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SOcietal Needs aNalysis and Emerging Technologies in the public Sector

Deliverable D3.1

SONNETS Innovation Identification Framework for the Public Sector

Workpackage	WP3 – Identification of Emerging Technologies and Innovation Identification Framework
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Abstract:	This deliverable provides the outline of the SONNETS Innovation Identification framework, which consists of high level guidelines and methods that will allow to collect, analyse and cross-check the viability and applicability of emerging ICTs that can stimulate innovation growth in the public sector.

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Contents

List of Figures

List of Tables

Definitions, Acronyms and Abbreviations

Acronym	Title
EC	European Commission
EU	European Union
IT	Information Technology
ICT	Information and Communication Technology
OECD	The Organisation for Economic Co-operation and Development
PS	Public Sector
SWOT	Strengths, Weaknesses, Opportunities and Threads
WP	Work Package

Table 1: Definitions, Acronyms and Abbreviations

Executive Summary

This document ("SONNETS Innovation Identification Framework for the Public Sector") is part of WP3 and relates with Task 3.1 "SONNETS Innovation Identification Framework Definition". It provides a detailed description of the SONNETS Innovation Identification Framework for the Public Sector and the different methodological steps involved in the latter. The document is structured into four sections.

Section 1 briefly discusses the purpose and scope of WP3, and of this document in particular. It also describes the associated tasks of WP3 and the linkages/interdependencies with other work packages (in particular with WP2 and WP4).

Section 2 presents the SONNETS Innovation Identification Framework for the Public Sector. It deliberates the changing and evolving nature of the public sector in the society and the immense pressure it faces for increasing its productivity, providing more efficient and citizen-centric services and augmenting democratic participation. This section also stresses the importance of innovation in and by the Public Sector to respond to a myriad of challenges (demographic changes and a rapidly ageing population, climate change, unemployment and resource scarcity) the EU currently faces. Thus, fostering innovation through the public sector has become an imperative. The section further elucidates the importance of changing societal context and the consequent emerging needs that need to be dealt with. The section argues in favour of the enabling and facilitating role, the ICTs play in nurturing innovation within and through the public sector.

The same section (Section 2) outlines the research methodology and data sources employed by the Innovation Identification Framework. A wide variety of methods and data sources are adopted to collect, analyse and validate the vast amount of information generated with regard to societal challenges and needs, emerging technologies and technological trends. The methods include desk-based research, interviews, focus groups, brainstorming and online consultations. The data sources include interview transcripts, focus group notes and other secondary data obtained from sources such as EC reports, industry reports, white papers, EU policy docs and academic content.

Section 3 elucidates the different phases and steps involved in the Innovation Identification Framework. The overall process of creating the Innovation Identification Framework is composed of seven interrelated steps, with the output of each step serving as a crucial input for the following step. For each step undertaken, a brief description of the phase, the goal, the inputs, the outputs and the methods employed is provided along with its proposed implementation within the project. The first step (Needs Identification) involves eliciting societal trends, challenges and needs through desk research, interviews and focus groups. The objective of the second step (Technology Identification) is to collect information and create a long list of emerging technologies and trends. The third step (Technology Analysis) aims at producing a compendium of technologies and trends by considering the various dimensions of the technologies, such as the

application domain, technology type and the market potential. Next, the Technology Assessment and Selection (Step 4) is intended to select a subset of technologies that hold relevance for the public sector and possess the adequacies to fulfil the identified societal and public sector needs. It is also aimed at proposing innovation solutions to fulfil the societal and public sector needs. Step 5 (Innovation Identification) is planned to evaluate the impact and feasibility of the innovation solutions along various aspects and policy domains. Scenario Building (Step 6) phase is meant to develop a series of hypothetical future scenarios that could guide the selection of those solutions that could be absorbed into the public sector. The final Step 7 (Validation) is planned as a validation activity for confirming and refining the overall findings of the WP3 (to be done through workshops and online consultation).

Finally, the document concludes with Section 4, wherein the conclusions and the future steps are discussed.

1 Introduction

1.1 Purpose and Scope

SONNETS is guided by the vision to provide the guidelines and a methodological process that will help to reshape and reform the public sector into a technology leader and innovation breeding carrier, playing a key role in technology development and showcasing. In this respect, the project targets the development of an ever-evolving methodological framework, backed up by an active community, driven forward by renowned experts and interested public sector officials and practitioners, for the rapid porting of emerging technologies into public sector services and into policy domains where innovation co-exists with increased effectiveness and efficiency. Thereby, a key component in the SONNETS work plan is the identification and analysis of emerging technologies and trends and the assessment of their innovation potential for the public sector. At this point, attention is drawn to the fact that in the context of the SONNETS project and the present deliverable, the terms "technologies" and trends refer exclusively to emerging ICTs and ICT trends respectively.

The present deliverable is released within the context of Work Package 3 "Identification of Emerging Technologies and Innovation Identification Framework" and is in particularly associated with Task 3.1 "SONNETS Innovation Identification Framework Definition". The latter has strong links with Work Package 2 and the needs' identification procedure and targets to lay the foundations for all the work to be conducted in this WP, and in particular to provide, in the context of a high level methodological framework, the description of activities, alongside with the guidelines and criteria, required for:

- The identification of societal trends and needs.
- The identification of current and emerging societal needs and the innovation requirements of the PS that could be translated into concrete innovation actions by the PS.
- The identification of emerging technologies and trends related to public sector.
- The interlinking of novel technologies and technological breakthroughs with the different societal and public sector needs identified in the previous WP (WP2).
- The assessment of those trends' impact in the domains observed.
- The drawing of the relations of those trends to the public sector and to the different policy domains.
- The projecting impacts of the adoption of those technologies to the public sector.

Along the above lines, the objective of this deliverable is to provide the aforementioned framework, entitled "SONNETS Innovation Identification Framework for the Public Sector", and thereby the methodology for collecting, analysing and cross-checking the viability and applicability of emerging ICTs in the public sector.

The framework, which has already been validated during the SONNETS Experts Focus Group in Torino in September 2016, is primarily intended to guide activities within the project and in particular within the rest of WP3 tasks, but may also be considered as a self-standing methodological aid for supporting the public sector's ICT transformation.

The final framework, as to be devised after further consultation with experts, will be provided as part of "D3.3 - Emerging ICTs and Innovation Potential for the Public Sector – Final Version" of WP3.

1.2 Approach for the Work Package and Relation to Other Work Packages

Work package 3 concerns, as already explained in Section 1.1, the development of the Innovation Identification Framework, and the identification of emerging technologies. It is a component of the project, active from the start of SONNETS until M12 that enumerates four interdependent tasks and is intended to produce three deliverables, as illustrated in Figure 1.

Task 3.1 is the introductory task to WP3, specifying through deliverable D3.1 the activities to take place in the following. Tasks 3.2 and 3.3 are concerned with the actual identification of emerging technologies and their analysis and impact assessment respectively, with their outcomes being compiled in deliverable D3.2, which stands as an initial list of emerging technologies and applications that could prove useful for the public sector. Finally, Task 3.4 pursues the validation and updating of these outcomes with the engagement of the targeted stakeholders, the results of this process being reported in deliverable D3.3.

Figure 1 below further illustrates Work Package 3 dependencies to the rest of SONNETS WPs. These include the use of deliverable D3.1, namely the Innovation Identification Framework as the means to couple WP2 and WP3 results both in the context of Task 3.3 on the identification of potential applications and services for the public sector and of their innovation potential for the latter, as well as within the frame of the gap analysis to be conducted in Task 4.2. They further include feeding Task 3.4 outputs, and thereby deliverable D3.3, to WP4 and its first task (Task 4.1) on the analysis of the most promising technologies.
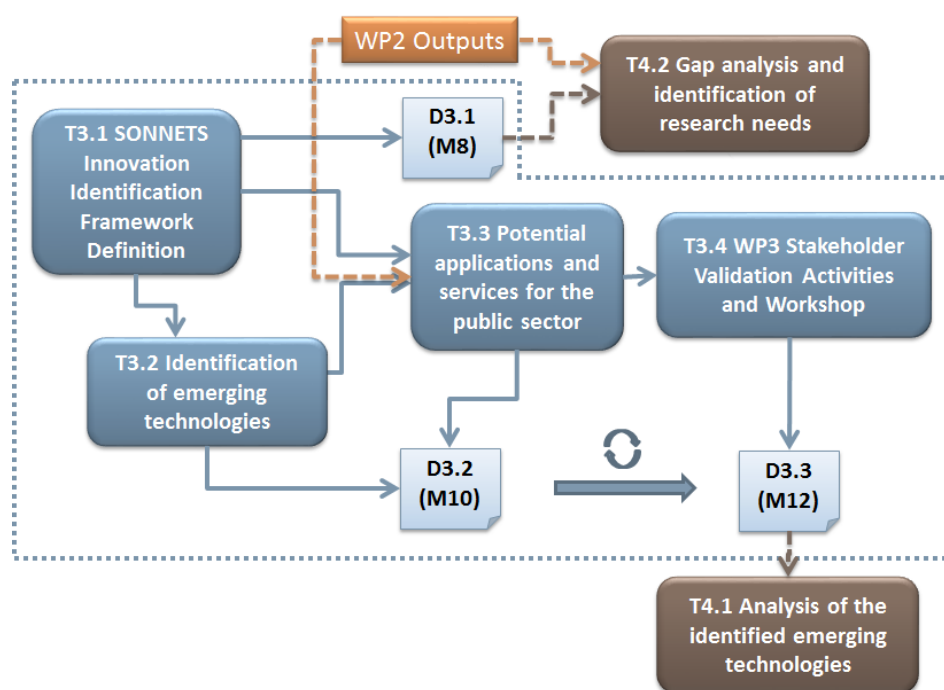
Figure 1: WP3 structure and dependencies with other WPs/tasks

1.3 Structure of the Document

The document at hand is structured as follows:

- Section 2 introduces the rationale behind the development of the SONNETS Innovation Identification Framework for the Public Sector, and thereby exposes the vision of bringing the public sector at the forefront of innovation promoting activities. In respect to that vision, it further discusses on the necessity to possess knowledge on the challenges and problems currently encountered by the public sector, the current societal trends, challenges and emerging needs, the innovation requirements of the PS, innovation actions the PS can undertake to address societal challenges and needs as well as on the key role of technological developments in fostering public sector innovation. Section 2 additionally provides an overview of the SONNETS Innovation Identification Framework, whereas it also outlines the stakeholder groups to be involved and details the innovation identification methods to be employed.

- Section 3 exposes the SONNETS Innovation Identification Framework Methodology on a step by step basis. Each step of the methodology is in particular presented in terms of its goal, work methods, inputs and outputs, while a plan of its implementation within the project context is also provided.

- Section 4 summarises the contents of the deliverable and reports relevant conclusions.

- A number of Appendices incorporate a set of guidelines for conducting interviews and guiding discussions in focus groups, as well as a set of templates for carrying out the related analysis and impact assessment tasks.

2 SONNETS Innovation Identification Framework for the Public Sector

2.1 The vision of transforming the public sector into an innovation breeding carrier

The public sector plays a key role in the society and the economy as regulator, service provider and employer. In addition to that, it is also responsible for fostering innovation in the private sector by providing funding to private companies, and contributing to the development of key technologies by investing on these in the early stages of development, when uncertainties for private companies are too high. Due to its role as a service provider in particular, the public sector is also - and has always been - the receiver of intense pressures for increasing its productivity, providing more efficient and citizen-centric services and enhancing democratic participation.

Nowadays, however, technological breakthrough and innovations, emerging trends, such as those of increased globalisation and mobility of people, goods and services, demographic change and ageing societies, chronic diseases, climate change, degradation of the natural environment and gradual depletion of its resources, and changing lifestyles create a complex and turbulent environment that is challenging the role of the public sector as perceived so far. On top of that, in the wake of the economic crisis, stressed public finances bring public sector organisations up against long-term challenges and problems, such as high unemployment rates, rising social security and health care costs, an outdated in several cases public service infrastructure that lags behind the current needs of citizens and businesses [1], and generally even greater pressures for producing "more with less" [2]. In this environment, public sector organisations, agencies and departments are cast into roles, where they must not only react to the crisis, but be pro-active problem solvers and seek new opportunities for value creation.

Along the above lines, the role of the public sector is changing from one that is expected to ensure stability, resilience and continuity to one that must also embrace a strategic and systematic effort to manage emergence of and create positive change [3], or, simply put, to innovate. In fact, in addition to the public sector's role in *catalysing innovation in the wider economy*, there is an urgent need to power innovation *within the public sector itself* in order to unlock radical productivity improvements and efficiency gains, to foster the creation of more public value and a better response to societal challenges [1].

Innovation in the public sector can be defined as the process of generating new ideas, and implementing them to create value for society [4], and may have an internal or external focus, pertaining to the development of improved processes or services respectively [5]. In particular, the European Commission identifies policies and initiatives for public sector innovation along three axes: (a) policies and initiatives with an internal focus on enhancing public sector efficiency, (b) policies and initiatives with an external focus on improving services and outcomes for citizens and businesses and (c) policies and initiatives with a focus on

promoting innovation in other sectors [6]. Overall, the goal is both *innovation in* the public sector (with internal or external focus), and *innovation through* the public sector (fostering innovation elsewhere).

These axes pertain to the vision of *transforming the public sector into an innovation breeding carrier* and are further in line with the goal of public sector innovation as defined by the OECD Observatory of Public Sector Innovation: "*to use new approaches, from policy design to service delivery, for a high performing, more responsive public sector*" [7].

2.2 Demand-driven innovation for addressing pressing and emerging societal needs

Since the end of the nineties, a significant amount of attention has been devoted to what was initially named eGovernment and subsequently also referred to as public sector innovation. As a consequence, a considerable amount of public resources were devoted to promote the digitalization and the improvement of government agencies' processes. Twenty years down the road, the results achieved are still considerably below expectations. The EU eGovernment Report 2016 recently published highlights how "online public services are becoming increasingly accessible across Europe, 81% being now available online. However, deeper analysis of user-centricity, transparency, cross-border mobility and in general quality of use shows that growth is uneven and a substantial number of EU countries are still lagging behind. This sends a clear signal for acceleration, in order to keep up with private sector pressing needs, and citizens' expectations" [8].

