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Mapping the use of emerging technologies within the public sector across the EU: The case of Public Sector Tech Watch

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ABSTRACT

Public organizations across the EU are integrating emergent technologies, but information on these applications remains scarce. The European Commission's Public Sector Tech Watch (PSTW) is the first observatory that monitors the use of emerging technologies in public organizations consolidating this information into a single repository. The PSTW, established in 2023, aims to be the central hub for stakeholders interested in the latest technological advancements for improving public sector services. This research uses PSTW as a case study to explore the evolution of mapping emerging technologies as an anticipatory practice in the public sector. Using Schatzkian practice theory, the study analyzes changes in activities, material arrangements, and organizing elements through interviews, observations, and document reviews. Findings reveal that expectations have become central, shaping both the evaluation of public value and the narratives in PSTW outputs. These developments suggest that the PSTW is progressively transforming into an anticipatory knowledge hub. Key drivers of this transformation are repository expansion, community-building initiatives, and alignment with broader EU digital policies. Our paper contributes to the literature on anticipatory practices by offering a longitudinal perspective, delving into the evolutionary process of the practice, and emphasizing the critical role of mapping practices in shaping expectations.

1. Introduction

In recent years, EU countries have experienced a significant boost in public sector digitalization efforts. Government digitalization, indeed, is one of the policy areas addressed by the Digital Decade programme[1], launched by EU institutions to set out digital ambitions to achieve by 2030 in the form of concrete targets, and the NextGenerationEU investment plan,[1] allocating €806.9 billion to ensure recovery across Member States after the COVID-19 pandemic.

As a result, national governments started experimenting with and adopting emergent technologies to improve and innovate their daily functioning. Defined by Rotolo et al. (2015) as "radically novel" technologies with fast growth rate and a considerable but uncertain socio-economic impact, emergent technologies currently include Artificial Intelligence (AI), blockchain, Distributed Ledger Technologies (DLT), the Internet of Things (IoT), and Virtual/Augmented Reality (VR/AR). Thanks to their perceived promise, governments at different levels have adopted tools of this kind to function and organize themselves in ways that allow them to cope with rapid changes (Gil-Garcia et al., 2014), thus maximizing public value (Ubaldi et al., 2019) in different policy areas, such as public order

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[1] NextGenerationEU recovery plan: https://www.consilium.europa.eu/media/45109/210720-euco-final-conclusions-en.pdf

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and safety, welfare, health, and environmental protection (Kalampokis et al., 2023).

However, the very nature of emergent technologies hinders efforts to identify them in public organizations (VerWey, 2023); not only are they uncertain in their definitions, but they also change quickly, even exceeding policymakers' ability to characterize and analyze them. As such, mapping emergent technologies becomes a crucial practice that can encourage public sector entities to envision potential future scenarios, assess the implications of new technologies, and prepare for various outcomes. Despite its growing importance, this practice remains fragmented, with contributions from international organizations (e.g., OECD's Observatory of Public Sector Innovation[2]) and NGOs (e.g., Algorithm Watch[3] reports).

This paper examines the evolution of the practice of mapping emerging technologies in the public sector, focusing on the European Commission's Public Sector Tech Watch (PSTW) as a case study. Launched in 2023, the PSTW serves as an observatory dedicated to monitoring and disseminating cases of emerging technologies across EU public administrations. Using Schatzkian practice theory, this study explores how the practice of mapping has shifted over time from a primarily descriptive exercise to an anticipatory practice that actively engages with future-oriented visions of digital transformation. Building upon earlier initiatives such as AI Watch and the Innovative Public Services Observatory (IPSO), the PSTW represents one of the largest repositories of emerging technologies in the public sector, offering a crucial resource to track where and how emerging technologies are being adopted and leveraged across different governmental contexts. The main research question guiding this study is: *How has the practice of mapping emerging technologies in the public sector evolved over time?* To address this question, the paper examines the activities, material arrangements, and organizing elements of this practice, paying particular attention to how it constructs and disseminates expectations about the future.

The paper begins with a review of the theoretical underpinnings of anticipatory practices and Schatzkian practice theory, which form the framework for analyzing mapping as a social practice (Section 2). It then details the methods employed, including a longitudinal case study of the PSTW, drawing on interviews, observations, and document analysis (Section 3). Following this, it introduces the case of PSTW, tracing its evolution from earlier mapping initiatives (Section 4). The analysis focuses on changes in the practice over time, particularly its shift toward an anticipatory orientation (Section 5). Section 6 discusses the PSTW's evolution into an "anticipatory knowledge hub". The last section concludes.

2. Theoretical background

Anticipatory practices are an emerging framework to describe and analyze those social practices involving, explicitly or implicitly, expectations of the future. As the literature shows, there is growing interest in anticipatory practices, with a number of studies explicitly mobilizing theories of social practices (e.g., Alvial-Palavicino & Konrad, 2019; Sahakian et al., 2023; Welch et al., 2020). This paper aligns with this strand of literature by applying a Schatzkian practice-based theoretical approach (Schatzki, 2002, 2019) to investigate the anticipatory practice of mapping emerging technologies in the public sector.

This section presents i) the core theoretical notions behind anticipatory practices, especially regarding technological innovation, and ii) the main elements of Schatzki's practice theory.

2.1. Anticipatory practices

In an era of rapid changes and their potentially disruptive impacts on society, imagining and managing the future has become a central challenge. Envisioning the future relates to expectations, which guide activities, provide structure and legitimacy, attract interest, foster investment, define roles and duties, and offer a shared understanding of what to expect and how to prepare for opportunities and risks. In particular, future expectations are crucial to providing the dynamism and momentum upon which so many ventures in science and technology depend (Brown & Michael, 2003). Indeed, very little in innovation can work in isolation from a highly dynamic and variegated body of understandings about the future (Borup et al., 2006).

