

Integrating knowledge and experience towards a public administration needs ecosystem

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Abstract— Public administrations are an integral part of every state, which is currently changing to gradually correct the weak points of the past. Data and digital technologies are there to support this endeavor, yet the opportunities they offer are not still fully exploited in Europe, despite governments' intentions to digitize public administration for smoother and more accessible administrative procedures. In parallel, digital transformation, intensified by the exceptional circumstances of the COVID-19 crisis, is both imperative and inevitable for almost every aspect of the modern world and economy. This creates both new needs and solutions for public administrations. This paper aims to identify the open needs encountered by public administrations, involving reflections on available methodologies, data, and tools towards evidence-based policy making tailored to these needs. To accomplish that, knowledge, as represented by extensive desk research, was integrated with experience as the outcome of qualitative interviews with public administration experts from different countries. Key findings are discussed in detail concluding with a public administration needs ecosystem, mapping the needs, and uncovering similarities to support the replication of practices and procedures in different policy making settings.

Keywords—public administration, needs, public sector, digitalization, policy making

I. INTRODUCTION

In recent years, mostly due to the COVID-19 pandemic, public administrations, along with a large chunk of the private sector, faced a huge challenge: to rapidly transform their services and gain the ability to offer governments' the necessary data in order for evidence-based policy making to be performed [1]–[3]. Public administrations, in particular, were faced with the challenge to place their national bureaucratic procedures in an international context and accumulate the pressure and impact of the COVID 19 crisis, along with the IT advancements, in order to use cross-sectoral available data for policy making [4], [5].

As stated in [6], the explosive growth in data, computational power, and social media creates new opportunities for innovating governance and policy-making, allowing these Information and Communication Technology (ICT) developments to affect all parts of the policy-making cycle and result in drastic changes in the way policies are developed. There is still, though, a lack of systematic research and development of a model on how big data and cloud

technologies can be used by public authorities to realize evidence-based policy making. An important actor, such as the public sector, should constitute a successful disruption paradigm through the adoption of novel approaches and state-of-the-art information and communication technologies [7]. The opportunities offered by digitalization, as well as digital transformation, and the availability of data are not, though, yet sufficiently seized or exploited in many countries, mostly due to the development stage of their public sector forming a set of uncovered needs that public authorities face in their everyday activities. Europe, in particular, offers a union with common policies thus shaping common conditions and issues faced by the different governments, but, at the same time, differentiations are encountered concerning the level of development of the various EU countries' public sectors and their accompanying needs [8], [9]. In parallel, the situation formed by both the COVID-19 crisis and the everchanging and evolving society constantly reshapes the public administrations' landscape and therefore the needs and the challenges they have to face.

The work presented approaches the aforementioned topic by identifying and analyzing the needs EU public administrations face in the current reality by analyzing previous research efforts to identify and record their needs, and enriching and validating them through new research and interviews with experts in the field. Through this approach, an inclusive list of needs for EU public administrations is constructed accompanied by an analysis in terms of different dimensions. We elaborate on the results of the study performed, through the following structure: Section II outlines the methodology used for the needs elaboration and analysis, consisting of background research and the design and implementation of qualitative interviews following specific guidelines. Section III collects and thoroughly analyses the outcomes of the study, setting out a public administration needs ecosystem, highlighting priorities among the needs and uncovering similarities among the participating countries. Section IV provides the conclusions of the document and describes potential future work.

II. METHODOLOGY

This paper aims at identifying and analyzing the non-covered needs that public administrations are facing, along with their interrelations to unveil similarities that could later help replicate successful practices and roadmaps in different

policy making settings. To accomplish that, the needs identification method was based on a qualitative research design following a stepwise approach to come up with a complete list of needs and their validation, as follows:

- Collection of background knowledge through desk research: A literature analysis was conducted focusing on theoretical and practical knowledge related to societal and public sector needs and challenges under the current circumstances at the dawn of 2022. Objects of the research have been policy documents, scientific papers, books, and industry reports, both in and outside of the public service domain. Needs identified in previous research along with the outcomes of the more recent literature analysis of this paper were leveraged as the basis for the next methodological step.
- Needs enrichment and validation through qualitative interviews: 22 interviews were conducted with public administration representatives to validate and enrich the identified public sector needs. The interviewees should have been experts in their field which had to be verified with at least three years of working experience in the public sector. We also aimed to cover different fields as indicated by the principal policy areas in which their work was located, as well as different European Union (EU) countries, reflecting diverse backgrounds and evolution of their public sector. During the interviews, each need was examined in terms of different dimensions, such as its type, scope, the policy domains to which it applies and the possibility to exploit big data and cloud services for its addressing. The interviewees were also requested to prioritize each need based on their experience and expertise.
- Content structuring and analysis: The results of the interviews and the new information produced concerning the different needs, and their interconnection were studied for the uncovering of similarities and relations not known before.

A. Background research outcomes

The systematic identification and assessment of the needs in the public sector could be critical for its evolution supplying society with novel services targeted at existing deficiencies [10]. The necessity to involve diverse stakeholder groups to accomplish that along with personal and political agendas which frequently might direct the outcome hinder this endeavor. These along with the diverging nature of the public sector around the world could justify the limited relevant research available in the literature.

Among the works that may stand out on the topic is the research in [11] - conducted under the SONNETS project in 2017- which led to the identification of an initial list of 53 public sector's needs, coming from desk research and interviews, that was then filtered by their Experts Committee concluding to 28 needs. Among the needs from the list, the need to "promote teleworking" sticks out in the current reality, especially due to the COVID-19 pandemic. One year later, other researchers under the BigPolicyCanvas project were engaged again with the topic, constructing a list of 28 needs for the public sector, classified into several categories [12].

This list was the outcome of literature review as well as interviews with experts in the public sector.

According to the EU eGovernment Action plan 2016-2020 [13] and the 2017 Tallinn Ministerial Declaration on eGovernment [14], the vision for the development of modern public services is to be: "*digital, cross-border and interoperable by default; inclusive and accessible; open and transparent; trustworthy and secure; and require users to supply information only once*". Therefore, it is made clear that the citizens need to be able to monitor administrative processes that involve them ("open and transparent processes"), as well as to be able to access public services when needed ("access services upon request") without access restrictions/limitations ("availability of channels for consuming public services").

In addition, the adoption of Big Data technologies in the public sector has been considered of utmost importance, since a huge amount of data are generated uninterruptedly [15]. The authors in [16] stress the issues that public agencies face and propose a possible solution for the adoption of big data in e-government. What's more, a team of researchers from Thailand published in 2021 a framework regarding the readiness level of applying big data technologies for construction management in the Thai public sector. They determined that the readiness level for the application of big data consists of the following factors: technological, organizational, environmental, process and quality readiness [17]. A new need might emerge from the above; the establishment of activity measurement and assessment procedures. The need declares that to assess a procedure which consists of a number of activities, each activity should be measured and assessed. Following this approach, the whole procedure can be measured.

From the above analysis, the well-established list in [12] set up in 2018 and finalized in 2019 [18] was considered the basis for the development of the initial, inclusive needs' list of our research, enriched with the outcomes of the above analysis. The next step involves the conduction of interviews as described in the next section, for which the derived list of needs was exploited for their validation and potential enrichment.

B. Design of qualitative interviews

The conduction of interviews with public administration representatives was decided to acquire an up-to-date overview of the needs and challenges of the public authorities in Europe as perceived by experts in the field. The aim was to validate the identified needs resulting from the background research in the previous section and facilitate the potential recognition of new needs. All interviews followed a structured questionnaire (APPENDIX), starting from introductory questions for their profile, followed by questions regarding the needs of public administrations, the covering of which would render public administrations more effective, efficient, and precise. Regarding the needs, the interviewees were first asked to elaborate on the public administration's needs by themselves as they perceive them, along with the difficulties they foresee in their accomplishment, before asking them to prioritize and assess the already identified needs list. The interviewees were instructed to do secondary questions when needed that would facilitate the interviewees in further elaborating on their experience, a process that might lead to the uncovering of latent needs as the outcome of the discussion. Each interview had a duration of up to one hour, and the interviewees should

have provided the relevant interview material to the interviewees, including the questions, at least two days before the interview. This aimed to allow the interviewees to consider and prepare their answers. Due to the Covid-19 circumstances, the interviews had to be conducted remotely using video conferencing platforms.

