, instead, a typical problem related to the implementation of a digital public service, which deals with citizens' data and participation. While there are clear regulations for the management of traditional services, as regards new services, not managed in one-way mode (G2C) but in collaboration between public and private bodies, there is no clear and stable regulatory framework. Regardless of a specific domain, when it comes to the end users and their personal data, it is necessary to guarantee a secure, transparent, and informed way to store, access, and use this data for the functionality of a service. The questions related to such a domain may include, e.g., understanding the types of data to be collected and managed, its storage, the actors using it, the

preparation of an appropriate data management plan and privacy policies, the IT instruments involved and so on.

- ***Provide access to the financial support for the SMEs affected by COVID***. Here the problem deals with a specific application domain for the financial instruments provided to private companies by the public administrations. The questions become quite specific (e.g., what types of supporting instruments are provided?, what legal context and company types are affected?, the types of documentation to be managed?), as well as the corresponding instruments (e.g., national / local tools to access the information about SMEs, instruments for exchanging, archiving and protocolling the legal documentation).

Given this distinction between the types of problem profiles, to appropriately and comprehensively describe a profile, we will use both a set of *common properties* and a set of *problem-specific properties*. The former will be used to place the problem within the co-production process, contextualize the implemented public service and its requirements, while the latter will be used to refine the specific functionalities related to the problem and to associate the corresponding INTERLINKERs that may support the implementation of these functionalities.

1.2.1.1 Properties of a Problem Profile

More specifically, the Problem Profile should include the following common characteristics:

- A **Type** of a problem, being a **Co-production Process Problem** or **Implementation Problem**. This is further refined as follows:
  - In case of Co-production Process Problem profile, the corresponding **Co-production Phase and Co-production Activity,** where the problem is raised.
  - In case of Implementation Problem profile, the corresponding **cross-cutting problem** or a specific **application domain** as suggested by the ISA2 EU taxonomy for the public services[8].
- **Description** and characterization of a problem.
- **Set of functionalities** addressed by this problem. In this way, we represent specific activities of the co-production process or a specific functionality/feature of the implementation. The set of functionalities may have a form of functional requirements specification, potentially related to the corresponding standards, regulations, and policies.
- Links to the relevant **standards** and **specifications** for the problem, focusing on the EU initiatives.
- Link to the relevant legal context **regulations** and acts, focusing on the EU initiatives.

[8] https://joinup.ec.europa.eu/collection/catalogue-services/document/study-european-taxonomy-public-services

- Characterization of the **context**, in which the problem should be addressed, if applicable. More specifically, we may distinguish
    - **Administrative scope** boundaries of the topic, e.g., EU, national, or local levels. That is, the eID CEF building block may operate at EU level, while MEF strategic planning module is applicable at the Italian level, and Etopia center Booking System tool operates only at Zaragoza.
    - **Form of the co-production governance model** applied, e.g., **top-down** w.r.t. **grassroot** initiatives-oriented.

Note that the profiles should not necessarily refer to software tools and functionalities. For example, the problem of Personal Data Protection may define a set of dimensions, regulations, and elements that will be implemented through a set of documents, templates, guidelines, and checklists. Similarly, profiles might be used to specify sustainability approaches to ensure long-time viability of public services.

Besides these common properties equally applicable to any problem addressed through the co-production process, each problem [type] may introduce also problem-specific features and properties, such as

- Characterization of the **stakeholders** involved in the problem - the intended user types for the INTERLINKER, being, for instance, citizens, PA and their representatives, SMEs, etc. This should be further refined in roles w.r.t. the co-production process. Further classification may refer to
    - Individuals vs. organizations
    - Private vs. public
- Definition or reference to a specific **taxonomy** and **vocabulary** that characterize various aspects of the problem in a particular manner.

1.2.2 INTERLINKER Modelling and Classification Process

In order to model and classify INTERLINKERs, we adopt the SOC approach proposed by CEF for the definition of building blocks. In that approach, the different types of digital and non digital solutions are mapped onto the Service Offering Canvas that aims at representing a particular digital topic. Furthermore, these solutions are classified according to their role and usage in the process of addressing such a digital problem. Similarly, in the INTERLINKER specification we define the *Problem Profile* as a characterization of a common problem arising during the co-production process and we classify possible supporting tools around such a problem. More specifically, we define the process of INTERLINKER modelling, classification, and implementation as follows.

- **Define Problem Profiles** relevant to the INTERLINK governance model, INTERLINK co-production process, and the core cross-cutting functionality necessary for the implementation of digital public services. To start with, we will address the problems and requirements emerged from modelling and analyzing the project pilots' use cases.
- **Map existing/new software services and digital solutions** implementing the required functionality as well as the corresponding operation management and supporting activities. For each considered solution, it is necessary to describe it in

relation to the Problem Profile, specifying the specific functionality covered and implemented; the specific usage context, etc.

- **Map existing/new non-technical (knowledge) INTERLINKERs to accelerate and facilitate adoption of the above solutions** in the form of documentation, materials, on-boarding training, agreements, exploitation models, smart contracts, etc, specifying the covered problem Profile features and functionality, the specific usage context, etc.

In this vision, **an INTERLINKER is represented as a software tool or a digital artifact that implements (a subset of) the functionalities defined by a Problem Profile corresponding to an activity of the public service co-production process or to an aspect of the public service implementation**. Indeed, different software alternatives may implement the same Problem Profile, as well as the same software may be used for different activities of the process corresponding to different Problem Profiles.

In order to become an INTERLINKER, however, such a candidate software or artifact should satisfy a set of requirements that refer to such aspects as interoperability, traceability, transparency, evaluability and integrability, among others. These requirements that will be introduced below, will define a compliance model to evaluate and assess the proposed entities before including them into the INTERLINKER catalogue. Such an assessment will facilitate the adoption and re-use of the solutions across different scenarios as it will simplify their integration and adoption both in the INTERLINK platform and in the specific co-production instances.

Another important benefit of this approach is how it can support the co-production process when performed especially by non-expert and heterogeneous teams. Rather than providing a flat catalogue of the INTERLINKER solutions, the INTERLINK platform may enrich the co-production process with instruments to guide the users and team to create new services. Since the INTERLINKERs are explicitly classified with respect to the activities of the process, such instrument, **co-production Wizard**, may be used in different phases of the process to identify, filter, and recommend the suitable solutions, given the activities the team is targeting, the specific context in which the co-production is engaged or the stakeholders involved (Figure 3). Relating the INTERLINKERs to each other facilitates further the exploration and on-boarding of the teams.

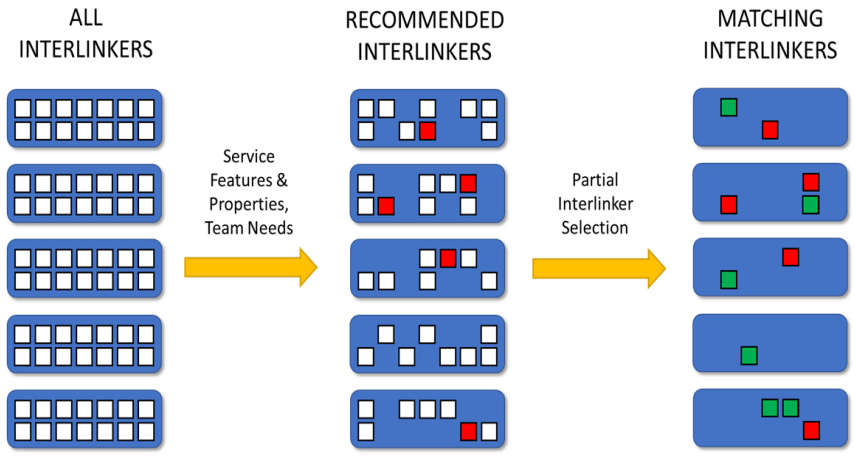

Figure 3. Schema of functioning of the INTERLINK Wizard

As a result, the platform will guide the users by:

- Proposing the activities and problems to address according to the current progress of the team in the co-production process. Taking into account the co-production context, i.e. the activities already performed and those in progress, the platform may suggest to the user/team what to do next, offering a filtered set of possible actions, e.g., informing about a possibility to perform evaluation, to collect feedback, etc.
- Assisting the selection of the INTERLINKERs when the team has decided the next problem to address. Such assistance will use i) the problem profile features and properties, ii) the set of available INTERLINKERs implementing these profiles and their constraints, and iii) the information about the implemented public service context to filter and propose the most appropriate candidates.

  Note that this guidance does not include the generic assistance and IT learning activities.

1.2.3 Classification of INTERLINKERs

Given these considerations, INTERLINKERs should be described and classified across the following dimensions:

- Classification w.r.t. the **corresponding Problem Profile** (and in this way also whether we deal with a CoProduction INTERLINKER or an Implementation INTERLINKER). That is, we associate each INTERLINKER to a one or more Problem Profiles and express its properties with respect to these profiles. More specifically, when defined by the problem profile, the INTERLINKER should be mapped on the specific **functionalities,** specifying which of those are directly supported by the INTERLINKER. Through this explicit mapping it will be possible to assist the co-production teams to select the appropriate instruments and tools.
- Types of **Stakeholders** targeted by the INTERLINKER, if applicable. In particular,
  - Public authorities
  - Citizens
  - Private businesses
  - Research organizations
  - Non-profit organizations
- Classification w.r.t. the **type of the INTERLINKER**. That is, the placement of the artifact in the SOC mapping – Enabling Service or Enhancing service. Note that in our case the SOC Core Services are covered by the Problem Profile defined above. More specifically, we define these types as
  - **Enabling Services**: the tools and artifacts providing the implementation and operation of the profile functionality. Distinguished in:
    - **Implementing Software and Artifacts**: implementation of the required functionality and feature sets as defined in the profile;
    - **Operation services**: additional digital solutions further classified in operational management of software at execution (e.g., hosting

platform), supporting services (e.g., help desks), and testing services (e.g., conformance checking, checklists, etc.).

- **Enhancing Services**: tools and artifacts to support stakeholders and their management:
  - **Onboarding services**: documentation, training, etc. for the adoption of the solutions for the digital problem;
  - **Follow-up services**: tools and knowledge to build relationships and awareness around the problem;
  - **External experts**: the companies and people that have an expertise in the corresponding domain and may support the implementation (through consultancy or direct involvement).

- Classification w.r.t. the **nature of the INTERLINKER**. According to the project vision, we distinguish **Software INTERLINKERs** (referred to as IT Enablers in the project description, e.g., various digital tools for decision making, group and activity coordination) and **Knowledge** (partnership tools, templates, canvases, best practices, guidelines). Below, we provide more detailed classification properties for the INTERLINKERs given this distinction. Note that in some cases an INTERLINKER may represent a combination of these elements grouped together to provide a more complete and exhaustive way to implement a problem profile functionality.
- **Associated INTERLINKERs**
  - Related INTERLINKERs (w.r.t. the activity, the implementation, etc). This includes, in particular, the knowledge INTERLINKERs such as training materials, examples, documents.
  - INTERLINKER dependencies (i.e., INTERLINKERs required by this one to correctly operate), sometimes complex INTERLINKERs may be composed of several enabling INTERLINKERs;
- The **context** in which the INTERLINKER is applicable. More specifically, we may distinguish:
  - Administrative scope boundaries for the INTERLINKER usage, e.g., EU, national, or local levels. That is, the eID CEF building block may operate at EU level, while the MEF strategic planning module is applicable at the Italian level, and the Etopia center Booking System tool operates only at Zaragoza.
  - Form of the co-production process applied, e.g., top-down w.r.t. grassroot initiatives-oriented.
  - Specific application domain, in which the INTERLINKER may be used. There may be cross-cutting (core) INTERLINKERs, such as team formation, document management, or business-specific ones, such as the strategic planning module envisaged for the MEF use case.
- The **constraints and limitations** related to the usage, integration, and exploitation of the service. In many cases these limitations may directly emerge from the above properties (e.g., limitation to a specific administrative context, need to

have a hosting environment for the open source software to use, need to perform SW integration and customization for non-ready to use software, payment, licensing), there may also be some specific constraints that should be made explicit and well documented.

- Relevant specific **regulations** and **standards**, as well as the reference to the specific taxonomies potentially defined for the corresponding problem domain, applicable to the INTERLINKER.

Indeed, such a classification is also highly extensible. It is possible for the co-production process to evolve or to be customized to a specific setting, e.g. a given PA, introducing new co-production activities and therefore opening new digital themes related to these activities. As a result, new INTERLINKER specifications may be introduced together with the new implementations and components.

1.2.3.1 Classification of Software INTERLINKERs

For software INTERLINKERs, the classification will consider the **software implementation** classification. In these regards we can distinguish, in particular,

- **Open Source software** versus **proprietary products**;
- **On-premise software** vs **Software-as-a-Service** solutions vs **installed apps**;
- **API-based** access vs. **UI-based** tool (or both);
- Operational environment: **Web based, mobile, desktop**;
- **License** types;
- For the On-premise software, the characteristics for the **deployment requirements**, being hardware and software environment required;
- For the API-based tools, the documentation of the API as **Open API**, if applicable
- Support for **Internationalization**.
- **Compliance** with the legal regulations and standards, e.g., GDPR, national, local, the forthcoming Data Governance Act.

Apart from these generic properties, it is necessary to provide a description of the software INTERLINKERs in terms of

- Aspects related to the **customization** of the tool and the possibility to enhance its functionality;
- Aspects related to the **integration** of the software with other tools (if applicable): e.g., standards supported for authentication, reference EU data models supported by the API; specific interoperability standards supported.

1.2.3.2 Classification of Knowledge INTERLINKERs

For knowledge INTERLINKERs further classification may introduce

- **Type of the knowledge INTERLINKER**:
  - visual template,
  - document template,
  - canvas,
  - best practices,
  - guidelines,
  - checklist,
  - survey template,

- legal agreement template (e.g., master service agreement, SLA, long-term support agreement)

- **Format**: document format used to represent the template:
  - open documents,
  - PDF,
  - structured formats (XML, RDF, JSON, CSV).

1.2.4 INTERLINKER Specification Template

Given the above model, a concrete INTERLINKER may be represented with the help of the following table. (See Appendix 2 - Sample Knowledge INTERLINKERs" and Appendix 3 - Sample Software INTERLINKERs" for examples of filled tables corresponding to sample knowledge and software INTERLINKERs).

Table 1. Schema for characterizing an INTERLINKER

Property	Synopsis
NAME	*A name of the INTERLINKER to be used in the catalogue. May correspond to the name of the corresponding software, service, or knowledge artifact.*
DESCRIPTION	*Textual description of the INTERLINKER, its functionality, usage, etc.*
RELEVANT PROBLEM PROFILES	*Reference to the problem profiles that the INTERLINKER aims to address, i.e. the INTERLINKER aims at responding to the features and functionalities defined by the corresponding problem profiles. These functionalities should be explicitly cited here.*
STAKEHOLDERS	*List of stakeholders, if applicable, that will be engaged in using this INTERLINKER*
TYPE OF INTERLINKER	*Either Enabling or Enhancing Service with the corresponding sub-classification.*
NATURE OF INTERLINKER	*Either Software, Knowledge, or composed INTERLINKER.*
ASSOCIATED INTERLINKERS	*List of related INTERLINKERs and dependency INTERLINKERs.*
USAGE CONTEXT	*Reference to the context characterization of the INTERLINKER (e.g., Administrative boundaries, application domain, etc).*
CONSTRAINTS AND LIMITATIONS	*Specific requirements and properties constraining the usage and exploitation of the INTERLINKER*
REGULATIONS AND STANDARDS	*Legal and technical context, where the INTERLINKER operates, as a set of relevant, normative acts, policies, standards, and specification the INTERLINKER adheres to.*
(for software) IMPLEMENTATION PROPERTIES	*Further classification of the software INTERLINKERs with* • ***Open Source software*** *versus* ***proprietary products****;* • ***On-premise software*** *vs* ***Software-as-a-Service*** *solutions vs* ***installed apps****;* • ***API-based*** *access vs.* ***UI-based*** *tool (or both);* • *Operational environment:* ***Web based, mobile, desktop****;* • ***License*** *types;*

	• *For the On-premise software, the characteristics for the **deployment requirements**, being hardware and software environment required;* • *For the API-based tools, the documentation of the API as **Open API**, if applicable* • *Support for **Internationalization**.* • ***Compliance** with the legal regulations and standards*
(for software) CUSTOMIZATION PROPERTIES	*Characterization of the tool with respect to its customization, adoption, and extension in various contexts.*
(for software) INTEGRATION PROPERTIES	*Characterization of the tool with respect to its integration with other software and components:* • *Authentication / authorization standards used;* • *Interoperability standards;* • *Reference data models in the EU context.*
(for knowledge) FORM OF KNOWLEDGE	*Type of knowledge INTERLINKER: e.g., visual template, document template, canvas, best practices, guidelines, checklist, survey template, legal agreement template*
(for knowledge) FORMAT	*Type of the format used by the INTERLINKER: PDF, open documents, structured formats (e.g., JSON, XML, RDF, CSV)*

1.3 INTERLINK Problem Profiles

As described in Section 1.2 above, our main focus is on the problem profiles that naturally emerge from the process of co-producing the public services, namely, a) the *problems related to the process itself* and b) *problems related to the functional and non-functional requirements of the service* defined through this process.

1.3.1 Co-Production Process Problem Profiles

This category collects the problems that the stakeholders involved in the co-production encounter in different phases of the process. This includes in particular,

- The problems related to the **organization** of the process (e.g., communication, team formation, project setup and management, etc);
- The problems related to **understanding** the needs and requirements of the new service, its context, objectives, etc.
- The problems related to the **definition** of a new service, its usage scenarios, use cases, functionality and design.
- The problems related to the **validation** of a service, its ideas and usage scenarios, quality of service and feedback.
- The problems related to the **sustainability** of the service.

Please note that these problems do not necessarily match a single specific co-production phase but find their placement in different phases answering specific questions or focusing on particular aspects of the process, as will be further discussed in Section 3.1 below.

1.3.2 Implementation Problem Profiles

In this category we may elicit all the problems related to the **implementation/building** of a public service. While in general such a list may contain a huge number of elements, especially when targeting different application domains and their specific problems and functionality, in the context of the INTERLINK project, we will focus on more general problems that are common to the implementation of public digital services and their characteristics as required by the EU eGovernment action plan, European Interoperability Framework (EIF)[9], and other related regulations.

According to these regulations, the areas that should be addressed by public services, regardless their particular application domain, scenario, or context, include:

- **Accessibility and Inclusiveness**[10]. This aspect aims at covering the public services provided digitally, in the form of Web sites or mobile applications, and requires that the service may be easily used by different categories of users, especially considering the people with disabilities. The specific problems in this area refer to:
    - the proper *ways of designing and structuring the UI* of the solution,
    - *implementing the accessible UI components*,
    - *evaluation* of the accessibility and *compliance* certification.

  Accordingly, the solutions in this area refer, e.g., to:
    - the best practices and guidelines for the implementation,
    - ready to use Design Kits and Software Development Kits for the implementation of the accessible Web and mobile applications
    - Tools to evaluate and certify the compliance of a digital service with the corresponding regulations.

  In some countries such solutions are already provided by national level agencies (see, e.g., Design Kit Italia from AgID[11]).
- **Openness and Transparency.** In the context of digital public services, the concept of openness refers to the data, specifications, and software, while transparency adds visibility over the internal processes, policies, and rules. In other terms, the strategy that the public service should apply promotes: the publication of the open data (when applicable and not conflicting with the restrictions imposed by privacy considerations); the usage of open source software; making the information about the service implementation explicit; the usage of open and standard specifications. The specific problems here would include, in particular:
    - The problem of *creating, publishing, and maintaining open datasets* emerging from the service functionality;
    - *Identifying appropriate data models and specifications* for common processes, data, functionality, etc;

[9] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0134

[10] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L2102&from=EN

[11] https://designers.italia.it/kit/

- The problem of *understanding, identifying, and managing software and data licenses* necessary to implement, use and expose data for the service.

Also in this context, a set of EU or national level initiatives exist that may provide a starting point for the implementation. These initiatives include:

- Open standards, best practices, and guidelines for open data management,
- Guidelines for the software selection and licensing;
- Set of reference data models (generic ones and specific for various domains);
- Tools and standards to catalogue the open datasets, public services, reusable software, etc.

- **Interoperability**. As specified by EIF, the *interoperability-by-design* paradigm is defined across different layers, namely legal, organizational, semantic, and technical. While the former two are more relevant for the co-production process activities, the latter two are more related to the implementation of public services. Here, the semantic interoperability deals more with the data modelling and the usage of common data models as described above. For what concerns technical interoperability, it refers to the usage of standard communication protocols and data formats. The specific problems emerging when implementing the interoperable digital public services may include:
  - *Identification of interoperability patterns* of the interactions (e.g., machine-to-machine interactions);
  - *Definition and implementation of technical interfaces* (APIs) for the service interoperability;

  The potential solutions referring to these problems may include:
  - Guidelines and best practices for service interface designs;
  - Interoperability patterns and profiles;
  - API specification standards;
  - Tools for creating and managing API catalogue.

- **Security and Privacy**. When dealing with the citizens as end-users, the public services often should treat the personal data of these users within the context of the digital service. To ensure the correct management of such data in compliance with the EU regulations such as GDPR, and in general with security and privacy by design principles, the implementation of the service should address a range of problems dealing with data management, service and data access control, informing users, etc. Some of these aspects are indeed relevant within the service design phase; for the implementation it is important to deal with:
  - Implementation of *secure storage and management of personal data*; this should also include the implementation of GDPR requirements (e.g., right to forget, information access, etc);
  - *Implementation of standard interoperable security protocols* for accessing services;
  - *Integration of trusted and certified identity management solutions* according to the national and EU regulations (e.g, eIDAS);

- *Definition and implementation of privacy policies* in compliance with GDPR;
- *Management of informed and transparent user consent* to deal with data.

The solutions to address this problem include, but are not limited to:

- Open and standard security protocol specifications and reference implementations;
- Compliance certification services and tools;
- Guidelines and best practices for the implementation of security measures necessary for the GDPR requirements;
- Tools for user management and authentication that integrate reference trusted authorities;
- Client libraries and SDKs for the implementation of security protocols for the Web sites, system integration, and mobile applications.

- **Documentation**. The appropriate documentation is crucial for the provision and reuse of public services as it provides deeper understanding and visibility of the service implementation, the underlying processes, data models and data flows, and simplifies the user adoption. In these regards, the problem of service documentation covers the aspects related to the service accessibility (simplifying the engagement of different stakeholders), transparency, and interoperability (in the way it is required not only by technical interoperability, but also by the organizational and semantic ones). The specific problems in this area may refer to:
  - Provide a *public service description in compliance with the EU models* and requirements (i.e., CPSV-AP[12] and its national adaptations);
  - Enable *collaborative knowledge creation and sharing* about public services;
  - *Publish the public services to service catalogues and reuse portals*.