The reasons for such results are manifold, nevertheless it may be said that part of the problem lies in the technological determinism and lack of citizen/customer orientation that characterized the management of the innovation process. As a matter of fact, any given innovation in the public sector may be considered valuable only to the extent to which it allows to attain a set of objectives that are perceived as being of intrinsic value either for society or for a specific target group of stakeholders. In other words, ICT is a means to an end [9].

The perception of value is strictly correlated with the needs of a society. In this respect, it is useful to mention that individual as well as collective needs may be hierarchically organized in order to provide a priority ranking. The work conducted at the beginning of the last century by the American psychology Abraham Maslow represents a cornerstone in this field [10]. His hierarchy of needs identifies five categories of needs having to do with physiology, security, belonging, esteem and self-actualization. In a resource constrained situation, such classification could represent a useful tool in identifying and prioritizing the long term strategic priorities that should be targeted in order to create value for the society. A value that - as Savitz [11] reminds us - unfolds along a number of dimensions touching upon financial, social, environmental aspects. We refer the reader to D2.1 for a more in depth discussion of the role of needs in innovation.

The notion of a demand-, or value-, driven innovation is emerging across academia and the world of practice. The business model ontologies tools

developed by Alex Osterwalder [12], [13] as well as the lean start-up methodology developed by Eric Ries [14] implicitly rely on the identification of the needs a given innovation intends to address as well as an early and intense involvement of the final users in the testing phases. It is also well recognized that involving and engaging with citizens and relevant stakeholders in the innovation phases and processes is crucial to implement local needs-oriented innovation [15]. To institutionalize this practice, the starting point is to ensure a thorough analysis of the emerging and societal needs of various stakeholder groups in the public sector.

The innovation framework proposed by the SONNETS project will thus incorporate a demand driven component that will increase the chances of orienting the innovation activities towards a better alignment with pressing and emerging societal needs. This is done by including in the methodology a number of data collection and co-creation activities that are detailed in D2.1.

2.3 The role of ICT in Public Sector Innovation

Information and Communication Technology (ICT) is widely accepted as a key enabler for innovation, particularly when referring to related disruptive technologies or technological breakthroughs that change the nature of products and services; not to mention, that it is usually the main factor to which the conversation narrows down when the question of how to achieve innovation is addressed.

One of the main reasons that ICT is considered capable to drive innovation is the fact that it is characterized by high flexibility and adaptability, so it can be used in many different ways and for many different purposes in various sectors of the economy, and enable important innovations in the business processes, products, services and business models of organisations [16].

Further, ICT has dramatically reduced various groups of costs, with particular impact on costs related to information processing and transfer. ICT has also removed many of the factors that imposed limitations in the production process, heavily affecting parameters such as time and place [17]. Moving closer to the public sector and the public service conceptualization, design and delivery domain in particular, ICT can lead in big productivity increases, costs' reduction and increased output quality [18]. The design of new products/services and improvements of important intangible aspects of existing products/services, such as convenience, timeliness, quality and personalization, also constitute factors that can be heavily ameliorated through the use of information and communication technologies [17].

Overall, technology may incarnate or simply underpin several forms of innovation in the public sector including, according to the typology by Windrum (2008) [19]:

- Service innovation, i.e. introduction of a new service product or an improvement in the quality of an existing one.
- Service delivery innovation, namely new or altered ways of delivering to clients, or otherwise interacting with them, for the purpose of supplying specific public services.

- Administrative and organizational innovation which stands for changes in the organizational structures and routines by which front office staff produce services in a particular way and/or back office staff support front office services.
- Conceptual innovation, mapping to the development of new world views that challenge assumptions that underpin existing service products, processes and organizational forms.
- Policy innovation, i.e. changes to the thought or behavioural intentions associated with a policy belief system.
- Systemic innovation and, thereby, new or improved ways of interacting with other organizations or knowledge bases.

Yet, in spite of its vast potential, technology has no value on its own. To make a difference, it has to be appropriately applied to solve specific problems, address specific challenges or meet certain goals, as defined by an organisation itself and its customers. In fact, it is only when technology is combined with insights on what customers want, that real innovation can take place. The public sector though does not have customers in the traditional sense; instead its role is, as already discussed, to provide quality public services and respond to citizens' and businesses' needs that pertain to a variety of policy domains, including administration, public order and safety, education, health and social care, etc. In this context, the vision of transforming the public sector into technology leader and innovation breeding carrier can only be fulfilled if the potential of emerging ICT technologies and related technological trends is combined with insights on the actual needs of citizens, businesses and public sector constituent organisations.

This is where the SONNETS Innovation Identification Framework for the Public Sector, a key outcome of the SONNETS project, comes in with the view to couple findings on emerging ICT technologies and technological trends that hold a high innovation potential with insights on current societal challenges and needs, in order to find opportunities for and critically assess the adoption of these technologies in the public sector, as well as to identify appropriate services and applications that may materialise the envisaged innovations. The role and methodological aspects of the SONNETS Framework are analysed at greater detail in the following section.

2.4 The SONNETS Innovation Identification Framework Methodology: Overview

The SONNETS Innovation Identification Framework is an innovative methodological framework that will accelerate the transformation of the public sector into an innovation breeding carrier. The goal of the SONNETS Framework is twofold and lies in supporting innovation both *__in__ **the public sector**_ and *__through__ **the public sector**_.
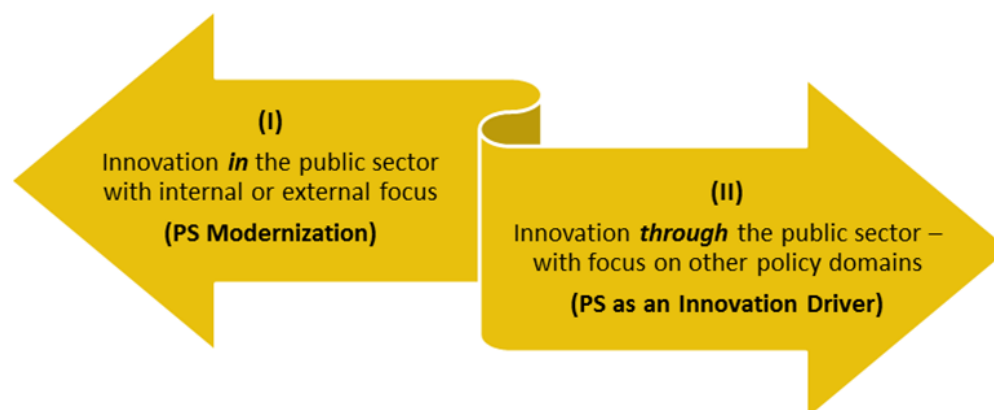
Figure 2: The goals of the SONNETS Innovation Identification Framework

Innovation in the public sector may have, as already explained in Section 2.1, an internal or external focus, pertaining to the improvement of the public sector internal processes and the former's efficiency, and the development of improved services for citizens and businesses respectively, and targets the public sector's modernization. On the other side, ***innovation through the public sector*** focuses on promoting the generation and implementation of innovative ideas and the corresponding creation of value in other sectors and pursues accordingly the transformation of the public sector into an innovation driver.

The Framework emphasizes the necessity to have an informed view of the current societal trends and challenges as a prerequisite for better accommodating the respective needs, as well as the role of Information and Communication Technology (ICT) as a key enabler for innovation, and pursues its goal by means of coupling findings on emerging ICTs and trends with insights on current societal challenges and needs. Such coupling is carried out on the basis of specifying and bringing into the foreground specific innovative solutions for the adoption of the identified technologies and the confrontation of the identified needs respectively. In this respect, the SONNETS Innovation Identification Framework, and more

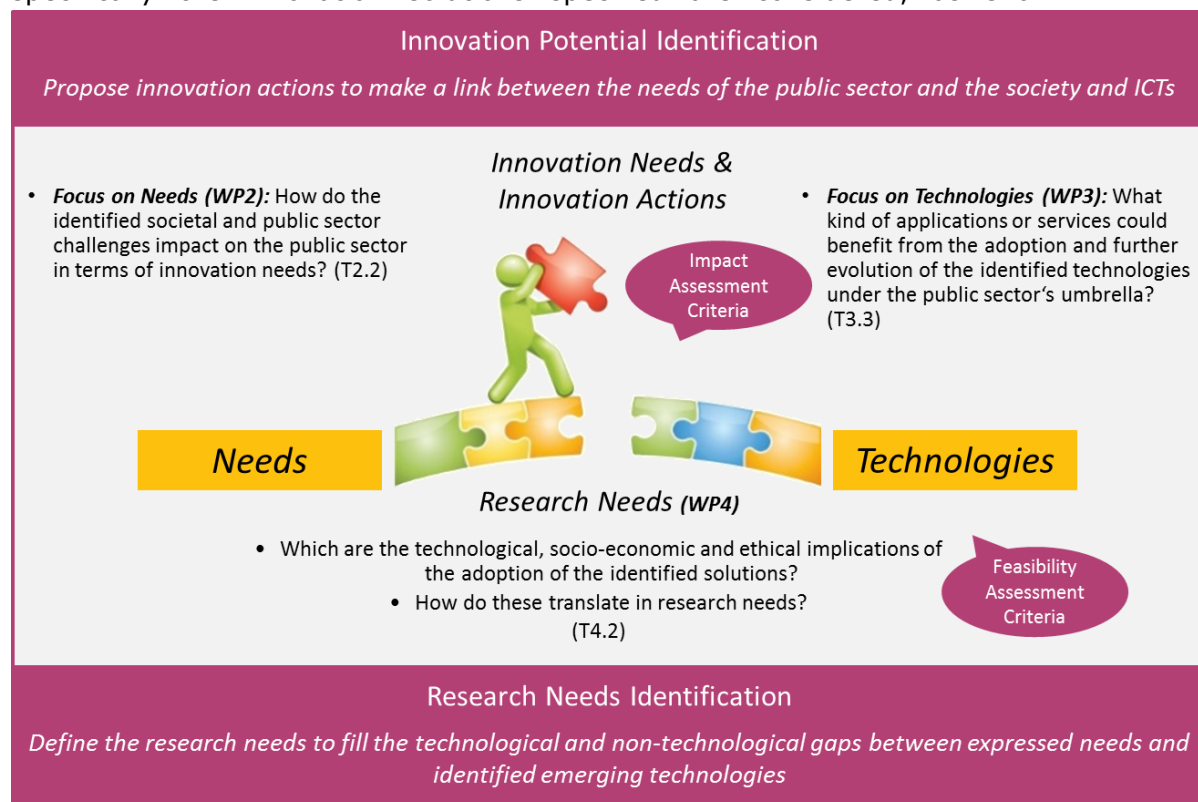specifically the innovation solutions specified are considered, as shown in

Figure 3, as the means to bridge the identified needs with technologies.

In the context of the SONNETS project, the identification of needs is the subject of WP2 activities, which pursue to address the question of how societal challenges and public sector needs impact on the former in terms of innovation needs. On the other hand, the identification of technologies constitutes the focus of WP3, which embarks, among others, on specifying applications and services that could benefit from the adoption of the identified technologies under the public sector's umbrella. In this context, the innovation actions specified, make up the point into which the two parallel processes of needs' and technologies' identification converge.

Still, the Framework does not limit its scope in the specification of relevant innovation solutions. It further addresses the assessment and evaluation of their actual innovation potential. The latter is considered under the prism of both the impact and feasibility of the identified solutions. To this end, the Framework defines a set of impact assessment criteria and feasibility assessment criteria, in order to evaluate the innovation potential of the solutions under consideration for the public sector. The former are used to evaluate the magnitude of the potential effects of the identified solutions, whereas the latter are employed to assess the research needs, which the technological, socio-economic and ethical implications of these solutions translate into. The rating of the specified solutions against both the dimensions of impact and feasibility allows to distinguish and, possibly prioritize, those solutions that hold greater value for the public sector, and lays the foundations for designing a concrete time plan of actions and a set of recommendations for their implementation in practice, i.e. for developing the

SONNETS Roadmap. Both the research needs identification as well as the roadmap design are dealt with under WP4.
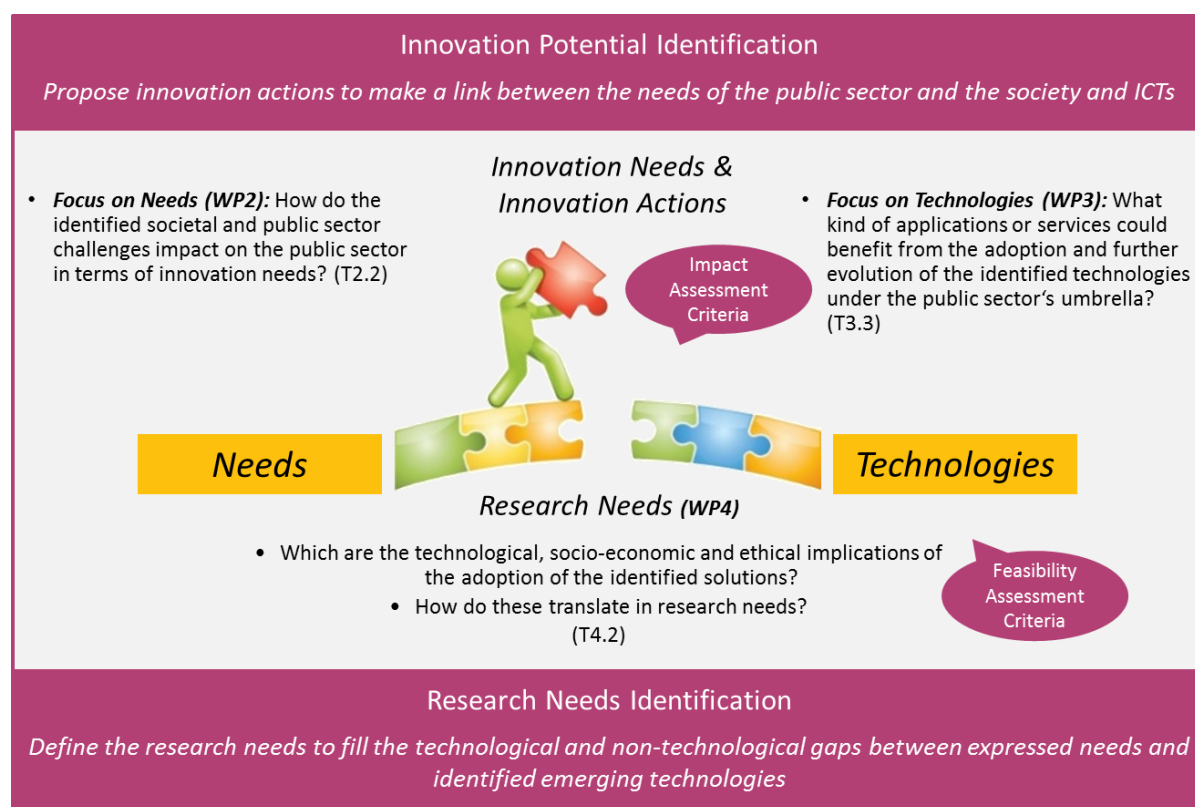