C. Main study

22 interviews with public administration representatives in key positions in their countries and with long working experience in the public sector were conducted from July to October 2021. Fig. 1 presents in detail the general profiling information of the interviewees. In accordance with the interviewees' selection criteria, all interviewees have three or more years of working experience in the public sector.

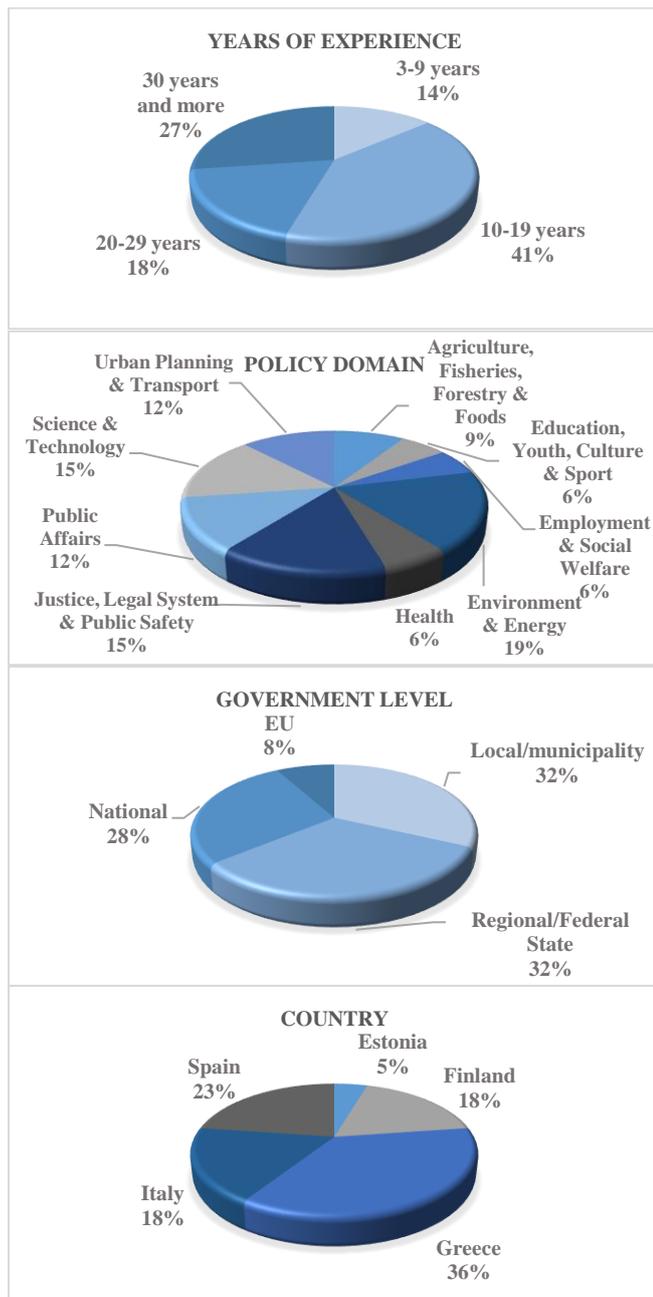


Fig. 1. Interviewees' general profiling information by: (a) Year of Experience, (b) Primary Policy Domain, (c) Government Level, (d) Country.