  While some tools may already exist to deal with these tasks (e.g., public repositories, EU tools and vocabularies for the service description), for what concerns collaboration service knowledge management and crowdsourcing, we are not aware about suitable and ready to use solutions.
- **Incentivisation**. A set of problems relates directly to the user-centricity of the public services for what concerns the engagement of the citizens in continuous improvement and evolution of the services. Throughout the activities related to crowdsourcing, collaborative management and execution, service usage and quality feedback, the citizens may participate in the service life-cycle. To foster this process and make it more attractive to the citizens, techniques and instruments based on the gamification and incentivisation may be applied within the service implementation. This includes, in particular:
  - *Gamification approaches and techniques* for user engagement;
  - Incentivisation mechanisms and instruments to *monitor, collect, and certify the user engagement activities and actions, e.g. a Social Coin*[13].
- **Monitoring and Feedback**. To provide high-quality public services, it is fundamental to be able to capture, collect, and represent the information about the

[12] https://ec.europa.eu/isa2/solutions/core-public-service-vocabulary-application-profile-cpsv-ap_en

[13] https://en.goteo.org/project/the-vis-à-vissocial-coin

service execution and its quality-related characteristics. This refers not only to the software services (e.g., performance, response time), but to services in general (e.g., procedure processing times, quality of information, etc). This makes the requirement of openness to be expanded also to the possibility for businesses and citizens to provide feedback regarding the usage of services, report problems and participate in the definition of new requirements. For what concerns the service implementation we, therefore, can speak about:

- The problem of *collecting and analyzing service quality metrics for software services*;
- The problem of *collecting and analyzing the properties related to the execution of underlying processes*;
- The problem of *collecting the feedback* of the service consumers, being end-users, integrating parties, or other stakeholders;
- The problem of *visualization of the collected data* in aggregated, anonymized and informative manner.
- The problem of *providing appropriate support tools* for the service consumers (e.g., help desks).

- **Cloud-readiness**. The EU Cloud Strategy[14] promotes the *Cloud-first principles* when developing and delivering new digital public services, systems, and solutions. The service implementation should consider and prefer cloud-native architectures and technologies, avoid vendor lock-in and guarantee portability across different standard Cloud solutions (multi-cloud). Most of the problems in this area require rather technical competences, and include:
  - *Understanding, selection, and engagement of cloud models* applicable to the scenario (e.g., Public, Private, or Hybrid Cloud);
  - *Definition of a Cloud-native architecture* suitable for the service in hands, considering open standards such as OpenStack or de facto ones such as Kubernetes;
  - *Identification and selection of appropriate Cloud service providers* (e.g., IaaS, PaaS, and/or SaaS solutions) for common problems (e.g., software deployment, mobile end user communication, elastic data storage, etc).

  The solutions in this area refer to a wide range of guidelines and best practices promoted, e.g., by local agencies (see, for instance, Italian AgID guidelines for Cloud adoption), technological solutions (e.g., Cloud-native Computing Foundation initiative[15]), catalogues of certified Cloud service providers, etc.

2 Methods for INTERLINKERs identification

As mentioned at the beginning of this deliverable, the elicitation of INTERLINKERs has been based on different perspectives and inputs coming from the different WPs of the INTERLINK project. In particular, the inputs coming from WP2 on the governance model, from WP4 and the initial list of requirements described in D4.1., and from WP5, that aims

[14] https://ec.europa.eu/info/sites/default/files/ec_cloud_strategy.pdf

[15] https://www.cncf.io/

at defining and executing the three proof-of-concept use-cases in the three PAs participating in the project. A fourth public body - the Municipality of Reggio Emilia - has been involved to enrich our understanding about PAs and their needs in relation to service co-production. Finally, this knowledge has been complemented with a desk research aiming at identifying best practices, guidelines and available tools for the co-production of public services, already validated methods and tools for service design, co-design and design thinking.

More in detail, the following synergies have been exploited:

- **Input from the governance model (WP2) and platform requirements (WP4).** The initial draft of the Governance Model developed in WP2 (and that will be described in detail in D2.1.) proposes a new collaborative governance model, based on a partnership between private actors (citizens and companies) and public administrations for the creation of new public services (Misikangas et al. 2021). As further described in D4.1, the model identifies two main phases of the co-production process (Co-Design and Co-Delivery) that are further specified in sub-phases. Analysing the flow of co-production is pivotal for distilling the problems encountered by collaborative teams of stakeholders and for designing enablers to support the process.
- **Elicitation of needs from actual use cases (WP5).** The elicitation of INTERLINKERs has been carried out in synergy with WP5 activities, focused on specifying the proof-of-concept experiments to be executed in the three PAs partners of INTERLINK, namely the Italian Ministry of Economy and Finance (MEF), the Latvian Ministry of Regional Development (VARAM) and the City of Zaragoza (ZGZ). The three use-case partners have been involved since the beginning of the project to elicit specific requirements related to the different public services to be developed and validated in each PA (see D4.1.). The general scenarios presented in D4.1. have been further refined and the needs of PAs specified and prioritized to come up with an advanced list of INTERLINKERs to be included in the Catalogue for the first pilot tests. Additional workshop activities were carried out in collaboration with the Municipality of Reggio Emilia, which represents a Public Administration external to the project consortium with a high interest in the project expected outcomes and which has already put in practice concrete co-production processes (see Appendix 4 - An example of co-production process and related problems: the Reggio Emilia case study" for more details on this activity).
- **Good practices on design of public services, service design, design thinking.** Inputs coming from the different project WPs have been complemented with a desk research aiming at identifying good practices and available tools for the co-production of public services, already validated methods and tools for service design, co-design and design thinking. A particular focus has been dedicated to review guidelines and tools developed in other European projects (e.g. Silearning[16]). Appendix 1 - Good practices on design of public services, service design, design thinking" at the end of this document summarizes the reviewed tools and methods. Furthermore, knowledge for the implementation of INTERLINKERs has been collected leveraging the technical know-how and

[16] https://www.silearning.eu/.

experience of partners in the consortium in the field of service-oriented architectures and user-centered design.

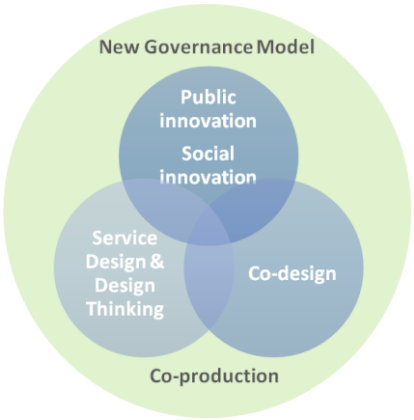

Figure 4. Fields of research that contribute to shed light on good practices to support public service co-production

2.1 Mapping INTERLINKERs from the co-production process

The INTERLINK platform aims at providing support - in terms of knowledge, facilitation tools and reusable components - to networks of stakeholders during the co-production of public services. For this reason, the identification of which knowledge and software resources are most valuable to be offered within the INTERLINK platform needs to start from an analysis of the co-production process of public services and the related governance models to make sure that the design of the Project platform fits the actual needs and information flows. The research performed in WP2 in the initial stages of the project development has provided preliminary indications on: the different phases of a co-production process, the major objectives that need to be pursued at each phase, the questions that may arise, the tasks to be performed to answer the questions.

As described in D4.1., the model focuses on the different phases of the co-production process, identifying two main phases of the process that are further specified in sub-phases (Figure 5):

- **co-design phase**: co-design concerns activities that incorporate "the experience of users and their communities" into the creation, planning, or arrangements of public services" (Bovaird and Loeffler, 2012). In this phase the co-production team is created and starts working together to define the service to be co-produced. The co-design phase entails two main sub-phases:
    - Engagement
    - Design
- **co-delivery phase**: co-delivery is a joint effort by public authorities and stakeholders to provide and improve public services (Alford, 2014; Nabatchi et.al., 2017) where the service is implemented and delivered in a sustainable manner. The co-delivery phase entails two main sub-phases:
    - Implementation
    - Sustainability

Iterative phases of **co-evaluation** are also necessary to check and monitor whether the co-production team is ready to proceed to the next phase.

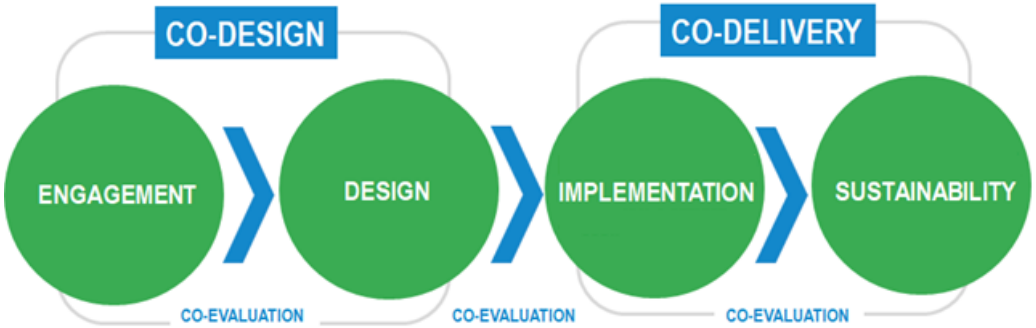

Figure 5. High-level view of the co-production process.

Table 2 shows an example of detailed analysis for each co-production phase, in terms of questions to solve and tasks to perform as reported in (Misikangas et al. 2021). Figure 6 provides an expanded overview of the major phases of a co-production process and the main objectives in each phase (based on (Misikangas et al. 2021) and the re-elaboration in Deliverable D4.1).

Table 2. Example of analysis of the co-production phases performed in workpackage WP2 (Misikangas et al. 2021)

PHASE	OBJECTIVE	QUESTIONS	TASKS
3. CO-EVALUATION (Go / No Go)	**Co-evaluation**	Is there a clear and accepted concept of the public service that can be developed?	Acceptance, technical feasibility, business and sustainability viability analysis
	Team formation	- Who should be on the team(s) in the next phase? - What support do they need?	Skills/expertise analysis

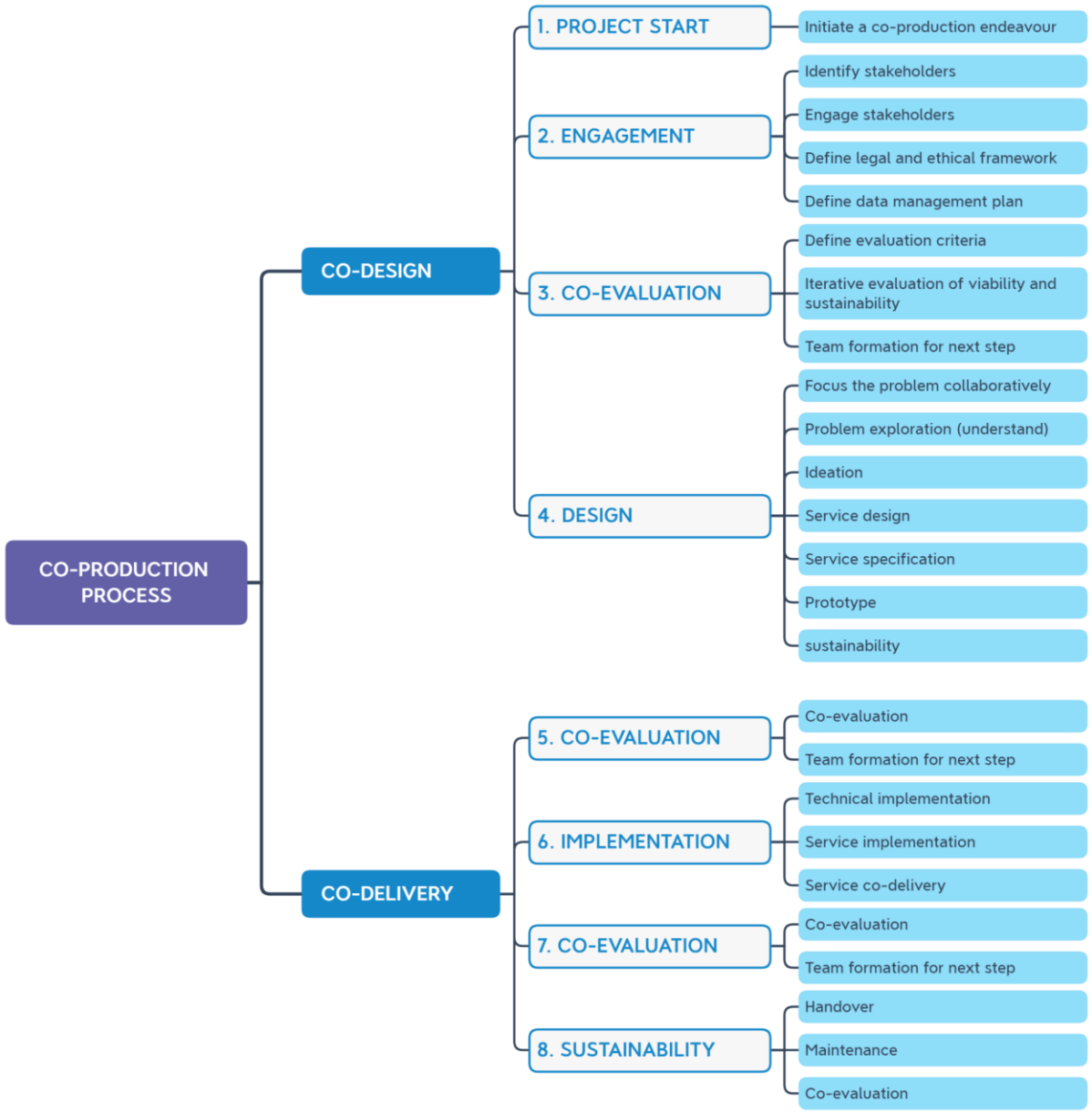

Figure 6. Expanded view of the major phases of a co-production process and the main objectives in each phase. Based on (Misikangas et al. 2021)

In collaboration with WP2, WP3 started from these intermediate results to further investigate the necessary knowledge and tools for performing the tasks. Figure 7 exemplifies how each objective in the co-production process (the light blue leaf nodes in Figure 6) was examined and split into found problem domains, which were expanded to describe possible enabling functionalities to be implemented in INTERLINKERs, as will be illustrated in the following Section 3 of this document.

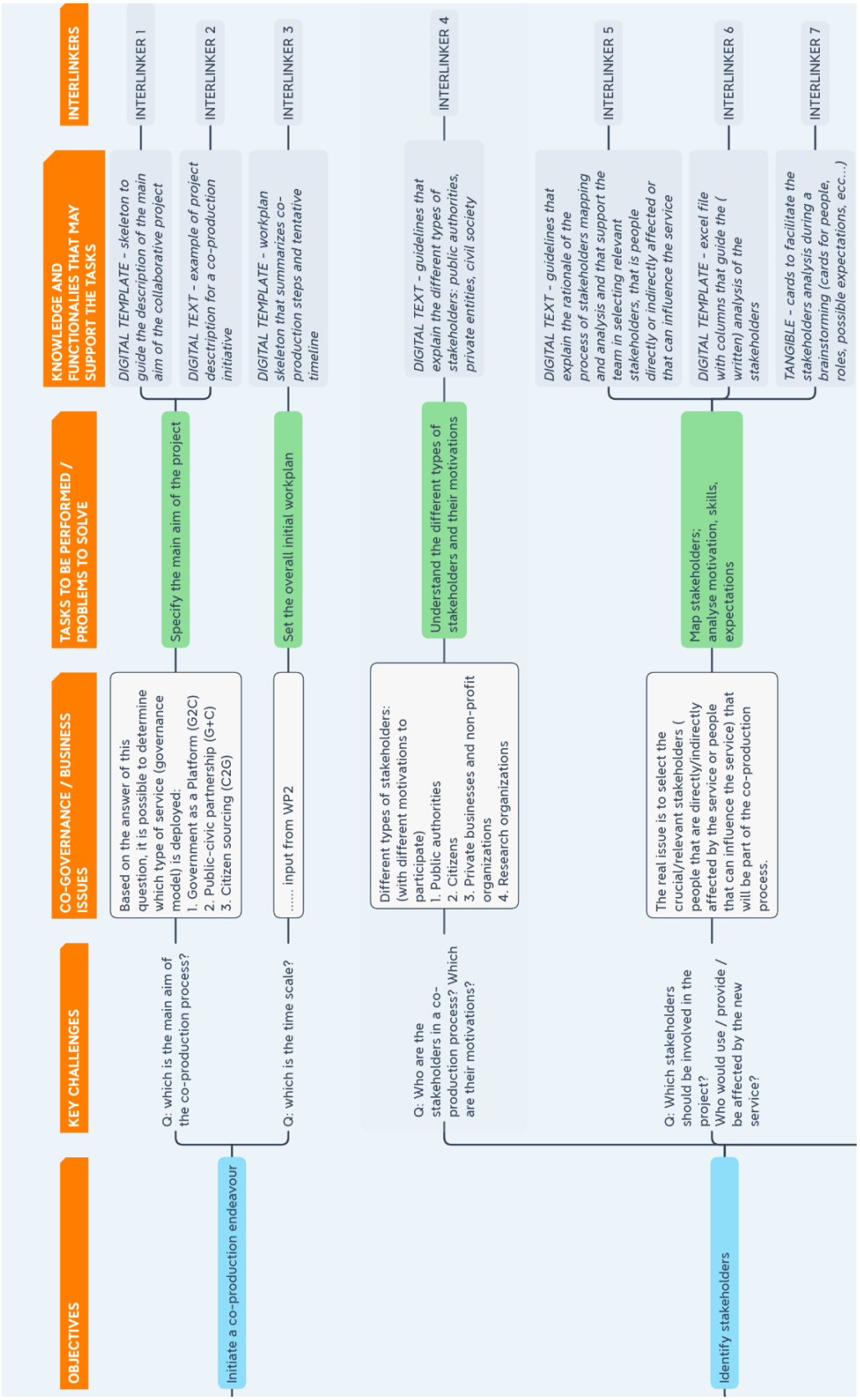

Figure 7. Analysis of the tasks that need to be performed for co-production objectives and of the resources that may support each task. Example analysis for the first two leaf nodes in Figure 6

The result of **this analysis work will be iteratively refined during the project as research in WP2 progresses and further details, critical issues and options are added to the conceptual map of co-production for public services**. Indeed, several tree-like maps may be required for different governance models (C2G, G2C, C+G) or even depending on the nature of every co-produced artifact, as these models represent different types of services, based on different rationales.

Refinements in the list of INTERLINKERs (knowledge-based as well as software ones) will be documented in the following stages of the project development within deliverables D3.2 "Initial repository of INTERLINKERs and partnership tools" (M16) and D3.3 "Final repository of INTERLINKERs and partnership tools" (M28).

3 List of Problem Profiles to be addressed by INTERLINKERs

This section of deliverable D3.1 collects preliminary specifications for knowledge and software INTERLINKERs that will populate the Catalogue. This is done by **listing the problems that stakeholders involved in a co-production process encounter and describing the knowledge and software functionalities that are required to help solve the problems**. For each INTERLINKER, deliverables D3.2[17] and D3.3[18] will then illustrate in detail all the resources (knowledge or software) that implement the actual enablers, as well as the formal description of the associated problem profiles that will be used to populate the INTERLINK platform.

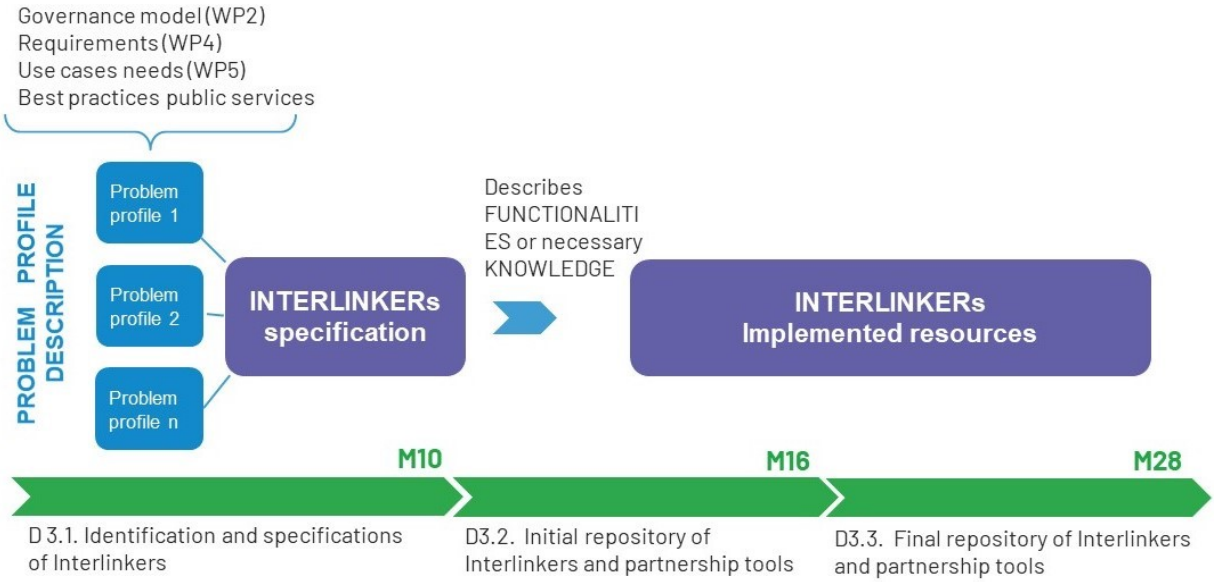

Figure 8. Relationship between contents in deliverables D3.1, D3.2 and D3.3.

[17] Deliverable D3.2 "Initial repository of INTERLINKERs and partnership tools" (M16).

[18] Deliverable D3.3 "Final repository of INTERLINKERs and partnership tools" (M28).

3.1 INTERLINKERs clustering according to Problem categories

As discussed in Section 1.2.3 above, INTERLINKERs may be classified according to different categorizations and points of view based on: corresponding problem they help to solve; type of targeted stakeholders; type of role in the SOC mapping (Enabling Service, Enhancing Services); nature of INTERLINKER (software / knowledge); context of application (administrative scope, governance model, specific application domain); classification based on software features; classification based on type of knowledge/template and digital format.

For the illustration of the list of potential INTERLINKERs to be integrated in the INTERLINK platform, in the following sections **we cluster groups of INTERLINKERs according to the categories of problems they help solve during the co-production process**. We follow the approach elaborated within National and European initiatives for the development of guidelines and kits for the co-production of citizen-centric public services. In particular, we merge the clustering sponsored by AGID (Agenzia per l'Italia Digitale) and the Italian National Department for the Digital Innovation[19] with the results distilled within the Silearning European project[20].