Figure 3: The role of the SONNETS Innovation Identification Framework

From a methodological point of view, the SONNETS Framework relies basically on the methods of desk-based research, interviews, focus groups and workshops, and open consultations, and encompasses six logical steps or phases as follows:

i) the identification of societal needs, societal and public sector trends/challenges (needs identification)
ii) the identification of emerging technologies and trends that make a difference today in other sectors (technology identification)
iii) the analysis of these technologies and trends in terms of their key characteristics and specificities (technology analysis)
iv) the assessment of these technologies in the domains originally met and their correlation to the public sector needs and societal challenges on the basis of existing services and applications, as well as new innovation solutions that may benefit from these technologies (technology assessment and selection)
v) the evaluation of these services' and solutions' innovation potential in terms of both their impact and feasibility (innovation identification)
vi) the selection among the former, of those that make more sense to be ported to the public sector through the development of adequate scenarios (scenario building)
vii) the evaluation and ratification of the overall findings (results validation)

These discrete but interrelated steps are presented at greater detail in the following sections and correspond to information collection, analysis and
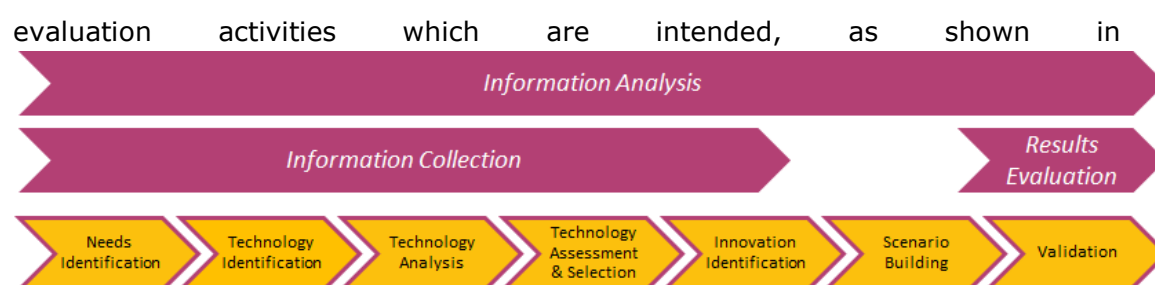
evaluation activities which are intended, as shown in
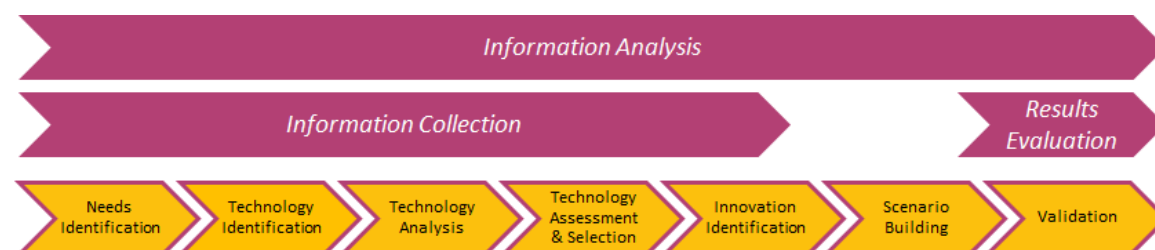

Figure 4, to take place in an overlapping way.

Figure 4: Methodology Flow Diagram

The SONNETS Innovation Identification Framework is going to guide the innovation identification activities within the SONNETS work-plan, but can also be used as a self-standing innovation framework for the public sector.

2.5 Stakeholders Involved

SONNETS mission is to lay the foundations for creating a more productive, responsive and innovation generating public sector, and thereby for addressing the needs of public sector employees and policy makers, but also catering for those of businesses and citizens, so as to develop a win-win situation for all relevant stakeholders. In this respect, it places particular emphasis on both identifying and understanding the needs of the former, and taking into consideration their views on the potential of emerging technologies to transform the public sector, as well as on the desired features of new and innovative public sector applications and services.

In this context, the project pursues not only the dissemination of its research findings to the targeted stakeholders, but also their actual involvement in shaping and validating these findings. In particular, as far as the identification, analysis and evaluation of existing and emerging needs and technologies is concerned, SONNETS foresees the engagement of a number of stakeholder groups in various stages of the Innovation Identification Framework Methodology, as follows:

- Public sector representatives: SONNETS targets primarily public sector institutions, which are eager to transform themselves into technology and innovation generators. Thereby, this group includes representatives of local, regional or central government authorities at national and international level, as well as policy makers and research planners. The latter should be engaged by means of interviews and focus groups or workshops with the view to offer insights on the public sector needs and requirements, discuss the technology and innovation readiness of their organisations and argue with regard to the impact and feasibility of identified innovation solutions.

- IT experts: these should be IT professionals and representatives from all public sector, business, and research domains. IT experts have a leading role when it comes to the adoption of new technologies and trends and thereby they should be engaged in the context of interviews and focus groups with the goal of revealing insights on existing and emerging technologies, assessing their maturity and relevance for the public sector and proposing solutions and applications for their adoption or implementation by the latter.

- Citizen representatives, civil society and the general public: SONNETS pursues the transformation of the public sector in the direction of better responding to society's needs and increasing citizens' trust on public services. In this respect, citizen and civil society representatives should be interviewed in order to offer an insider's perception of the problems and challenges encountered nowadays by citizens, both in the context of their interaction with public authorities, as well as within other aspects of their daily life. Additionally, the promotion of awareness of a wider audience, representing the general public or the society at large, on innovation-driven solutions and initiatives, as well as the former's actual engagement in their validation, should further be pursued by means of online consultations.

- ICT research community, private sector representatives: this group includes ICT research organisations, company, business associations, industry, and not-for-profit organizations representatives that may be interested in SONNETS outcomes, as the latter may be beneficiary for their own research/commercial activities. These should be involved through interviews, focus groups and workshops in the identification of the needs of the private sector, the assessment of strategic technology choices' and trends' potential to cover these needs, as well as the recognition of use cases and best practices that should be considered by the public sector, so as to improve its operation.

Along the course of the project, SONNETS consortium will get in touch with representatives of all of the aforementioned stakeholder groups as per the needs of the SONNETS Innovation Identification Framework Methodology and through the work methods described in detail in the following paragraph.

Additionally, SONNETS partners will work in close collaboration with the SONNETS Experts Committee, a panel of experts, assembled for the exact purpose of supporting the innovation identification process within SONNETS. The members of the SONNETS Experts Committee have profound knowledge on the operation of the public sector and the use of ICT in its context and will contribute in the innovation identification process as interview partners while also attending the SONNETS events, and in particular the WP3 validation workshop, and participating in a number of follow-up teleconferences as per the needs of the project. These experts will further act as multipliers to extend the multidisciplinary network of stakeholders and teams that will be targeted during the project execution. Further to that, the consortium will count with the support of the SONNETS Expert Advisory Group, a team of external experts willing to

contribute to the project goals, providing feedback on the SONNETS outcomes during the validation workshops to be organized.

Stakeholder Group	Main Focus of Involvement	Methods of involvement
Public sector representatives	• Identification of public sector requirements • Identification of public sector employees' needs • Assessment of the technology and innovation readiness level of pubic administrations • Assessment of the impact and feasibility of innovation solutions' implementation in the public sector	• Interviews • Focus groups / or workshops
IT experts	• Identification of existing and emerging technologies • Assessment of technology maturity • Assessment of technology relevance for the public sector • Suggestion of technological innovation solutions	• Interviews • Focus groups / or workshops
Citizen and civil society representatives	• Identification of citizens' daily life problems and challenges in terms of their interaction with the public sector • Suggestion of innovation solutions	• Interviews
ICT research community and private sector representatives	• Identification of business and industry needs • Assessment of strategic technology choices' and trends' potential to cover the needs of the private sector • Identification of technology use cases and best practices	• Interviews • Focus groups / or workshops
SONNETS Experts Committee	• Identification of public sector requirements • Identification of business and industry needs	• Interviews • Focus groups / or workshops

Stakeholder Group	Main Focus of Involvement	Methods of involvement
	• Assessment of technology maturity • Suggestion of technological innovation solutions	
SONNETS Expert Advisory Group	• Evaluation of technological and innovation solutions' proposals	• Focus groups / or workshops
All stakeholders and the general public	• (Awareness promotion on the role of ICT and the innovation potential of ICT solutions) • Evaluation of technological and innovation solutions' proposals	• Online consultation

Table 2. Overview of Stakeholders Engagement

2.6 Innovation Identification Work Methods

The methods to be employed for facilitating the innovation identification process, and thereby for collecting, analysing and evaluating information with regard to societal challenges and public sector needs, as well as emerging technologies and technological trends, include desk-based research, interviews, focus groups, brainstorming and online consultations. A brief description of each method is provided below, along with an explanation on its use in the context of the SONNETS project. Additional information on how these methods map to the methodological steps of the Framework is provided in Section 4.

2.6.1 Desk-based research

Desk-based research, also met as secondary research, is the term used for describing the process of tracking down useful information already available in print or published on the internet. It is concerned with the summary, collation, analysis and/or synthesis of existing knowledge and research, contrary to primary research, in which data are collected from research subjects or experiments [20]. Traditionally using library sources, desk-based research has now largely moved to the internet, leveraging the vast amount of publicly available resources and the latest advances in search engine intelligence. Desk-based research can serve as a stand-alone research technique or as the initial stage of a project and a precursor to primary research.

2.6.1.1 Desk-based research in SONNETS
In the context of the SONNETS project, desk-based research will target the identification of societal challenges and public sector needs (as mandated by the work plan of WP2), as well as the identification of emerging technologies and technological trends, along with the potential detection of additional information on these technologies' characteristics in terms of maturity, market potential,

growth, impact etc. (serving the work plan requirements of WP3). The identification of societal and public sector needs will be based upon the examination of a number of sources of information in both the academic and grey literature. On the other hand, the identification of technologies and trends will rely on relevant EC resources, research projects and roadmaps, studies from consultancy firms (e.g. Gartner Hype Cycles, Forrester, Forbes, Deloitte, Accenture, etc. reports), and technology articles, as well as online resources mining algorithms (e.g. Google Trends, 'Research Trends' by Scopus, etc.). The "FITMAN Anlzer", an unstructured data and social data analytics tool, designed and developed by NTUA, will also be employed in order to identify trends out of discussion happening in Web2.0 channels such as Twitter. The outcomes of desk-based research, i.e. the materials collected, will be used as a pool of preliminary and raw findings that will be further complemented, reviewed, revised, refined and validated along the course of the project with the help of the work methods exposed in the following paragraphs, i.e. with the help of interviews, focus groups brainstorming and online consultations.

2.6.2 Interviews

An interview is another type of qualitative research, which takes the form of a one-to-one conversation with one person acting in the role of the interviewer and the other in the role of the interviewee, and where questions are asked to elicit information on a specific topic. The main goal of an interview is to understand the meaning of what the interviewees say and comprehend their experiences [21]. An interview may take place face-to-face and in person, or online using videoconferencing software.

2.6.2.1 Interviews in SONNETS

In the frame of SONNETS, interviews will take place with the help of short questionnaires (consisting of no more than 10 questions), on a face-to-face or online communication basis, and will be recorded unless the interviewee specifically asks for them not to be recorded, in which case, extensive notes will be taken instead.

In particular, two rounds of interviews will be carried out, serving the research requirements of both WP2 and WP3: The first round of interviews will have a focus on needs and will pursue the identification of societal and public sector needs, whereas they will involve a number of privileged informants, acting as representatives to the public (public administrations) and enterprise sector (businesses) and the society at large (individuals). The second round of interviews will have instead a technology focus and will target the recognition of technologies and trends that are anticipated to have a significant impact for the public sector and its constituent policy domains, whereas they will involve accordingly a number of IT experts, coming from the public sector, the business and research communities. A set of 43 interviews will be conducted in total for these purposes (35 interviews with privileged informants and 10 interviews with IT experts), using the interview guidelines that are incorporated in Appendices A and B of this document.

In spite of the primary goal being in both cases the identification of needs and technologies respectively, these interviews will not limit their scope in a simple

enumeration of related items. Instead, as shown through the relevant guidelines, they will pursue to elicit insights on the wider context surrounding the identified needs and technologies. More importantly, in spite of their different focus, they will encourage interviewees to bring up innovation solutions that may be implemented to address the identified needs and in parallel apply the identified novel technologies in actual use case settings, thereby contributing into establishing a link among societal and public sector needs and emerging technologies and trends, which make up the two pillars of the Innovation Identification Framework.