The majority of them have more than 10 years of experience with 27% of them having more than or equal to 30 years of experience. Regarding the interviewees' primary policy domain, there was no limit on the number of policy domains they could declare since their expertise may extend to more than one. 8 out of the 22 interviewees selected more than one policy domain. For the categorization of policy domains, the categories of previous research work [19] were adopted which in turn had drawn inspiration from the data categories of the European Data Portal [20]. As observed, 9 out of the 12 policy domains are being covered through the conducted interviews bringing the knowledge and experience of the interviewees for the problems faced and non-covered needs of these policy domains. The interviewees represent five different EU countries in both Northern and Southern Europe, experiencing very different levels of digitalization in their public administrations. Finally, concerning the administrative level at which their work is primarily located, local, regional and national levels are approximately equally represented.

III. RESULTS: THE PUBLIC ADMINISTRATION NEEDS ECOSYSTEM

The conducted interviews effectively enriched the already available list of needs; either by adding needs that were not already listed (minority of the cases), or by enriching the context of already identified needs (majority of the cases). From the described stepwise process, a final list of needs and challenges arose, as depicted in Table I. Each need is characterized by a descriptive title and an ID that supports its referencing in the below analysis.

Before diving into the identified needs and their attributes and prioritization, the interviewees were asked about their familiarization with big data and cloud technologies, and their use in their daily working practice. The answers were quite interesting since they revealed the open space for further digitalization of the public sector. Only 33% of the interviewees replied that they use Cloud services or Big Data technologies in their professional activity. They were mostly referring to cloud-based technologies, and, in many cases, they noted that they are not properly established in their organization (e.g., they are using personal credentials). Most of them also highlighted the need for technological renewal. The rest 67% of the interviewees responded that they do not use Cloud services or Big Data technologies at all. Some of them also added that they are not familiar with the term. The interviewees were then asked to prioritize the list of needs in Table I, declaring a "High", "Medium", and "Low" priority, along with a justification for the high prioritized needs. Summing up the interviewees' answers, an almost equal balance among the different scores is noted in Fig. 2.

TABLE I. LIST OF IDENTIFIED NEEDS FOR EUROPEAN PUBLIC ADMINISTRATIONS

ID	Need's title
1	Development of domain-specific target and indicator systems
2	Involvement of the public and citizens, as well as the development of citizen-centred policy making
3	Forward-looking strategic planning for the use of data and technologies as well as for practical implementation
4	Strengthen citizens' trust in public administration
5	Continuous Evaluation of Policies
6	Improve and strengthen Europeanization
7	Take into account local and regional specificities
8	Environmental Awareness and Protection
9	Cross-linked information exchange
10	Secure organizational framework
11	Improve the process of recruiting/mobility in order to acquire suitable staff in a timely manner
12	Establish target-oriented personnel development
13	Improved incentive structures for working in the public sector
14	Cooperative working between decision-makers, departments, hierarchy levels
15	Process and resource optimization
16	Standardization of processes
17	Cope with the production of huge volumes of data
18	Deeper understanding of IT potential and IT processes
19	Ensuring data security taking into account the protection of citizens' privacy
20	Establishment of a comprehensive technical infrastructure and IT architecture
21	Coherent use of digital technology across policy areas
22	Standardization of data management
23	Link between impact, quality, performance measurements and financial information
24	Include scientific knowledge and expertise
25	Ensure availability of (real-time) information and knowledge
26	Comprehensive knowledge and information management
27	Better quality standards in the formulation and evaluation of norms
28	Secure legal framework
29	Promote teleworking
30	Open and transparent processes
31	Access services upon request
32	Availability of channels for consuming public services
33	Establish activity measurement/assessment procedures
34	Development of digital skills

Fig. 3 provides a summary of the prioritization input collected per need. On the horizontal axis, the needs' ID is given, corresponding to the respective need of Table I. The total number of interviewees' answers on needs prioritization is depicted, distributed in "High", "Medium" and "Low" priority scores. As observed, need 16 – "Standardization of processes" has collected the largest number of "High" priority answers, followed by need 9 – "Cross-linked information exchange".