The following categories have been identified:

- Enablers to ORGANIZE

  This category includes INTERLINKERs that provide support to tasks like team management, project management, team engagement, communication. These enablers are transversal to different phases of a co-production process.

- Enablers to UNDERSTAND

  This category includes INTERLINKERs that are helpful in analysing problems, user needs and roles, the context of service application. These enablers are transversal to different phases of a co-production process.

- Enablers to DEFINE

  This category includes INTERLINKERs that provide support in planning and designing the different aspects, scenarios and interfaces of public services. These enablers are particularly useful during the ENGAGE and DESIGN phases of a co-production process.

- Enablers to BUILD

  This category includes INTERLINKERs that offer knowledge and building blocks for the creation/improvement of public services. These enablers are particularly useful during the IMPLEMENTATION phase of a co-production process.

- Enablers to VALIDATE

[19] Kit | Designers Italia

[20] https://www.silearning.eu/tools/

This category includes INTERLINKERs that provide support to testing ideas viability, acceptability, quality of service, quality of production process. These enablers are transversal to different phases of a co-production process and enable the iterative refinement of the collaborative project ideas and results.

- Enablers to SUSTAIN

  This category includes INTERLINKERs that help decide aspects related to the way public services will work in the long term and will provide benefit to different stakeholders. These enablers are particularly useful during the DESIGN and SUSTAINABILITY phases of a co-production process.

Different categories of knowledge and software INTERLINKERs can help support the various phases of a co-production process, as illustrated in Figure 9. Some enablers (for example validation enablers) are helpful iteratively throughout the process, given the intrinsic iterative nature of a service design process that implies progressive refinement and incorporation of stakeholders' feedback. Other enablers (for example those for understanding a problem) can be used at different levels of granularity and depth according to the co-production phase under consideration (e.g. early stage of problem understanding vs. advanced context analysis).

The phases in Figure 9 reflect the current status of development of the governance model as corresponding to the research progress in WP2 at M10 (Misikangas et al. 2021).

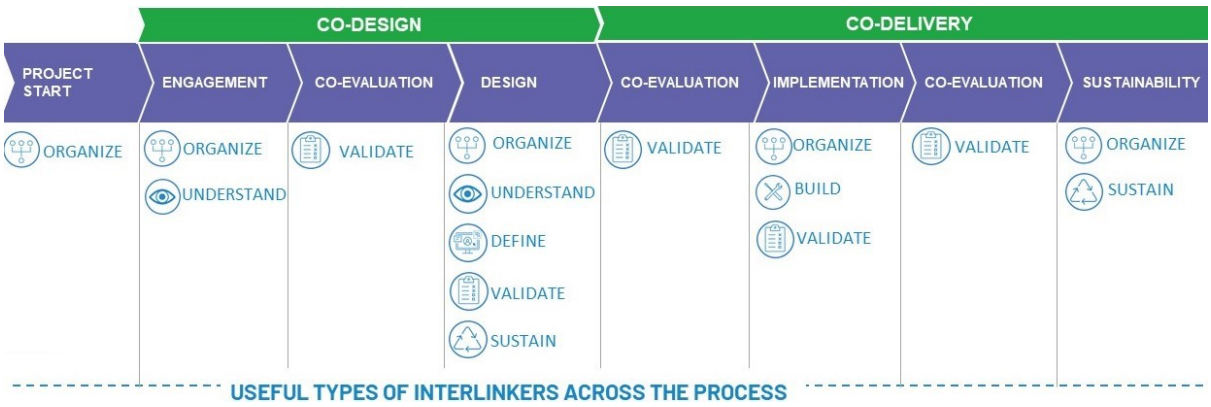

Figure 9. Multiple mapping of INTERLINKERs categories to the co-production process phases

Table 3 here below defines the schema that has been used to describe the problems that may emerge (also iteratively) during the phases and activities of the co-production process and the set of functionalities that they call for. These functionalities represent specifications for (knowledge and/or software) INTERLINKERs to be implemented. Multiple implementation solutions (INTERLINKERs) may fit the same specifications.

Table 3. Schema for describing problems and functional specifications that INTERLINK can address by providing specific INTERLINKERs

PROBLEM ID	***Identification code***

PROBLEM NAME	*A meaningful short name to identify a Problem that the INTERLINK platform should help address*
RELEVANT CO-PRODUCTION TASKS	*Reference to co-production phases / objectives / tasks where this problem is relevant. References are in the format PHASE :: OBJECTIVE :: TASK and make reference to the contents of the preliminary map of the co-production process illustrated in Section 2.1*
PROBLEM DESCRIPTION	*Brief description of what the Problem involves and by which means could be solved*
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	*List of functionalities or of knowledge that INTERLINKER(s) should provide to help solve the problem*
TYPE OF RESOURCES FOR IMPLEMENTATION	*List of types of resources that are required to implement the desired functionalities*
EXISTING CANDIDATE INTERLINKERS	*Links to existing knowledge or software resources reusable for the implementation of INTERLINKERs solving the Problem*
RELATED LITERATURE	*References to existing standards, project results, literature providing background to the Problem and suggesting implementation choices for INTERLINKERs*

3.2 Overview of Problem Profiles for INTERLINKERs

Table 4 provides an overview of the list of Problem Profiles related to the co-production of public services that have been identified at M10 and that will guide the implementation of INTERLINKERs.

Table 4. Summary of INTERLIKERs clustered by category

 **Enablers to ORGANIZE**	• ORG.PROBLEM.1 - Project aim description
	• ORG.PROBLEM.2 - Workplan and project management
	• ORG.PROBLEM.3 - Registration and authorization
	• ORG.PROBLEM.4 - Team communication
	• ORG.PROBLEM.5 - Stakeholders engagement plan
	• ORG.PROBLEM.6 - Collaboration tools
	  ○ ORG.PROBLEM.6.1 - Document collaboration
	  ○ ORG.PROBLEM.6.2 - Data visualization
	  ○ ORG.PROBLEM.6.3 - Discussion board
	• ORG.PROBLEM.7 - Non-disclosure agreement definition
	• ORG.PROBLEM.8 - Partnership agreement definition
	• ORG.PROBLEM.9 - Data management plan definition
	• ORG.PROBLEM.10 - Inform the public

	• ORG.PROBLEM.11 - Consensus building and agreement seeking with the public • ORG.PROBLEM.12 - Develop a shared language • ORG.PROBLEM.13 - Loyalty, incentives and rewards • ORG.PROBLEM.14 - Consent collection
 **Enablers to UNDERSTAND**	• UND.PROBLEM.1 - Collaborative problem refinement • UND.PROBLEM.2 - Stakeholders mapping • UND.PROBLEM.3 - Data collection about users and their behavior (or user research) • UND.PROBLEM.4 - Identify and understand users of the service • UND.PROBLEM.5 - Ideas crowdsourcing • UND.PROBLEM.6 - Ecosystem mapping
 **Enablers to DEFINE**	• DEF.PROBLEM.1 - Guidelines for public service design • DEF.PROBLEM.2 - Brainstorm service ideas • DEF.PROBLEM.3 - Organize a co-design workshop • DEF.PROBLEM.4 - Define the interaction flow among users and service • DEF.PROBLEM.5 - Define requirements and service specifications • DEF.PROBLEM.6 - Content design
 **Enablers to BUILD**	• BUILD.PROBLEM.1 - User Interface Design for Public Services • BUILD.PROBLEM.2 - Implement Accessible Digital Public Services • BUILD.PROBLEM.3 - Open Source Software Licensing • BUILD.PROBLEM.4 - Implementing Interoperable Digital Public Services • BUILD.PROBLEM.5 - Implementing Secure and Trusted Digital Public Services • BUILD.PROBLEM.6 - Engage and incentivise citizen participation for the co-implementation and co-delivery of public services • BUILD.PROBLEM.7 - Cloud-ready digital public services • BUILD.PROBLEM.8 - Re-use of CEF Building Blocks • BUILD.PROBLEM.9 - Collaborative knowledge sharing on public processes and services (Servicepedia and Good-practicepedia)
 **Enablers to VALIDATE / EVALUATE**	• VAL.PROBLEM.1 - Define evaluation criteria • VAL.PROBLEM 2 - Ongoing co-evaluation (Go-no go) • VAL.PROBLEM.3 - Develop and test a proof of concept • VAL.PROBLEM.4 - Test the digital service with experts • VAL.PROBLEM.5 - Monitoring and ongoing evaluation of the service co-delivered • VAL.PROBLEM.6 - Competitive advantage analysis
 **Enablers to SUSTAIN**	• SUS.PROBLEM.1 - Define a sustainability / business plan • SUS.PROBLEM.2 - Competitive advantage analysis • SUS.PROBLEM.3 - Feasibility analysis/study • SUS.PROBLEM.4 - Maintenance • SUS.PROBLEM.5 - Periodic evaluations with stakeholders (for service sustainability)

3.2.1. Problem category: ORGANIZE

The cluster of INTERLINKERs providing support to organizational matters includes enablers addressing the following problems :

- ORG.PROBLEM.1 - Project aim description
- ORG.PROBLEM.2 - Workplan and project management
- ORG.PROBLEM.3 - Registration and authorization
- ORG.PROBLEM.4 - Team communication
- ORG.PROBLEM.5 - Stakeholders engagement plan
- ORG.PROBLEM.6 - Collaboration tools
  - ORG.PROBLEM.6.1 - Document collaboration
  - ORG.PROBLEM.6.2 - Data visualization
  - ORG.PROBLEM.6.3 - Discussion board
- ORG.PROBLEM.7 - Non-disclosure agreement definition
- ORG.PROBLEM.8 - Partnership agreement definition
- ORG.PROBLEM.9 - Data management plan definition
- ORG.PROBLEM.10 - Inform the public
- ORG.PROBLEM.11 - Consensus building and agreement seeking with the public
- ORG.PROBLEM.12 - Develop a shared language
- ORG.PROBLEM.13 - Loyalty, incentives and rewards
- ORG.PROBLEM.14 - Consent collection

PROBLEM ID	ORG.PROBLEM.1
NAME	**Project aim description**
RELEVANT CO-PRODUCTION TASKS	PROJECT START :: initiate a co-production endeavour :: specify the main aim of the project
PROBLEM DESCRIPTION	This problem refers to the need to support the initiators of a co-production project to **describe the main aim and expected benefit of establishing a collaborative network of stakeholders and engaging them in the co-production process**
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	To solve this problem, the following knowledge enablers would be helpful: - a **template** to guide the preparation of the problem description, a tentative list of possible stakeholders, and (brief) draft scenarios. Possible template fields are for example: • Title for the co-production initiative • Context and description • Actual organization of the service • Limits/challenges of the actual service / initiatives • Future/desired scenario • Key Actors and roles • Related initiatives and projects • Available resources and links to other relevant documents - **examples** of template filing for inspiration
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL TEMPLATE - Doc file • DIGITAL TEXTUAL EXAMPLE - Doc file

EXISTING CANDIDATE INTERLINKERS	Knowledge resources: ● See template used for the initial problem statement of INTERLINK use cases described in Annex 1 of Deliverable D4.1. ● See example illustrating how the template can be filled in with exemplary content inspired to the VARAM use case in Appendix 2 - Sample Knowledge INTERLINKERs" below
RELATED LITERATURE	

PROBLEM ID	**ORG.PROBLEM.2**
NAME	**Workplan and project management**
RELEVANT CO-PRODUCTION TASKS	PROJECT START :: initiate a co-production endeavour :: set the overall initial workplan CO-EVALUATION :: iterative evaluation of viability and sustainability :: adjust the project workplan
PROBLEM DESCRIPTION	This item refers to the problem of preparing a **workplan that summarizes the co-production steps, the timeline and the milestones for the collaborative project**. The workplan needs to be sharable with the other members of the collaborative network and updatable as the project progresses.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge resources to support the preparation of the workplan should include: - a **visual template** that highlights the (possibly iterative) stages of a co-production process, based on the knowledge distilled in WP2 - **examples** of instantiated project workplans for inspiration. Different workplan templates should be made available to fit different governance models and different application domains. For co-production processes of large dimensions and complexity, desired functionalities include **software tools** that support a dynamic update of the workplan, with the additional management of milestones, tasks status, assignment of activities to people, with functionalities like: - Gantt and milestones representation - task management (creation, distribution and monitor) - time tracking - issues management
TYPE OF RESOURCES FOR IMPLEMENTATION	● DIGITAL VISUAL TEMPLATE ● DIGITAL VISUAL EXAMPLE ● SOFTWARE TOOL
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: ● Models of co-production process developed in WP2 Project management software: ● MeisterTask (https://www.meistertask.com/) ● Trello (https://trello.com/) ● MyCollab-Project (https://mycollab.com/)
RELATED LITERATURE	

PROBLEM ID	ORG.PROBLEM.3
NAME	**Registration and authentication**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Define and apply Data Management Plan :: Ensure trusted services IMPLEMENTATION :: Technical implementation :: Ensure trusted services
PROBLEM DESCRIPTION	This problem refers to the need to ensure authentication to applications and secure services.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The INTERLINKERs solving this problem need to satisfy eID compliance and GDPR compliance. The following functionalities are envisaged: Authentication • Authentication based on OAuth2.0/ OpenID Connect protocol and identity management using external Identity Providers (social, national, eID) User Information • Information about the currently authenticated user as of OpenID Connect APIs Authorization/Role management • Create user groups • Add user to a group with the specified roles • Change roles of the user within the group
TYPE OF RESOURCES FOR IMPLEMENTATION	• SOFTWARE COMPONENT • TECHNICAL USER MANUAL
EXISTING CANDIDATE INTERLINKERS	Software implementing authentication and authorization: • Authentication and Authorization Component developed by FBK compliant with eIDAS regulation • SPID (Italian Public Digital Identity System) or CIE • Key Cloak • Google, Azure, Auth0
RELATED LITERATURE	Pillar 1 - 2. Accelerating the take-up of eIDAS services | Futurium (europa.eu) EU regulations and eGovernment platform standards (Baheer et al. 2020)

PROBLEM ID	ORG.PROBLEM.4
NAME	**Team communication for co-production**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: identify stakeholders :: Create a contact list of network participants ENGAGE :: engage stakeholders :: Create awareness and communication ENGAGE :: engage stakeholders :: Communicate benefit for stakeholders IMPLEMENTATION :: use case scenario :: Team communication and management
PROBLEM	This problem item addresses the need to develop appropriate strategies for

DESCRIPTION	communicating the initiative, to actually contact stakeholders and schedule meetings.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	To solve this problem the following resources should be made available: - **guidelines** for a communication plan and contact strategy - **software tools** that support the easy preparation and distribution of communication material within the network, and the scheduling of meetings. Useful functionalities for team communication are: - email automation for personalization - pre-designed templates for newsletters - rich text and embedded forms - reports on opens and clicks Useful functionalities for meeting scheduling are: - calendar presentation - meeting organization and scheduling - meeting participants invitation management - share participants time slot availability
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • SOFTWARE TOOLS
EXISTING CANDIDATE INTERLINKERS	Software for team communication: • Mailchimp (https://mailchimp.com/) • MailerLite (https://www.mailerlite.com/) • …….. Software for team management: • Google Calendar (https://workspace.google.it/intl/en/products/calendar/) • Doodle (https://doodle.com/en/) • Dudle (https://dudle.inf.tu-dresden.de/?lang=en) • Easyappointments (https://easyappointments.org/)
RELATED LITERATURE	

PROBLEM ID	**ORG.PROBLEM.5**
PROBLEM NAME	**Stakeholders engagement plan**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Engage stakeholders :: create an engagement plan
PROBLEM DESCRIPTION	This problem refers to the need to support the initiators of a co-production project to **plan the active involvement of relevant actors** in the co-production team. This problem is related to UND.PROBLEM.2 "Stakeholder mapping" that provides knowledge on how effective and balanced co-production teams can be created, which are the different types of stakeholders, their motivations and potential role in the project.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	To solve this problem, the following knowledge enablers would be helpful: - **Digital template** (excel file) to describe for the potential stakeholders identified during the "Stakeholders mapping" (UND.PROBLEM.2): - 1. the desired or expected level of involvement - 2. potential issues related to their engagement - 3. motivations and barriers that can support finding the best strategy to engage them in the co-production process. - 4. responsible person - 5. timing of engagement during the different stages of the co-production process - **Example** of template filled for inspiration Research activities in progress within tasks T5.2 and T5.4 will contribute findings that will help further detail methods for stakeholders engagement, as will be documented in Deliverable D5.1 (M12).
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL EXCEL FILE • DIGITAL EXAMPLE
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: - Preliminary work in INTERLINK Task 5.3 (Use Case Community Building) and related materials contributing to D5.2 that will be delivered at M12 - Silearning stakeholders mapping https://www.silearning.eu/tools-archive/stakeholders-map2/ - Service design tools https://servicedesigntools.org/tools/stakeholders-map
RELATED LITERATURE	- Brandsen, Taco & Steen, Trui & Verschuere, Bram. (2018). How to Encourage Co-Creation and Co-Production: Some Recommendations. 10.4324/9781315204956-47. - Ann C. Svendsen and Myriam Laberge. Convening Stakeholder Networks: A New Way of Thinking, Being and Engaging. The Journal of Corporate Citizenship, no. 19, 2005, pp. 91–104. JSTOR, www.jstor.org/stable/jcorpciti.19.91 - WISER (2020) A manual for co-production in African weather and climate services. Second edition. Link: https://futureclimateafrica.org/coproduction-manual/

PROBLEM ID	**ORG.PROBLEM.6.1**
PROBLEM NAME	**Document collaboration**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: various objectives DESIGN :: various objectives IMPLEMENTATION & CO-DELIVERY :: various objectives SUSTAINABILITY :: various objectives CO-EVALUATION :: various objectives
PROBLEM DESCRIPTION	This problem addresses the need that might emerge at different stages of a co-production initiative to collaboratively produce and share documents. Tasks may include the need to organize and manage documents among the co-production team members, share documents among stakeholders, and help multiple people in the team work together on files to achieve a single final version.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	To solve this problem, **software tools** are required to support functionalities like: - authentication and authorization - document creation and editing, track changes - document storage (retrieve content, document versioning) - management of dedicated repositories for each service co-creation project - management of access rights granted only to members of the working group - support for different document formats
TYPE OF RESOURCES FOR IMPLEMENTATION	• SOFTWARE TOOLS for document collaboration
EXISTING CANDIDATE INTERLINKERS	Software resources: • Google workspace is a collection of cloud computing, productivity and collaboration tools, software and products developed for digital document collaboration • Microsoft 365 • Dropbox • MediaWiki
RELATED LITERATURE	

PROBLEM ID	**ORG.PROBLEM.6.2**
NAME	**Data visualization**
RELEVANT CO-PRODUCTION TASKS	CO-EVALUATION :: co-evaluation DESIGN :: Problem exploration (understand) :: Collect data about users and their behaviour
PROBLEM DESCRIPTION	This problem refers to the need of using maps or charts to help the co-production team understand different measurable aspects for a public service, like for example: variables describing the context of the service, KPIs, evaluation variables like usability, acceptance, easy to use, quality of service
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	To support the team in visualizing data, **software tools** are required to; - upload large sets of data - handle and manage geographic information - output different chart, graph and map types - possible output in form of report - visualize interactive on-line maps/charts - create dashboards
TYPE OF RESOURCES FOR IMPLEMENTATION	• SOFTWARE TOOLS for data analysis and evaluation
EXISTING CANDIDATE INTERLINKERS	Sample software to visualize data in dashboards: • Tableau • Qlik • Kibana

	• Google Graph • Bespoke dashboards for public administrations created in numerous European projects
RELATED LITERATURE	- Andrew Ballard (2020) Promoting Performance Information Use Through Data Visualization: Evidence from an Experiment, Public Performance & Management Review, 43:1, 109-12

PROBLEM ID	**ORG.PROBLEM.6.3**
NAME	**Discussion board**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: engage stakeholders :: Create awareness and communication
PROBLEM DESCRIPTION	This problem relates to the need to support open discussion among the co-production team members. E.g. Discussion forum where the co-creation team can discuss ideas, service features, plan actions.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	To support the team in online discussions, **software tools** are required to; - support conversation on threads - provide notification of discussions - moderate contents - provide administrative dashboards - manage discussion groups - support polls for decision making
TYPE OF RESOURCES FOR IMPLEMENTATION	• SOFTWARE SERVICE
EXISTING CANDIDATE INTERLINKERS	Sample software to manage discussion boards: • Discourse • Loomio
RELATED LITERATURE	

PROBLEM ID	**ORG.PROBLEM.7**
NAME	**Non-Disclosure Agreement Definition (NDA)**
RELEVANT CO-	ENGAGEMENT :: Define Legal and Ethical Framework :: Define a partnership

PRODUCTION TASKS	agreement SUSTAINABILITY :: Handover :: Maintenance
PROBLEM DESCRIPTION	This problem item addresses the need to support the co-production team in defining an agreement for not disclosing confidential information that they need to share with each other as a necessary part of co-producing a service together.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge enablers solving this problem should contain descriptive **text** that explains the rationale and the benefit of preparing and signing a NDA, as well as, **templates** for guiding the preparation of the agreement, and **examples** of NDA agreements for the co-production of services. The baseline agreement template should cover: - Overall aim and domain of the NDA agreement - Type of agreement: mutual vs non-mutual - List of parties involved - Definition of what is deemed to be confidential - The scope of the confidentiality obligation by the receiving party - The exclusions from confidential treatment - The term of the agreement - Obligations - Duration of the agreement Multilingual versions of the agreement templates should be available
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL TEXTUAL EXAMPLES
EXISTING CANDIDATE INTERLINKERS	Examples of NDA are available here: *https://nondisclosureagreement.com/*
RELATED LITERATURE	

PROBLEM ID	**ORG.PROBLEM.8**
NAME	**Partnership agreement definition**
RELEVANT CO-PRODUCTION TASKS	ENGAGEMENT :: Define Legal and Ethical Framework :: Define a partnership agreement CO-EVALUATION :: Team formation for next step :: Revise the map of stakeholders
PROBLEM DESCRIPTION	This problem item addresses the need for information about good practices, templates and examples for preparing documents that define in a formal way **agreements for a collaborative network of stakeholders.**

	This need may emerge during the initial engagement of the stakeholders to write down the terms and general plan for the collaboration. When co-evaluation takes place on the outcome of the collaboration with respect to what was specified in the partnership agreement, possible revisions of the document may need to be introduced.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge enablers solving this problem should contain descriptive **text** that explains the rationale and the benefit of preparing and signing a partnership agreement, **templates** for guiding the preparation of the agreement, and **examples** of successful partnership agreements for the co-production of services. The baseline agreement template should cover: - Overall aim and domain of the agreement - The list of network partners - Rules for extending the network of stakeholders after the initial agreement signing - Definition of partner roles and levels of commitment - Definition of rules of fair play, obligations, rights within the collaborative network - Contact persons - Advisory board - Thematic work groups - Dissemination and communication plan - Monitoring and evaluation plan - Duration Alternative versions of the agreement template may be required for different governance models (e.g. G2C, C2G, C+G). Multilingual versions of the agreement templates should be available
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL TEXTUAL EXAMPLES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • A sample partnership agreement is represented by the Protocollo d'Intesa per la realizzazione del Progetto "Reggio Emilia – Smart City" (partnership agreement for the implementation of the project "Reggio Emilia – Smart City") • Other resources: https://legaltemplates.net/form/partnership-agreement/ For the implementation of knowledge INTERLINKERs addressing the problem of preparing partnership agreements, input will be provided by WP6.
RELATED LITERATURE	