2.6.3 Focus groups / Workshops

A focus group is actually a form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs, and attitudes towards a product, service, concept or idea [22]. Questions are asked in an interactive group setting where, ideally, participants' responses stimulate and influence the thinking and sharing of others. Focus groups can reveal a wealth of detailed information and deep insight. When well executed, a focus group creates an accepting environment that puts participants at ease allowing then to thoughtfully answer questions in their own words and add meaning to their answers [23].

Apparently, conducting a successful focus group requires detailed planning. Factors, such as the number and profile of people to be involved, the duration of the focus group, the number and type of questions to be addressed, as well as the overall planning and conduction of the session are quite critical for its success. A focus group should consist of six to ten people, participating in an open discussion, led by a skilled moderator. The group should be large enough so as to generate ideas and not to limit discussion, but not so large that some participants are left out and voices get lost. Participants should be selected on the basis of specific criteria, i.e. a set of key attributes to possess, established upfront and based on the purpose of the study. On the other side, the ideal amount of time to dedicate to a focus group should be between 45 to 90 minutes. This time frame should be enough to elicit different ideas and opinions from the different people involved, while more than that could possible lead to unproductive discussions.

The scope of the focus group owes also to be clear and specific, so as to facilitate the rest of the process and the generation of the appropriate questions in particular. The latter have to be carefully selected and formulated. As a focus group is not supposed to last for more than two hours, its time frame should be sufficient for eight to ten questions. This means that only the ones that are really important and qualify for the purpose of the focus group should be included. Questions should further be short and to the point, focused on one dimension each, worded unambiguously and in a way that cannot be answered simply with a "yes" or "no" answer and ordered so as to address issues from the general to the specific. Of course, one or two introductory or warm-up questions could also be included, so as to set the scene for participants.

The selected questions should then form the basis for generating a more detailed script for the focus group, including an opening section to welcome participants, introduce the scope and objectives of the focus group, the questions' part, and a

closing section to wrap up the focus group and gather any additional feedback from the participants.

During the focus group session, emphasis should be put on closely monitoring time, so as not to exceed the schedule, and keeping the discussion on track, allowing for all questions to be answered. The role of the facilitator is particularly important during this phase. The latter should be knowledgeable about the project, able to listen attentively, lead discussion, keeping personal views out of it and remaining neutral, cover adequately all prepared questions within the time allotted, and of course get participants to talk and fully explain their answers, making sure that all feel comfortable and that each and every one of them is heard. It is a good practice for the moderator to paraphrase and summarize long, complex or ambiguous comments, as this demonstrates active listening and clarifies the comment for everyone in the group. An assistant facilitator should be present as well, bearing the responsibility of taking notes but also noting and recording body language or other subtle but relevant clues.

After the focus group, the notes and feedback recorded should be transcribed to avoid any memory lapses, summarized and analysed for trending comments and other important elements, such as issues, problems, or questions that arose during the focus group. As a last step, conclusions should be reached, their implications should be discussed and specific actions to address them should be planned.

Practice has shown that usually it takes more than one focus group on the issue of interest to produce valid results, usually at least three or four. A good indication of having conducted enough focus groups would be reaching a point of saturation with regard to the answers/feedback obtained for a particular set of questions.

Overall, the basic steps to plan, carry out and exploit the outcomes of a good focus group could be summarized as follows [24]:

Before the Focus Group

- Define the purpose of the focus group

- Establish the preparatory activities' timeline

- Decide on the number of participants and establish the individuals' participation criteria

- Identify the participants

- Generate the appropriate questions

- Arrange the focus groups logistics (reserve the time and location, plan for food and refreshments, etc.)

- (Invite participants in anticipation of a no-show rate of 10 to 20 percent.)

- Prepare any supportive materials required (list of participants, projection equipment, presentation, notepads and pens, etc.)

<u>During the Focus Group</u>

- Carry out the focus group as per the plan

<u>After the Focus Group</u>

- Transcribe the notes that were taken during the focus group and compile an appropriate summary

- Analyse the focus group data

- Report the focus groups results and translate them into actionable insights

2.6.3.1 Focus groups in SONNETS

In the scope of the SONNETS project, focus groups are intended to either take the form of closed workshops, organized by the members of the consortium in own premises and engaging selected and predefined participants according to the plan exposed above, or that of open workshops, taking place in the frame of related events or workshops, in which the SONNETS consortium will participate, with the help of semi-structured questionnaires and online polls.

In particular, an introductory focus group with members of the SONNETS Expert Committee will be conducted in M7 of the project to cater for the needs of both WP2 and WP3, whereas a number of additional workshops will be organised along the course of the project in the frame of other events, in which SONNETS partners will participate, as per the opportunities arising along the course of the project.

Additionally, four small workshops will take place within M9 to M10 of the project, in Madrid, Athens, Torino and Cologne, i.e. the cities represented by the consortium members, with the participation and engagement of civil servants and IT representatives of public administrations. These workshops will act as a means of validating the insights acquired on societal and public sector needs, but also bringing up and discussing the feasibility of appropriate innovation actions and linking the former with specific technologies and trends, thus having a needs' and technologies' orientation at once.

Further to that, in the context of WP3, a validation workshop will also be organised by M12 of the project, most likely in Brussels, in order to present and discuss with experts and interested stakeholders the knowledge accumulated around emerging technologies and related innovation solutions. Particular emphasis will be placed in this case in inviting and ensuring the participation of stakeholders with a multidisciplinary background (i.e. representatives of public authorities, civil society organisations, ICT research organisations, companies, etc.). Guidelines on the content of the aforementioned workshops and focus groups can be found in Appendices A and B of this document, as the questionnaires designed to support the conduction of interviews can also be leveraged to encourage discussion in the context of the focus groups to be organized.

2.6.4 Brainstorming and Discussion

Brainstorming stands for the process of generating creative ideas and solutions through intensive discussion. It is a group creativity technique by which efforts are made to find a solution for a specific problem by gathering a list of ideas spontaneously contributed by its members [25]. Every participant is encouraged to think aloud and suggest as many ideas as possible, no matter how outlandish or bizarre they might initially seem. Some of these ideas can be crafted into original, creative solutions to a problem, while others can spark even more ideas [26]. Analysis, discussion, or criticism of the aired ideas is allowed only when the brainstorming session is over and an evaluation session begins [27]; otherwise it stunts idea generation and limits creativity.

2.6.4.1 Brainstorming in SONNETS

Within SONNETS, brainstorming is going to be used as a complementary work method that will enhance the consortium attempts towards the identification of innovation solutions, whereas it will also support the development of hypothetical future scenarios to contextualise and evaluate these solutions.

2.6.5 Online Consultation

The concept of an online consultation pertains in general to using the Internet in order to ask a group of people their opinion on one or more specific topics, allowing for trade-offs between participants [28]. With the rise of the internet popularity with the public as a means of voicing opinion and participating in politics, an online consultation or e-consultation has come to be representative of the exchange that takes place between government and citizens using the internet, as a form of online deliberation: an agency may consult a group of people to get their thoughts on an issue when a project or a policy is being developed or implemented, e.g. to identify or access options, or to evaluate ongoing activities. Through the public engagement attained through an online consultation, government agencies can hold interactive dialogues with the public as they have a more direct route to citizen opinion via the Internet, while they can eventually develop more citizen-centred policies.

2.6.5.1 Online Consultation in SONNETS

In the context of the SONNETS project, the method of online consultation will be employed as a means of validating the research findings of the innovation identification process with the participation of a wide audience of people, representing stakeholders from all the targeted stakeholder groups and especially the general public. In particular, the key takeaways generated with regard to societal and public sector needs will be put on public display in a specialised system, accessible through the SONNETS website, and allowing commenting and voting, with the goal of coming up with a prioritization of identified needs and a suggestion of related innovation solutions to address them. The same approach and rationale will be further used to gather feedback and comments around the main findings on emerging technologies and trends with the view, in this case, to create consensus concerning their potential and thereby concerning the impact and feasibility of the related identified innovation solutions. Online consultation activities will take place between M10 and M12 of the project.

3 Step by Step Methodology

3.1 Overview of the Framework

This section presents an overview of the methodological steps of the SONNETS Innovation Identification Framework, outlining for each step of the process, the work methods employed, the stakeholders involved, the main focus of the activities undertaken and the outputs generated. These steps are described at greater detail in the following paragraphs.

Step	Work Methods	Stakeholders Involved	Main Focus	Output
i. Needs Identification	• Desk-based Research • Interviews • Focus groups	(Privileged informants) • Citizen representatives • Private sector representatives • Public sector representatives • SONNETS Experts Committee	• Identification of societal challenges and citizen needs • Identification of business and industry needs • Identification of public sector needs	• List of Needs
ii. Technology Identification	• Desk-based Research • Interviews	• IT Experts • SONNETS Experts Committee	• Identification of existing and emerging technologies	• Long list of Technologies
iii. Technology Analysis	• Desk-based Research • Interviews • Focus groups	• IT Experts • SONNETS Advisory Group	• Information Collection on existing and emerging technologies	• Compendium of Technologies and Trends
iv. Technology Assessment & Selection	• Desk-based Research • Interviews • Focus groups	• IT Experts	• Assessment of technology impact in other domains • Assessment of technology relevance for the public	• Short list of Technologies • Draft list of potential Innovation solutions

Step	Work Methods	Stakeholders Involved	Main Focus	Output
			sector • Interlinking of technologies with relevant needs • Identification of related innovation solutions and interlinking with technologies	
v. Innovation Identification	• Desk-based Research • Interviews • Focus groups	• IT Experts • Public sector representatives • Private sector representatives • ICT research community • SONNETS Experts Committee	• Assessment of innovation solutions impact for the public sector • Assessment of innovation solutions feasibility	• Innovation potential records
vi. Scenario Building	• Brainstorming • Discussion	• SONNETS Experts Committee	• Development of scenarios for the future of the public sector	• Public sector scenarios
vii. Validation	• Workshop • Public Consultation	• Public sector representatives • Civil society representatives • Private sector representatives • ICT research	• Collection of feedback and evaluation of findings • Ratification of results	• Final list of Technologies and selected Innovation solutions

Step	Work Methods	Stakeholders Involved	Main Focus	Output
		community • The general public • SONNETS Experts Committee • SONNETS Expert Advisory Group		

Table 3. Overview of the SONNETS Framework Methodology

3.2 Needs Identification

Phase Description

The identification of existing pressing or emerging societal needs, challenges and trends is a key component and prerequisite for delivering innovations that hold true value for the society; thereby, it constitutes the first step and starting point of the SONNETS Innovation Identification Framework Methodology. The latter targets more specifically to identify societal challenges and public sector needs and can be based, given the abstract and wide scope of the subject under study, on qualitative research: the latter should incorporate both a systematic literature review approach, taking into account all relevant research and scientific papers, policy documents, white papers and European Union reports, industry reports, as well as interviews and focus groups with representatives of the stakeholder groups (e.g. citizens, businesses, public sector officials and employees), the needs and requirements of which are to be determined.

These methods are intended to serve as the means to collect but also analyse, prioritize and validate targeted stakeholder needs, and thus generate a list of needs, that can be leveraged in the subsequent steps of the methodology to propose relevant innovation solutions and guide the selection of technologies. Provided that the SONNETS Innovation Framework aims at supporting ICT-driven innovation, attention is drawn to the fact that the latter pertain solely to the ICT domain; therefore the list of needs to be compiled is also to be restricted to needs that can be addressed through the adoption and use of ICT.
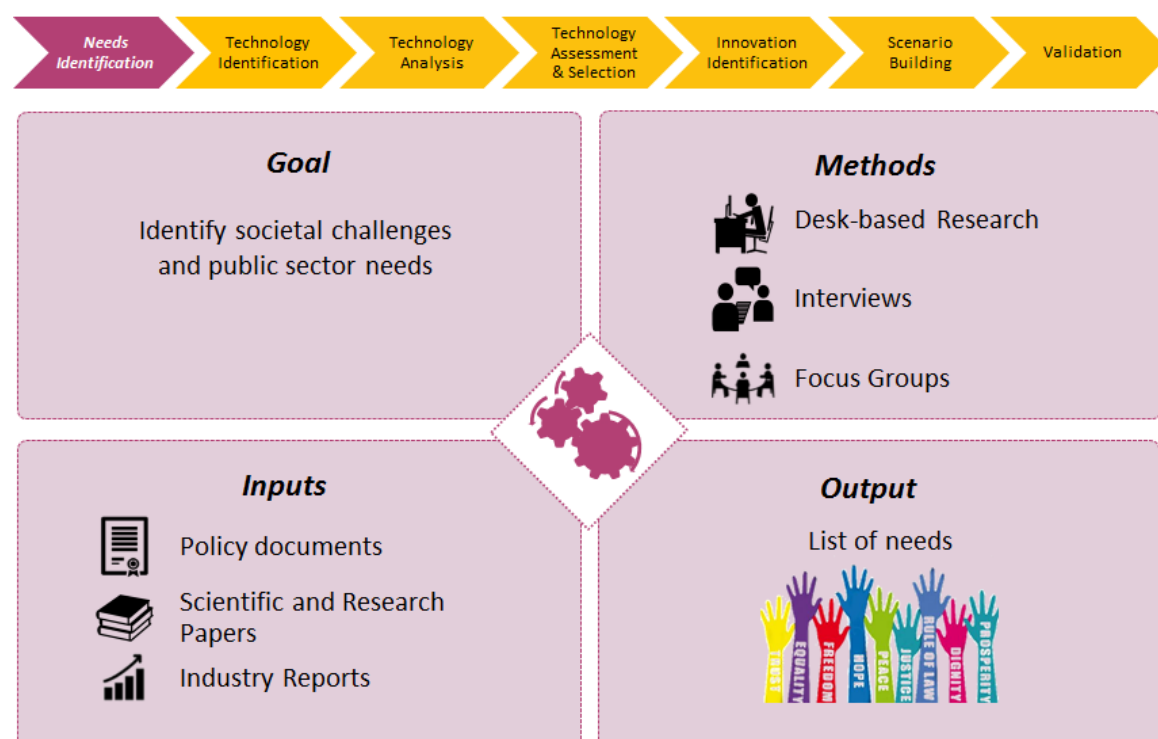

Figure 5. Needs identification phase

Proposed Implementation

In the context of SONNETS, needs are to be elicited through a deductive, multi-stage process, that targets to transform an originally collected, wide range of societal needs into a more concrete list of needs that are recognized as priority ones (i.e. needs that need immediate action) by the stakeholders involved and can be addressed through the use of ICT.

