DOCTORAL CONSORTIUM

MEASURING SMART PUBLIC GOVERNANCE MATURITY IN PUBLIC ADMINISTRATION INSTITUTIONS: A MULTI-ATTRIBUTE APPROACH

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The paper conceptualizes a multi-attribute model based on the design science approach for measuring smart public governance maturity in public administration institutions. This is achieved on the basis of a systematic literature review (i.e. content analysis) of Web of Science and Scopus records. The SPG attributes or criteria elicited from these two databases are integrated into a decision support model, thus setting the layout of a multi-attribute model for measuring smart public governance maturity in public administration institutions. The final model conceptualized here consists of 29 attributes or criteria grouped into four categories: (ICT)-enabled governance innovation in the public sector, inter-organisational changes, changes in citizen-government interaction, and outcome–public value creation.

Keywords:
design science research; public administration institutions; maturity; multi-attribute model; smart public governance

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1 Introduction and Problem Definition

In this paper, we present a design of a multi-attribute model based on the design science approach for measuring smart public governance maturity in public administration institutions. The need for such a model emerges in a context where various governments and societies across the globe see a possibility to address rapidly changing socio-economic pressures and complex public policy problems by adopting the 'smart public governance' (SPG) concept (Šiugždiniene et al., 2017). However, the label SPG is a fuzzy concept (Lin, 2018; *cf. Table 1 in Appendix for a selection of various SPG definitions*), and the absence of a commonly accepted SPG definition makes measuring SPG difficult. For the purpose of this paper, the working definition of SPG is as follows: smart public governance is a process based on the use of ICT's or in today's times adoption of various smart "disruptive" technologies (e.g., big data, Internet of Things, and artificial intelligence) (Zhao & Zou, 2021; Zhu & Kou, 2019; Jiang et al., 2019; Pereira et al., 2018) to upgrade (modernise) traditional (bureaucratic or hierarchical) administrative systems (e.g., institutional change – dismantling old department/institutional silos) (Meuleman, 2021; Scott & Gong, 2021; Hansen, 2014; Bannister, 2001), involving new forms of multi-actor collaboration and participation (Popova & Popovs, 2023; Šiugždiniene et al., 2017; Bolivar & Meijer, 2016; Willke, 2007) in decision-making processes (Jiang et al., 2022; Örselli et al., 2022; Demirel & Mülazımoglu, 2021; Scholl & AlAwadhi, 2016), with a focus on outcomes (e.g., creating public value) (Criado & Gil-Garcia 2019; Webster & Leleux, 2018; Albino et al., 2015; Batagan 2011; Gil-Garcia, 2012). Such a holistic definition affirms that SPG must be seen as a transformative and socio-technical governance approach (Jucevicius & Juceviciene, 2018) and not solely techno-centric focused.

Over the last decade, scholars in the smart city (SC) research domain have increasingly turned their attention to SPG, referring to smart city governance (SCG), smart urban governance, and/or smart local governance (e.g., Jiang et al., 2022; Criado & Gil-Garcia, 2019; Pereira et al., 2018; Scholl & AlAwadhi, 2016; Meijer & Bolivar, 2015). However, SPG does not follow the same maturity process as the SC (Anthopoulos et al., 2021). Therefore, there's a gap in research regarding its application and maturity in broader governance contexts – especially in the context of public administration institutions. And, despite the sizeable opportunity of the SPG concept, challenges for public governance systems to become or be smart

exceed the scope of their current capacities. A limited quantity of either theoretical frameworks, toolboxes or roadmaps and models to measure SPG have been put forward in literature by scholars (notably Ruijer et al., 2023; Lin, 2018; Šiugždiniene et al., 2017; Bolivar & Meijer, 2016; Scholl & Scholl, 2014). However, they are not directly useful (applied or practical) approaches for measuring the maturity of SPG. Therefore, a more holistic approach that identifies attributes (criteria) of SPG (as discussed in this paper) appears to be lacking. To provide the conceptual design for measuring SPG maturity in public administration institutions, this paper is guided by the following research question: *which attributes (also criteria) correspond to the aspect (i.e. the subject/area) should be considered when measuring the maturity of SPG in public administration institutions?*

By answering the research question, the paper endeavours to add clarity and rigor to the ongoing debate by proposing a practical tool, the multi-attribute model, designed to measure the maturity of SPG in public administration institutions. To provide an as clear as possible elaboration of our model's conceptual design, we have structured the paper into four sections. In the next section, we present the methodological framework based on content analysis of Web of Science and Scopus records. In addition, in the third section, we present the results of the content analysis studies – the list of SPG attributes (criteria), which are used for the structure of the multi-attribute model for measuring smart public governance maturity in public administration institutions. Finally, in the last section, we discuss open questions that need to be taken into consideration by future research.