PROBLEM ID	**ORG.PROBLEM.9**
NAME	**Data Management Plan Definition (DPM)**

RELEVANT CO-PRODUCTION TASKS	ENGAGEMENT :: Define Data Management Plan
PROBLEM DESCRIPTION	This problem item refers to the need to describe the data management life cycle for all data sets that are collected, processed or generated by the co-production of public services.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge enablers addressing this problem should include descriptive **text** that explains the rationale and the benefit of preparing a Data Management Plan, **templates** for guiding the preparation of the plan, **examples** of Data Management Plans. - The baseline Data Management Plan template should cover: - Overall aim and domain of the DMP - Motivations to collect data - Flow of data - Potential impact of data - The handling of data during & after the end of the project - The types of data - Definition of user and supplier preferences concerning data? (ownership, minimalization, responsibility, sharing, archiving, anonymity) - Policies for access and sharing - Policies and provisions for re-use - -Plans for archiving data
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL TEXTUAL EXAMPLES
EXISTING CANDIDATE INTERLINKERS	Sample knowledge resources: • MIT Libraries https://libraries.mit.edu/data-management/plan/write/ • Online tool to develop DMP https://www.dcc.ac.uk/dmponline%20 For the implementation of knowledge INTERLINKERs addressing the problem of defining a Data Management Plan, input will be provided by WP6.
RELATED LITERATURE	

PROBLEM ID	**ORG.PROBLEM.10**
NAME	**Inform the public**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Engage stakeholders :: Engage citizens in the co-production process CO-EVALUATION
PROBLEM DESCRIPTION	This problem item addresses the need to provide members of the public with the information they need to understand the project, the decision process, and also to understand how public input influenced the decision.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	INTERLINKERs addressing this problem need to provide **information** and **guidelines** on how to reach out to citizens and inform them on the creation of innovative public services. Sample methods to inform the public are for example: ● In-person methods to inform: public meetings, briefings, telephone contacts ● Remote methods to inform: printed and digital information (fact sheets, newsletters and bulletins), web sites, information repositories, information hotlines, information kiosks, press and media, social media) All these methods have specific constraints for their application, e.g. preferred number of participants, and contexts they are best suited for, e.g. type of audience or the current phase of the project[21]. Activities within INTERLINK WP5 are currently investigating which methods for informing and engaging the public are best suited for the three project use cases.
TYPE OF RESOURCES FOR IMPLEMENTATION	● DIGITAL TEXTUAL GUIDELINES - Html pages, downloadable PDF file
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: ● Public Participation Guide from US Environmental Protection Agency provides tools for public participation and public outreach in environmental decision-making https://www.epa.gov/international-cooperation/public-participation-guide-tools-inform-public ● Good practices developed within related European projects, for example ○ WeLive, Deliverable D4.4 – Citizens' and Stakeholders Engagement & Cooperation plan V2"[22] ○ Citadel, Deliverable D3.8 - Final CITADEL Methodology for co-creating a public service[23]
RELATED LITERATURE	(EUROCITIES 2020) Citizen engagement at local level. EUROCITIES principles on citizen engagement[24]

PROBLEM ID	**ORG.PROBLEM.11**
NAME	**Consensus building and agreement seeking with the public**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Engage stakeholders :: Engage citizens in the co-production process EVALUATION
PROBLEM DESCRIPTION	This problem item addresses the need to provide members of the public with the possibility to actively participate in the decision process, whenever this is desired by the selected governance model.

[21] https://www.epa.gov/international-cooperation/public-participation-guide-tools-inform-public

[22] https://www.welive.eu/sites/default/files/WeLive-WP4-D44-REP-170531-v10-UPDATED.pdf

[23] https://www.citadel-h2020.eu/sites/citadel.drupal.pulsartecnalia.com/files/documents/D3.8_Final_CITADEL_Co-Creation%20Methodology_v1.0_20190331.pdf

[24] https://eurocities.eu/wp-content/uploads/2020/08/2020_Principles_on_citizen_engagement_FINAL-1.pdf

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	INTERLINKERs addressing this problem need to provide **information** and **guidelines** on how to let public discussion converge and select preferred solutions. **Software tools** to aid e-voting are also relevant for this problem item. Sample methods for agreement seeking with the public are for example consensus workshops, advisory boards, citizen juries and computer assisted processes that include functionalities like online presentation, interactive polls and Q&A with participants, as well as real time visualization of answers. All these methods have specific constraints for their application, e.g. preferred number of participants, and contexts they are best suited for, e.g. type of audience or the current phase of the project[25]. Activities within INTERLINK WP5 are currently investigating which methods for consensus building and agreement with the public are best suited for the three project use cases.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES - Html pages, downloadable PDF file • SOFTWARE TOOLS
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Public Participation Guide from US Environmental Protection Agency provides tools for public participation and public outreach in environmental decision-making https://www.epa.gov/international-cooperation/public-participation-guide-tools-consensus-building-and-agreement-seeking Software tools: • Slido for live Q&A and polls with real time visualization https://www.sli.do • Mentimeter is a platform for interactive tutoring and learning and engage audience in a collaborative presentation https://www.mentimeter.com
RELATED LITERATURE	(EUROCITIES 2020) Citizen engagement at local level. EUROCITIES principles on citizen engagement[26]

PROBLEM ID	**ORG.PROBLEM.12**
NAME	**Develop a shared language (and value diversity)**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Engage stakeholders DESIGN :: Transversal to all the design phases IMPLEMENTATION :: Service co-delivery
PROBLEM DESCRIPTION	This problem item addresses the need of providing guidance on how to develop a shared language among the co-production team members to ensure effective co-design and co-production of services. Developing a shared language is crucial to be able for stakeholders to: i) build a common ground for joint action, ii) share, mutually agree on, and understand a long-term research plan and protocol, iii) to ongoingly evaluate the success or failure of

25 https://www.epa.gov/international-cooperation/public-participation-guide-tools-consensus-building-and-agreement-seeking

26 https://eurocities.eu/wp-content/uploads/2020/08/2020_Principles_on_citizen_engagement_FINAL-1.pdf

	decisions.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge enablers coping with this problem should include descriptive **text** that explains the rationale and the benefit of developing a shared language and of valuing the diversity of experiences, skills and values that each participant in the co-production process brings. The enablers should propose **activities** that the team might perform to create a shared language and value diversity. They should provide **guidelines** for discussing and exchanging knowledge, to value the knowledge of team members. In co-production processes it is crucial for participants to embrace diversity, to respect different values and knowledge systems.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Team Canvas included in the Sileraning toolkit: https://www.silearning.eu/tools-archive/team-canvas/
RELATED LITERATURE	WISER (2020) A manual for co-production in African weather and climate services. Second edition. Link: https://futureclimateafrica.org/coproduction-manual

PROBLEM ID	**ORG.PROBLEM.13**
NAME	**Loyalty, incentives and rewards**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Engage Stakeholders DESIGN :: Ideation IMPLEMENTATION
PROBLEM DESCRIPTION	Citizen participation in collaborative projects strongly depends on their motivation and their willingness to interact with governmental institutions and provide input on the given task.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Enablers related to this problem should provide guidance and tools to track citizens' engagement and reward participation.
	• Guidelines and tips on how to monitor citizens' level of engagement and track activities performed by citizens and other entities engaged in the collaborative process (e.g. participation in a workshop, submission of ideas on a web portal, attendance to events)
	• Guidelines to define the rewarding strategy
	• Types of rewarding mechanisms that can be used to sustain, encourage participation, according to the type of audience and depending on the tasks
	  ○ intrinsic rewarding (e.g.: fun, self-realization, challenging tasks etc.)
	  ○ extrinsic rewarding (e.g.: financial or non-financial rewards, career improvement, reputation etc.)
	• Guidelines and tools to assess and follow-up the user's engagement and satisfaction level of the public.
	• Module to track and follow up the engagement and satisfaction of citizens/participants.

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • SOFTWARE TOOLS
EXISTING CANDIDATE INTERLINKERS	
RELATED LITERATURE	https://en.goteo.org/project/the-social-coin, https://www.slideshare.net/dipina/social-coin-blockchainmediated-incentivization-of-citizens-for-sustainable-collaborative-processes

PROBLEM ID	**ORG.PROBLEM.14**
NAME	**Consent collection**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Engage Stakeholders DESIGN :: Ideation IMPLEMENTATION
PROBLEM DESCRIPTION	At different stages of the co-production process stakeholders (including citizens) are contacted, interviewed, asked for ideas and opinions. It is important to inform them about the context and purpose of the data collection and to gather their consent to be able to use the collected data collected in compliance with data protection regulations.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge enablers coping with this problem should include descriptive **guidelines** that explain the importance of complying with the GDPR at all stages of co-production. **Templates** for inform sheets and consent forms should be provided for different types of venues and data to be collected. Multilinguality and compliance to different national regulations should be supported.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES
EXISTING CANDIDATE INTERLINKERS	Materials under selection in WP6.
RELATED LITERATURE	

3.2.2. Problem category: UNDERSTAND

The cluster of INTERLINKERs providing support to understand and analyse a given challenge or matters includes the following enablers:

UND.PROBLEM.1 - Collaborative problem refinement
UND.PROBLEM.2 - Stakeholders mapping
UND.PROBLEM.3 - Data collection about users and their behavior (user research)
UND.PROBLEM.4 - Identify and understand users of the service
UND.PROBLEM.5 - Ideas crowdsourcing
UND.PROBLEM.6 - Ecosystem mapping

PROBLEM ID	UND.PROBLEM.1
NAME	**Collaborative problem refinement**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Problem exploration
PROBLEM DESCRIPTION	This item relates to the need of exploring and refining the problem that a service addresses. The service design process is a problem-solving activity and it is important to clearly understand which is the challenge that the team addresses and how more information can be collected to understand how the service should be designed. Guidelines and tools are needed to help teams in discussing initial ideas and assumptions, refine them through structured methods and become aware about the missing information that still needs to be collected.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The knowledge enablers solving this problem should include descriptive text that explains the rationale and the benefit of collecting and discussing ideas to refine the problem/challenge. Enablers should propose activities that the team might perform to refine the challenge concept, guiding the application of structured methods to collect and discuss ideas, such as brainstorming, and activities to elicit initial assumptions, to agree on ideas and refine them. This enabler should cover: - **Explanation** of the benefits for defining the challenge and refining the understanding of the problem to be addressed - Tips to structure an open discussion that value diversity and knowledge exchange - Methods that can be used to discuss and collaboratively refine the idea, such as a structured brainstorming - **Guidelines** on how to conduct a brainstorming for problem refinement - **Templates** that can be used to organize ideas during a brainstorming for problem refinement and identification of missing information (e.g. Ideas crowdsourcing, data collection through user research,..). These knowledge enablers can be associated to the use of a **Software enabler** to perform online brainstorming

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL TEXTUAL EXAMPLES • SOFTWARE TOOL
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Interaction Design Foundation on Problem statement: https://www.interaction-design.org/literature/article/stage-2-in-the-design-thinking-process-define-the-problem-and-interpret-the-results • IDEO guidelines for braistorming: https://www.ideou.com/blogs/inspiration/7-simple-rules-of-brainstorming • Silearning tool for group problem definition https://www.silearning.eu/wp-content/uploads/2017/04/problem-definition.pdf • Service design tools: Hypothesis Generation https://servicedesigntools.org/tools/hypothesis-generation Software for online brainstorming: • MINDMASTER • Google JAMBOARD • MIRO • MURAL • CMAP tool
RELATED LITERATURE	Polaine, L. Løvlie, Ben Reason. Service Design. From Insight to Inspiration. Rosenfeld Media, 2013

PROBLEM ID	**UND.PROBLEM.2**
NAME	**Stakeholders mapping**
RELEVANT CO-PRODUCTION TASKS	ENGAGE :: Identify stakeholders :: Map stakeholders, Analyse motivations, skills, expectations ENGAGE :: Identify stakeholders :: Visually map the network of stakeholders
PROBLEM DESCRIPTION	This problem item relates to the need to support the initiators of **the co-production process to identify, select and plan the active involvement of stakeholders** in the co-production team. It is important that the initiators of a co-production process understand who are the potential stakeholders, which are their motivations to participate and potential barriers, which skills and expertise they might bring in the project, and which type of support they need to fully contribute to the project.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge for "stakeholders mapping" should include: - **Guidelines** that explain the rationale of the process of stakeholders mapping and analysis and that support the team in selecting relevant stakeholders, that is people directly or indirectly affected by the service or that can influence the service. Different types of stakeholders exist that have diverse motivations to participate, different skills and potential roles to play in the project: public authorities (public servants and politicians, citizens (potential end-users and experts), private business and non-profit organizations (SMEs, freelance, etc).

	Also different roles should be considered: 1) service end-users, 2) co-production team, 3) Interlink partners
	- **Guidelines** to analyse stakeholders motivations and potential incentives to participate: i) personal, ii) society, iii) financial, iv) governance, iv) research
	- **Templates** that support the team in
	  - creating a stakeholders map, which is helpful for understanding the complexity of building relationships, realizing which connectors can be crucial for innovation development and why
	  - in making the network balanced, i.e. by
	  - ensuring inclusiveness, or openness to all who wish to participate
	  - ensuring representativeness, ensuring that the interests of all stakeholders are effectively advocated
	  - ensuring impartiality, or all parties being treated equally
	  - recognising gender and cultural differences
	- **Tangible material** to facilitate the stakeholders analysis during a brainstorming (cards for people, roles, possible expectations, etc.)

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL AND PHYSICAL TEXTUAL CANVAS and CARDS • DIGITAL TEXTUAL EXAMPLES • SOFTWARE TOOL
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Silearning toolkit: https://www.silearning.eu/tools-archive/stakeholders-map2/ • Service design tools https://servicedesigntools.org/tools/stakeholders-map Software for online brainstorming • MINDMASTER • Google JAMBOARD • MIRO • MURAL • CMAP tool
RELATED LITERATURE	Giordano Fanny, Morelli Nicola, De Götzen Amalia, Hunziker Judith. The stakeholder map: A conversation tool for designing people-led public services. 2018

PROBLEM ID	**UND.PROBLEM.3**
NAME	**Data collection about users and their behavior (user research)**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Problem exploration DESIGN :: Sustainability CO-EVALUATION :: Co-evaluation SUSTAINABILITY :: Co-evaluation
PROBLEM	This problem item refers to the need to support teams in collecting data and information about users and their behaviour for different purposes and phases of

DESCRIPTION	the co-production process, e.g. to better understand a phenomenon, to improve knowledge on citizens' needs toward services, to measure attitudes and expectations, to monitor users satisfaction toward a service or a facility.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The enablers addressing this problem item should help select the most appropriate data collection methods according to the specific information goals, explaining their pros and cons. For each method presented (e.g. survey, interviews, etc), guidelines and templates should be provided.
	Knowledge enablers should cover articulated **guidelines** including:
	- Motivations to perform user research, according to the phase of the process and specific needs in terms of data collection, e.g.:
	  - understand a phenomenon
	  - validate an hypothesis
	  - evaluate a service
	  - monitor service quality
	- Benefits of collecting data directly from users
	- Type of data that can be collected and their pro and cons: qualitative vs quantitative
	- Description of the different methods to collect data
	- Guidelines to support the team in deciding which is the best method to use to collect data, according to their informative needs, constraints and skills
	- The description of the process that should be followed to define a protocol for data collection
	- Description of how to collect and manage personal information when conducting user studies
	- Tips on how to collect data through interviews
	- Tips on how to collect data through focus groups
	- Tips on how to collect data through online surveys
	- Tips on how to collect data through web data
	
	Specific **templates** with already validated dimensions and scales are provided to support the set-up of the user research, such as
	- satisfaction / perceived quality of a service
	- intention to use / easy to use scale
	These knowledge enablers can be associated with the use of **Software tools** for surveys.

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • SOFTWARE TOOL
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • THINK DESIGN https://think.design/services/user-research-company/ • GOV.UK https://www.gov.uk/service-manual/user-research/how-user-research-improves-service-design • User research methods described in Usability.gov usability.gov/how-to-and-tools/methods/user-research/index.html Software tools for surveys: • Google Forms • Survey Monkey • Qualaroo
RELATED LITERATURE	Kuniavsky M. Observing the User Experience: A Practitioner's Guide to User Research. Ed. Morgan Kaufmann. 2012 Morgan D. L. (1998) The Focus Group Guidebook, SAGE Publications.

PROBLEM ID	UND.PROBLEM.4
NAME	**Identify and understand users of the service (Personas)**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Problem exploration DESIGN ::Ideation DESIGN :: Service Design
PROBLEM DESCRIPTION	A co-production team might need help to define the targets of the service and the characteristics of the users of the service and which are their main needs and the challenges they experience.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge enablers addressing this problem should include - Descriptive **text** that explains the rationale of clearly identifying the target users of a service and a definition of "Personas" as a method to identify, understand and empathize with users of a service - **Guidelines** on how to identify "Personas" - **Guidelines** and **templates** to use "Personas" during the design process
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL CANVAS
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Open Design Kit http://opendesignkit.org/methods/personas/ • Designers Italia - Template for Personas https://designers.italia.it/kit/esperienza-utente/ • IDEO Design Kit https://www.designkit.org/methods/co-creation-session
RELATED LITERATURE	Cooper A., Reimann R, (2003) About face. The essentials of interaction design, Wiley Publishing, Inc.

PROBLEM ID	UND.PROBLEM.5
NAME	**Ideas crowdsourcing**
RELEVANT CO-PRODUCTION TASKS	DESIGN ::Ideation
PROBLEM DESCRIPTION	This problem relates to the need to support the co-creation team to collect ideas from a large set of contributors (e.g. citizens) related to a specific challenge, organize and manage the ideas and eventually evaluate them. Crowdsourcing projects can target both internal and external participants via dedicated tools and platforms, questionnaires, social media, competitions and other methods.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The enablers solving this problem should contain descriptive **text** that explains the rationale and the benefit of collecting crowdsourced data.
	Guidelines, **tips** and **examples** are to be made available to support the co-creation team to collect ideas from a large set of contributors (e.g. citizens).
	Information that should be included:
	- Definition of ideas crowdsourcing
	- Benefits of crowdsourcing
	- When this method can be helpful
	- Process to set-up an ideas crowdsourced initiative
	- Which participants should be involved?
	- Understand motivations for participation: why do people participate in this kind of activity? Which are their motivations?
	- Barriers and challenges in using crowdsourced data
	- How to promote the initiative (channeles, strategies, etc)
	- Examples of projects in which crowdsourced data have been used
	- Methods that can be used to perform ideas crowdsourcing:
	  - SW tools
	  - Social media
	  - Online questionnaire
	  - Public workshops
	
	This knowledge enabler can be associated to the use of **software enablers** to perform ideas crowdsourcing

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • SOFTWARE TOOL
EXISTING CANDIDATE INTERLINKERS	Software resources: • Brightidea • Loomio • FUTURA TRENTO
RELATED LITERATURE	Liu H. K. Crowdsourcing: Citizens as co-producers of public services. In Policy & the Internet. Vol. 13, Issue2. 2021, Pp. 315-331

PROBLEM ID	**UND.PROBLEM.5**
NAME	**Ecosystem mapping (Understand the relationships among all the entities of a service ecosystem)**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Problem exploration IMPLEMENTATION :: Service co-delivery
PROBLEM DESCRIPTION	This problem item refers to the need to map in a synthetic representation all the key roles that can impact on the user, organization and service environment. The ecosystem map is built by first displaying all the entities, and then connecting them based on the type of value they exchange.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The knowledge enablers addressing this problem, first of all, include descriptive **text** that explains the rationale and the benefit of mapping all the entities involved in the delivery of a service. **Guidelines** should be provided to - explain the process that should be followed to map the entities - illustrate the difference between actors (primary, secondary, etc), organizations, services **Templates** should be prepared to facilitate - the listing of actors and their role - the visual representation of the map of actors and their relationships
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL CANVAS
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Designers Italia https://designers.italia.it/kit/analisi-contesto/ • Service Design Tools https://servicedesigntools.org/tools/ecosystem-map
RELATED LITERATURE	J. Vink, K. Koskela-Huotari, B. Tronvoll, B. Edvardsson, K. Wetter-Edman. Service Ecosystem Design: Propositions, Process Model, and Future Research Agenda Journal of Service Research (IF10.667), 2020.