This process is to be jointly undertaken by the consortium members and the SONNETS Expert Committee and includes primarily the conduction of desk-based research and the subsequent creation of a repository of relevant sources (i.e. academic papers, EU policy documents, industry reports and documents from other EU projects) along with the compilation of a raw, long list of needs and their clustering under broad heading and categories. It further includes the analysis and refinement of the former list by means of interviews with a number of privileged informants, representing individuals, businesses, and the public sector, as well as the identification of top priority needs among them, as stated above, and the generation of a final list of needs. The process foresees additionally the organization of a focus group with the members of the SONNETS Experts Committee as a means of further refining and confirming the generated list of needs, as well as the eventual validation of the latter by means of workshops and online consultations. The needs' identification process is described at greater detail in deliverable D2.1.

3.3 Technology Identification

Phase Description

The next step of the SONNETS Innovation Identification Framework Methodology is that of technology identification. This step pertains purely to the conduction of information collection activities, and thereby its nature is a preparatory one, whereas its goal is to provide a pool of emerging technologies and trends that make a difference today in other sectors.

From a methodological point of view, this step relies mainly on extensive desk-based research, and the examination thereby of a variety of information sources, including European Commission resources, research project documents and roadmaps, studies from consultancy firms and online tools, whereas it also encompasses the conduction of interviews with IT experts from the public sector and the business and research communities, as described in Section 2.4 of the present document.

The output of this step, and thus of the aforementioned methods is anticipated to be a preliminary, long list of technologies and technological trends that will be reviewed and refined during the subsequent steps of the methodology.
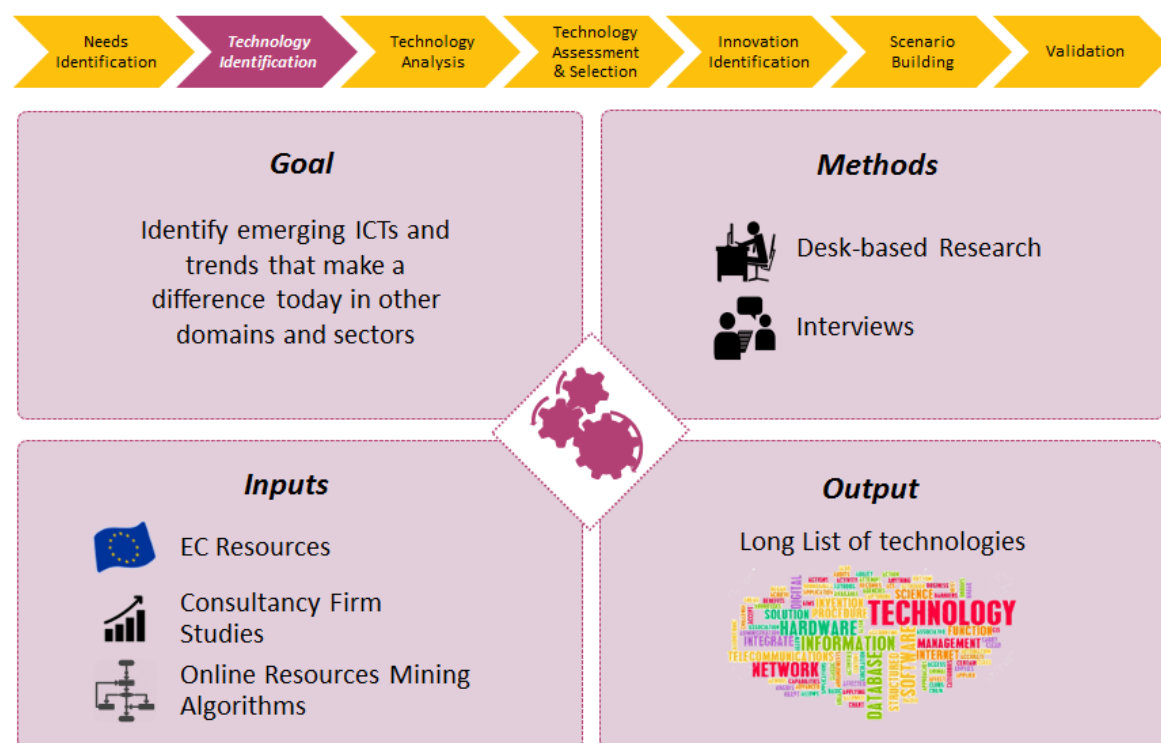
Figure 6. Technology Identification phase

Proposed Implementation

In the context of the SONNETS project, technology identification will be performed both by means of desk-based research and the conduction of interviews with IT experts. Desk-based research will take place in particular under the prism of a crowdsourcing approach, involving both the SONNETS partners, as well as the members of the SONNETS Expert Committee, each of which will place effort on identifying and contributing a notable number of online resources and documents on emerging technologies and trends, towards the creation of a common knowledge base. In this context, preference will be given to reports and testimonials, produced by reliable and credible sources (indicatively Gartner Hype Cycles, IDC, Forrester, Forbes, Deloitte, Accenture, etc. reports), whereas emphasis will also be placed on the volume of materials, available on the web for each of the identified technologies / trends, in order to drive conclusions on the maturity and popularity of the related terms, and thereby compile a list of well-established and widely accepted technology and trend related terms.

On the other hand, the consortium will take care of planning and carrying out a number of interviews with IT experts, representing the public sector as well as the business and research communities. A minimum of 8 interviews will be performed, following the interview guidelines, presented in Appendix B and targeting to elicit information on existing and emerging technologies and trends.

3.4 Technology Analysis

Phase Description

The preliminary list of technologies, generated in the technology identification phase is anticipated to feed into the next step of the framework methodology, entitled as technology analysis. This step targets to go a little deeper with regard to the technologies and trends identified, and thereby to record basic information on them, in order to create a deeper understanding of their characteristics and specificities. Such information needs to include besides the description of the technology's/trend's actual scope and application or usage, a note on the application domain, in which the former is originally met, as well as evidence on its anticipated growth and potential in the market.
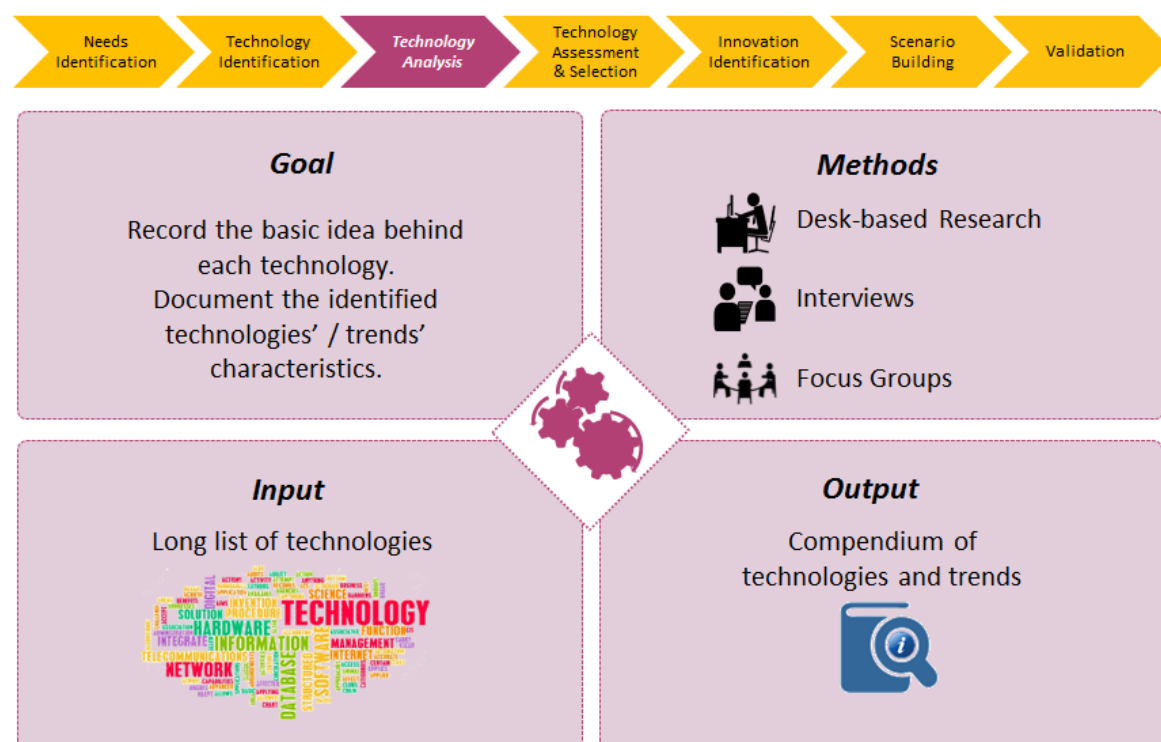
Figure 7. Technology Analysis phase

The methods to be employed in the technology analysis phase include the conduction of desk-based research and interviews, as well as the organisation of focus groups, whereas its outcomes can be summarised in the compilation of a compendium, incorporating basic but quite enlightening information on the identified technologies and trends.

Proposed Implementation

In the context of the SONNETS project, the technology analysis phase is going to take place, as prescribed in the previous paragraph, by means of desk-based research, interviews and focus groups, engaging stakeholders with a multidisciplinary background. The information to be collected through these methods will be presented and analysed in a uniform way, leveraging the template of Appendix C, which incorporates a number of aspects, as follows:

- Identifier: a unique identifier that determines the particular technology or technological trend addressed.

- Type: an indication of whether a technology is a self-standing one or has resulted from the technological convergence of other fields and which these fields are.

- Description: a brief description of the scope, aims and usage of the technology/ trend addressed.

- Application Domain of Origin: the application domain, in which a technology / trend is originally met.

- Related Market Potential / Forecasted Growth: quantitative (statistic) or qualitative information on the anticipated growth and spread of the technology / trend addressed or the potential and growth of the related market.

- Related Terms: a list of similar terms used to describe the particular technology / trend or to denote specific aspects of it, and that can be employed to collect further information.

- Source(s): a reference to the source(s) drawing attention to or pointing out the particular technology / trend as an important one for the years to come.

3.5 Technology Assessment and Selection

Phase Description

The fourth step of the SONNETS Innovation Identification Methodology maps to technology assessment and selection. This step is intended to dive even deeper with regard to the analysis of the identified technologies and trends, targeting to assess, on the one side, the impact of the former in the given domains, and to select, on the other, a subset of those, based on their relevance for the public sector, and thereby their potential adequacy to fulfil the identified societal and public sector needs. Apparently, this phase is meant to use as input both the long list and glossary of technologies as well as the confirmed and validated set of societal and public sector needs, whereas it will employ the same arsenal of methods, namely desk-based research, interviews and focus groups that are prescribed in Section 2.4 of this document. On the other hand, as an outcome, it will deliver a short list of technologies and a draft, preliminary list of potential innovation solutions.
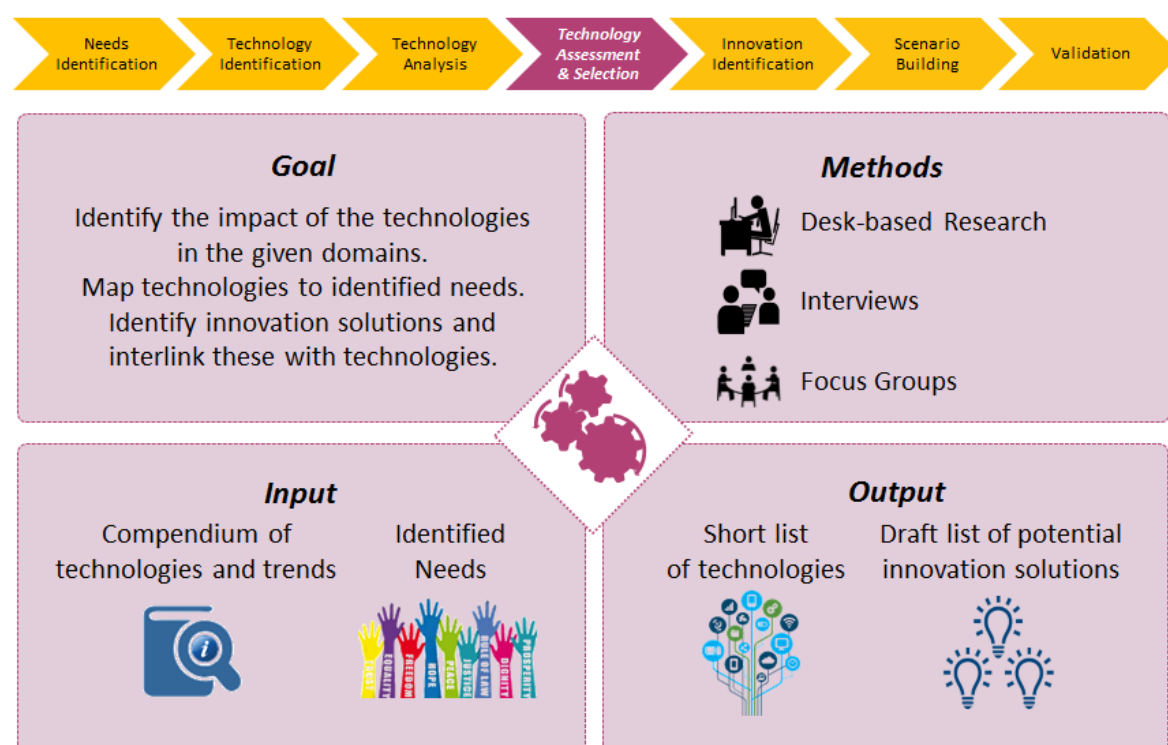
Figure 8. Technology Assessment and Selection phase

Proposed Implementation

Technology assessment and selection in the frame of the SONNETS project is going to be supported, as described above, through desk-based research, interviews and focus groups that will facilitate the collection and analysis of information and feedback on the impact of the identified technologies in the domains originally met, as well as on their relevance for the public sector and the different policy domains. Technology assessment is more specifically going to be grounded on a SWOT approach. The latter is going to be an adapted SWOT analysis, that will use the "Strengths" and "Weaknesses" components of the SWOT matrix to identify the impact, namely the benefits and weak points, of each identified technology / trend in the domain originally met, and the "Opportunities" and "Threats" blocks to draw high level correlations among the considered technologies and trends and the opportunities of their adoption, usage and promotion by the public sector as well as the imposed challenges and threats, and thereby to provide raw evidence on whether their adoption by the latter is attainable and meaningful.