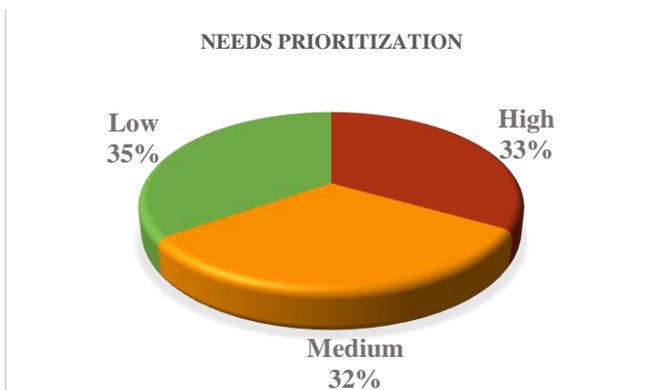


Fig. 2. Interviewees' prioritization levels for the identified needs

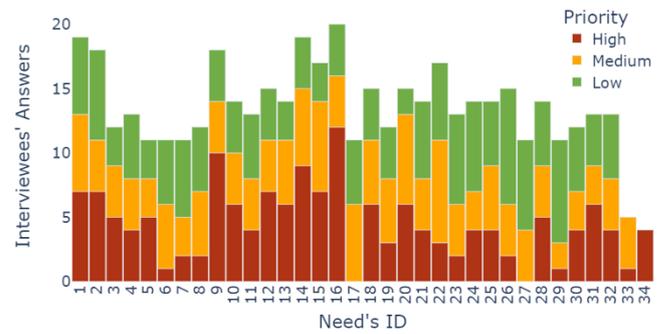


Fig. 3. Needs prioritization based on the interviews

Particular attention should be given to Need 34 – "Development of digital skills" which has only four answers in total being a newly added need that arose from the interviews. All four interviewees mention the need, though, as a high priority one. On the contrary, need 17 – "Cope with the production of huge volumes of data" and need 27 – "Better quality standards in the formulation and evaluation of norms" have been considered by none as significant, top priority needs for the public sector. It is generally observed that the total number of interviewees' responses and comments per need varies significantly. The justification for this is that the list of identified needs was long and the interviewees were asked to comment freely on it, without necessarily touching upon each need from the list, to avoid their distraction and disinterest.

In this context, to sort the needs based on their priority taking into account the interviewees' answers, both the plain answers' number and their percentage of the total answers per need should be considered. To combine both and account for the fact that the "Priority" is an ordinal variable, a simple method of assigning a score to ordinal categorical data was applied [21], [22], as follows: for each need, "High" priority answers were scored for 3, "Medium" for 2 and "Low" for 1. Then, the average score per need based on these scores was computed. In Fig. 4, the needs are depicted sorted in descending order based on the computed average prioritization score.

Due to the process followed, where the interviewees were free to discuss the list of needs as they see fit, the high prioritized needs were more boosted than the medium and low priority ones. Therefore, Fig. 5 depicts only the high prioritized needs grouped per country. The bigger the rectangle the greatest the number of interviewees prioritizing the need as high. The number of high prioritized needs was greater for Greece as was the number of interviews conducted for the country.

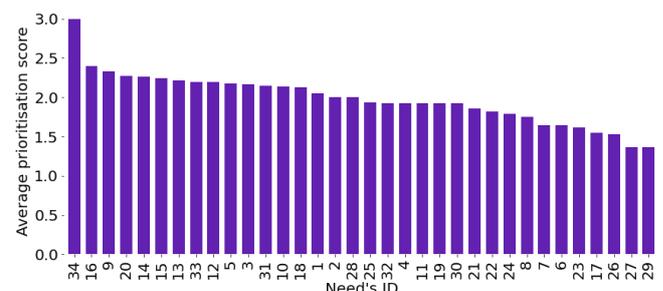


Fig. 4. Sorted list of needs of public administrations based on the computed average prioritization score