3.2.3. Problem category: DEFINE

DEF.PROBLEM.1 - Guidelines for public service design
DEF.PROBLEM.2 - Brainstorm service ideas
DEF.PROBLEM.3 - Organize a co-design workshop
DEF.PROBLEM.4 - Define the interaction flow among users and service
DEF.PROBLEM.5 - Define requirements and service specifications
DEF.PROBLEM.6 - Content design

PROBLEM ID	**DEF.PROBLEM.1**
NAME	**Guidelines for (digital) public service design**
RELEVANT CO-PRODUCTION TASKS	DESIGN ::Transversal to all the phases of the service design
PROBLEM DESCRIPTION	Public Administrations and their service providers may require a general introductory guidance on how to approach the design of high-quality public services. The guidelines should refer to the different issues related with the "Service design" problem.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The knowledge enablers addressing this problem should be in the form of descriptive **text** that summarizes the main guidelines related to the design of digital public services. They should provide information on these topics: - principles of citizen-centred design, - principles of service design and of e-government, - aspects of project management, - required expertise for service design, - accessibility, - relevant regulations, - good practices for content design, - language, - issues related to SEO, - principles of user research, - guidelines for user interface design.
TYPE OF RESOURCES FOR IMPLEMENTATION	DIGITAL TEXTUAL GUIDELINES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: ● Designers Italia Guidelines (AGID) https://docs.italia.it/italia/designers-italia/design-linee-guida-docs/it/stabile/index.html ● OECD Recommendations for Digital Government Strategies https://www.oecd.org/gov/digital-government/Recommendation-digital-government-strategies.pdf ● IDEO & NESTA Guidelines : Designing for Public Services https://www.nesta.org.uk/toolkit/designing-for-public-services-a-practical-guide/
RELATED LITERATURE	

PROBLEM ID	**DEF.PROBLEM.2**
NAME	**Brainstorm service ideas**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Ideation
PROBLEM DESCRIPTION	Brainstorming sessions may be useful in different phases of the co-production process. During each phase, the template and materials useful to guide the discussion should be customized to facilitate the organization of the specific event. During the "ideation" stage, the co-production team may require specific guidance in organizing and managing a brainstorming to produce service ideas, discuss and select them, through divergent and convergent phases of group discussion.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge enablers addressing this problem should cover: - Descriptive **guidelines** explaining the rationale and the benefit of organizing a brainstorming for discussing service ideas - When it is useful to organize a brainstorming - A **template** description of the process that should be followed to organize and manage a brainstorming - **Tools and materials** that can be used to organize a brainstorming: online vs offline

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL CANVAS • SW FOR BRAINSTORMING
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Service design Toolkit: https://servicedesigntools.org/tools/brainstorming • Silearning design tools https://www.silearning.eu/tools-archive/brainstorm-web/ Software tools for online brainstorming: • MINDMASTER • Google JAMBOARD • MIRO • MURAL • CMAP tool
RELATED LITERATURE	R. C. Lee The Outcome-Based Collaborative Brainstorming of Strategic Service Design. HCI (21) 2016: 511-518

PROBLEM ID	**DEF.PROBLEM.3**
NAME	**Organize a co-design workshop**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Ideation :: Problem Exploration :: Service design
PROBLEM DESCRIPTION	After the understanding of the problem and the brainstorming of the service ideas, the co-production team should elaborate concrete solutions for a given challenge. Co-design workshops are useful at this stage as collective activities organized to discuss design issues and choices. Enablers are required to suggest how the co-production team can work together and with relevant actors (also considering the map of actors developed thanks to the INTERLINKER "Map of actors") to start defining the service to be co-designed and co-delivered.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Enablers supporting this problem item include descriptive **text** that explains the rationale and the benefits of performing co-design workshops as part of a co-production process and template materials to guide organizing and managing the workshop. Enablers should cover: - Definition of a co-design workshop - Motivations to carry out a co-design workshop - Tips on how to organize a co-design workshop (e.g. define the topic, define the agenda, choose the data, prepare presentation and material for the workshop, define roles: who is the moderator? - Tips on how to moderate a co-design workshop - Activities that can be performed during a co-design workshop (using INTERLINKERs such as "Map of the Actors"; "Personas") - Examples

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL CANVAS
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Nielsen Norman Group Guidelines for organizing co-design workshops https://www.nngroup.com/articles/facilitating-ux-workshops-guide/ • Designers Italia - Template for Co-design Workshop https://designers.italia.it/kit/co-progettazione/ • IDEO Design Kit https://www.designkit.org/methods/co-creation-session
RELATED LITERATURE	Steen et al (2011) Benefits of Co-design in Service Design Projects. In International Journal of Design, Vol 5, No 2 (2011) http://www.ijdesign.org/index.php/IJDesign/article/view/890/346

PROBLEM ID	**DEF.PROBLEM.4**
NAME	**Define the interaction among users and service (Scenarios and User Journey)**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Service design
PROBLEM DESCRIPTION	The co-production team may need guidance on how to define the interaction between the users and the service, reflecting on how a solution might be used by concrete users in a concrete context.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Descriptive **text** that
	- explains the rationale and the benefits of clearly defining the interaction among users and a service before implementing it.
	- suggest tools that can be used to reach this goal, such as "Scenarios", and "User Journey"
	- For each method presented:
	  - benefit of using it in a design process
	  - how to use it
	  - templates
	  - Examples

TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL CANVAS
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Templates used in INTERLINK for scenarios and personas description. See INTERLINK Deliverable 4.1. • Designers Italia https://designers.italia.it/kit/esperienza-utente/ • Silearning toolkit https://www.silearning.eu/tools-archive/customer-journey/ • Service design Tools https://servicedesigntools.org/tools/user-scenarios • Interaction design Foundation

	https://www.interaction-design.org/literature/topics/user-scenarios
RELATED LITERATURE	Carroll JM, (2000) Making use: Scenario-based design of human-computer interactions, MIT Press, Cambridge, Massachusetts.

PROBLEM ID	**DEF.PROBLEM.5**
NAME	**Define requirements and service specifications**
RELEVANT CO-PRODUCTION TASKS	Design :: Service specifications
PROBLEM DESCRIPTION	The ideas and service design concepts need to be translated into formal requirements and service specifications to proceed with the implementation of the service. Guidance may be needed on how to collect, structure and communicate requirements and all the service specifications that clarify the objective of the service and how it should be developed.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The knowledge enablers addressing this problem item should provide descriptive **text** that - explains the rationale and the benefits of clearly defining how a system /service should work - illustrates different approaches for specifying system requirements and service specification and the pros and cons of the different approaches - explains how to select the best approach based on the task, team composition and other factors - contains **guidelines and templates** on how requirements can be represented - contains **guidelines and templates** on how service specifications can be represented
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • VOLERE Templates for requirements description https://www.volere.org/templates/ • Service Design Tools https://servicedesigntools.org/tools/service-specifications
RELATED LITERATURE	Bertot, J., Estevez, E., & Janowski, T. (2016). Universal and contextualized public services: Digital public service innovation framework. Government Information Quarterly, 33(2), 211–222. doi:10.1016/j.giq.2016.05.004

PROBLEM ID	**DEF.PROBLEM.6**
NAME	**Content design**

RELEVANT CO-PRODUCTION TASKS	DESIGN :: Service specification :: Content Design
PROBLEM DESCRIPTION	When defining a new public service, the co-production team needs to prepare adequate content. Guidance is needed on how to select and use the most appropriate language according to the users of the digital service and their skills.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Enablers addressing this problem item should provide **guidelines** and operational tools to create content, review it collaboratively and define the correct tone of voice with which to address users. **Examples** and **templates** to provide guidance in the good practice of using a shared approach to the creation and management of textual and multimedia content are required.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL TEXTUAL EXAMPLE
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Designers Italia https://designers.italia.it/kit/contenuti-linguaggio/
RELATED LITERATURE	Nielsen, J., and Molich, R. (1990). Heuristic evaluation of user interfaces, Proc. ACM CHI'90 Conf. (Seattle, WA, 1-5 April), 249-256

3.2.4. Problem category: BUILD

The cluster of INTERLINKERs providing support to the implementation of a public service may be varied, depending on the specific needs of each case study. We focus here on some general problems for the development of public services (BUILD.PROBLEM.1-8) and on domain problems that characterize the three INTERLINK use cases and have the potential to be of interest also to other Public Administrations (e.g BUILD.PROBLEM.9).

BUILD.PROBLEM.1 - User Interface Design for Public Services
BUILD.PROBLEM.2 - Implement Accessible Digital Public Services
BUILD.PROBLEM.3 - Open Source Software Licensing
BUILD.PROBLEM.4 - Implementing Interoperable Digital Public Services
BUILD.PROBLEM.5 - Implementing Secure and Trusted Digital Public Services
BUILD.PROBLEM.6 - Engage and incentivise citizen participation to the implementation and co-delivery of public services
BUILD.PROBLEM.7 - Cloud-ready digital public services
BUILD.PROBLEM.8 - Re-use of CEF Building Blocks
BUILD.PROBLEM.9 - Collaborative knowledge sharing on public processes and services (Servicepedia and Good-practicepedia)

Nota Bene. For the implementation of the INTERLINK use cases also general knowledge and software enablers belonging to the other problem clusters may be reused, for example collaboration tools (ORG.PROBLEM.6.1, ORG.PROBLEM.6.2, ORG.PROBLEM.6.3), enablers for loyalty, incentives and rewards (ORG.PROBLEM.13), or enablers for the measurement of quality of service and citizen satisfaction (VAL.PROBLEM.5).

PROBLEM ID	BUILD.PROBLEM.1
NAME	**User interface design**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Service specification IMPLEMENTATION :: Technical implementation
PROBLEM DESCRIPTION	The implementation of the user interface should guarantee usability. Co-production team members involved in the interface design should be aware of good practices for interface design in the domain of public services.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Knowledge resources addressing this problem items should include: - **Guidelines and templates** on User Interface Design - Guidelines and templates to design usable UI
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Nielsen & Norman User Interface Design Guidelines https://www.nngroup.com/articles/ten-usability-heuristics/ • Design System: Designers Italia https://designers.italia.it/kit/progettazione-interfaccia/ • Design system by Google https://material.io/ • Design System: Europa Component Library https://ec.europa.eu/component-library/ec/getting-started/
RELATED LITERATURE	Nielsen, J., and Molich, R. (1990). Heuristic evaluation of user interfaces, Proc. ACM CHI'90 Conf. (Seattle, WA, 1-5 April), 249-256

PROBLEM ID	BUILD.PROBLEM.2
NAME	**Implement accessible digital public services**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Service Design IMPLEMENTATION :: Technical implementation :: Service implementation
PROBLEM DESCRIPTION	When the public services are provided digitally in the form of Web sites or mobile applications, it is necessary that the service may be easily used by different categories of users, especially considering the people with disabilities. The

	services should be provided in a multi-channel manner, maximizing the exploitation by potentially any group of users or by the agents acting on their behalf, and providing clear statements regarding the accessibility limits in the current implementation.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The functionalities expected to address this problem include in particular: • the proper ways to design, organize, structure and implement accessible user interfaces; • realization of reusable accessible general purpose components; • the ways to evaluate and certify the accessibility requirements compliance according to the existing normative regulations.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES AND BEST PRACTICES (available at the EU level or at the local / national level) • DESIGN AND SOFTWARE DEVELOPMENT KITS containing ready-to-use components for accessible UI implementation • TOOLS FOR ACCESSIBILITY EVALUATION
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • W3C: Strategies, standards, resources to make the Web accessible to people with disabilities https://www.w3.org/WAI/standards-guidelines/wcag/ • Design Guidelines for digital services of PA (in Italian): https://docs.italia.it/italia/designers-italia/design-linee-guida-docs/it/stabile/index.html Software tools: • Validator W3C: http://validator.w3.org/ • Colour Contrast Analyzer: https://developer.paciellogroup.com/resources/contrastanalyser/ • WebAIM: https://webaim.org/resources/contrastchecker/ • Siteimprove Browser Extensions and Web Developer Toolbar: browser extensions • Nvda Screen Reader: http://www.nvda.it/ • Various accessibility tools promoted by W3C https://www.w3.org/WAI/ER/tools/
RELATED LITERATURE	• European Interoperability Framework https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0134 • EU Directive 2016/2102 on Accessibility of the Websites and and mobile applications of public sector bodies https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L2102&from=EN

PROBLEM ID	**BUILD.PROBLEM.3**
NAME	**Open Source Software Licensing**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION :: Technical implementation :: Service implementation
PROBLEM DESCRIPTION	The EU and national legislation promote the use and adoption of Open Source software solutions as a way to reduce the development cost, to avoid the lock-in effect and to foster the adoption driven by Open Source communities. In other terms, Open Source is an enabler for the reusability principles underlying the European Interoperability Framework. Facing this problem, it is necessary to facilitate the selection, development, and maintenance of the Open Source software products.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The functionalities expected to address this problem include in particular: ● Understanding different types of Open Source licenses, their limits and applicability; ● the proper ways to manage the acquisition of the software products ensuring appropriate licensing; ● methodological approach to the development of Open Source software in order to foster active public community and reuse; ● proper ways to maintain and support the evolution of the Open Source software solutions.
TYPE OF RESOURCES FOR IMPLEMENTATION	● DIGITAL TEXTUAL GUIDELINES AND BEST PRACTICES FOR SOFTWARE LICENSING (available at the EU level or at the local / national level) ● DIGITAL TEXTUAL GUIDELINES AND BEST PRACTICES FOR OSS DEVELOPMENT AND MAINTENANCE
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: ● Open Source guides: https://opensource.guide/ ● Guidelines for acquiring and reuse of of the software for PA (in Italian): https://docs.italia.it/italia/developers-italia/lg-acquisizione-e-riuso-software-per-pa-docs/it/stabile/index.html Expert bodies: ● AgID Competence Center for re-use and Open Source: https://www.agid.gov.it/it/design-servizi/riuso-open-source/centro-competenza-riuso-open-source
RELATED LITERATURE	● European Interoperability Framework https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0134 ● EU Open Source Software Strategy: https://ec.europa.eu/info/departments/informatics/open-source-software-strategy_en

PROBLEM ID	**BUILD.PROBLEM.4**
NAME	**Implementing Interoperable Digital Public Services**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION :: Technical implementation :: Service implementation
PROBLEM DESCRIPTION	European Interoperability Framework requires digital services to achieve an appropriate level of technical interoperability. When it comes to the implementation, it refers to the usage of standard communication protocols and data formats in order to guarantee the usage of the service in machine-to-machine communications, to facilitate software integration and re-use.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The functionalities expected to address this problem include in particular: ● identify, select, and implement appropriate interoperability patterns for interacting with the service; ● design and definition of suitable service interfaces (APIs) following the API-first approach; ● documentation and publishing of the interfaces.

TYPE OF RESOURCES FOR IMPLEMENTATION	DIGITAL TEXTUAL GUIDELINES SOFTWARE LIBRARIES AND TOOLS DIGITAL SPECIFICATION STANDARDS TOOLS FOR API MANAGEMENT
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: ● AgID. Guidelines for technical interoperability for PA and related operational documents: interaction patterns, interoperability profiles, implementation recommendations (in Italian). https://www.agid.gov.it/it/infrastrutture/sistema-pubblico-connettivita/il-nuovo-modello-interoperabilita Standards and software: ● Open API specification and relevant tools: https://www.openapis.org/ ● WSO2 API Manager https://wso2.com/api-manager/
RELATED LITERATURE	● European Interoperability Framework https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0134 ● AgID Interoperability Model (ModI), Italy

PROBLEM ID	**BUILD.PROBLEM.5**
NAME	**Implementing Secure and Trusted Digital Public Services**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION :: Technical implementation :: Service implementation
PROBLEM DESCRIPTION	Digital public services should ensure that the interactions with these services takes place in a secure and trustworthy environment, following the principle of security by design. Access control, user identification, data management should be made compliant with the corresponding regulations, including e.g., the Regulation and Directive for data protection, Regulation on electronic identification, etc.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The functionalities expected to address this problem include in particular: ● implementing secure communication protocols for service interaction; ● implementation of the trusted and protected user identification and authentication; ● implementation of secure storage of personal data; ● guarantee transparent, informed, and controllable management of personal data in line with GDPR requirements; ● guarantee security in operations (audit, monitoring, incident handling).
TYPE OF RESOURCES FOR IMPLEMENTATION	● DIGITAL TEXTUAL GUIDELINES AND BEST PRACTICES ● DIGITAL TEMPLATES FOR PRIVACY POLICIES AND CONSENT FORMS ● DIGITAL CHECKLISTS FOR SECURITY IMPLEMENTATION AND REVIEW ● DIGITAL TEMPLATES FOR DATA MANAGEMENT REGISTRIES ● OPEN STANDARD PROTOCOLS FOR SECURE COMMUNICATIONS ● TOOLS FOR USER AUTHENTICATION AND AUTHORIZATION ● LIBRARIES FOR SECURE PROTOCOL IMPLEMENTATIONS ● TOOLS FOR SECURITY AUDIT AND COMPLIANCE CHECK

EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • EDPB Guidelines 4/2019. Data Protection by Design and by Default. https://edpb.europa.eu/sites/default/files/files/file1/edpb_guidelines_201904_dataprotection_by_design_and_by_default_v2.0_en.pdf • AgID Minimum Security Measures for Public Administration. https://www.agid.gov.it/en/security/Minimum-ICT-security-measures-for-public-administrations • AgID Guidelines and technology standards for API interoperability security in information systems (in Italian). https://docs.italia.it/AgID/documenti-in-consultazione/lg-sicurezza-interoperabilita-docs/it/bozza/index.html • AgID guidelines for the development of secure software (in Italian). https://www.agid.gov.it/it/sicurezza/cert-pa/linee-guida-sviluppo-del-software-sicuro • Open Web Application Security Project (OWASP). https://owasp.org/ Software: • eIDAS-Node Integration Package and relevant eIDAS eID profile. https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/How+to+implement+or+operate+an+eIDAS-Node • OpenID Connect protocol and tools. https://openid.net/developers/libraries/ • Open Source Authentication and Authorization Server implementations • ENISA selection of security tools. https://www.enisa.europa.eu/tools
RELATED LITERATURE	• European Interoperability Framework https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0134 • EU Regulation 2016/679 (GDPR). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32016R0679 • EU Regulation 2014/910 (eIDAS). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.257.01.0073.01.ENG

PROBLEM ID	**BUILD.PROBLEM.6**
NAME	**Engage and incentivise citizen participation to the implementation and co-delivery of public services**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION :: Technical implementation :: Service implementation
PROBLEM DESCRIPTION	One of the objectives for the open, transparent, and interoperable public services is to make them citizen-centric and enable the participation of citizens to the execution, improvement and evolution of the service. To achieve this, it is necessary to incentivise and make more attractive such participation and collaboration. A wide range of techniques, ranging from gamification, to feedback,

	and to rewards may apply.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The functionalities expected to address this problem include in particular: • Define the incentives, rewards, policies, and appropriate mechanisms for continuous end user engagement • Adopt and implement gamification techniques for sustainable participation; • Implement the solutions to monitor, collect, and certify the end user actions and contributions.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES AND EXAMPLES • SOFTWARE FOR DATA COLLECTION AND ACTIVITY MONITORING • SOFTWARE FOR GAMIFICATION TECHNIQUES • SOFTWARE FOR CERTIFIED REWARD MANAGEMENT
EXISTING CANDIDATE INTERLINKERS	Software resources: • Gamification Engine (FBK) • AUDABLOK[27] / AUDACoin toolkit for managing incentives and rewards for open data crowdsourcing based on blockchain technologies (DEUSTO)
RELATED LITERATURE	• European Interoperability Framework https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0134

PROBLEM ID	**BUILD.PROBLEM.7**
NAME	**Cloud-ready digital public services**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION :: Technical implementation :: Service implementation
PROBLEM DESCRIPTION	In line with the Cloud-first principle promoted by EU Cloud Strategy, it is requested that the digital public services, when implemented as software solutions, adopt Cloud architectures and Cloud solutions to ensure their compatibility, portability, and scalability. In these settings, it is important to define and realize a proper Cloud strategy for the service implementation, appropriate Cloud-native architectures, different types of Cloud providers, as well as appropriate Cloud technologies and enablers.

[27] AUDABLOK: Engaging Citizens in Open Data Refinement through Blockchain

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The functionalities expected to address this problem include in particular: • Identify and apply the appropriate Cloud adoption strategy for PA • Identify and apply the appropriate Cloud migration strategy for PA software • Implementation of the new digital services following Cloud-native architectures • Adoption and usage of Cloud technologies and solutions for the service development and provisioning
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES AND BEST PRACTICES • DIGITAL TEMPLATES FOR CLOUD ASSESSMENT AND PLANNING • CLOUD INFRASTRUCTURE PROVIDERS • CLOUD TECHNOLOGIES AND ENABLERS
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Cloud Enablement Kit (in Italian): https://www.agid.gov.it/sites/default/files/repository_files/manuale_di_abilitazione_al_cloud_11pt_id2.pdf • AgID Cloud computing competence evalution template https://docs.google.com/spreadsheets/d/1_5aEEDg4TGDEJB8EM5ZQqb6XgGtCxISLRFa_-I2BscU/edit#gid=829270166 • AgID App Cloud migration strategy assesment template https://docs.google.com/spreadsheets/d/1P8lcsCxEXKYk7oZVoHrS6rhNmqdPz4bHfzmsmWq4akQ/edit#gid=1101730863 • Cloud-Native Computing Foundation https://www.cncf.io/ Software • Cloud computing technologies, providers, tools. https://landscape.cncf.io/
RELATED LITERATURE	• European Interoperability Framework https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52017DC0134 • European Commission Cloud Strategy https://ec.europa.eu/info/sites/default/files/ec_cloud_strategy.pdf • Italian Norms and Regulations https://docs.italia.it/italia/piano-triennale-ict/cloud-docs/it/stabile/riferimenti-normativi-con-estratti.html • Spanish Electronic Administration Portal https://administracionelectronica.gob.es/

PROBLEM ID	**BUILD.PROBLEM.8**
NAME	**Re-use of CEF Building Blocks**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION :: Technical implementation

PROBLEM DESCRIPTION	Building Blocks are endorsed by the European Commission and ensure that digital services will be fully compatible with others on the market and become interoperable, EU-compliant final products. In the CEF approach definition, a Building Block is an open and reusable digital solution. The implementation of new public services should take advantage of CEF Building Blocks as much as possible.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	This problem is addressed by providing guidance on how to develop digital services in compliance with EU regulations and CEF principles. Currently, there are eight Building Blocks: Big Data Test Infrastructure, Context Broker, eArchiving, eDelivery, eID, eInvoicing, eSignature and eTranslation. Information and reference to the Connecting Europe Facility (CEF) should be provided and given proper visibility and promotion.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • SOFTWARE TOOLS
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • Vision of the CEF Building Blocks https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/The+Vision https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/Service+Offering+Canvas+Playbook Software resources: • CEF Building Blocks repository https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/CEF+Digital+Home
RELATED LITERATURE	

Collaborative knowledge sharing on public processes and services (Servicepedia & Good-Practicepedia)

During the preliminary analysis of the three INTERLINK use cases, a common need emerged for digital services that support Public Administrations to create and share with different stakeholders (i) clear descriptions of which public services are offered to citizens and how they can be used and (ii) descriptions of best practices on different types of processes that can be shared in a virtuous cycle with other PAs to improve the way public organizations work.

This need was expressed in different specific terms in the three use cases as:

- a "Servicepedia" (VARAM use case): digital tools which allow the co-production team to create web documents describing public services and annotate them with comments, questions, answers, terms which can be browsed, queried or even suggested to users when accessing different parts of a web document. The

information can be voted, commented, extended by other users in a Wiki-like manner;

- an "Open repository of good practices" (MEF use case): a repository which collects information that can be used to improve PAs' capacity with know-how. The metadata associated with the documents in this open repository is meant to facilitate search and browsing of good practices according to different search dimensions (e.g. application domain, creator of the good practice, ...);
- a "Service catalogue" (ZGZ use case): a chart of services to make clear and transparent the offer of a public innovation hub in terms of programs, facilities, equipement, mentorship.

(For more details on the requirements emerged from use cases see Section 3.3 in Deliverable D4.1).

The above desired services share pivotal aspects:

- the collaborative nature of the task that calls for **a process of co-production of information** to make sure the views, needs and questions of all the producers, co-deliverers and consumers of the information are properly taken into account;
- the need to define **templates of good descriptions** to be reused uniformly across a catalogue of similar services or good practices from the same Public Administration;
- the usefulness to adhere to **standards for service descriptions**[28] to guarantee a degree of cross-domain and cross-border interoperability between public service catalogues;
- agile methods for searching and browsing through the available information that is facilitated by **standard classifications of public services** and processes;
- the need to **monitor how information is accessed** to derive data on quality and usefulness of service.