Technology selection will be then based upon these preliminary correlations, as well as on matching technologies and trends with identified challenges and needs. On another level, technology selection will further rely on bringing up existing applications and services that may benefit from the adoption and further evolution of the investigated trends and technologies under the public sector's umbrella, as well as on conceptualising new and innovative services and applications that have the potential to materialize the envisaged benefits. Overall, the linking of identified technologies and trends to the public sector and other policy domains will take place along three levels, these of the SWOT analysis

identifying opportunities and threats, the correlation with specific needs and the identification of existing or new services.

The materials collected during this phase will be accordingly presented and analysed in a uniform way, leveraging the template of Appendix D, which incorporates a number of aspects, as follows:

- Identifier: a unique identifier that determines the particular technology or technological trend addressed (same as in the technology analysis phase).

- SWOT Analysis: a summary of the SWOT analysis conducted for each technology or technological trend under investigation in the way described above.

- Relevance for Public Sector: preliminary assumptions on the relevance of each analysed technology or trend for the public sector as a result of the opportunities and threats identified through the SWOT analysis.

- Relevant Needs: a list of the societal challenges and public sector needs that may be associated with the particular technology or trend.

- Potential Applications / Services: a list of existing or new services that may materialise the envisaged innovations.

3.6 Innovation Identification

Phase Description

The fifth step of the Framework Methodology pertains to technology identification and constitutes a key task in the process of transforming the public sector into an innovation breeding carrier. The focus during this step transposes from the level of technologies to the level of the innovation solutions identified and the goal is to come up with a systematic way to record and assess the innovation potential of these solutions. The latter has to be evaluated in particular against the dimensions of both the impact and feasibility of the identified solutions, thus calling for the determination and consideration of appropriate assessment criteria.

The innovation identification step is intended to employ as well the methods of interviews and focus groups primarily and desk-based research secondarily in order to collect and analyse information on the innovation potential of the identified solutions, while as an output it shall produce a set of appropriate records.

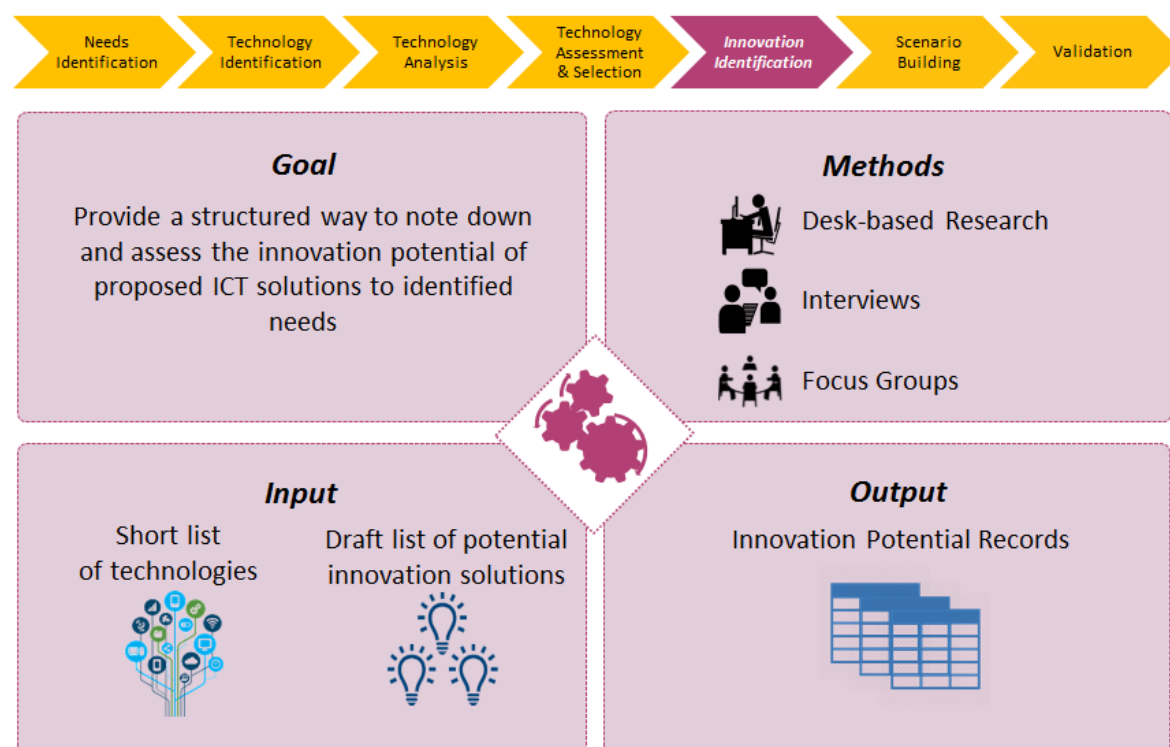**Figure 9. Innovation Identification phase**

Proposed Implementation

Innovation identification in the frame of SONNETS relies on the aforementioned methods and follows a structured approach which takes into account the goals of the Innovation Identification Framework and involves a number of impact and feasibility assessment dimensions.
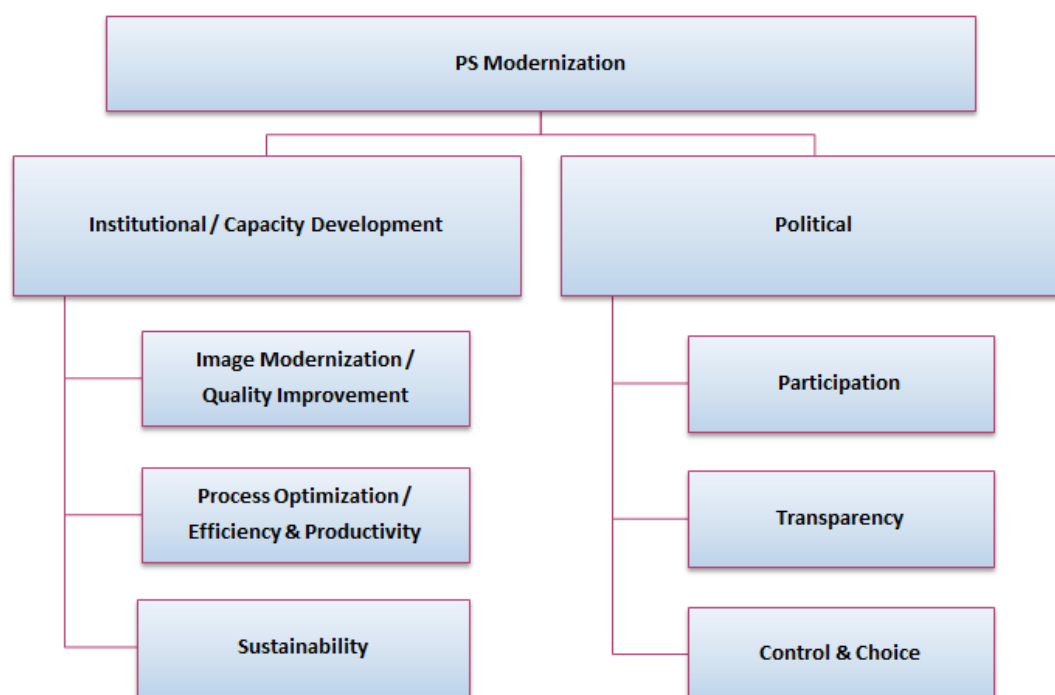

Figure 10. "Public Sector Modernization" Impact Assessment Areas

In particular, a number of vertical dimensions are recognised, against which the impact of the identified solutions can be assessed. These pertain in the case of public sector modernization to the institutional or capacity development and political domains, encompassing aspects such as those of image modernization and quality improvement, process optimization, efficiency and productivity and sustainability, and participation, transparency and control respectively.

On the other hand, and as far as the goal of the public sector into an innovation driver is concerned, these areas pertain to key policy domains: these are the economic, environmental and social domains (and in the context of the latter the education and health domains as well), each being also analysed accordingly in a number of lesser aspects, as well as key policy fields that are found in the intersection of these domains, such as those of employment and well-being.
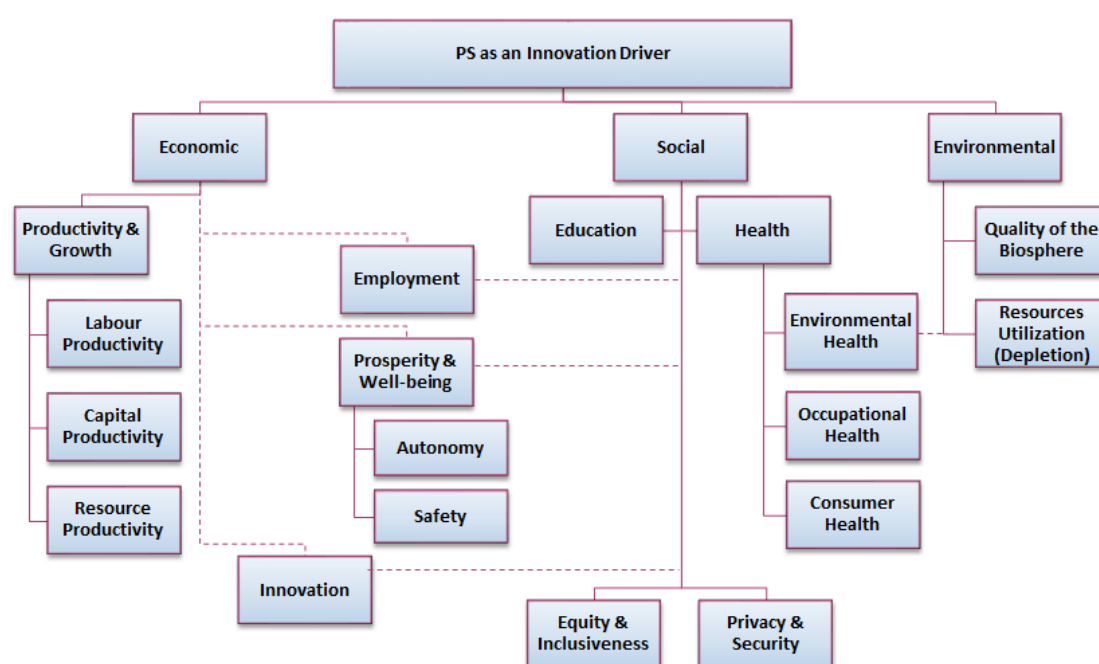
Figure 11. "Public Sector as an Innovation Driver" Impact Assessment Areas

These make up, as already explained, a number of vertical dimensions and are further complemented, as shown in Figure 12 by a set of horizontal impact assessment dimensions, referring to the extent of application of the identified solutions, therefore to whether the former can be applied at the individual, local, regional, national or international level, and to the anticipated influence, the latter being direct, indirect or non-existent.

On the side of the feasibility, the assessment analysis takes into account aspects such as the existing ICT infrastructure and know-how, the status of the related legislative framework and regulation, the readiness of the stakeholders involved in terms of their education, their skills and their financial resources, as well as the technology maturity and attempts to evaluate the identified solutions against these aspects on an appropriate qualitative scale. Attention is drawn to the fact that these aspects make up the criteria to be used for the identification of the research needs, and thereby of the prerequisites needed in terms of research in order for the public sector to reach the desired goals, whereas they also cultivate

the ground for the conduction of a more detailed PEST analysis in the context of the SONNETS Roadmap.