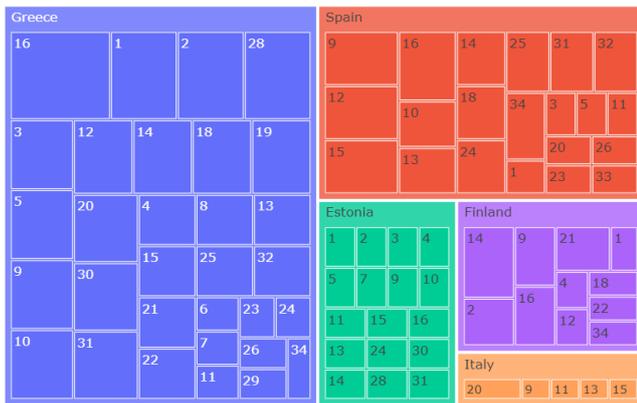


Fig. 5. High prioritized needs per country

Need 16 – “Standardization of processes” stands out as the most selected by the interviewees high prioritized need, while it is also considered a high priority need for Spain, Estonia and Finland. For Greece, need 1 – “Development of domain-specific target and indicator systems”, need 2 – “Involvement of the public and citizens, as well as the development of citizen-centered policy making” and need 28 – “Secure legal framework” are also high prioritized ones. For Spain, apart from need 16, needs 9 – “Cross-linked information exchange”, 12 – “Establish target-oriented personnel development” and 15 – “Process and resource optimization” are deemed the most important. For Estonia, there was only one representative and therefore all needs considered “High” by them are depicted in the figure. For Finland, need 14 – “Cooperative working between decision-makers, departments, hierarchy levels” was the top one rated, which is also observed in a high position for Greece and Spain as well. Finally, for Italy the need with the highest priority is the need 20 – “Establishment of a comprehensive technical infrastructure and IT architecture”, which is also witnessed in Greece and Spain, the other two Mediterranean countries participating in the research, but not that highly rated.

IV. DISCUSSION AND FUTURE WORK

Current needs and challenges that EU public administrations are facing are preventing their renewal which would have a significant impact on citizens’ everyday life, as well as the global economy and the environment [23], [24]. The identification of these needs along with any differentiations among the different domains and countries is the first step towards its renovation through the integration of appropriate technologies and policies to cover them. In this context, this paper offers a structured approach that combines both desktop research and the expertise of EU public sector experts, as extracted from targeted interviews and leads to the identification of an inclusive list of needs, along with their prioritization and interlinking. The different countries in which the interviewees operate enabled the analysis to be conducted in total and per country and the extraction of valuable insights, similarities and differences among them.

An important observation was the limited use (and in most cases absence) of big data and cloud technologies to support public administration processes, as acknowledged by the interviewees. Big data and cloud technologies are already transforming the business world and the public sector has also to cope with this transformation. ICTs have already been perceived on many occasions as an enabler for crisis mitigation, as in the case of the 2008 financial crisis [25]. The

new reality that the COVID-19 crisis has brought forward, with the remarkable increase in remote working and the general unstable working and living conditions, further strengthens this ascertainment, manifesting the need for adaptability of the public sector, new technological solutions and robust policies, driven by its current uncovered needs.

The COVID-19 situation had also an impact on this research since restrictions were still in place in most EU countries when the interviews were to take place, and therefore they had to be conducted without a physical presence. Being the main instrument of input concerning the public sector’s needs, this fact imposed some difficulties both in finding the interviews’ needed slots and in having the crucial interaction for a richer and broader discussion with the experts. It is assumed, though, that only the extent, and not the quality, of the input was affected.

Regarding the input collected, the flexibility given to the interviewees, in discussing, commenting, and prioritizing the needs as they see fit and by focusing on the needs they want in whatever order, significantly facilitated the conversation, and made it easier to keep the discussion vivid. It complicated, though, the analysis on our part since the interviewees, in most cases, only mentioned explicitly the high, and occasionally the medium, prioritized needs, and they considered all the rest as “Low” needs. Therefore, a “High” need for an interviewee was definitely high prioritized, but a “Low” need might have been indeed a not prioritized need or a need from the list where not much attention was paid to prioritize accordingly. To overcome this issue, by the end of the interview the interviewees were explicitly asked whether the not mentioned during the discussion needs were needs of low priority to their view. If the interview’s time was not sufficient for the interviewee to answer positively with confidence, the need was considered unassessed by them, leading to the differentiation of interviewees’ answers’ per need in Fig. 3.