Figure 10 below shows how these common requirements contribute to specify the core profile of a digital and knowledge service that could be supported by a set of INTERLINKERs.

[28] For example the Core Public Service Vocabulary Application Profile (CPSV-AP) developed within the ISA[2] European initiative (https://ec.europa.eu/isa2/solutions/core-public-service-vocabulary-application-profile-cpsv-ap_en).

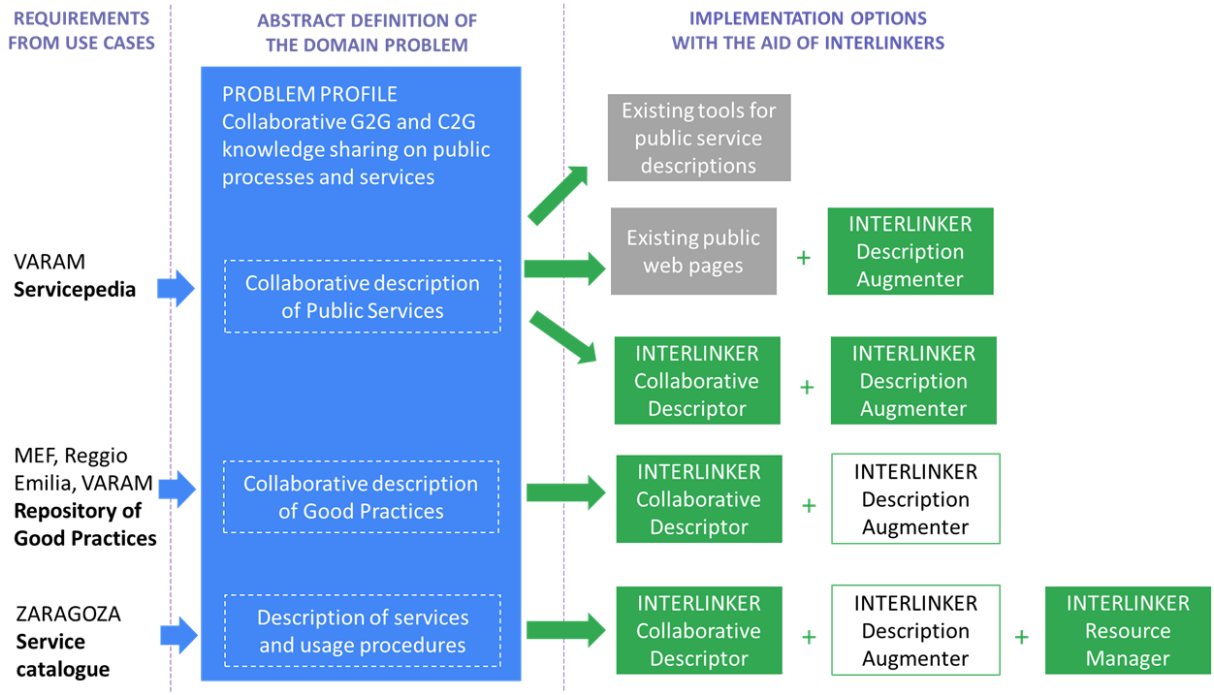

Figure 10. Problem statements emerged from the use cases (left) that call for collaborative knowledge creation and sharing (center) and their possible implementation with INTERLINKERs (right).

PROBLEM ID	*BUILD.PROBLEM.9*
NAME	**Collaborative knowledge sharing on public processes and services (Servicepedia & Good-Practicepedia)**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION
PROBLEM DESCRIPTION	This problem item addresses the need of a digital service that supports the **collaborative creation of effective descriptions of public services or processes** that can be useful (i) for the daily work of people who provide information about the services to the public, (ii) for citizens and other end-users of the services, (iii) for other PAs that would like to replicate the services or the processes at their local level. The domain problem considered here encompasses the following user tasks: **1) Co-creation and co-delivery of information of public utility**, e.g. ● creation and sharing of knowledge on public services ● creation and sharing of good practices on public services and processes ● collaborative process of information creation to ensure quality descriptions and active participation of all the stakeholders involved in the delivery of information ● collaborative process of information enrichment with citizens involvement **2) Structuring of information according to standard classifications and data models** for public services and process descriptions 3) In some case the need may also be to **co-create information that augments and better explains existing information sources** and is shown in overlay **4) Monitoring of quality of information service**

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	In brief, the expected functionalities to solve the problem are the following: - Repository of shareable documents - Templates for creating good descriptions - Authentication - Manage access and edit rights of different user groups - Add annotations to web document parts or terms - Browse, search and filter through available documents, templates and annotations - Edit, comment and revise templates, document parts or annotations - Resolve comments and approve revisions and annotations - Versioning of documents - Underlying database - Multilinguality - Monitor the access to service descriptions - Customizable graphical layout to align with PA corporate image A more detailed specification of the required functionalities is described in Appendix 3 - Sample Software INTERLINKERs" of this document.
TYPE OF RESOURCES FOR IMPLEMENTATION	• SOFTWARE TOOLS
EXISTING CANDIDATE INTERLINKERS	The enablers solving this problem can be implemented in different ways: 1. through existing tools that support the editing of good service descriptions, like for example the components developed within the ISA2 initiative. ISA2 investigated the harmonisation of national and European service catalogues to help European public administrations to understand what is available in other countries and also to access some common tools and data models to describe public services in an interoperable manner[29]. Existing software like MediaWiki[30] could also be considered. 2. through the augmentation of existing web sites offering information about public services and good practices. The augmentation could offer contextual help, F.A.Q.s and examples that make it clear to different stakeholders how the services work (INTERLINKER Description Augmenter, see specifications in Appendix 3, Section 8.2 "Description Augmenter" INTERLINKER); 3. through the combination of tools that enable both the initial collaborative creation of good descriptions (INTERLINKER Collaborative Descriptor, see specifications in Section 8.1 below) as well as the creation of contextual help information that is used to augment the baseline descriptions in a more flexible and personalized way (INTERLINKER Description Augmenter, see specifications in Section 8.2 below).
RELATED LITERATURE	

[29] https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/cpsv-ap-tools#Implementations

[30] https://www.mediawiki.org/wiki/MediaWiki

3.2.5. Problem category: VALIDATE

The cluster of INTERLINKERs providing support to validation problems are transversal to all the co-production phases and can apply to (i) the co-production process itself (internal monitoring and self-validation) and to (ii) a public service, considering different stages of the service development, from first concepts, to low-fidelity prototypes to the final implemented system.

VAL.PROBLEM.1 - Define evaluation criteria
VAL.PROBLEM 2 - Ongoing co-evaluation (Go-no go)
VAL.PROBLEM.3 - Develop and test a proof of concept
VAL.PROBLEM.4 - Test the digital service with experts
VAL.PROBLEM.5 - Monitoring and ongoing evaluation of the service co-delivered

Research activities in progress within tasks T5.2 and T5.4 will contribute findings and examples that will help further detail the problem profiles related to this category, as will be documented in Deliverable D5.1 (M12).

PROBLEM ID	VAL.PROBLEM.1
NAME	**Define the evaluation criteria and KPIs**
RELEVANT CO-PRODUCTION TASKS	CO-EVALUATION
PROBLEM DESCRIPTION	Defining the evaluation criteria for a service to be co-delivered is a crucial step to monitor the quality of the co-designed and co-delivered service. Enablers addressing this problem should support the team in finding the most appropriate criteria, agree on them and use them in the evaluation of the service co-delivered
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The knowledge enablers supporting this problem item should include: - **Guidelines** for the selection of KPIs for co-produced public services - **Guidelines** on how to define the evaluation criteria according to the type of service - Set of standard criteria **templates** that might be used to evaluate the service, like for example **acceptance, usability, trust, quality of service**: - evaluation dimensions defined for digital services and summarized in standard evaluation questionnaires - **Examples** of KPIs and evaluation criteria set by significant Use Cases
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES • DIGITAL TEXTUAL EXAMPLES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • User Experience Questionnaire UEQ • User Experience Questionnaire Short UEQ-S • Technology Acceptance Model for e-Government services

RELATED LITERATURE	Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS quarterly, 319-340. Belanche, D., Casaló, L. V., & Flavián, C. (2012). Integrating trust and personal values into the technology acceptance model: The case of e-government services adoption. Cuadernos de Economia y Direccion de La Empresa, 15(4), 192–204. https://doi.org/10.1016/j.cede.2012.04.004 Wirtz, J., & Lee, M. C. (2003). An examination of the quality and context-specific applicability of commonly used customer satisfaction measures. Journal of Service Research, 5(4), 345-355. Limayem, M., Hirt, S. G., & Cheung, C. M. (2007). How habit limits the predictive power of intention: The case of information systems continuance. MIS quarterly, 705-737. Tan, C. W., Benbasat, I., & Cenfetelli, R. T. (2008, January). Building citizen trust towards e-government services: do high quality websites matter?. In Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008)(pp. 217-217). IEEE.

PROBLEM ID	***VAL.PROBLEM.2***
NAME	**Ongoing internal co-evaluation (Go-no go)**
RELEVANT CO-PRODUCTION TASKS	CO-EVALUATION
PROBLEM DESCRIPTION	This problem profile refers to the reflection strategy that supports the co-production team in iteratively evaluating whether the service is feasible and viable in the longer run (sustainable) or not, and hence deciding if it is worth continuing the co-production effort. Enablers in this category should provide support to the team during different stages of the project, supporting them in reflecting and continuously evaluating the process and the outcomes of the collaborative process.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	The enablers addressing this problem should provide guidance and tools on co-evaluation activities according to the stage of the process to be evaluated and should include: - enablers for internal assessment of resources - enablers for checking which are the competencies required for addressing the next phases of the process - enablers to check competencies and skills internal to the group - .... More detailed specifications for the desired knowledge and functionalities to solve this problem profile will be elaborated as research in WP2 on the governance models and co-production process progresses.
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL CHECKLISTS • DIGITAL TEXTUAL TEMPLATES • DIGITAL GRAPHICAL CANVAS • [TBD]

EXISTING CANDIDATE INTERLINKERS	• Self-assessment framework developed by NEF https://www.seemescotland.org/media/7287/co-production-self-assessment-framework.pdf
RELATED LITERATURE	Boyle, D. and Harris, H. (2009: 11) The Challenge of Co-production: how equal partnerships between professionals and the public are crucial to improving public services, nef/NESTA; London, UK.

PROBLEM ID	**VAL.PROBLEM.3**
NAME	**Develop and test a proof of concept**
RELEVANT CO-PRODUCTION TASKS	DESIGN :: Service design :: Prototype
PROBLEM DESCRIPTION	This problem addresses the need to validate a concept of a service or to verify the assumptions about a final product before developing it. Different types of proof of concepts can be used, according to the stage of service development and the type of service, whether it is a digital service or not.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Enablers addressing this problem should provide guidance on the different approaches to develop and test a proof of concept, in which situations they could be useful, and on how to use the insights coming from the test to improve the service before developing and co-delivering it. - Descriptive text explaining what is a proof of concepts, which are the different types of proof of concepts that can be realized - Examples and Templates of experience scenarios - Examples andTemplates of Pen & paper mock-ups - Examples and Templates of Low-fidelity prototypes - Examples of MVP(minimum version of product) - Descriptive text explaining how these artefacts might be used to validate and refine a concept of a new service
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL EXAMPLES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • *Designers Italia* https://designers.italia.it/kit/prototipazione/
RELATED LITERATURE	W.Tan, D.Liu, R. Bishu, Web evaluation: Heuristic evaluation vs. user testing, International Journal of Industrial Ergonomics, Vol. 39, Issue 4, 2009, Pp. 621-627,

PROBLEM ID	**VAL.PROBLEM.4**
NAME	**Test the digital service with experts**

RELEVANT CO-PRODUCTION TASKS	CO-EVALUATION :: DESIGN :: Prototype
PROBLEM DESCRIPTION	This problem addresses the need to perform an early evaluation of the digital service leveraging experts without involving end users.
SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Enablers to support this problem item should include guidelines on how to conduct an Heuristic Evaluation (also Expert evaluation) and templates with the heuristics (principles) to follow to perform the test. The test can be conducted with early mock-ups as well with functioning systems.
TYPE OF RESOURCES FOR IMPLEMENTATION	DIGITAL TEXTUAL GUIDELINES DIGITAL TEXTUAL TEMPLATES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: ● Nielsen Norman Group https://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/
RELATED LITERATURE	Nielsen, J., (1994b). Heuristic evaluation. In Usability Inspection Methods. (Eds.) Zhang, Z., Basili, V. & Shneiderman, B. Perspective-based Usability Inspection: An Empirical Validation of Efficacy. Empirical Software Engineering 4, 43–69 (1999).

PROBLEM ID	**VAL.PROBLEM.5**
NAME	**Monitoring and ongoing evaluation of the co-delivered service**
RELEVANT CO-PRODUCTION TASKS	IMPLEMENTATION :: Co-delivery
PROBLEM DESCRIPTION	This problem addresses the need to continuously monitor the service co-delivered in order to keep work on track, regularly review progress, make adjustments and changes if necessary.

SET OF FUNCTIONALITIES / KNOWLEDGE TO IMPLEMENT	Enablers should provide guidance and tools on how to monitor and evaluate services co-delivered.
	- Guidelines on how to monitor services co-delivery
	- Steps to follow to set up a monitoring process:
	  - Review the indicators you are going to measure, also according with KPIs (like number of users, users' satisfaction, other dimensions specifically related to co-production, ...)
	  - Decide if indicators should be measured through qualitative or quantitative methods
	  - Collect and analyse data

	- List of tools that can be used to monitor the quality of the service co-delivered - Use data to implement changes and improve service co-delivery
TYPE OF RESOURCES FOR IMPLEMENTATION	• DIGITAL TEXTUAL GUIDELINES • DIGITAL TEXTUAL TEMPLATES
EXISTING CANDIDATE INTERLINKERS	Knowledge resources: • GOV.UK https://www.gov.uk/service-manual/measuring-success/measuring-user-satisfaction
RELATED LITERATURE	OECD (2013), "Citizen satisfaction with public services", in Government at a Glance 2013, OECD Publishing, Paris. DOI: https://doi.org/10.1787/gov_glance-2013-56-en

3.2.6. Problem category: SUSTAIN

The cluster of INTERLINKERs providing support to the definition of strategies that guarantee the sustainability of co-produced public services includes enablers addressing the following problems:

SUS.PROBLEM.1 - Define a sustainability / business plan
SUS.PROBLEM. 2 - Competitive advantage analysis
SUS.PROBLEM. 3- Feasibility analysis/study
SUS.PROBLEM. 4 - Maintenance
SUS.PROBLEM. 5- Periodic evaluations with stakeholders (for service sustainability)

Research activities in progress within tasks T2.4 and T2.5 will contribute findings that help fill in the problem profiles related to this category.

In particular, deliverable D2.4 "Co-business model specification and analysis" (M16) will describe a draft co-business model, as an extension of the governance model, to ensure long-term sustainability of co-created services and platform operation. The co-business model will also consider fair rewards to all stakeholders that have contributed to innovate, implement or maintain a public service in order to inspire.

Deliverable D2.5 "Guidelines for co-exploitation processes" (M32) will instead describe processes and practices to enable smooth and sustainable co-exploitation of the created services and possibly hand over of a service development project to another team for maintenance.

4.INTERLINKERs Catalogue API specification

Deliverable D4.1 "List and description of the socio-technical requirements" identified the following preliminary requirements for the catalogue collecting INTERLINKERs within the INTERLINK platform (GUID.REQ.4, D4.1, page 48).

ID	GUID.REQ.4
Name	Catalogue of INTERLINKERs
Requirement type	Functional requirement
Content/description	The catalogue of INTERLINKERs is a software component that contains all the available INTERLINKERs, that are building blocks fostering co-production that will be specified in WP3. It will index INTERLINKERs' metadata so that advanced search and matchmaking can be performed over the available enablers. Features associated to the Catalogue of INTERLINKERs are: ● User exploration (search & find): INTERLINKERs can be be explored and browsed thanks to a number of filters/categories that depend on the INTERLINKERs classification: ○ Co-production process phase (e.g. engagement, design,.) ○ Co-production activity (e.g. communication, raising awareness,..) ○ Placement of the artifact in the SOC mapping (Specification, Enabling Service, Operation Service, Enhancing service, or an accompanying Service Documentation) - this search filter is of particular interest to technical users and developers of INTERLINKERs ○ Corresponding digital problem (Core Profile) tackled by the INTERLINKER. ○ Nature of the INTERLINKER: Software INTERLINKERs (referred to as IT Enablers in the project description, e.g., various digital tools for decision making, group and activity coordination) and Knowledge (partnership tools, templates, canvases, best practices, guidelines). ○ Involved stakeholders – the intended user types for the INTERLINKER, being, for instance, citizens, PA and their representatives, SMEs, etc. This should be further refined in roles w.r.t. the co-production process. ○ Context in which the INTERLINKER is applicable. ○ Usage in the INTERLINK platform. ○ Associated INTERLINKERs ● Use of the INTERLINKERs: INTERLINKERs can be selected from the catalogue to be reused. INTERLINKERs are associated to a set of

	resources, depending on the type of INTERLINKER (e.g. Knowledge vs ICT-based INTERLINKERs): ○ Software INTERLINKERs: a procedure with all steps and actions that are needed for the initialization and deployment of a new instance of the resource, such as source code/ reference to implementation, Licensing, lessons learned, etc. ○ Knowledge INTERLINKERs: guidelines, best practices, canvas ● Rating, promotion and feedback of INTERLINKERs: end users might be able to rate available INTERLINKERs so that those highest ranked appear at a more relevant place in the catalogue, add comments providing feedback about their experience using them, suggesting changes to be performed or promoting their usage by disseminating information about them in social media.
Motivation/rationale	INTERLINK aims to simplify the co-delivery of public services by promoting the reuse of ready-made building blocks or enablers (INTERLINKERs) among those stakeholders willing to tackle the joint co-production of innovative and sustainable public services, which might be triggered following a top-down, bottom-up or even a hybrid approach. For that, it is essential to publish a range of illustrative value-added INTERLINKERs that will encourage adopters of the INTERLINK governance model and supporting platform to facilitate their co-production of brand new or derived public services leveraging those available enablers. The success of INTERLINK highly relies on making available to the Open Government community a significant range of useful widely-adopted INTELINKERs which can be integrated into different public services belonging to diverse cross-European public administrations.
Fit Criterion (Measurable)	Availability of an INTERLINKERs catalogue populated with useful widely reusable knowledge and software INTERLINKERs. The ambition is to populate the catalogue with at least 10 INTERLINKERs by April 2022 (M16) when the 1st pilot evaluation iteration takes place. The 2nd iteration of piloting will start in M27 (March 2023) and another additional 10 INTERLINKERs are envisaged.
Author	FBK, DEUSTO
Revision	v1

According to this requirement and to the detailed INTERLINKER Specification Model described in Section 1 of this deliverable, the following API specification for the Catalogue of INTERLINKERs has been elaborated.

API	METHOD	Description
Logical grouping of API	**API Method**	**Description of the method and high-level functionality**

methods for a specific problem		
INTERLINK MANAGEMENT		
	View Interlinker	View details of a specified Interlinker. Represent the Interlinker properties in a structured way.
	Create Interlinker	Create and publish new Interlinker definition.
	Modify Interlinker	Modify definition of a specified Interlinker.
	Delete interlinker	Delete interlinker definition from catalogue.
	List Interlinkers	List interlinkers with pagination and filtering. Filters apply to all the classification properties of the Interlinker. It should be possible to perform a free text search of the Interlinkers based on its textual attributes
	List interlinkers by co-production phase	List interlinkers associated to a specific co-production phase through core profile. May be used by the "Wizard"
	List interlinkers by co-production task	List interlinkers associated to a specific co-production task through core profile. May be used by the "Wizard"
	List Interlinkers by problem profile	List interlinkers associated to a specific problem profile
	List related interlinkers	List interlinkers associated to the specified one through specification, common task, common phase
	View user interlinkers	View interlinkers where the user is involved (as a publisher, rating / commenting operations).
	View team interlinkers	List interlinkers published by the specified team.
INTERLINK COMMUNITY		
	Rate interlinker	Assign rating to interlinker (value + text). The rating requires the authenticated user and may be changed by that user.
	Ask a question	Ask a question regarding Interlinker. A question and a description (structured text) should be provided.
	Answer a question	Answer a question regarding interlinker.
	Follow Interlinker	Subscribe to receive updates to the interlinker. The updates include: • changes in the definition • new questions • new answers • new ratings
	Get statistics	Statistics about rating, questions/answers, followers, usage, ... It is possible to obtain the statistics within the overall period of observation or only limited to a specific

		time interval.
PROBLEM PROFILE MANAGEMENT		
	Create Problem Profile	Create a new problem profile definition. As specified in Section 1.2.1.1, the profile is defined with a set of properties describing and classifying it with respect to the co-production process, legal and technical settings, functionality, context.
	Update Problem Profile	Update problem profile definition. Change the profile definition properties given the specified profile ID.
	Remove Problem Profile	Remove problem profile definition given the specified profile ID.
	Search Problem Profiles	Search and list the problem profiles, optionally filtering them according to parameters corresponding to the profile definition attributes. It should be possible to perform a free text search of the profiles based on its textual attributes
	View Problem Profile	View details of the specified profile ID
ASSET MANAGEMENT		
	Create Asset	Create and upload a generic material, specifying its type (link, file), the relevant entity (e.g., problem profile, Interlinker, public Service).
	Remove Asset	Remove asset from the storage
	List Assets	List assets associated with the specific entity. A separate API method for each category (Interlinker, Problem Profile, Public Service)
	View Asset	View asset metadata
	Modify Asset	Change asset properties
	Download Asset	Download asset resource
	Change Asset Visibility	Change policies for asset access: public asset, project asset.

This high-level API description will be further refined as the Open API Specification[31] document.

[31] https://www.openapis.org/

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6. Appendix 1 - Good practices on design of public services, service design, design thinking

The following table summarizes the findings of a desk research aiming at identifying good practices and available tools for the co-production of public services, already validated methods and tools for service design, co-design and design thinking, with particular focus on guidelines and tools developed in other European projects.