Impact Assessment Dimensions
- **Vertical Dimensions**
  (Scope of Application)
  - Institutional / Capacity Development
  - Political
  - Economical
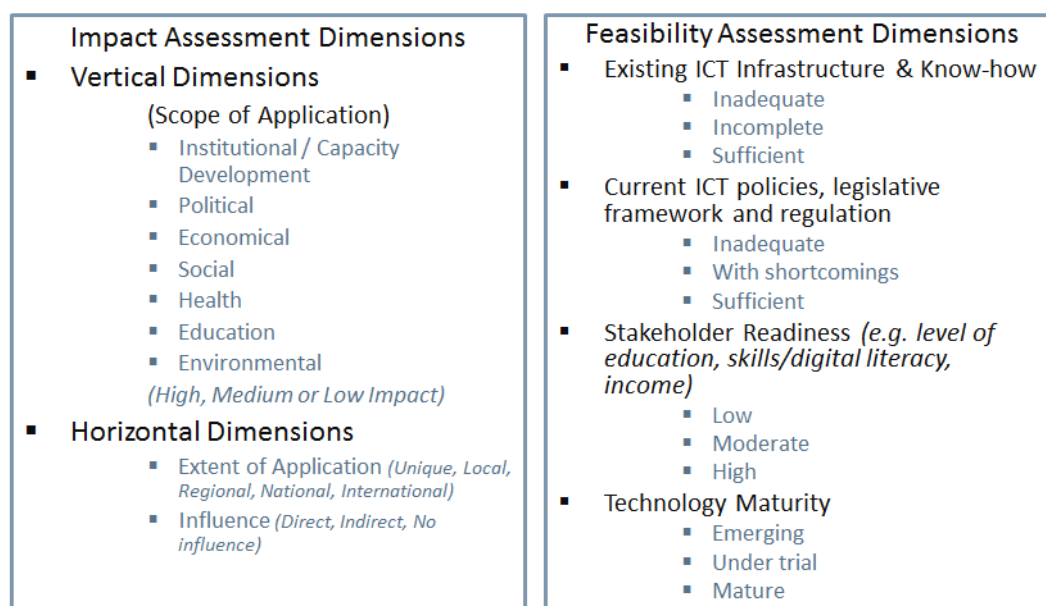 - Social
  - Health
  - Education
  - Environmental
  (High, Medium or Low Impact)
- **Horizontal Dimensions**
  - Extent of Application (Unique, Local, Regional, National, International)
  - Influence (Direct, Indirect, No influence)

Feasibility Assessment Dimensions
- Existing ICT Infrastructure & Know-how
  - Inadequate
  - Incomplete
  - Sufficient
- Current ICT policies, legislative framework and regulation
  - Inadequate
  - With shortcomings
  - Sufficient
- Stakeholder Readiness (e.g. level of education, skills/digital literacy, income)
  - Low
  - Moderate
  - High
- Technology Maturity
  - Emerging
  - Under trial
  - Mature

Figure 12. Overview of Impact and Feasibility Assessment Dimensions

3.7 Scenario Building

Phase Description

The scenario building phase is meant to set the scene for the application of the identified solutions through the development of a series of hypothetical future scenarios that will guide the selection of those solutions among them that make more sense to be ported into the public sector. This step is anticipated to use as input the previously generated innovation potential records and to leverage brainstorming techniques in order to develop scenarios on the future of the public sector. Such scenarios can be structured and differentiated in particular along the axes of the public sector's role, which can be the leading one (public sector as the lead innovator) or a more supportive one (public sector as innovation facilitator), and the degree of power concentration, which may range from centralized control and decisions to federated control and autonomous decisions.
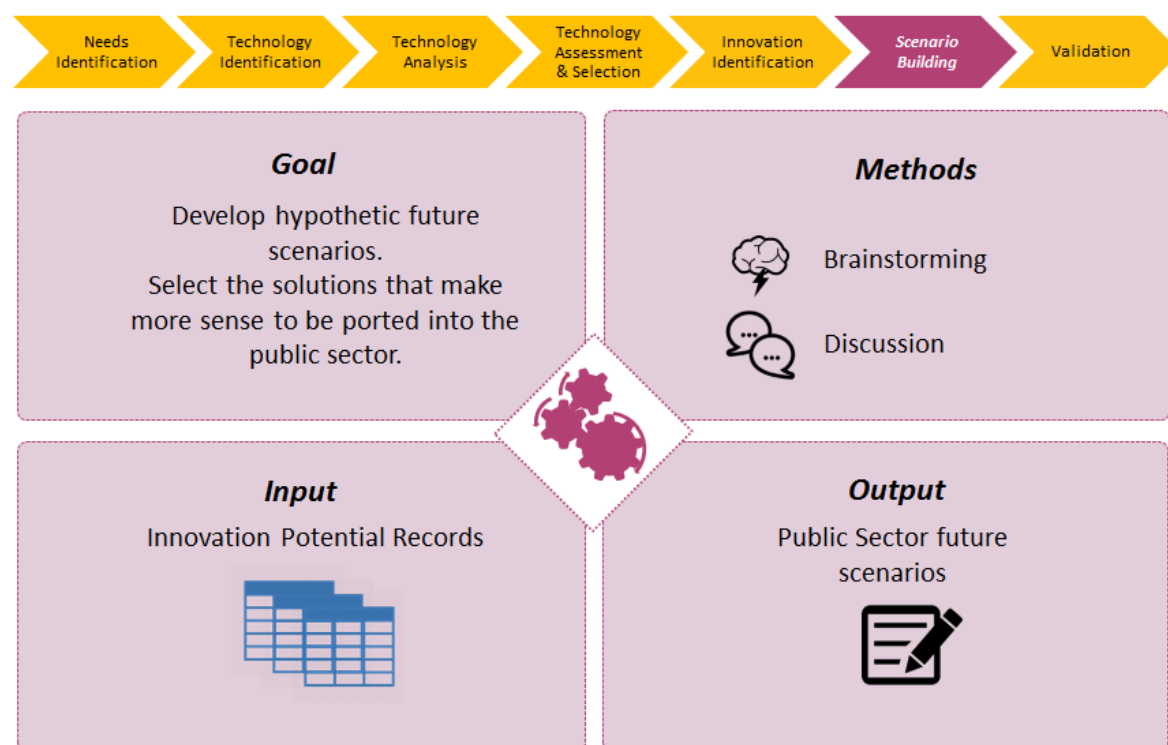
Figure 13. Scenario Building phase

Proposed Implementation

In the context of the SONNETS implementation, the consortium will use the structured innovation solutions records, derived from the previous step and will work through extensive brainstorming and discussions on their enrichment and the development of relevant scenarios for the future of the public sector. The scenarios will be more specifically generated through a crowdsourcing approach that will involve both the project partners as well as the members of the SONNETS Experts Committee and will provide an analysis of how different socio-economic parameters, i.e. those of the Existing ICT Infrastructure and Knowhow, the Legal Framework, the Stakeholder Readiness and the Technology Maturity affect future perceptions for the public sector. The derived scenarios will eventually be mapped onto a two-dimensional level, where the x-axis will be taken to reflect the role of the public sector, with its negative extreme representing the case in which the public sector is absent from innovation promoting procedures and its positive extreme indicating respectively the case in which the public sector acts as the protagonist in related developments. The y-axis will reflect accordingly the degree of power concentration within a society, having centralized control on the top and federated control on the bottom. The scenarios analysis as well as their mapping against the aforementioned two dimensions will facilitate during the validation phase, discussions with the targeted stakeholders as well as the generation of conclusions with regard to (a) where they believe we will be in the future and (b) where they would like to be in the future.

3.8 Validation

Phase Description

The refined list of innovation solutions and respective technologies and the developed scenarios will eventually provide input for the last step of the framework methodology, targeting the validation of the overall findings. The latter is intended to place these findings under evaluation in order to gather feedback, revise and validate the results. Evaluation and validation in this context are to be performed through specialized workshops, engaging representatives of public authorities, civil society organizations, research institutes and companies, and online public consultations, engaging the general public.
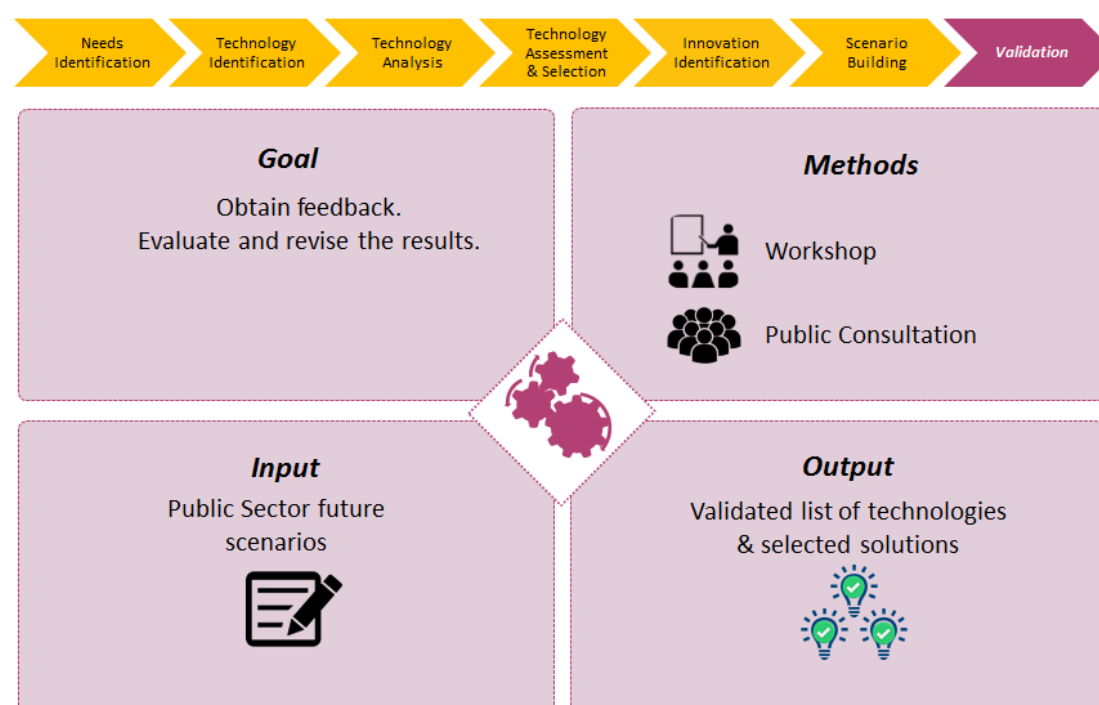

Figure 14. Validation phase

Proposed Implementation

SONNETS will pursue the validation of its findings in line with the description of the particular step of methodology, i.e. by coupling offline validation with online feedback, through the organisation of physical workshops and online consultation activities respectively. In particular, four small workshops will take place with the participation of civil servants and IT representatives of public administrations as a means of discussing with the former and validating the insights acquired on societal and public sector needs. Additionally, a validation workshop will be organised in order to present and discuss with experts and interested stakeholders the knowledge accumulated around emerging technologies and related innovation solutions. Parallel to those, online validation activities will be carried out involving voting and commenting on findings with regard to societal and public sector needs and emerging technologies and trends with the view to create consensus and to prioritize related innovation solutions in terms of their impact and feasibility.

4 Conclusions

What is the purpose of this report?

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The purpose of this report is to describe and explain the "SONNETS Innovation Identification Framework for the Public Sector" which forms the basis of the methodology of SONNETS for collecting, analysing and cross-checking the usability of emerging ICTs in the public sector.

Thus, this framework is primarily intended to guide activities within the project, but may also be considered as a self-standing methodological aid for supporting the public sector's ICT transformation.

Which objective of SONNETS does this report pursue?

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SONNETS pursues the objective to provide guidelines and a methodological framework that will help to reshape and transform the public sector into a technology leader and driver of innovation.

This methodology includes the analysis of current and upcoming societal needs as well as the identification and analysis of emerging ICT technologies/trends and the assessment of their innovation potential for the public sector.

This report helps to achieve this objective by elaborating the methodological framework and the subsequent steps of the SONNETS work plan.

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How does the SONNETS methodology work?

SONNETS pursues the aim to support innovation both *in* the public sector and *through* the public sector as an innovation driver with a focus on other policy domains.

To achieve this objective SONNETS will:

1. Identify societal needs and trends that need to be met by public sector services:
    ➢ These trends will be collected by using desktop research methods and will be validated by interviews with experts and by focus groups.
2. Identify emerging ICT technologies and trends:
    ➢ The technologies will be identified by means of desk-based research as well as by the conduction of interviews with IT experts.

3. Analyse these ICT technologies and trends in terms of their key characteristics and specificities:

   ➢ The technology analysis will be performed by using desk-based research as well as experts' interviews and focus groups. The aim of this analysis is to describe the technologies regarding e.g. their usage, scope, original application and forecasted market potential and growth.

4. Assess these ICT technologies regarding their potential to meet societal challenges and public sector needs:

   ➢ This technology assessment will include a SWOT (strength, weaknesses, opportunities and threats) analysis. Furthermore, these technologies will be correlated with the identified societal challenges and needs to assess their relevance for the public sector. Additionally, new innovative solutions will be put forward which may benefit from these ICT technologies.

5. Evaluate the innovation potential of these solutions regarding their impact and feasibility

   ➢ The impact of these solutions will be assessed along two dimensions. Firstly, a vertical dimension, which includes e.g. the transformation of the public sector itself (like image modernization, process optimization or political aspects like the participation of citizens) as well as aspects of the public sector as an innovation driver. In the horizontal dimension this assessment includes aspects like the extent of the application or the type of influence.

   ➢ Regarding the feasibility issues like the existing ICT infrastructure, ICT policies and legal frameworks, the level of education of the stakeholders as well as the technology maturity will be taken into account.

6. Develop scenarios to validate the usability of a specific technology in the public sector:

   ➢ The scenarios, generated through a crowdsourcing approach, will provide an analysis of how different socioeconomic parameters (e.g. ICT infrastructure and knowhow, the legal framework) will affect the benefit and usability of new ICT technologies in the public sector and will be mapped against the axes of the public sector's role and the degree of power concentration.

7. Evaluate the overall findings of SONNETS

   ➢ SONNETS will use a variety of different valuation methods, like online feedback and workshops, to be able to include the insights and opinions of a broad range of experts.

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Which methods does the SONNETS methodology include?

The SONNETS methodology includes desk-based research methods, interviews, focus groups, brainstorming and online consultation.

Which stakeholders are involved in the process?

The SONNETS network includes a broad range of experts covering the area of ICT as well as knowledge of the public sector. During the course of the project the experts of this network are engaged and involved in a number of activities like workshops, interviews or direct feedback. The engagement of the experts takes primarily place through the establishment of and interaction with two supportive bodies, namely the SONNETS Experts Committee and the SONNETS Advisory Group.

In more detail the SONNETS network includes representatives of the public sector, IT experts, citizen representatives and members of the ICT research community.
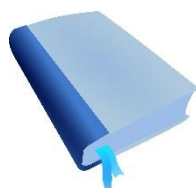
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How will this report be used within the project?