The current analysis paves the way for our next steps which involve the mapping of the needs with available big data and cloud technologies and ICT services for evidence-based policy making which could disrupt the way public administrations are operating rendering them more people-centric. Public administrations are an integral part of every organized state, and its malfunctioning may have significant implications for the modern world. Given also the current unstable environment, more research involving EU experts of the public sector operating in different countries, such as the one presented in this paper, shall further assist in understanding and deciphering the various needs and challenges of EU public administrations in their different dimensions.

ACKNOWLEDGMENT

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101004605.

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APPENDIX - INTERVIEWS GUIDELINES AND QUESTIONS

Instructions for the interviewers: All the following questions should be asked to the interviewees. In certain cases, follow-up questions are given that can be asked to encourage the interviewee in contributing more expansive answers. Please record the interviews unless otherwise requested by the interviewee. If the interviewee asks not to be recorded, please keep thorough notes on the interview.

No entire transcripts of the interviews are inquired. Instead, detailed reports or summaries of the interviews should be provided, structured around the questions asked, along with any further potential insights or observations emerging from the interviews.

The interviews will have a duration of up to 1 hour. The interviewers should have provided the relevant interview's material to the interviewees, including the questions, at least two days before the interview. This will allow the interviewees to consider and prepare their answers.

Introductory Questions – Profiling Information

The interviewer should note down as much information as possible about the respondent, in order to be able to provide adequate profiling information, when reporting the respective activities.

1. Please briefly describe your professional activity. Please provide information about your field(s) of expertise, your specialist focus and your function.
2. How long have you worked in the public sector?
3. In which policy area is your work primarily located? Please choose from the list below:
 - a) Agriculture, Fisheries, Forestry & Foods
 - b) Economy & Finance
 - c) Education, Youth, Culture and Sport
 - d) Employment and Social Welfare
 - e) Environment and Energy
 - f) Health
 - g) Foreign Affairs and Defense
 - h) Justice, Legal System & Public Safety
 - i) Public Affairs
 - j) Science & Technology
 - k) Urban Planning & Transport
 - l) Institutional Questions/ Internal Services
4. At which administrative level is your work primarily located?
 - a) Local/municipality

- b) Regional/Federal State
- c) National
- d) EU

Main Questions

5. What do public administrations need to get more effective, efficient and precise, in your opinion? Please name the key needs (at least three) according to your opinion.

The interviewer should note down all named needs including real life examples, mentioned by the respondent.

6. Could you classify them as one of the following types?

- a) Information
- b) Legal
- c) Organizational
- d) Strategical
- e) Technical

The interviewer should map the needs mentioned by the respondent with a type, based on the respondent's answer.

7. What scope each of the previously mentioned needs has?

- a) Local
- b) Regional
- c) National
- d) EU

The interviewer should map the needs mentioned by the respondent with a scope, based on the respondent's answer.

8. Are you aware of any Big Data or Cloud services technologies that may cover part of the needs you identified before? Follow up questions: If yes, do you use any of these technologies for this purpose? Do you use them to cover specific needs? Are these well-established technologies in your organization?

The interviewer should note down as many information as possible for the technologies mentioned by the respondent, how these are used, in what extent, etc.

9. Would you prioritize any of the following identified needs over the others and why? Note a "High", "Medium", "Low" priority level to prioritize them. Provide a justification for the "High" priority needs, in your view.

The interviewer should go through the following list of identified needs and note down the indicated priority and its justification.

Needs	Priority			Justification
	High	Medium	Low	
Each need as identified by the interviewee before				
Each need as presented in Table I				

10. Can you distinguish needs from the ones you identified and the provided table (i.e., Table I) that are specific to certain policy domains (choose from the policy domain categories of question 3) from your point of view and experience?

The interviewer should go through the list of identified needs and note down the indicated policy domain/s (one or more) for each need.