NAME	TYPE	Funding/ owner	Language	DESCRIPTION
JOINUP https://joinup.ec.europa.eu/	EU Reuse portal	Official website of the European Union	EN	European collaborative platform and catalogue for sharing knowledge, good practices and IT solutions in the public sector. Joinup is a collaborative platform created by the European Commission and funded by the European Union via the Interoperability solutions for public administrations, businesses and citizens (ISA2) Programme. It offers several services that aim to help e-Government professionals share their experience with each other.
NIO - National Interoperability Framework Portal https://nio.gov.si/nio/vstopna.nio?lang=en	Reuse portal	Republic of Slovenia	EN	The NIO Portal is a website dedicated to publishing interoperability solutions and products of the public sector. It connects a catalogue of interoperability solutions with best practices for re-using its content. The repositories of the NIO portal are used as catalogues. These catalogues contain information on datasets and data structure, their use, data administrator etc. The owner of the information is always the institution which created them, regardless if the institution is part of the private sector or a non-governmental organisation.
SIC Public Sector Innovation Blog https://www.silearning.eu/	Design kit for public sector	EU H2020	EN	The SIC Public Sector Innovation Blog is an online, open resource available for civil servants, policy makers, practitioners and researchers to expand their knowledge on how to manage co-creation in the public sector. The Social Innovation Manual is an online, open resource available for innovators, intermediaries and public sector/private sectors to improve their skills in design for Social Innovation. It is a repository of knowledge created throughout the project, and a tool that gives the opportunity to find information about new initiatives and events related with co-creation in the public sector and more broadly with public sector innovation.
Designer.italia/KIT https://designers.italia.it/kit/ui-kit/	Design kit for public sector	MID - Ministero Innovazione tecnologica/ trasformazione digitale	IT	Designers Italia is the reference point for the design of digital public services: models, kits and guides to facilitate design processes centered on the needs of citizens
OPSI Toolkit https://oecd-opsi.org/search-toolkits/	Design kit for public sector	OECD	EN	Toolkit Navigator: A compendium of toolkits for public sector innovation and transformation, curated by OPSI and our partners around the world. A repository of toolkits to be used for public sector innovation

DIY - Practical Tools to trigger & support Social Innovation https://diytoolkit.org/	Design kit for social innovation	NESTA	EN	The DIY Toolkit has been especially designed for development practitioners to invent, adopt or adapt ideas that can deliver better results.
NESTA Designing for **Public Services** https://media.nesta.org.uk/documents/nesta_ideo_guide_jan2017.pdf	Design kit for public services design	NESTA / IDEO	EN	Design for Europe This guide has been made possible with support from Design for Europe, a three-year programme co-funded by the European Commission to boost design and innovation across the continent
ELINET https://elinet.pro/awareness-raising-tools/	Awareness campaign	EU - European Literacy Policy Network (ELINET)	EN	ELINET Portal contains different toolkits and guidelines on how to structure an awareness campaign to raise literacy in Europe. Portal with Checklist to organize a raising Awareness Campaign, a repository of good practices to follow
Service Design Tools https://servicedesigntools.org/	Design kit	oblo.design PoliMi	EN	An on-going project bridging academic research and professional practices. Repository of tools to conduct research, design, and do prototyping. URL: https://servicedesigntools.org/tutorials/how-to-make-a-digital-service-real
DRLab ToolKit https://drlab.unitn.it/en/design-tools/	Design kit	UniTN | DRLab	EN	A design tool is any collection of actions, thoughts and/or physical objects that help, facilitate or make possible other actions, thoughts and physical objects. Toolkit containing methods to conduct service design, along with an indication of the process phases they refer to, their level of difficulty, the level of facilitation required and their aims.
eXo Platform https://docs.exoplatform.org/en/6.0/#user-docs	Collaborative environment	eXoPlatform	EN	Help Your Teams Connect, Collaborate and Get Things Done
INNOCHALLENGE https://www.innochallenge-project.eu/	Innovation challenge	EU Project	EN	INNOCHALLENGE collected good practices, organized peer-learning workshops, and produced an Actionable Guide that is now available to all European Innovation Agencies, policy makers, SMEs and interested stakeholders to learn how to activate Open Innovation contests for SMEs. Toolkit containing guidelines, canvas and other resources to design and implement open innovation initiatives
ENoLL https://enoll.org/about-us/	Living lab	EU Network	EN	Living Labs (LLs) are user-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings. LLs are both practice-driven organisations that facilitate and foster open, collaborative innovation, as well as real-life environments or arenas where

				both open innovation and user innovation processes can be studied and subject to experiments and where new solutions are developed. The portal contains projects, best practices, toolkits, link to webinar in the field of Living Lab
Decide Madrid https://decide.madrid.es/debates	Citizen participation portal	City of Madrid	ESP	citizen participation portal of the Madrid City Council. Open Government portal allows three types of citizen participation processes to be carried out: citizen proposals, public hearing and participatory budgets. This open government portal allows the implementation of full participatory citizen processes in city councils. By making its open source available under the AGPLv3 license, it allows any city council to adapt it to their needs and processes. The different participation mechanisms included in this portal are: citizen proposals, public hearing and participatory budgets.
Collabto https://www.collabto.com/en/	Collaborative environment	Collabto	EN	web platform, for preparing, managing and promoting research and innovation projects. Web-based collaboration and management platform for joint research and innovation projects. It provides teams with a secure, cloud-based solution that combines advanced project management and resource planning tools with smart team collaboration features for the whole lifecycle of their research and innovation projects.Tools to manage your teams, track time, plan resources, share documents and monitor tasks
SERVICEPEDIA https://simpatico-project.com/?page_id=88	Citizen participation e-services improvement	EU Project	EN	e-government environments with a collaborative space where citizens and civil servants share and exploit accessible knowledge about public procedures, and more specifically, where citizens can solve their doubts and actively take part in the enhancement of e-services.
OGP Toolbox https://ogptoolbox.org/en/tools	Reuse portal open government	Etalab, French minister- on behalf of the Open Government Partnership community.	EN	Portal with reusable digital solutions to improve democracy. Goal: empower public, private and civil society actors worldwide by sharing digital tools and resources, in order to promote democracy, transparency, participation and collaboration. Specific obective of the platform: allow actors to identify the digital tools better suited to their needs, by collecting and describing them in the most objective way possible; collaborate to make digital tools more accessible and easier to use;create favourable conditions to further the development of better digital tools; foster the sharing of experience between actors and giving feedback on existing tools.
IAP2 spectrum Public Participation https://iap2.org.au/wp-content/uploads/2020/01/2018_IAP2_Spectrum.pdf	Framework for citizens participation	International Association for Public Participation	EN	IAP2's Spectrum of Public Participation was designed to assist with the selection of the level of participation that defines the public's role in any public participation process. The Spectrum is used internationally, and it is found in public participation plans around the world.
Stakeholders engagement toolkit	Stakeholder engagement		EN	This toolkit provides a step-by-step guide to developing and implementing a successful stakeholder engagement plan. For each step in the process, a template is included to support users in developing their plan.

https://www.dhhs.vic.gov.au/publications/stakeholder-engagement-and-public-participation-framework-and-toolkit				
GoNano Toolkits for co-creation http://gonano-project.eu/toolkits-for-co-creation/	Tools and methodologies for co-creation	http://gonano-project.eu/toolkit-for-researchers-and-engineers/	EN	GoNano developed a Co-creation toolkit in which we would like to share our lessons learned. We hope it will support researchers and engineers who would like to engage with citizens and societal stakeholders as a source of creative thinking. The toolkit offers a six-step approach to help researchers and engineers define their goal, identify the relevant stakeholders and design, implement and reflect on the co-creation process. GoNano hopes to inspire researchers and engineers to continue this journey, working together with citizens and societal stakeholders to create value in new settings, with new topics and with creative outcomes.

7. Appendix 2 - Sample Knowledge INTERLINKERs

This appendix collects the specifications of three sample knowledge INTERLINKERs that support the resolution of problems emerging during the organization of a co-production process and the understanding of the service to be produced. The actual Knowledge INTERLINKERs that will be implemented and integrated in the INTERLINK platform will be described in deliverables D3.2 (Initial repository of INTERLINKERs and partnership tools - M16) and D3.3 (Final repository of INTERLINKERs and partnership tools - M28).

7.2. "Project Description Example" INTERLINKER

Following the template for INTERLINKER specification described in Section 1.2.4, the knowledge enabler that helps stakeholders understand with a concrete example how to initially describe the main aim of a co-production project can be defined as follows.

INTERLINKER SPECIFICATION	
Property	***Value***
NAME	PROJECT DESCRIPTION EXAMPLE
DESCRIPTION	This INTERLINKER provides an example of how to describe the main aim and expected benefit of establishing a collaborative network of stakeholders and engaging them in the co-production process
RELEVANT PROBLEM PROFILES	ORG.PROBLEM.1 - Project aim description
STAKEHOLDERS	PAs and Private organizations initiating a co-production process
TYPE OF INTERLINKER	Enhancing Service
NATURE OF INTERLINKER	Knowledge INTERLINKER.
ASSOCIATED INTERLINKERS	"Project description template" INTERLINKER
USAGE CONTEXT	- administrative: any (international, national and local level) - organizational: public and private users - domain: any co-production process - process: Citizen sourcing (C2G): government designs and delivers a service, but asks citizens for the voluntary commitment of resources to improve the service itself, such as their voluntary labour or their personal data

CONSTRAINTS AND LIMITATIONS	*(Specific requirements and properties constraining the usage and exploitation of the INTERLINKER(* N/A
REGULATIONS AND STANDARDS	*(Legal and technical context, where the INTERLINKER operates, as a set of relevant, normative acts, policies, standards, and specification the INTERLINKER adheres to)* N/A
(for knowledge) FORM OF KNOWLEDGE	*(Type of knowledge INTERLINKER: e.g., visual template, document template, canvas, best practices, guidelines, checklist, survey template, legal agreement template)* Filled document template
(for knowledge) FORMAT	(Type of the format used by the INTERLINKER: PDF, open documents, structured formats (e.g., JSON, XML, RDF, CSV)) PDF

Here follows a sample mock-up implementation for the "Project Description Example" INTERLINKER. It consists of a textual document briefly describing the initial aim of one of the co-production use cases developed within the INTERLINK project.

PROJECT DESCRIPTION EXAMPLE	
Coordinator of the co-production project:	VARAM (Latvia)
Title:	**Facilitating operation of State and Municipal Unified Customer Service Centres by examining options of co-delivering services with third parties**
Context and description:	*(Describe the context in which a co-production approach might be exploited and the stakeholders potentially interested in the process)* The unified customer service centers (hereinafter – CSCs) operate throughout the territory of Latvia offering both local and national level public services (service owners – municipalities and several national government institutions), and consultations. The implementation and potential implications of introducing new governance model by transferring some of CSCs functions to third parties could be explored more in-depth, as the initial view is that it could provide benefits to the local community and reduce the administrative burden to CSCs, yet at the same time such co-delivery could be also linked to potential risks, such as clients' data privacy breaches, lower service quality, legal restrictions on the implementation of such a model etc. However, if carried out in an appropriate manner, the prospective innovation could benefit **VARAM** as the coordinating national government institution providing the framework and policy of CSC operations, as well as – potentially in the future – the owners of the services through the CSCs (**municipalities** and **government institutions**).

Actual organization of the service	*(Please describe the actual organization of the service, if applicable)* The CSCs provide its services in trilateral cooperation between VARAM, the local government and the national authorities providing their services through the CSCs.
Limits/challenge of the actual service/initiatives	*(Describe the limits/challenges of the current situation and the type of desired improvement)* Even though the overall customer satisfaction of CSCs services is high (9.4 out of 10 points in 2019), it is considered that customers should be slowly introduced in a helpful manner to self-servicing in the use of digital services with the help of an assistant in CSC. Such consultations are time consuming if done in a proper manner and usually require one-to-one communication. The co-delivering of such consultation service could promote local communities' digital literacy and lighten the workload of CSCs.
Future/desired scenario 1 **(even if still hypothetical)**	*(Describe the scenario in which a co-production approach might support actors involved in co-creating and co-delivering a service)* The consultation service is available physically at CSC and also by phone, or email. A platform supporting co-production is publicly available to VARAM representatives and they want to introduce a new consultation delivery model by introducing digital agents in the service delivery. In the collaborative platform VARAM, digital agents, and possibly representatives from state institutions and municipalities whose services are also provided in the CSCs go through the end-to-end design process of an enhanced consultation service. In the process involved, participants use different available administrative templates to design the new delivery process, identify potential gaps and necessary steps. The action plan is drafted in the collaborative platform. The necessary administrative, legal and other changes are listed and prioritized. The progress of the process can be monitored (finished phases, next phases, inter-dependencies of activities etc.). Once the design phase is finished, the process is transferred to the test phase where the co-delivery process is implemented and tested in a limited environment. The potential issues in information co-delivery are identified, and corrected. After finishing the test phase, the co-delivery of service is transferred to the launch phase, where it is introduced in the real environment. The monitoring and feedback process is in place throughout the whole process.
Future/desired scenario 2	*(please insert another scenario if available)*

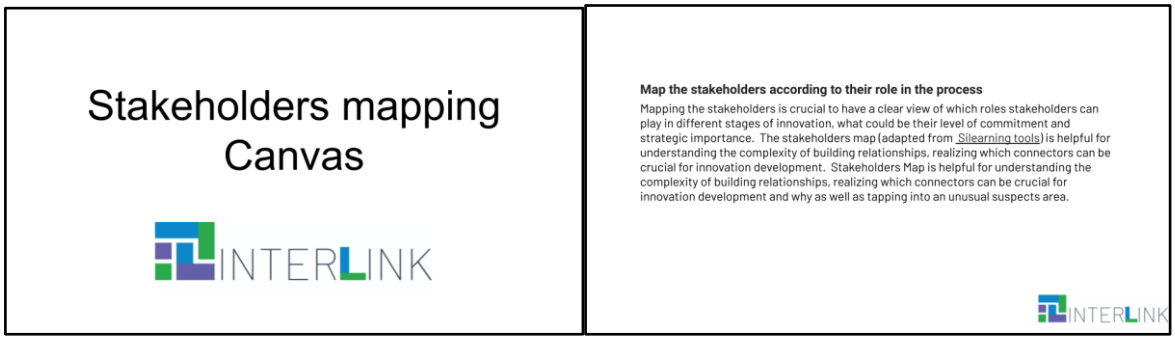
Key Actors and roles Define the type of actors involved in the co-production of the service and expected roles	• **VARAM –** interested in transferring partly the consultation function to third parties (NGOs, digital leaders) • **Municipalities and state institutions** whose services are provided by CSCs, co-delivery could improve the availability of their services • **Digital agents –** helping customers in applying/receiving services, including digital services
Related initiatives and projects	*(Describe related initiatives that can help to better understand the use case)* **Training and communication programme "My Latvia. Do digital" –** 2017 – 2020 6000 digital agents trained 2020 – 2022 2000 digital leaders (from digital agents) trained, 10 000 people assisted, 10 NGOs engaged
Available resources and links to other relevant documents	Document: An analysis of the "My Latvija.lv. Do digital" for digital agent group profiles
Notes	

7.3. "Stakeholders Visual Map Canvas" INTERLINKER

INTERLINKER SPECIFICATION	
Property	***Value***
NAME	*STAKEHOLDERS VISUAL MAP CANVAS*
DESCRIPTION	Mapping the stakeholders is crucial to have a clear view of which roles stakeholders can play in different stages of innovation, what could be their level of commitment and strategic importance. The stakeholders map (adapted from Silearning tools) is helpful for understanding the complexity of building relationships, realizing which connectors can be crucial for innovation development.
RELEVANT PROBLEM PROFILES	UND.PROBLEM.2 - Stakeholders mapping
STAKEHOLDERS	PAs and Private organizations initiating a co-production process
TYPE OF INTERLINKER	Enabling Service
NATURE OF INTERLINKER	Knowledge INTERLINKER.

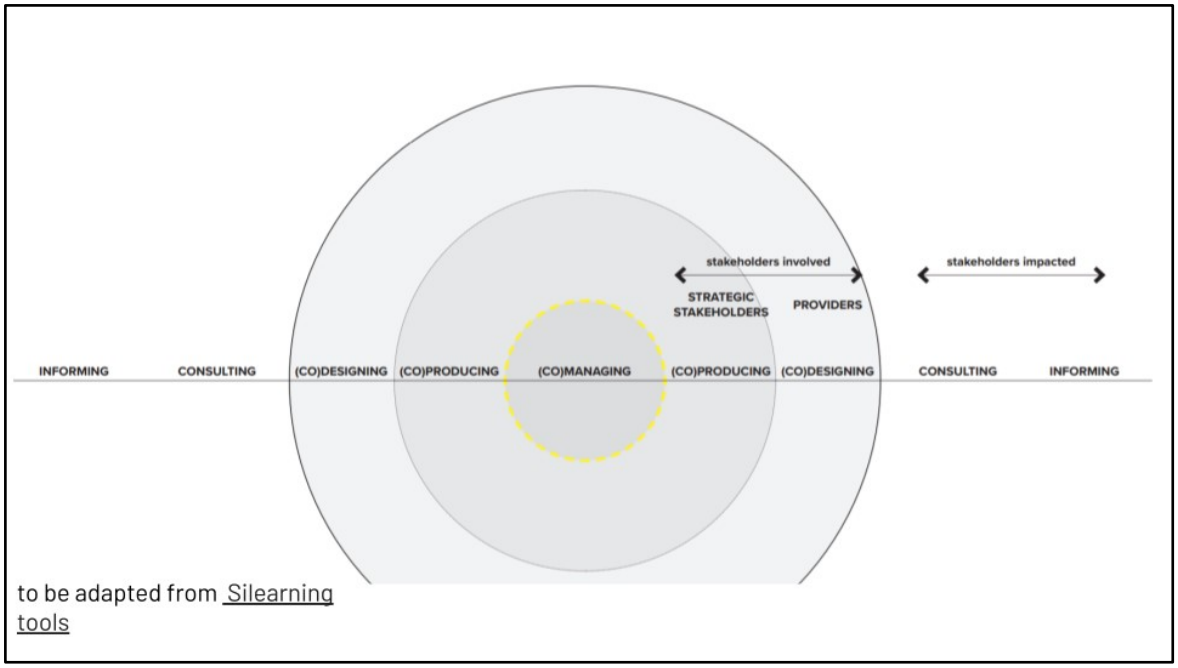
ASSOCIATED INTERLINKERS	*(List of related INTERLINKERs and dependency INTERLINKERs.)* • Guidelines for Stakeholders mapping • Stakeholders analysis template
USAGE CONTEXT	*(Reference to the context characterization of the INTERLINKER (e.g., Administrative boundaries, application domain, etc))* - administrative: any (international, national and local level) - organizational: public and private users - domain: any co-production process - process: any
CONSTRAINTS AND LIMITATIONS	*(Specific requirements and properties constraining the usage and exploitation of the INTERLINKER)*
REGULATIONS AND STANDARDS	*(Legal and technical context, where the INTERLINKER operates, as a set of relevant, normative acts, policies, standards, and specification the INTERLINKER adheres to)*
FORM OF KNOWLEDGE	*(Type of knowledge INTERLINKER: e.g., visual template, document template, canvas, best practices, guidelines, checklist, survey template, legal agreement template)* Digital visual template; printable version to support tangible interaction during focus groups
FORMAT	*(Type of the format used by the INTERLINKER: PDF, open documents, structured formats (e.g., JSON, XML, RDF, CSV))* PPT

Here follows a sample mock-up implementation for the "Stakeholders Visual Map Canvas" INTERLINKER borrowed from the resources developed within the Silearning initiative for public service innovation[32]. It consists of a graphical template on a Power Point slide with instructions on how to fill it by PAs and Private organizations initiating a co-production process. This mockup will be further refined by considering and possibly merging other consolidated toolkits for public service innovation (as for example the canvases for the map of actors and the map of the ecosystem developed by Designers Italia[33] for the innovation of Italian Public Administrations).



[32] https://www.silearning.eu/wp-content/uploads/2017/04/stakeholders-maps2.pdf

[33] https://designers.italia.it/kit/analisi-contesto/



7.4. "Stakeholders analysis template" INTERLINKER

INTERLINKER SPECIFICATION	
Property	***Value***
NAME	*STAKEHOLDERS ANALYSIS TEMPLATE*
DESCRIPTION	This knowledge INTERLINKER provides a template document to identify and analyse the people, groups, and organizations that have a significant influence on the project direction and its success or who are significantly impacted by the project. The template helps the team in analysing stakeholders engagement according to different dimensions: 1. the desired or expected level of involvement 2. potential issues related to their engagement 3. motivations and barriers that can support you in finding the best strategy to engage them in the co-production process. 4. expectations of the different stakeholders 5. skills and potential role within the co-production process 6. responsible person
RELEVANT PROBLEM PROFILES	UND.PROBLEM.2 - Stakeholders mapping
STAKEHOLDERS	PAs and Private organizations initiating a co-production process
TYPE OF INTERLINKER	Enabling Service
NATURE OF INTERLINKER	Knowledge INTERLINKER.

ASSOCIATED INTERLINKERS	*(List of related INTERLINKERs and dependency INTERLINKERs)* • Guidelines for Stakeholders mapping • Stakeholders Visual Map Canvas
USAGE CONTEXT	*(Reference to the context characterization of the INTERLINKER , e.g., Administrative boundaries, application domain, etc)* - administrative: any (international, national and local level) - organizational: public and private users - domain: any co-production process - process: any
CONSTRAINTS AND LIMITATIONS	*(Specific requirements and properties constraining the usage and exploitation of the INTERLINKER)*
REGULATIONS AND STANDARDS	*(Legal and technical context, where the INTERLINKER operates, as a set of relevant, normative acts, policies, standards, and specification the INTERLINKER adheres to)*
FORM OF KNOWLEDGE	*(Type of knowledge INTERLINKER: e.g., visual template, document template, canvas, best practices, guidelines, checklist, survey template, legal agreement template)* Digital document template
FORMAT	*(Type of the format used by the INTERLINKER: PDF, open documents, structured formats (e.g., JSON, XML, RDF, CSV))* XLS, XLSX

Here follows a sample mockup, implementable in the form of an excel file, that illustrates the functionalities expected for the "Stakeholders analysis template" INTERLINKER:

NAME OR GROUP	ROLE	SKILLS & EXPERTISE	LEVEL OF INVOLVEMENT
Describe stakeholders (e.g. ZGZ municipality, XX team, ..)	Describe the role of each stakholder in the process	Decribe the skills and expertise that stakeholders might bring in the process	What level of involvement is expected?
E.g. Municipality of XXX			

POTENTIAL ISSUES	MOTIVATION, DRIVERS, EXPECTATIONS	MILESTONES	ACTIVITIES	ESPONSIBLE PARTY
Known or potential issues related to their engagement in theprocess	Which are the motivations, drivers, barriers of the stakeholders? Have they expectations?	At what point in the change initiative is this stakeholder's involvement required?	What activities directly involve or impact the stakeholder?	Team member(s) responsible

8. Appendix 3 – Sample Software INTERLINKERs

In the following, we describe two software INTERLINERs that will be implemented in the project and that support the domain problem of "Collaborative knowledge sharing on public processes and services" (BUILD.PROBLEM.1). The full list of the Software INTERLINKERs that will be implemented and integrated in the INTERLINK platform will be described in deliverables D3.2 (Initial repository of INTERLINKERs and partnership tools - M16) and D3.3 (Initial repository of INTERLINKERs and partnership tools - M28).