Expectations about the future play a pivotal role in shaping anticipatory practices, which are crucial in understanding how futures are imagined, constructed, and governed within the realm of technoscience. In this regard, expectations are also profoundly "generative" (Borup et al., 2006, p. 285) as they affect socio-technical fields' constitution (Alvial-Palavicino, 2015). Anticipatory practices have been defined as those practices

> by which expectations of the future are created, either in explicit and structured forms, such as in the case of calculations, modeling, scenarios, forecasting, etc.; or in more implicit and less formal ways such as in the case of expectations embedded and embodied in grant proposals, prototypes, standards, or crowdsourcing
> (Alvial-Palavicino & Konrad, 2019)

The notion of anticipatory practice has been used to analyze innovations and related social phenomena in different fields of research and policymaking, which are, indeed, an intensely future-oriented business with an emphasis on the creation of new

[2] The Observatory of Public Sector Innovation (OPSI) is a global initiative of the OECD that supports governments in fostering innovation in the public sector. OPSI serves as a platform for knowledge-sharing, capacity-building, and collaborative problem-solving, aiming to help governments address complex challenges and improve public services.

[3] Algorithm Watch is a non-governmental, non-profit organization based in Berlin and Zurich, advocating for fair and transparent algorithms and Artificial Intelligence (AI) in defense of justice, human rights, democracy and sustainability. It publishes reports with cases of AI applications within the public sector but it does not have a proper repository.

opportunities and capabilities (Borup et al., 2006). Anderson's seminal works have been among the first to shed light on such practices. He investigated how anticipatory knowledge practices are instrumental in creating futures in the context of emerging technologies such as nanotechnology (Anderson, 2007) and discussed different logics behind anticipatory actions (Anderson, 2010).

Anticipatory practices often involve structured foresight exercises (Schoen et al., 2011), namely systemic instruments operating in a "sea" of expectations (van Lente, 2012) to identify promising pathways, engage relevant stakeholders, and create common visions into action. In particular, Technology Foresight (TF) (Martin, 1995) focuses on long-term technological development, identifying strategic research areas and key technologies with high economic and social potential. TF employs various methods (Alvial-Palavicino, 2015; Popper, 2008) to anticipate technological trends, opportunities, and challenges, such as scenarios (e.g., Bierwisch et al., 2015), Delphi surveys (e.g., Keller & von der Gracht, 2014), horizon scanning (e.g., Michels et al., 2024), and story thinking (e.g., Marshall et al., 2023).

Anticipatory practices can also involve implicit and unstructured expectations. This is the case of mapping. As a small body of literature suggests, mapping practices can have an intrinsic anticipatory character. On the one hand, some scholars have mapped foresight exercises. For instance, Popper (2012) examined the mapping of forward-looking activities, arguing that it helps policy-makers identify gaps for policy intervention and enables foresight practitioners to develop future research strategies. Similarly, Saritas et al. (2022) used science mapping to assess foresight trends and practices, revealing an expanding focus on emerging and disruptive technologies. More recently, Ariza-Álvarez & Soria-Lara (2024) demonstrated how participatory mapping complements, expands, and modifies scenarios' formulation. On the other hand, scholars also devoted attention to the mapping of technologies. Houghton et al., (1996) were among the first to map Information Technologies, highlighting its value in "exploring relationships between products and services, market segments and industries" (p.915). Gudanowska (2014) defined technology mapping as creating visualizations of technologies and their interconnections, including their spatial localization and relational dynamics. One example of technology mapping is given by Sampaio et al. (2018), who mapped photovoltaic technologies to trace their development pathways.

This paper addresses two relevant gaps in the current research on anticipatory practices. First, as Alvial-Palavicino and Konrad (2019) argue, little attention has been given to the contextual and procedural aspects through which expectations are generated, disseminated, and shared, as well as the diverse material and institutional settings where anticipatory practices unfold. Additionally, existing research often falls short of comprehensively exploring how such practices evolve over time. Second, despite its critical role in shaping and envisioning future expectations, studies specifically examining mapping practices described above are limited and deserve further inquiry.

2.2. *Practice-based theoretical framework*

Practice theory is a broad family of approaches increasingly popular in social sciences (Spaargaren et al., 2016). The term "theory" could be misleading since there is no singular theoretical approach. Quite the opposite, theories of practices are a vibrant and variegated family that shares the idea of having the entity of practice as the central social *unit of analysis* or *conceptuality* (Schatzki, 2019). In the last two decades, there has been an upsurge of scholars who have revisited theories of practices in a variety of fields. Within sociology and social philosophy, Theodore Schatzki (2002); Schatzki et al., (2001), Elizabeth Shove (2022; Shove et al., 2012), Andreas Reckwitz (2002), Davide Nicolini (2012) and Silvia Gherardi (2019), amongst others, have elaborated, complemented, and also reformulated the practice ontologies as they were initially developed in the 1970s and 1980s by Pierre Bourdieu (1990) and Anthony Giddens (1979) in particular.

For this research, Schatzki's approach provides the theoretical basis for investigation. For Schatzki (2001, 2015, 2019), social reality unfolds through bundles of practices and material arrangements. Practices are understood as spatial-temporal nexuses of doings and sayings organized by (practical and general) understandings, rules, and teleoaffectivities. Practical understandings refer to knowing how certain actions should be performed within practices (e.g., skills); in contrast, general understandings are those general senses of things that influence activities at the core of practices and connect practices among each other. Rules include all those directives, laws, instructions, and remonstration that influence actions within practices. Lastly, teleoaffectivities are essentially the goals pursued by individuals and the emotions associated with them, as they combine goal-oriented (teleo) elements with substantive or ethical meanings (affective). Teleoaffectivities hold practices together, thus suggesting that practices are directed towards an objective that holds significant meaning for the practitioners. Expectations about the future are part of teleoaffectivities (Sahakian et al., 2023; Welch et al., 2020) as they represent collective beliefs and assumptions about what is likely to happen or what should be aimed for (Konrad et al., 2017). Lastly, material arrangements refer to "collections of people, artifacts, organisms and things that are linked by such matters as contiguity, causality and physical connections" (Schatzki, 2015, p.15) shaping practices.

According to Schatzki, practices and material arrangements are strongly interconnected among and within each other: "[w]hile practices effect, use, react to, bestow meaning on and are inseparable from the entities that compose linked arrangements, arrangements induce, channel, prefigure and are essential to practices" (Schatzki, 2015, p.15). For instance, practices relate among each other by sharing common goals, activities, or chains of action, while relations among arrangements involve intermediate physical connections and common elements. Relations between practices and material arrangements form constellations, namely larger nexuses in social life. At the core of constellations, which is a widely spread concept in the literature (e.g., Gherardi, 2019; Hui et al., 2017; Shove et al., 2012), there is the idea that practices never occur alone. Indeed, constellations of practices connect with others and all together constitute the plenum of practices.