This report is intended to be the methodological guideline for the work in the subsequent work packages of SONNETS.

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What are the next steps?

The methodological guidelines described in this report will be used, tested and if necessary adapted during the course of the SONNETS project.

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5 References

[1]   European Commission., "Powering European Public Sector Innovation: Towards A New Architecture - Report of the Expert Group on Public Sector Innovation," 2013.

[2]   S. Harley and K. Mayne, "Transforming the Public Sector – The role of the CFO in driving change," Grant Thornton Australia Ltd, 2014.

[3]   J. Bourgon, A New Synthesis of Public Administration: Serving in the 21st Century, School of Policy Studies, Montreal: McGill-Queen's University Press, 2011.

[4]   G. Mulgan, "Ready or not? Taking innovation in the public sector seriously," NESTA Provocation 03, London, 2007.

[5]   L. R. León, P. Simmonds and L. Roman, "Trends and Challenges in Public Sector Innovation in Europe," DG Enterprise, Brussels, 2012.

[6]   ICEG European Center, "Policies Supporting Innovation in Public Service Provision - INNO-Grips Policy Brief No. 5," INNO-Grips, 2012.

[7]   "Observatory of Public Sector Information," OECD, [Online]. Available: https://www.oecd.org/governance/observatory-public-sector-innovation/.

[8]   European Commission, "eGovernment Benchmark 2016 – A turning point for eGovernment development in Europe?," 2016.

[9]   E. Ferro , B. Caroleo, M. Leo, M. Osella and P. Elisa, "The Role of ICT in Smart City Governance," in *Proceedings of the International Conference for E-Democracy and Open Government*, Krems, Austria, 2013.

[10]   A. H. Maslow, "A Theory of Human Motivation. .," *Psychological Review,* vol. 50, no. 4, pp. 370-396, 1943.

[11]   A. W. Savitz, The Triple Bottom Line, San Francisco: Jossey-Bass Wiley, 2006.

[12]   A. Osterwalder, Business Model Generation, self published, 2010.

[13]   A. Osterwalder, Y. Pigneur, G. Bernarda and A. Smith, Value proposition Design, Wiley, 2015.

[14]   E. Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Random House Inc, 2011.

[15]   R. Heeks, C. Foster and Y. Nugroho, "New models of inclusive innovation for

development," *Innovation and Development,* vol. 4, no. 2, pp. 175-185, 2014.

[16] T. F. Bresnahan and M. Trajtenberg, "General purpose technologies "Engines of growth"?," *Journal of Econometrics,* vol. 65, pp. 83-108, 1995.

[17] S. Arvanitis, E. Loukis and V. Diamantopoulou, "The Impact of Different Types of ICT on Innovation Performance of Greek Firms," in *Proceedings of the European, Mediterranean & Middle Eastern Conference on Information Systems (EMCIS)*, 2011.

[18] P. Kokkinakos, S. Koussouris, D. Panopoulos, D. Askounis, A. Ramfos, C. Georgousopoulos and E. Wittern, "Citizens Collaboration and Co- Creation in Public Service Delivery," *International Journal of Electronic Government Research (IJEGR) 8,* vol. 8, no. 3, p. 33–62, 2012.

[19] P. Windrum and P. Koch, Innovation in Public Sector Services Entrepreneurship, Creativity and Management, Edward Elgar Publishing, 2008.

[20] S. Crouch and M. Housden, Marketing Research for Managers (Third Edition), Butterworth-Heinemann, 2003.

[21] "Interview," Wikipedia, [Online]. Available: https://en.wikipedia.org/wiki/Interview_(research) .

[22] "Focus group," Wikipedia, [Online]. Available: https://en.wikipedia.org/wiki/Focus_group.

[23] "Guidelines for Conducting a Focus Group," [Online]. Available: https://assessment.trinity.duke.edu/documents/How_to_Conduct_a_Focus_Group.pdf.

[24] "Conducting A Focus Group," [Online]. Available: http://www.cse.lehigh.edu/~glennb/mm/FocusGroups.htm.

[25] "Brainstorming," Wikipedia , [Online]. Available: https://en.wikipedia.org/wiki/Brainstorming .

[26] "Brainstorming," MindTools , [Online]. Available: https://www.mindtools.com/brainstm.html .

[27] "Brainstorming," BusinessDictionary, [Online]. Available: http://www.businessdictionary.com/definition/brainstorming.html .

[28] "Online Consultation," Wikipedia, [Online]. Available: https://en.wikipedia.org/wiki/Online_consultation.

I. Appendix A: Guidelines for Interviews with Privileged Informants (Needs-focused interviews)

In the following sections the reader may find a set of guidelines, developed with the goal of supporting the conduction of interviews with privileged informants (i.e. citizen, business and public sector representatives) towards the identification of societal challenges and public sector needs. The questions have been adapted and customized to the characteristics of each group of interviewees so as to encourage the latter to argue on their own perspectives. The same sets of questions can be used to promote discussions within focus groups.

I.1 Guidelines for interviews with citizen representatives

Barring exceptional circumstances, all questions must be asked. If the interviewee does not expand on the questions him/herself, follow-up questions are provided that can be asked in order to get more expansive answers. Please record the interviews, unless the interviewee specifically asks for them not to be recorded. If the interviewee does not want it to be recorded, please take extensive notes on the interview.

At this time, we are not asking for full transcripts of the interviews. Instead, please provide detailed summaries or reports of the interviews. These summaries should be structured around the questions asked, along with any additional observations or insights that might emerge from the interviews.

Introductory Questions

1. **Can you briefly describe your profile, i.e., occupation, family etc.**

2. **Could you describe the ways in which you interact with the public sector (PS)?**

Follow-up questions:

- What do you usually contact PS for?
- How often do you interact with the public sector and at what levels (municipality, state level or national level)?
- How do you approach PS?
- What are the main problems or challenges you encounter in dealing with public sector?

3. **Since how long have you been interacting with public sector?**

Substantive Questions

4. **Could you please mention the key needs in your opinion?**

The interviewer should note down all the needs mentioned by the respondent.

5. **Out of the needs you mentioned, what are the most important needs?**

After the interview, the interviewer should match the needs against the list of macro needs, tick the ones suggested by the interviewee.

6. Could you propose actions/solutions that might be taken to address these needs?

The actions/solutions include both technological and non-technological solutions. Please ask for a solution corresponding to each need.

Follow-up question:

- Can you please provide some real life examples or cases where such solutions have been implemented or are being implemented?

After the interview, interviewer should check the list of innovation items, tick the ones suggested by the respondent. If the action proposed is not included in the list of innovation actions, please add it to the list for future references.

7. Apart from the needs mentioned on the list, are there any other major needs that are emerging and could impact you in the coming years?

Follow-up questions:

- How can these needs be addressed?
- Who can address these needs?
- Do you think these future needs will have a positive or negative impact?
- What do you think the overall repercussions of these new needs will be for public administration in your country?

I.2 Guidelines for interviews with business representatives

Barring exceptional circumstances, all questions must be asked. If the interviewee does not expand on the questions him/herself, follow-up questions are provided that can be asked in order to get more expansive answers. Please record the interviews, unless the interviewee specifically asks for them not to be recorded. If the interviewee does not want it to be recorded, please take extensive notes on the interview.

At this time, we are not asking for full transcripts of the interviews. Instead, please provide detailed summaries or reports of the interviews. These summaries should be structured around the questions asked, along with any additional observations or insights that might emerge from the interviews.

Introductory Questions

1. **What is your business about? What are the main business activities you undertake?**

2. **How long are you in this business?**

Follow-up questions:

- Has your business changed at all over time?
- In what way?

3. **Do you interact with the public sector? If yes, could you describe the ways in which you interact with the public sector (PS)?**

Follow-up questions:

- What do you usually contact PS for?
- How often do you interact with the public sector and at what levels (municipality, state level or national level)?
- How do you approach PS?
- What are the main problems or challenges you encounter in dealing with public sector?

Substantive Questions

4. **Could you please mention the key needs in your opinion?**

The interviewer should note down all the needs mentioned by the respondent.

5. **Out of the needs you mentioned, what are the most important needs?**

After the interview, the interviewer should match the needs against the list of macro needs, tick the ones suggested by the interviewee.

6. **Could you propose actions/solutions that might be taken to address these needs?**

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The actions/solutions include both technological and non-technological solutions. Please ask for a solution corresponding to each need.

Follow-up question:

- Can you please provide some real life examples or cases where such solutions have been implemented or are being implemented?

After the interview, interviewer should check the list of innovation items, tick the ones suggested by the respondent. If the action proposed is not included in the list of innovation actions, please add it to the list for future references.

7. Apart from the needs mentioned on the list, are there any other major needs that are emerging and could impact you in the coming years?

Follow-up questions:

- How can these needs be addressed?
- Who can address these needs?
- Do you think these future needs will have a positive or negative impact?
- What do you think the overall repercussions of these new needs will be for public administration in your country?

I.3 Guidelines for interviews with public sector representatives

Barring exceptional circumstances, all questions must be asked. If the interviewee does not expand on the questions him/herself, follow-up questions are provided that can be asked in order to get more expansive answers. Please record the interviews, unless the interviewee specifically asks for them not to be recorded. If the interviewee does not want it to be recorded, please take extensive notes on the interview.

At this time, we are not asking for full transcripts of the interviews. Instead, please provide detailed summaries or reports of the interviews. These summaries should be structured around the questions asked, along with any additional observations or insights that might emerge from the interviews.

Introductory Questions

1. **Could you please briefly describe your role/the role of your organisation?**

2. **How long have you worked in this role?**

Follow-up question:

- Has your role changed at all over time?
- In what way?

Substantive Questions

3. **Could you please mention the key needs for your organization in your opinion?**

The interviewer should note down all the needs mentioned by the respondent.

4. **Out of the needs you mentioned, what are the most important needs?**

After the interview, the interviewer should match the needs against the list of macro needs, tick the ones suggested by the interviewee.

5. **Could you propose innovation actions/solutions that might be taken to address those needs?**

The actions/solutions include both technological and non-technological solutions. Please ask for a solution corresponding to each need.

Follow-up:

- Can you please provide some real life examples or cases where such solutions have been implemented or are being implemented?

After the interview, interviewer should check the list of innovation items, tick the ones suggested by the respondent. If the action proposed is not included in the list of innovation actions, please add it to the list for future references.

6. Can you pick the policy domains necessary to address the societal needs and trends?

At this point, interviewees should be shown the list of policy domains, so that they can match the policy domains against the key identified needs. If some policy domains are not mentioned, interviewees should be asked for their inputs. It is possible that a key need falls under the purview of multiple policy domains. The interviewees should be asked to map multiple policy domains, wherever relevant.

7. Apart from the needs mentioned on the list, are there any other major needs that are emerging and could impact you in the coming years?

Follow-up questions:

- How can these needs be addressed?
- Who can address these needs?
- Do you think these future needs will have a positive or negative impact?

II. Appendix B: Guidelines for Interviews with IT Experts (Technology-focused interviews)

The following questionnaire has been designed in order to guide the conduction of interviews with IT Experts. The same sets of questions can be used to foster discussions within focus groups.

Introductory Questions:

1. **Can you briefly describe your profile, i.e. your occupation, the field(s) of expertise, your interest in ICT, etc.?**

Main Questions:

2. **In your opinion, which are the most important technologies / technological trends that could impact the public sector in the following (five) years?**

Follow-up Questions:

- Which are the most important technologies / technological trends that could improve the operation of the public sector in the following years?
- Which are the ones that could transform the public sector into an innovation driver?
- Which are your predictions on the growth or market potential of these technologies?

The interviewer should note down all the technologies / technological trends mentioned by the respondent and map them against the axes of "i. public sector modernization" and "ii. public sector as an innovation driver". Additionally, the interviewer should note down the expert's quantitative or qualitative judgement on the growth of each technology identified.

3. **Which are the societal needs / needs of the public sector that could be addressed through the use of these technologies?**

The interviewer should note down at least one or more needs for each technology / trend identified.

4. **Could you please expand on the way in which each of these technologies / trends could benefit the public sector / businesses / citizens?**

Follow-up Questions:

- Which are the specific (policy) domains (e.g. political, economic, social, environmental, etc.), these technologies will have an impact on?
- Which will be the extent of that impact (e.g. individual cases, local, regional, national, international level)?
- Is this impact direct or indirect?

5. How feasible do you consider the adoption of these technologies / trends by the public sector?

Follow-up Questions:

- Are these technologies mature enough and ready for adoption?
- Does the public sector already possess the necessary infrastructure and know-how for their adoption? Is the necessary legislative framework already in place?
- How would you evaluate the readiness of the stakeholders involved, in terms of their educational level, skills, income, etc.?

6. Do you see any relevant costs/risks/threats generated by their adoption?

7. Could you propose relevant services and applications to put these technologies/ trends in practice, i.e. to exploit the former for addressing specific needs?

Follow-up Questions:
- What is the type of innovation these solutions stand for (e.g. service innovation, service delivery innovation, organizational innovation, etc.)?
- Can you provide real life examples or cases where such services / applications have been implemented or are being implemented?

Here, the interviewer should use the list of innovation actions, derived from WP2, to tick the ones suggested by the respondent and add the technology applications or innovation actions not already included.

III. Appendix C: Technology / Trend Analysis Template

Technology / Technological Trend	
Identifier	*Te.No or TeT.No*
Type	*e.g.* *- for technologies: "self-standing technology" or "resulting from the technological convergence of the fields of …"* *- for trends: "based on the technology of …"*
Description	
Application Domain of Origin	*e.g. Enterprise Sector, Manufacturing, Telecommunications, etc.*
Related Market Potential/Forecasted Growth	
Related Terms:	
Source(s)	

IV. Appendix D: Technology / Trend Assessment Template

Technology / Technological Trend	
Identifier	*Te.No or TeT.No*
SWOT Analysis	
Relevance for Public Sector	
Relevant Needs	
Potential applications / services	