8.1. "Collaborative Descriptor" INTERLINKER

Following the template for INTERLINKER specification described in Section 1.2.4, the software enabler for collaborative descriptions can be described as follows.

Property	*Value*
NAME	**COLLABORATIVE DESCRIPTOR**
DESCRIPTION	INTERLINKER which supports the collaborative creation of effective service descriptions that can be useful (i) for the daily work of people who provide information about the services to the public and (ii) for citizens and other end-users of the services. The enabler can also be used to collaboratively create other types of descriptions related to public procedures and processes (good practices in government). It supports the definition of templates of good descriptions to be reused uniformly across a catalogue of similar services or good practices from the same Public Administration. It conforms to standards for service descriptions to guarantee a degree of cross-domain and cross-border interoperability between public service catalogues. It offers agile methods for searching and browsing through the available information that is facilitated by standard classifications of public services and processes. The INTERLINKER also monitors how information is accessed to derive data on quality and usefulness of the service.
RELEVANT PROBLEM PROFILES	BUILD.PROBLEM.1 - Collaborative knowledge sharing on public processes and services (Servicepedia & Good-Practicepedia)
STAKEHOLDERS	Employees of Community Service Centers (CSCs), Digital agents, citizens (for the VARAM use case scenario); employees of national and local Public Administrations (for the MEF use case scenario); employees of public innovation hubs, citizens (for the ZGZ use case scenario)
TYPE OF INTERLINKER	Enabling Service
NATURE OF INTERLINKER	Software
ASSOCIATED INTERLINKERS	• "Descriptions Augmenter" INTERLINKER • "Registration and Authentication" INTERLINKER • "Loyalty, incentives and rewards" INTERLINKER

USAGE CONTEXT	- administrative: national (Latvia, Italy) and local level (Zaragoza) - organizational: public and private users - domain: description of public services, description of good practices, description of available resources and services for an innovation lab - process: Citizen sourcing (C2G): government designs and delivers a service, but asks citizens for the voluntary commitment of resources to improve the service itself, such as their voluntary labour or their personal data
CONSTRAINTS AND LIMITATIONS	*(Specific requirements and properties constraining the usage and exploitation of the INTERLINKER)*
REGULATIONS AND STANDARDS	*(Legal and technical context, where the INTERLINKER operates, as a set of relevant, normative acts, policies, standards, and specification the INTERLINKER adheres to)* ● Standard for classification of public services: the European Taxonomy for Public Services (https://joinup.ec.europa.eu/sites/default/files/news/2019-09/ISA2_European%20taxonomy%20for%20public%20services.pdf) ● Implementation based on Public Service Description Creator and CPSV-AP Data Validator documented at https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/cpsv-ap-tools#Implementations
(for software) IMPLEMENTATION PROPERTIES	● Open Source software ● Software-as-a-Service ● UI-based tool and API (REST) ● Operational environment: Web based ● Documentation of the API as Open API 3.0 ● Support for Internationalization ● Conformance to the legal regulations and standards
(for software) CUSTOMIZATION PROPERTIES	Customization available to configure the service to specific PA portals Customization available to select languages
(for software) INTEGRATION PROPERTIES	*(Characterization of the tool with respect to its integration with other software and components:* ● *Authentication / authorization standards used;* ● *Interoperability standards;* ● *Reference data models in the EU context.)* ....

8.1.1. API specification for "Collaborative Descriptor" INTERLINKER

Logical grouping	Functionality	Description
USER TASK: Ensure quality descriptions; Structure information according to standard classifications and data models		
CATALOGUE OF DOCUMENT TEMPLATES		Templates allow to create uniform sets of documents with similar structure and type of content. Document templates may be for example:

		Template for public service descriptions Template for describing a best practice of a PA process Template for describing a service offered by an innovation hub as Etopia Templates for describing Examples and Frequently Asked Questions Possible implementation of templates: ● simple version: templates are document skeletons with empty parts (or placeholder material). To create an instance document it is sufficient to create a copy of the template and fill in the empty parts. The same functionalities available for documents apply to templates (e.g. the collaborative editing) – the creation of the document is less constrained ● more formal version: each template has an associated data model, which lists the required fields and predefined graphic rendering rules. The editing of a new document requires selecting the data model and filling in a form with fields from the data model. This option requires editing support for the data model of the template and for a constrained filling in of the template to create a document. Automatic checks can be implemented to verify the completion of the information included in the documents.
	create template	Create a new document template from scratch. Assign it a unique identifiers
	clone template	Clone an existing document template, assign it a new unique identifier
	read template	Retrieve a template from the catalogue and show its contents
	modify template	Editing of an existing template (e.g. for customization)
	delete template	Delete a template
	list templates	Support the browsing of the catalogue of template documents by ordering of templates according to different criteria, e.g. - by popularity - by date of creation
	filter templates	Support the filtering of templates e.g. - by creator - by service domain - by type of document (service description vs. good practice description vs. facility description)
	search templates	Support the searching of templates - by text / keywords
	manage comments on a template	Create / Read / Modify / Delete comment on a template
	template history	Keep track of changes on a template to allow to recover previous versions
	template verification	Check that the template complies with EU standards for public service descriptions

	template voting	Let the authoring team to vote on whether the template / parts of the template are of good quality
	template approving	Mark a template as approved by the collaborative team that worked on it
	access rights on templates	Manage subsets of document templates which are owned and managed (edited, deleted) by a specific PA / private entity
	publish a template / group of templates as public	Make a template / group of templates accessible and reusable by the other users of the INTERLINK platform
USER TASK: Co-creation and co-delivery of information of public utility		
CATALOGUE OF DOCUMENTS		Documents may be for example: Public service descriptions Descriptions of best practices of a PA process Descriptions of services offered by an innovation hub as Etopia
	select a template and create document	Select a template from the template catalogue to start edit a new document. Assign it a unique identifier
	clone document	Clone an existing document, assign it a new unique identifier (the new document inherits the same template used to create the original document)
	read document	Retrieve a document from the catalogue and show its contents
	modify document	Editing of an existing document
	delete document	Delete a document
	list documents	Support the browsing of the catalogue of documents by ordering according to different criteria, e.g. - by popularity of access - by date of creation
	filter documents	Support the filtering of documents e.g. - by creator - by service domain - by type of document (service description vs. good practice description vs. facility description) - by exploiting standard classification criteria for service descriptions
	search documents	Support the searching of documents - by text / keywords
	manage comments on a document	Create / Read / Modify / Delete comment on a document

	document history	Keep track of changes on a document to allow to recover previous versions
	document voting	Let the authoring team to vote on whether the document / parts of the document are of good quality
	document approving	Mark a document as approved by the collaborative team that worked on it
	link documents	Insert links to related documents (e.g. to examples or frequently asked questions)
	access rights on documents	Manage subsets of documents which are owned and managed (edited, deleted) by a specific PA / private entity
	publish a document / group of document as public	Make a document / group of document accessible and reusable by the other users of the INTERLINK platform
	(advanced) upgrade to new template	Update an existing document to an updated version of the template data model (e.g. when a new required descriptive field is introduced in the template)
	(advanced) document quality check	Check which documents have incomplete descriptive fields (automatic quality check of information contained in the service/process descriptions)
USER TASK: Monitoring of quality of information service		
MONITORING OF ACCESS	statistics	Compute statistics on documents / templates / annotations editing, search, access
	repository quality check	Automatic quality check on the catalogue of service descriptions
MISCELLANEA		
USER RIGHTS MANAGEMENT	manage user roles	Different stakeholders may be granted different read/write rights on the documents / templates / annotations Different stakeholders may be granted different comment/vote rights on the documents / templates
CUSTOMISABLE GRAPHICAL INTERFACE	corporate image	Different organizations may wish to expose to the public a catalogue of service descriptions or good practices with a clear PA corporate image
	multilinguality	The service needs to be reusable across PAs that belong to different countries in Europe Within the same country, PAs may offer information in different languages

8.2. "Description Augmenter" INTERLINKER

Following the template for INTERLINKER specification described in Section 1.2.4, the software enabler for augmenting descriptions of public services with additional information and clarifications can be described as follows.

Property	*Value*
INTERLINKER NAME	**DESCRIPTION AUGMENTER**
DESCRIPTION	INTERLINKER which allows to annotate web documents with comments, questions, answers, terms which can be browsed, queried or even suggested to users when accessing to different parts of a web document. The annotations can be voted, commented, extended by other users in a Wiki-like manner
RELEVANT PROBLEM PROFILES	BUILD.PROBLEM.1 - Collaborative knowledge sharing on public processes and services (Servicepedia & Good-Practicepedia)
STAKEHOLDERS	Employees of Community Service Centers (CSCs), Digital agents, citizens,
TYPE OF INTERLINKER	Enabling Service
NATURE OF INTERLINKER	Software
ASSOCIATED INTERLINKERS	• "Collaborative Descriptor" INTERLINKER • "Registration and Authentication" INTERLINKER • "Loyalty, incentives and rewards" INTERLINKER
USAGE CONTEXT	- administrative: national (Latvia, Italy) and local level (Zaragoza) - organizational: public and private users - domain: description of public services, description of good practices, description of available resources and services for an innovation lab - process: Citizen sourcing (C2G): government designs and delivers a service, but asks citizens for the voluntary commitment of resources to improve the service itself, such as their voluntary labour or their personal data
CONSTRAINTS AND LIMITATIONS	*(Specific requirements and properties constraining the usage and exploitation of the INTERLINKER)*
REGULATIONS AND STANDARDS	*(Legal and technical context, where the INTERLINKER operates, as a set of relevant, normative acts, policies, standards, and specification the INTERLINKER adheres to)*
IMPLEMENTATION PROPERTIES	• Open Source software • Software-as-a-Service • UI-based tool and API (REST) • Operational environment: Web based • For the On-premise software, the characteristics for the deployment requirements, being hardware and software environment required • Documentation of the API as Open API 3.0 • Support for Internationalization • Conformance to the legal regulations and standards

CUSTOMIZATION PROPERTIES	Customization available to configure the service to specific PA portals Customization available to select languages
INTEGRATION PROPERTIES	*(Characterization of the tool with respect to its integration with other software and components:* ● *Authentication / authorization standards used;* ● *Interoperability standards;* ● *Reference data models in the EU context)*

8.2.1. API specification for "Description Augmenter" INTERLINKER

Logical grouping	Functionality	Description
USER TASK: co-create information that augments and better explains existing information sources		
DOCUMENT AUGMENTATION (annotations)		Document augmentation refers to the possibility of showing overlaid additional information (annotations) in certain parts of a document. Annotations may consist, for example, of simplified descriptions offered in plain language, terms explanation, examples, frequently asked questions. Annotations are helpful whenever this type of information is not directly included in the main document or in linked documents.
	define annotable element	Declare that one element in a document is annotable (e.g., form, field, paragraph, word, phrase)
	create an annotation	Create a new annotation item and assign a unique identifier Annotations can follow templates. In this case the creation of an annotation corresponds to 1) selecting an appropriate template from the template catalogue, 2) create an empty annotation item with that structure
	link annotation to annotable element	Define the annotable element / list of annotable elements an annotation is related to.
	read annotation	Retrieve the content of a annotation from the catalogue
	show annotation in context	Show the content of an annotation in overlay to an annotable element of a document
	link annotation as reply	link an annotation to another as a "reply"
	modify annotation	Editing of an existing annotation
	delete annotation	Delete an annotation
	list related annotations	Retrieve all the annotations that are linked in a "reply" dependency chain

	list annotations	Support the browsing of annotations by ordering them according to different criteria, e.g. - by popularity - by date of creation
	filter annotations	Support the filtering of annotations e.g. - by creator - by role of the user - by type of information
	search annotations	Support the searching of annotations - by text / keywords
	(advanced) recommend annotations	Automatically compute which annotations should be shown for a certain user
	submit annotation	In case the annotation is created by user roles with certain access rights (e.g. citizens) the annotation is not published immediately (e.g. when a citizen posts a question)
	send annotation notification	In case an annotation is submitted by user roles with certain access rights (e.g. citizens), the owner of the associated document is notified
	annotation approving	Mark an annotation as approved by the collaborative team that created the original document to be shown on the document
	access rights on annotations	Manage subsets of document annotation which are owned and managed (edited, deleted) by a specific PA / private entity
USER TASK: Monitoring of quality of information service		
MONITORING OF ACCESS	statistics	Compute statistics on documents / templates / annotations editing, search, access
	repository quality check	Automatic quality check on the catalogue of service descriptions
MISCELLANEA		
USER RIGHTS MANAGEMENT	manage user roles	Different stakeholders may be granted different read/write rights on the documents / templates / annotations Different stakeholders may be granted different comment/vote rights on the documents / templates
CUSTOMISABLE GRAPHICAL INTERFACE	corporate image	Different organizations may wish to expose to the public a catalogue of service descriptions or good practices with a clear PA corporate image
	multilinguality	The service needs to be reusable across PAs that belong to different countries in Europe Within the same country, PAs may offer information in different languages

9. Appendix 4 - An example of co-production process and related problems: the Reggio Emilia case study

To refine our understanding of actual co-production practices and the problems experienced by Public Administrations in managing the different phases of the process, we organized a workshop with representatives of the Reggio Emilia Municipality (Italy). The workshop had the goals to depict the organisational model behind their co-production processes, identify barriers and reflect about the type of support they might need to improve the process performance and quality. The dialogue with a Municipality not directly involved in the INTERLINK Consortium was considered relevant to start validating the first ideas about the co-production process and to generalize the first lists of problems (Problem Profiles) and related digital solutions (INTERLINKERs) envisioned.

The governance model followed by Reggio Emilia Municipality is based on three pillars, that are strictly connected with INTERLINK goals and mission: (i) *Participatory governance*, to promote stakeholder involvement and to ensure that everyone contributes with their own ideas, skills and solutions; (ii) *Transparency*, to make decisions transparent and open to the participation of citizens, organizations and businesses (e.g. openness and publication of data and procedures); (iii) *Sustainability* to rationalize processes and plan initiatives that will be integrated into normal operational flows and organizational structures, so as to ensure continuity and allow for a medium-long term horizon.

The Reggio Emilia Municipality implements its participative governance model within the "*Smart City protocol*", a formal framework to boost strategic initiatives for digital and social innovation. Launched in 2017, the protocol has already involved 36 local organizations to design and implement joint initiatives which, through collaborations and sharing of working methods, solutions and skills, allow subscribers to promote innovation and development of the territory and thus improve the quality of life and services.

The workshop was organized online in July 2021 and involved two representatives of the Municipality who were asked to select a service co-designed and co-delivered within the Reggio Emilia Smart City protocol and to reconstruct the different phases of the co-production process. For each of the mentioned phases, we prompted them to define:

- Actors involved, their role in the process and the procedure to engage them
- Relationships among the actors
- Procedures and best practices used to manage the different phases
- Channels and tools used to communicate with the network and management tools to coordinate the process
- Decision-making process: how decisions are made?
- Transparency of the process: how the process is communicated externally? Which information is accessible by citizens?

The service selected for analysis was "MySpace"[34], an Integrated single access point to online services where citizens can find online services and information resources, such as those required to print a certificate, enroll children in preschools, etc. By logging in with the same credentials, citizens are able to access the on-line services of the Municipality of Reggio Emilia, and other private and public parties.

Figure 11. A screen shot of the MySpace portal

Project phases

In the following, a summary of the co-production phases emerged along with the characteristics of each phase are described.

Project launch

The idea of the service emerged internally to the Municipality, which started collaborating with some selected external stakeholders such as subsidiary companies, before the creation of the institutional framework "Smart City Protocol". The first phase was hence a pioneering phase started in 2012 where a restricted team started planning and defining the first service idea.

Actors involved:

- "technical" staff of the Municipality, technical employees of the subsidiaries (e.g. companies which deals with the waste tax, mobility agency that deals with school transport, etc)
- service initially designed within a small technical group, a group that subsequently expanded to other stakeholders.

Engagement

Formalization of collaboration and network enlargement (2014/2015)

[34] https://openapps.comune.re.it/cruscottocittadino/public/cruscotto.jsf

The informal network was then institutionalized thanks to the formal appointment of the "digital councilor" of the Municipality, who played a crucial role in strengthening the importance of digitalization at the political level

Actors involved:

- Formal engagement of stakeholders previously involved. A *memorandum of understanding* was signed by the organizations interested in participating in the working group. This list of organizations committed to develop collaborative projects and to boost strategic initiatives for digital and social innovation
- Digital councilor. He strengthened the strategic nature of digital projects, giving more external visibility to initiatives: towards companies and towards citizens

Feasibility check of the service

The feasibility of the service was analysed by the Municipality with a restricted group of organizations

Actors involved:

- A limited number of stakeholders took part in this technical phase.

Design phase

In this phase, the extended group of stakeholders is activated to collect information about the design of the new service.

Actors involved: all the signatories of the protocol were involved. Organizations were asked to identify an internal contact to participate in the activities. Communication was managed through email.

In the design phase two subphases were performed:

- *Consultation of the network*: a data collection was performed to refine the understanding of the service features and functionalities. While at the initial stage of the process information was collected through a direct confrontation with the technical representatives of the subsidiaries involved, in this enlarged phase, information was collected during a meeting: a guided discussion was organized, followed by the administration of a card designed to collect information about the online services that organizations already offer to citizens and customers, their interest to bring their online service in the citizens portal and their ideas about the design of the service. A structured discussion followed in which participants brought their experience with online services and their perspective on a single access portal.
- *Sharing of results.* The outcome of the consultation activity was elaborated by the Municipality: ideas emerged and other relevant information were organized in a *PowerPoint* presentation and published on the website dedicated to the initiative, a sort of shared repository accessible only by participants and stakeholders involved.

Development phase

In this phase, the online portal was developed by a restricted technical team.

Actors involved: small teams of technical actors proceeded in parallel on different features of the digital solution. In this phase, direct communication among actors was developed.

Evaluation phase

Throughout the process, periodic internal evaluations were performed, in the form of self-reflection with stakeholders to adjust the process and refine the understanding of the ICT solution to be released. Informal methods were used to manage the internal assessment.

The developed service was evaluated between the 1st and 2nd cycle to lay the foundations for the second edition.

- *A survey was administered to citizens to evaluate* the relevance and effectiveness of the services provided by the Municipality. The Municipality was supported by the University Bocconi to define, administer and analyse the survey data.
- The results emerged from the survey were presented and discussed among the extended network of stakeholders

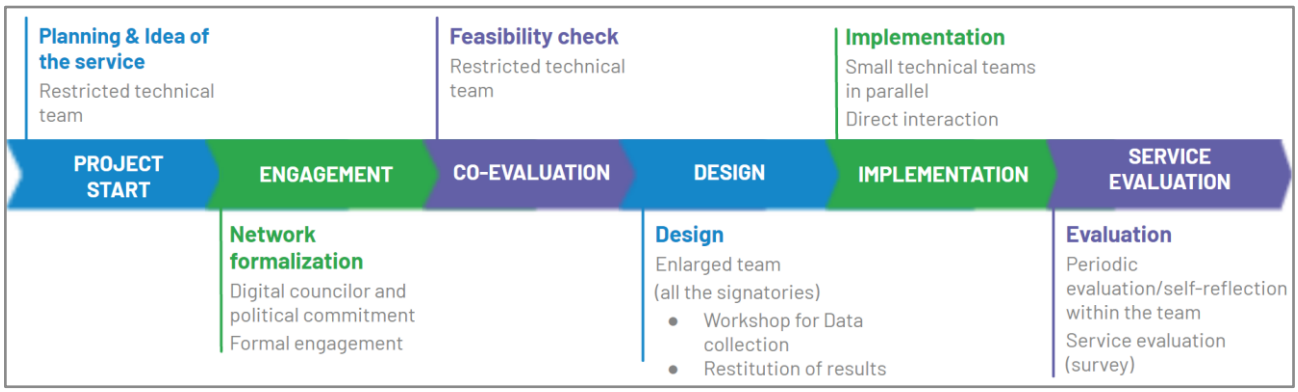


Figure 12. The collaborative process that lead to the development and delivery of the MySpace portal

Characteristics of the Reggio Emilia Municipality co-production process

From this preliminary analysis of a co-production process a number of interesting insights for the INTERLINK project can be derived; we summarize them in the following:

Stakeholders' network evolution and iterative redefinition of teams.

The experience of the development of MyPortal shows that the network of stakeholders is not a stable entity but that it evolves over time: actors involved change according to the different phases and different needs of the initiative (e.g. information collection vs technical development) and phases in which an extended group of stakeholders are involved alternate to phases in which only a restricted team is active (or several small groups work in parallel). Moreover, the network structure and level of institutionalization also evolved over time in relation to the changes in the political landscape. The network of stakeholders activated in the initial "pioneering phase" is enlarged and formally established thanks to the appointment of the "Digital councilor" that formalized the collaboration and network enlargement.

Use of ICT throughout the collaborative process.

Reggio Emilia Municipality promoted the use of a collaborative platform - *Alfresco Share*[35] - to encourage collaboration and communication among participants. Yet the platform was mainly used as a shared archive where to store project documents. The reasons behind the poor use of the platform as a collaborative environment are mainly related to the fact that online interaction within a collaborative environment should be encouraged and sustained over time and the Municipality staff failed to provide adequate stimulation. Another reason is that for technical partners involved in the operational/development phase more direct communication channels were needed. Finally the handovers of participants also played a role. Representatives of organizations that participated in the first phases delegated to colleagues the participation to successive phases. This also led to a poor use of the collaborative portal for communication purposes in favour of the email.

Pain points and needs of the Reggio Emilia Municipality

Finally, during the workshop we could also identify a number of challenges that the INTERLINK project could address.

Challenges	Potential support	INTERLINK
Handover of participants	Support continuity of joint action	Collaborative environment Team management tools
Lack of citizen involvement for service evaluation	Tool for quality assessment and monitoring	INTERLINKERs for collecting data from users (guidelines, surveys, SW)
Lack of awareness about how the collaborative process proceeds	Useful data & insights on the collaborative process: Participation: Which participants really contribute to initiatives? Interaction: between participants to the network: ties and synergies?	Collaborative environment INTERLINKERs for co-evaluation / self-reflection (internal assessment)
Improve communication with & between stakeholders	Informal, collaborative channel (beyond repository)	Collaborative environment
Create and share best practices	Examples of good practices: procedures to replicate a successful initiative how to manage open data made available to other stakeholders communication campaigns that have proved effective	INTERLINKER Collaborative descriptor: to collaboratively describe and share Good Practices

[35] https://docs.alfresco.com/content-services/6.0/using/share/