In this paper, drawing on Schatzkian practice theory, we operationalize social practice through three dimensions: 1) doings and sayings (i.e., activities), 2) material arrangements (actors, technologies, etc.), and 3) organizing elements (teleoaffectivities, rules, general and practical understandings). We acknowledge the risk of producing a reductive scheme of the social practice of mapping

emerging technologies due to the 'scientific urge to build simplifying, diagrammatic models of social life' (Schatzki, 2002: xii). Nonetheless, we believe that such a description of practice is useful and that examining these elements aids in understanding how the practice unfolds over time. The Schatzkian approach has thus been chosen due to its emphasis on the interconnectedness of doings, sayings, and material contexts, which allows for a detailed exploration of how social phenomena evolve, emphasizing the significance of context in shaping practices.

Our approach takes a longitudinal perspective to study the evolution of the practice of mapping emerging technologies in the public sector. This focus on tracing changes over time in activities, material arrangements, and organizing elements resonates with the Biographies of Artifacts and Practices (BOAP) framework (Hyysalo et al., 2019), particularly in its emphasis on understanding how practices and materialities co-evolve. However, BOAP often centers on the trajectories of specific artifacts across multiple contexts, whereas our study focuses primarily on the practice itself rather than the artifacts it engages with. Thus, while the methodological sensibilities of BOAP inform our work, our theoretical commitments and focus on anticipatory practices mark a distinct approach.

3. Methods

This paper aims to understand how the practice of mapping emergent technologies in the public sector unfolds over time. To do so, it delves into the European Commission's PSTW, which constitutes an influential case study (Seawright & Gerring, 2008) to investigate the practice of mapping emergent technologies in public organizations. Although other institutional and non-institutional actors attempted to collect information about emerging technologies such as AI and blockchain (e.g., OECD's Observatory of Public Sector Innovation; national repositories of AI systems; reports produced by civil society organizations), at the time of writing (December 2024), the PSTW is the largest public repository collecting cases on all the EU countries in several public sectors. Therefore, its complexity is well-suited to looking into the nuances of the practice under inquiry.

The research collected data about the PSTW evolution over time, the overall context of its creation, development, management, institutional and non-institutional actors involved, and their understandings of the practice. Data collection consisted of a triangulation of in-depth interviews, observation, and desk review of documents. More specifically, semi-structured interviews took place online between May and August 2024 and involved 9 interviewees (see Appendix A), among which 5 former or current EU staff members and 4 external contractors' employees. The sampling procedure followed the criterion approach (Miles & Huberman, 1994): all interviewees are direct participants in the practice as their primary work is (or was) strictly related to either the PSTW or the initiatives that preceded it. All interviews followed the same interview guide (Appendix D), slightly adjusted according to the type of interviewee. The observation occurred mainly online by attending the PSTW webinars,[4] which happened between February and December 2024. Lastly, an in-depth desk review of background documents, mainly official reports, press releases, and videos from the EU, helped complement the interviews and observation (Appendix B). Data were analyzed with a practice *sensibility* that has been used as a "filtering and sensemaking device" (Sedlačko, 2017). Operationally, we conducted a deductive thematic analysis, which enabled the identification, analysis, and reporting of patterns and themes within data about the PSTW (Braun & Clarke, 2012). In the analysis, the themes – i.e., repeated patterns of meaning – have been generated from the data using the Shatzkian practice theory elements previously discussed (activities, material arrangements, organizing elements).

4. Case study: Public Sector Tech Watch

Launched by the European Commission in September 2023, the PSTW is an observatory dedicated to monitoring, analyzing, and disseminating the use of emerging technologies, such as AI, blockchain, and virtual reality, within the public sector in Europe. As the website states, the observatory "aims to become the one-stop for all stakeholders – public sector officials, policymakers, private companies, academia – interested in the latest technological developments to improve public sector operations and service delivery".[5] In particular, the PSTW identifies, collects, and analyzes use cases of emergent technologies in national administrations within the EU, publishes results on scientific foresight reports, and carries out community-building activities, such as workshops and webinars on the topic.

The PSTW builds up on two previous efforts of the Commission on innovation in the public sector, which ultimately converged into the observatory: AI Watch and Innovative Public Services Observatory (IPSO). Started by the JRC already between 2018 and 2019 with the Directorate-General for Communications Networks, Content and Technology (DG Connect)[6] of the Commission, the AI Watch

[4] The recorded sessions of PSTW webinars are available at the following link: https://www.youtube.com/@GovTechConnect/videos (last access: December 2024)

[5] Public Sector Tech Watch website: https://joinup.ec.europa.eu/collection/public-sector-tech-watch (Last access: December 2024).

[6] Directorate-General for Communications Networks, Content and Technology: it develops and carries out the Commission's policies on digital economy and society and research and innovation. It invests in research, innovation, deployment and uptake of trustworthy and green digital technologies. Through funding, legislation and policy initiatives, it helps ensure European leadership and independence in critical digital technologies (such as AI, Common Data Spaces, high-performance computing, 5 G, micro-electronics, blockchain and quantum).

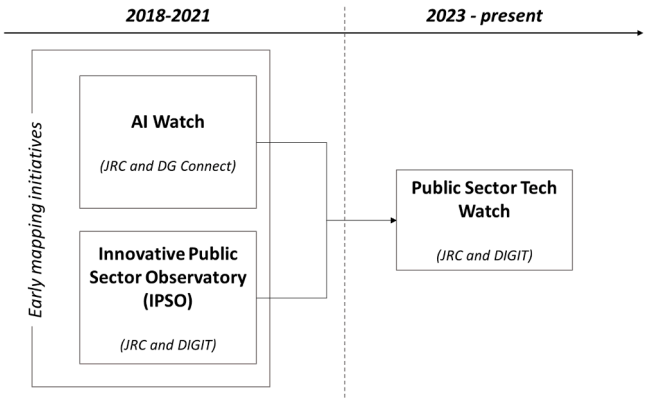

Fig. 1. Evolution of EU mapping initiatives (authors' elaboration).

produced research about AI applications in sectors such as the public sector, health, and transport. Due to this, it started mapping AI systems in national administrations across EU countries via surveys, workshops, desk research, and publishing the results in scientific reports (see Appendix C). Overall, the observatory collected and analyzed 686 cases of AI in the public sector. In parallel, IPSO was a platform jointly created by DIGIT and JRC in 2019 in the framework of the EU ISA[2] Programme,[7] with the purpose of monitoring the adoption of emerging technologies for the provision of public services across Europe. IPSO collected 330 cases of public services (Perego et al., 2020); besides AI, it included IoT, DLT, and blockchain.

The PSTW is jointly managed by the Directorate-General for Digital Services (DIGIT)[8] and the Joint Research Centre (JRC)[9] of the Commission, with the support of external contractors from the private sector. The observatory is provided within the Joinup community platform[10] - the Commission's one-stop shop for interoperable and open digital government ICT solutions - and consists of a repository of cases of emergent technologies adopted by public organizations across different EU Member States, administration levels (e.g., central, local), sectors (e.g., health, education, defense), and process types (e.g., enforcement, monitoring, internal management). Moreover, the cases' status also varies as the applications can be implemented, under development, piloted, or not in use anymore. Case collection follows a quite structured process (see Appendix D): cases are either researched and collected by the PSTW managers or are directly reported by national administrations; cases are then classified according to a pre-defined taxonomy and stored in the repository, which is openly available on the PSTW website and can be downloaded in CSV and XLSX formats.

At the time of writing, the observatory also includes other contents, such as "Stories", which illustrate testimonials showcasing the implementation of technological solutions by European public organizations, and "Knowledge Centre" that archives and promotes reports and research publications about the cases within the repository. The observatory also allows national governments and public administrations to self-report their emerging technologies' applications and be included in the observatory repository after evaluation by the PSTW team; the "Best Cases Award" rewards and gives visibility to the most innovative applications reported by national administrations. Lastly, the observatory has a strong connection to the EU Commission's GovTech initiatives through a dedicated section on its website.

5. PSTW mapping emerging technologies: the evolution of a practice

This section explores the evolution of the practice of mapping emerging technologies in the public sector using a Schatzkian practice theory approach. By examining the main elements of the practice, i.e., activities, material arrangements, and the organizing elements of the practice (teleoaffectivities, rules, general and practical understandings), we aim to illustrate how the practice has changed over time. As described in Section 4, the PSTW originates from two initiatives previously carried out by the Commission – AI Watch and IPSO. For comparative purposes, we present our findings (see Table 1) by distinguishing between two moments in the

[7] ISA[2] Programme: From 1 January 2016 until 31 December 2020, the programme supported the development of digital solutions that enable public administrations, businesses and citizens in Europe to benefit from interoperable cross-border and cross-sector public services. It consisted of actions, such as facilitating secure file exchange, developing next generation digital networks, and promoting sharing and reuse of digital solutions https://ec.europa.eu/isa2/isa2_en/

[8] Directorate-General for Digital Services (DIGIT): European Commission's department responsible for digital services that support other Commission departments and EU institutions in their daily work and that help public administrations in EU member countries. As domain leader for IT, DIGIT enables, drives and supervises the Commission's digital transformation and the transformation of its IT delivery model.

[9] Joint Research Centre (JRC): provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society. It works closely with research and policy organizations in the Member States, with the European institutions and agencies, and with scientific partners in Europe and internationally, including within the United Nations system. In addition, the JRC offers scientific expertise and competence from a very wide range of disciplines in support of almost all EU policy areas.

[10] Joinup: https://joinup.ec.europa.eu/collection/joinup last access 18/12/2024

Table 1
Comparison of the practice between early mapping initiatives (AI Watch, IPSO) and PSTW.

	Early Mapping Initiatives (AI Watch, IPSO)	PSTW
Activities (doings and sayings)	• Identifying and categorizing cases; exploratory in nature • Minimal database maintenance due to limited resources • Emphasis on scientific research practices • Less attention to dissemination or community-building	• Identifying and categorizing cases, outsourced to external contractors • Increased emphasis on database maintenance and ensuring relevance • Production of informative reports (practical insights, success stories and lessons learned) • Expanded community-building and dissemination practices (workshops, webinars, etc.)
Material arrangements	• Smaller-scale observatories • Focused on specific technologies (e.g., AI, blockchain) rather than a broad spectrum	• Larger-scale observatory hosted on the Joinup platform • Creation of new sections like Stories and Knowledge Hub in the observatory • Greater reliance on external contractors for case collection and maintenance • Broader technological focus (e.g., VR, quantum computing) to ensure long-term relevance
Organizing Elements	*Teloaffectivities* • Exploratory focus on assessing AI impact and demystification (AI Watch) • Driven by scientific curiosity and commitment to assessments • Interest in scaling up best practices (IPSO) *General Understandings* • Little knowledge about AI in general, thus awareness-raising potential of the topic • Focused on academic rigor and e-government scholarship *Practical Understandings* • Early stage, less formalized taxonomy *Rules* • Guided by less structured policy frameworks, with fewer regulatory alignments	*Teloaffectivities* • Increased use of expectations • New goals: community building, matchmaking opportunities, positioning as a knowledge hub, expanding repository • Emphasis on usefulness and collaboration *General Understandings* • Consistent belief in the importance of mapping practices • Emphasis on collective sensemaking and shared goals for digital transformation *Practical Understandings* • Formalized and complex taxonomy • Skills developed through experience and memory • Continuous improvement and relevance maintenance *Rules* • Strong alignment with the Interoperable Europe Act and AI Act to legitimize and structure the practice

evolution of the practice: the early mapping initiatives (AI Watch and IPSO) and the current PSTW. From a practice-based perspective, each of these projects can be understood as a bundle of practices and material arrangements. The practice of mapping emerging technologies is central to all these initiatives, but it does not occur in isolation; it is always embedded within and connected to other practices. In this section, we aim to highlight not only the transformations within the practice itself but also how its connections with other practices have evolved over time.

5.1. Changes in activities (doings and sayings)

In all the initiatives under observation, the core *mapping activities* – i.e., identifying and categorizing cases – have remained consistent over time. Currently, these activities have been primarily outsourced to external contractors, while practitioners on the EU Commission side (researchers and managers) mainly focus on supervising and engaging in internal discussions to ensure the proper application of the taxonomy used to classify the cases. Mapping leads to the creation of a database that collects all the cases identified. In the early initiatives, database maintenance was minimal due to limited personnel. As the number of cases increased, *maintenance activities* became more crucial. According to the interviewees from the EU Commission, this shift in focus was necessary to ensure the accuracy and relevance of the growing repository. However, maintenance of the database keeps on being challenging because of the "substantial dependence on data sourced from publicly accessible channels" (PSTW report 1/2024, p. 43).

Mapping is linked with many other practices, such as scientific research practices, community-building practices, and communication and dissemination practices. Using the cases collected in the database, JRC practitioners perform different *scientific research practices* (e.g., supervising data gathering, analyzing the data, writing reports, etc.). These practices have been a consistent feature across all the initiatives (albeit less prominently in IPSO), with their centrality evolving over time. In the AI Watch, for instance, practitioners situated their efforts within the broader scientific discourse, with the aim of contributing to the e-government literature and "develop[ing] a behavioral and structural model to organize and aggregate the different factors affecting the adoption and implementation of AI in public administration" (AI Watch report 2020, p. 76). Since the establishment of the PSTW, the reports published have been more focused on providing practical insights that highlight real-life examples, success stories, and lessons learned from the implementation of emerging technologies in public administrations. This shift indicates a broader realignment of priorities in the initiative, transitioning from a primarily academic orientation towards a more pragmatic, application-oriented approach. A JRC interviewee clearly highlighted this distinction by comparing the reports produced under the PSTW with those released by the JRC: "One thing is a dissemination report where you present statistics on cases; another thing is a report where you bring new, innovative

content, where you try to take a step forward in terms of knowledge" (INT_01 - EU Commission).

Community-building practices, which were in their nascent stages during the early mapping initiatives, have become central to the PSTW. According to the interviewees, workshops, webinars, and other events are core components for engaging different stakeholders interested in emerging technologies in the public sector. Finally, with the PSTW, there has been a significant increase in *communication and dissemination practices*, including writing stories, highlights, and informative reports. As one interviewee involved in PSTW communication activities underlined, these efforts aim to attract users, make the repository more accessible, and foster a "bottom-up virtuous circle" (INT_02 – External contractor) where public organizations and tech providers share their innovations, hoping to be featured in the observatory.

5.2. Changes in material arrangements

Changes in material arrangements have been prominent in the evolution of the practice. The most palpable change is the continuous *expansion of the observatory*. This growth is reflected not only in the increasing number of reported cases but also in the addition of several new sections on the website. As we discussed above, the *actors involved* changed over time, with DIGIT assuming an increasingly central position. DIGIT, which, according to our interviewees, has undergone a transformation from a technical to a more policy-oriented DG, now oversees the observatory. According to one senior manager who witnessed the shift from early mapping initiatives to PSTW (INT_08), the transition to DIGIT has influenced the strategic direction of the observatory, aligning it more closely with broader policy objectives related to digital transformation and interoperability. With the establishment of the PSTW, external consulting firms have been introduced in a more systematic manner to help handle significant portions of case collection and maintenance. This outsourcing was only partly due to the increasing complexity and scale of the practice. As highlighted by a JRC interviewee, the primary motivation for outsourcing specific aspects was that, following the consolidation of the taxonomy, the case collection was deemed to have limited scientific value:

> We consolidated a methodology of case collection such that the added value in terms of scientific work on this side had become very residual. […] since there was a consolidated methodology and taxonomy, since everything was consolidated, it became an activity that could also be subcontracted.
>
> (INT_01 – EU Commission)

Overall, the reliance on external contractors, combined with the sheer volume of cases in the observatory, has significantly altered the approach to data collection. In the early initiatives, mapping was an explorative endeavor, with each case of emerging technology being highly valued by the practitioners. As one interviewee explained:

> Initially, the mapping was so explorative that if someone came telling they had a case, you would take it because there were so few that each piece of data had a much greater value… now if someone tells me they have a case, I say: "but do you have a link? Do you have something to prove it to me? If you don't have that, look… I have 1000 cases, I won't take the responsibility of writing yours.
>
> (INT_01 – EU Commission)

According to the JRC practitioners, the increasing number of cases and the shift to outsourcing have resulted in a more selective and rigorous process of inclusion in the database aimed at maintaining the observatory's credibility. However, external contractors face a different set of pressures. Operating under contractual obligations to meet pre-defined targets, they may risk prioritizing quantity over quality. As one contractor noted, "[finding a pre-defined number of cases] is actually a contractual obligation for us!" (INT_02 – External Contractor). These changes in the material arrangements indicate how the observatory's growth and operational shifts have introduced tensions between maintaining scientific rigor and meeting the practical demands of project continuity.

Another important material element of the observatory is the *hosting platform*. Today, the PSTW is hosted on the Joinup Platform, which supports interoperable solutions for European public administrations. According to one of the interviewees from the EU Commission (INT_07), this platform was chosen because it aligns PSTW with broader EU initiatives on interoperability, enhancing its visibility and relevance. Furthermore, various interviewees confirmed that Joinup has been a reliable and familiar platform within the European Commission for many years, providing various functionalities that facilitate collaboration and information sharing. However, it also presents some limitations that require practitioners to adapt their communication and technical strategies, often working around constraints to achieve their objectives.

> For example, on Joinup, we can't do the "search" operation… we don't have the possibility of filtering… that's a silly thing, isn't it? But to make you understand: why can't we do it? Because the functionality doesn't exist in Joinup… So, I would love to be able to search by keywords, by type of document, by date, etc., but the possibility just doesn't exist, the only thing I can do is to go to the general search, but it gives me results even outside the PSTW. If, instead, I want to do a search within that page, it is not possible.
>
> (INT_02 – External Contractor)

Despite these challenges, the transition to Joinup indicates a strategic move to embed the observatory within a larger ecosystem of digital government solutions, with the aim of increasing its impact and reach.

The last change in material arrangements concerns the e*merging technologies* themselves. While the AI Watch originally focused on AI and IPSO on blockchain and APIs, the PSTW now includes a broader range of emerging technologies, such as VR/AR and quantum computing. On the one hand, this expansion reflects the evolving landscape of technological innovation in the public sector. On the other hand, the decision to focus on emerging technologies more broadly reflects a proactive approach to staying relevant in a rapidly changing environment, ensuring that the observatory can adapt to new developments and emerging trends. As stated by one of the interviewees, they "decided not to focus on AI but to keep something that could last in the medium to long term […] because maybe at some point AI will no longer have the same value it has today as a word" (INT_01 – EU Commission).

5.3. Changes in the organizing elements of the practice

Teleoaffectivities, i.e., goal-oriented and affective elements, are the most significant changes in the evolution of the practice. Early mapping activities aimed to "set the research agenda", "put a whole new research topic", and also to "demystify AI" (INT_03 – EU Commission) in the case of the AI Watch, and "identify and assess best practices to be scaled up" (INT_09 – EU Commission) in IPSO. Over time, the PSTW, instead, adopted new goals, emphasizing community-building and aligning itself with other GovTech initiatives, such as *GovTech Connect*, a project led by DG CONNECT that seeks to mobilize the GovTech innovation ecosystem by engaging SMEs, public and private sector innovators, investors, civil society, academia, and NGOs. The interviewees presented this link as a sort of logical step to integrate efforts, maximize impact, and build a stronger, unified narrative around digital innovation in the public sector. This integration indicates a shift in the observatory's role and orientation from an academic-inspired research tool to a more market-oriented tool. This transformation is clear in the evolving teleoaffectivities underpinning its activities. If initially, according to the interviewees, the aim was to contribute to e-government scholarship, refine conceptual frameworks, and support evidence-based policymaking, the linkage with GovTech initiatives has introduced goals such as fostering public-private partnerships, promoting the scalability of solutions, and facilitating the commercialization of innovations through "matchmaking opportunities" (INT_07). As clearly stated by one interviewee, "the good vision we have in mind for the future is simply to facilitate this matchmaking and for the PSTW to become the place everyone goes to" (INT_07).

The shift in goals and orientation interestingly brought a more strategic focus on the creation and diffusion of expectations. In other words, as the shift from early mapping initiatives to the PSTW progressed, expectations took on an increasingly central role in the practice, and practitioners started to use their expectations as a key tool to assess the public value of emerging technologies, as also reported in the official documentation of the PSTW:

> the assessment process for evaluating the public value of the collected use cases incorporates both the tangible benefits outlined in the use cases and the *potential value they could deliver* to the public sector. Given that many of these cases are still in early stages and have not yet undergone formal impact assessments, the *evaluation of public value is predominantly based on informed projections and expectations provided by the PSTW team.*
> (PSTW report 2/2024, p. 34, emphasis added)

Expectations are not confined to internal evaluations. Practitioners started to diffuse them through their website, with the aim of transforming the observatory into a hub for shaping collective understandings of emerging technologies. The diffusion of expectations is not an explicitly stated objective of the PSTW but serves as an implicit mechanism to achieve its broader goals (e.g., expanding the repository, increasing its relevance, events and matchmaking opportunities, etc.). Nonetheless, according to our interviewees, by articulating the possibilities and implications of various technological applications, the PSTW wants to become a conduit for fostering dialogue, sharing insights, and influencing broader narratives around digital transformation in the public sector. Through this dissemination of expectations, practitioners try to foster a shared orientation toward the future among public administrators, researchers, and policymakers. This *future vision of digital public administration* (Esko & Koulu, 2023), further discussed in Section 6, enthusiastically highlights the transformative potential of emerging technologies to address public sector challenges while enhancing efficiency and transparency.

General understandings, i.e., the shared ethos and sense of the practice, have remained relatively stable. Practitioners agree that mapping practices are vital for the EU's digital transformation, recognizing both their benefits (e.g., raising awareness about emerging technologies) and limitations (e.g., data quality and representativeness issues). Regular discussions help address the "many greys actually, not only about the technologies but also about who implements them… and so these discussions are quite common" (INT_05 – External Contractor), fostering collective sensemaking (Meyer, 2019) around technological and contextual nuances.

Practical understandings, or the skills and know-how required, have evolved with the formalization of the taxonomy, which has become more stable over time, leading to the outsourcing of case collection to external firms. Practitioners emphasize that categorization remains a learned skill requiring institutional memory and experience: "[Mapping emerging technologies] also requires a little bit of memory… being the living memory of the observatory is important because a lot of concepts are very grey" (INT_05 – External Contractor). This creates a tension between the need for standardized procedures and the discretion required to address complex, context-dependent cases. Despite formalization efforts, evaluations largely rest with a small group of Commission staff and external

contractors, whose judgments, shaped by tacit knowledge, are currently not peer-reviewed or externally validated, raising concerns about possible biases and transparency.

Rules governing the practice have evolved significantly, with PSTW now aligning with the Interoperable Europe Act[11] and the AI Act.[12] These policies legitimize the observatory and emphasize innovation and AI development. The Interoperable Europe Act highlights interoperability as central to the EU's digital agenda, while the AI Act fosters policy experimentation and skills development. Together, these measures have structured PSTW's approach, positioning it within broader EU policy goals, fostering collaboration, and ensuring its alignment with public sector innovation priorities.

6. Discussion – cultivating the anticipatory elements of mapping emerging technologies

This section discusses the implications of the evolution of mapping emerging technologies in the public sector into an anticipatory practice. Our analysis reveals a transformation in the PSTW, shifting from cataloging emerging technologies to actively creating, using, and sharing expectations that shape future visions of digital public administration. We argue that the PSTW is evolving into an "anticipatory knowledge hub" – a platform that not only documents emerging technologies but also tries to influence future developments and decision-making processes. This shift is particularly evident in two key developments: the introduction of the Stories section on the website and the strategic partnership with the GovTech Connect initiative.

By documenting successful implementations and emphasizing expected benefits, the PSTW Stories create a repository of future-oriented examples that highlight the transformative potential of technologies like AI, blockchain, and VR/AR. Each story includes an emphasis on *anticipated outcomes* of the solution, such as improved service delivery, enhanced interoperability, or increased efficiency. On the one hand, PSTW stories provide policymakers and practitioners with tangible examples of technological success, which can guide decision-making and inspire similar initiatives. On the other hand, stories generate momentum around emerging technologies by framing them as inevitable and beneficial, thereby mobilizing stakeholders toward adoption and investment. This excessive emphasis on success stories of emergent technology applications risks building a techno-solutionist narrative (Morozov, 2013) – the belief that technological innovation inherently offers solutions to complex societal challenges. While the PSTW formally acknowledges the importance of evaluating risks and impacts, declaring that "[p]ublic administrations should have the necessary knowledge and tools to evaluate the risks and impacts of their AI solutions, and should transparently share these evaluations with the public" (PSTW report 2/2024, p. 56), the content disseminated through the PSTW Stories often skews toward overemphasizing the benefits of emerging technologies. Although each story includes a segment highlighting the main challenges identified for each case, these predominantly concern the practicalities of implementation rather than broader risks or unintended consequences. The institutional nature of the PSTW as a European Commission initiative likely shapes this framing, prompting it to avoid critically examining Member States' policies or practices and to adopt a generally more cautious and impartial approach (Closa, 2019; Winzen, 2023). As a result, the PSTW Stories largely emphasize technological breakthroughs and transformative potential, leaving limited room for discussing systemic risks, ethical dilemmas, or social inequalities that may arise from the adoption of these technologies. Consequently, the PSTW risks shaping collective expectations and decisions in ways that favor technological optimism while limiting opportunities for more balanced and reflective discourse.

The PSTW's alignment with the GovTech Connect initiative further underscores its transition to an anticipatory practice. GovTech Connect places a strong emphasis on the creation of "strategic foresight insights [and] future-oriented policy recommendations",[13] with the aim of helping different stakeholders to "invest in Europe's GovTech future".[14] The emphasis on matchmaking and scalable solutions in GovTech Connect highlights a tendency to frame public sector challenges as opportunities for technological fixes. This can risk overshadowing discussions about whether these solutions align with long-term public values or adequately address structural and systemic issues. The strong presence of private-sector actors within the GovTech ecosystem also raises concerns. The risk of vendor lock-in, where public administrations become dependent on specific private providers, and the influence of profit-driven priorities on public decision-making deserve closer scrutiny, as they may shift power and accountability from public institutions to private entities (Bharosa, 2022).

As an "anticipatory knowledge hub", the PSTW already manages to connect actors belonging to various spheres of society on emergent technologies in the public sector. PSTW events, indeed, usually convene policymakers, researchers, and civil society actors, cultivating an intersectoral community and encouraging debate on the topic. Furthermore, PSTW's actors, like the JRC, co-produce reports based on PSTW data with academic researchers and disseminate them at academic and practitioner conferences across the EU.

Furthermore, based on the perspectives shared by the practitioners interviewed, the PSTW's mapping practice appears to hold the potential for meaningful impact, shaping behaviors, decisions, and activities across various spheres of society. First, the practice could influence future supranational policymaking by providing EU institutions with insights into technological trends and challenges. This might support the setting of legislative priorities (e.g., establishing ethical and operational standards) and help identify underserved technologies or regions requiring additional funding and support. Second, the mapping practice could influence Member States'

[11] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32024R0903 last access December 2024

[12] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1689 last access December 2024

[13] From the GovTech Connect website: https://interoperable-europe.ec.europa.eu/collection/govtechconnect/welcome-board last access 11/12/2024

[14] Name of a GovTech Connect webinar held in June, 2024 (recording available at: https://www.youtube.com/watch?v=WP2wffCtQnk&t=9s&ab_channel=GovTechConnect last access 11/12/2024)

innovation strategies, though not without risks. By observing how other countries innovate, national policymakers might identify complementary strengths and gaps, fostering cross-border knowledge-sharing. However, this dynamic could also spur competition, leading administrations to prematurely adopt emerging technologies or engage in "check-the-box" exercises, potentially overlooking their readiness for effective implementation. Third, the practice is seen as having the potential to shape research agendas by revealing trends in the adoption of emergent technologies in the public sector. This might open opportunities for the critical exploration of existing applications, especially their ethical, legal, and societal implications, while identifying new avenues for research and collaboration among universities and disciplines. Fourth, the practice may provide private sector actors with insights into market opportunities for prioritized technologies in public sector adoption. This could encourage private companies to increase R&D investments, upskill their workforce, and foster public-private partnerships. However, such dynamics might disproportionately favor large corporations over smaller players, leading to market concentration and speculative investments in overhyped technologies. Finally, the practice might enhance transparency for civil society actors (e.g., activists and journalists), enabling them to scrutinize the ethical and societal implications of emergent technologies in the public sector. This could empower these actors to raise public awareness and advocate for responsible design, development, and use. Nevertheless, excessive social pressure might deter public organizations from openly sharing their experimentation and innovation efforts, potentially hindering transparency. Whether these performative effects will translate into tangible outcomes remains a topic for further research.

7. Conclusions

This paper has analyzed the evolution of the practice of mapping emerging technologies in the public sector, using the European Commission's PSTW as a case study. A practice theory perspective made visible how mapping shifted from a descriptive to an anticipatory practice by highlighting changes in activities, materials, and organizing elements. By applying a Schatzkian practice theory lens, we showed how expectations are 1) incorporated in the internal evaluations of the public value of emerging technologies and 2) disseminated through the PSTW outputs with the aim of aligning stakeholders toward a shared vision of digital public administration. The PSTW's alignment with GovTech Connect further highlights its anticipatory orientation but also raises concerns. This transition positions the PSTW as more than a repository of emerging technologies: it increasingly appears to function as an "anticipatory knowledge hub," engaging with broader narratives of innovation in the public sector.

Our findings contribute to the growing body of literature on anticipatory practices, particularly within the context of technological innovation. This study responds to calls for a deeper exploration of how anticipatory practices evolve over time and within specific institutional contexts (Alvial-Palavicino & Konrad, 2019; Sahakian et al., 2023). By examining the PSTW's shift from earlier initiatives like AI Watch and IPSO, we provide insights into how activities, material arrangements, and organizing elements co-evolve to reflect changing institutional priorities and societal expectations. Furthermore, we enrich discussions on the anticipatory dimensions of mapping, a relatively underexplored area in foresight studies (Popper, 2012; Saritas et al., 2022). Our findings indicate how mapping practices serve as a key step within a broader set of practices that contribute to shaping collective understandings. Yet, these practices might exert both positive and negative influences on policy directions, market dynamics, research trends, and civil society advocacy efforts. By framing emerging technologies only as success stories, the PSTW disseminates a predominantly optimistic narrative that mobilizes stakeholders and resources. However, this framing risks reinforcing a narrow techno-optimistic perspective, aligning with critiques of "technological solutionism" (Morozov, 2013) and potentially marginalizing critical reflections on societal risks and ethical concerns.

Despite its contributions, the study has limitations. First, our work focuses solely on actors directly involved in the practice of mapping emerging technologies, such as PSTW practitioners. This focus was a deliberate choice to provide a detailed understanding of the internal evolution of the practice, including its activities, material arrangements, and organizing elements. While this approach allows for an in-depth exploration of how the practice has developed over time, it does not capture the perspectives of external actors, such as national policymakers, private sector representatives, and civil society organizations. Future research could complement this work by adopting a multi-actor approach to better understand how the PSTW's outputs are received, interpreted, and influence behaviors and governance structures across broader societal domains. Another limitation lies in the single-case design. While the PSTW provides a rich and complex example, mapping practices vary significantly across institutional and geographical settings. Comparative studies involving other initiatives, such as the OECD's Observatory of Public Sector Innovation or national AI repositories, could shed light on how different institutional logics, cultural contexts, and policy priorities influence the design and outcomes of mapping practices. Additionally, our study primarily focused on the anticipatory aspects of mapping; future work could investigate the interplay between these anticipatory elements and other dimensions of public sector innovation, such as accountability, equity, and inclusivity (Ubaldi et al., 2019).

In conclusion, this paper lays the groundwork for future research on the evolving expectations surrounding the EU's practice of mapping emerging technologies in the public sector. We suggest that fostering greater reflexivity and adopting a more pluralistic approach to mapping could help practitioners move beyond linear narratives of progress, creating room for more diverse, inclusive, and critically engaged visions of technological futures. This shift holds the potential to transform mapping into a tool not just for documenting innovation but for critically imagining and co-creating pathways toward a more just and sustainable digital public sector.

CRediT authorship contribution statement

Veneziano Michele: Writing – original draft, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Gerli Carolina:** Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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Appendices

A. List of Interviewees

Table 2
List of people interviewed with sectors affilitation and interview dates.

CODE	SECTOR	DATE OF INTERVIEW
INT_01	EU Commission	6/05/2024
INT_02	External Contractor	6/05/2024
INT_03	EU Commission	8/05/2024
INT_04	External Contractor	31/05/2024
INT_05	External Contractor	31/05/2024
INT_06	External Contractor	31/05/2024
INT_07	EU Commission	10/06/2024
INT_08	EU Commission	18/06/2024
INT_09	EU Commission	01/08/2024

B. List of Documents Analyzed

Table 3
Analyzed documents list with document type, URL and DOC code.

NAME	DOCUMENT TYPE	URL	DOC CODE
AI Watch - Artificial Intelligence in public services	Science for Policy	https://publications.jrc.ec.europa.eu/repository/handle/JRC120399 (last access: December 2024)	AI Watch report 2020
AI Watch. European landscape on the use of Artificial Intelligence by the Public Sector	Science for Policy	https://ai-watch.ec.europa.eu/publications/ai-watch-european-landscape-use-artificial-intelligence-public-sector_en (last access: December 2024)	AI Watch report 2022
Public Sector Tech Watch Mapping Innovation in the EU Public Services	EU Publication	https://joinup.ec.europa.eu/collection/public-sector-tech-watch/document/collective-effort-exploring-applications-artificial-intelligence-and-blockchain-public-sector (last access: December 2024)	PSTW report 1/2024
Methodology for the Public Sector Tech Watch Use Case Collection	EU Publication	https://interoperable-europe.ec.europa.eu/collection/public-sector-tech-watch/document/methodology-public-sector-tech-watch-use-case-collection (last access: December 2024)	PSTW method 2024
Public Sector Tech Watch Adoption of AI, Blockchain and other emerging technologies within the European public sector	EU Publication	https://interoperable-europe.ec.europa.eu/collection/public-sector-tech-watch/document/public-sector-tech-watch-adoption-ai-blockchain-and-other-emerging-technologies-within-european (last access: December 2024)	PSTW report 2/2024

C. Visualization of the Process of Maintainance of the PSTW Repository

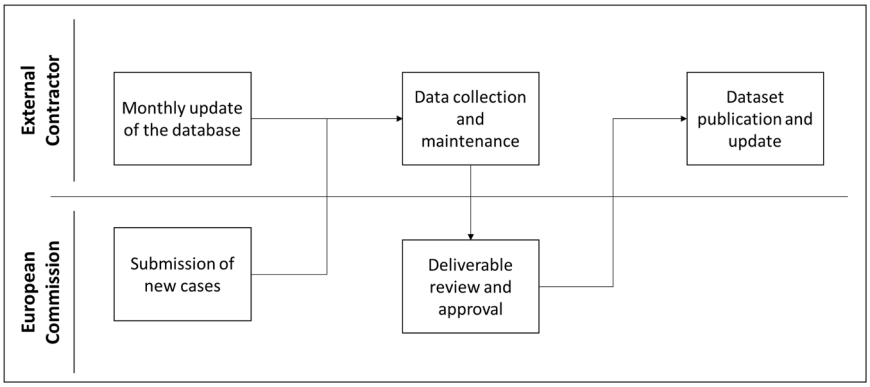

Fig. 2. Process of maintainance of the PSTW repository (authors' elaboration).

D. Interview Guides

Interviewees participating the PSTW practice now or in the past (EU COMMISSION/EXTERNAL CONTRACTOR)

BACKGROUND OF THE INTERVIEWEE
1) What is your role in the PSTW project?

DESCRIPTION OF PSTW
2) How does PSTW work?
3) What are the tools that you use to map emerging technologies in the public sector?
4) How did the project evolve over time?
   a. How did the project start in the first place?
   b. Have you encountered any roadblocks on the way?
5) How many people are involved?
   a. Do you think the number is enough to ensure the project's sustainability?
6) What are the prospects for PSTW in the near future?

MAPPING OF EMERGING TECHNOLOGIES IN THE PUBLIC SECTOR
7) Why is it important to map emerging technologies in the public sector?
8) What are the difficulties of mapping emerging technologies?

CONCLUSIONS
9) Is there anything we haven't discussed so far that you want to add?
10) Are there any other people involved either in PSTW or in the broad topic of emerging technologies in the public sector we should talk to?

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