2 Methodology

2.1 SPG attributes (criteria)

2.1.1 Content analysis of the Web of Science (WoS) and Scopus records

In the search for an answer to the research question, a content analysis of the WoS and Scopus records was conducted in order to identify SPG attributes (criteria).

The list of attributes (criteria) for the SPG multi-attribute model was gathered from:

- A structured literature review, i.e., content analysis of WoS and Scopus papers. The selection of papers has been performed on the basis of the following criteria:
    - time-span of the records: 8 years, between 2015 and 2023,
    - including terms (in title, abstract and keywords): "smart public governance" OR "smart governance" OR "smart city governance" OR "smart urban governance" OR "smart local governance" OR "smart public administration" AND "indic*" OR "meas*" OR "defin*" OR "tool" OR "empirical analysis" OR "model" OR "framework",
    - type: article,
    - written in the English language.

The content analysis focused on SPG and its associated/related terms. Despite representing different scopes of governance (e.g., state versus city or regional), these terms are often used synonymously (Vujković & Jukić, 2023). Restricting the analysis exclusively to records specifically referencing SPG would have excluded significant data about SPG attributes (criteria).

Using this criteria, 427 records were initially identified. After a thorough review to eliminate duplicates, 242 records remained. A screening process, which involved examining the introduction, literature review, and conclusions of each record, determined that 80.9% did not meet two crucial inclusion criteria – the paper needs to:

- have definitions or interpretations of the following essential terms: smart public governance, smart city governance, smart urban governance, smart local governance, smart public administration, OR
- coverage essential foundational components (building blocks), including attributes (criteria), indicators, elements, dimensions, and measurement tools (models, theoretical and conceptual frameworks).

Ultimately, 46 records (10.7%) qualified for in-depth analysis. This stage involved a second, detailed review of the full papers to extract definitions/interpretations of terms and a comprehensive list of SPG attributes for a multi-attribute model. On this basis, 29 subordinate and 13 single-parent SPG attributes (criteria) were

identified. Table 1 presents a detailed list of the SPG attributes (criteria) and information about the source of each attribute.

Table 1: List of SPG attributes (criteria) according to their source

Attribute (criteria)	Source
1. (ICT)-enabled governance innovation in the public sector	Lindgren & Veenstra (2018); Pereira et al. (2018); Lin (2018); Bolivar & Meijer (2016)
1.1. Present IT infrastructure – the basis for the use of emerging technologies in PA	DESI (2023); Lin (2018); Bolivar & Meijer (2016); Scholl & Scholl (2014)
1.2. The use of emerging technologies in PA	Ruijer et al. (2023); Ronzhyn et al. (2019); Brennan et al. (2019); Lindgren & Veenstra (2018); Lin (2018); Bolivar & Meijer (2016); Scholl & Scholl (2014)
1.2.1. Artificial intelligence in PA – impact, use and presence	Mergel et al. (2023); Van Noordt & Misuraca (2022); Newman et al. (2022); Misuraca & Van Noordt (2020); Choi et al. (2021); Craglia et al. (2018)
1.2.1.1. The impact of artificial intelligence to automate routine processes	Savignon et al. (2024); Giest & Klievink (2024); Van Noordt & Misuraca (2022); Newman et al. (2022); Kolkman (2020); Misuraca & Van Noordt (2020); Veale & Brass (2019); Mikalef et al. (2019); Brennan et al. (2019); Arntz et al. (2016); Kostoff (2004); Danziger & Andersen (2002); Bovens & Zouridis (2002)
1.2.1.2. Using artificial intelligence to improve public services	Savignon et al. (2024); Giest & Klievink (2024); Willems et al. (2023); Van Noordt & Misuraca (2022); Misuraca & Van Noordt (2020); Pencheva et al. (2020); Okuyucu & Yavuz (2020); Veale & Brass, (2019); Mikalef et al. (2019); Veenstra et al. (2019); Kim & Cho (2017)
1.2.1.3. Using artificial intelligence for decision-making	Van Noordt & Misuraca (2022); Misuraca & Van Noordt (2020); Pencheva et al. (2020); Okuyucu & Yavuz (2020); Veale & Brass (2019); Mikalef et al. (2019); Veenstra et al. (2019); Vydra & Klievink (2019); Kim & Cho (2017)
1.2.1.4. Use of virtual assistants (chatbots/talkbot/interactive agent) to support the provision of information	Misuraca & Van Noordt (2020); Androutsopoulou et al. (2019); Cooper et al. (2018)
1.2.2. Cloud computing utilization in PA organisations – data lakes for data collection	Ramos et al. (2023); Miloslavskaya & Tolstoy (2016)
1.2.3. Presence of innovation labs for testing emerging technologies	Favoreu et al. (2024); Bartelt et al. (2020); Tõnurist et al. (2017)
1.3. Using data for the transformation of traditional PA to smart PA	Ruijer et al. (2023); Newman et al. (2022); Fridriksson (2018); Scholl in Scholl (2014)
1.3.1. Big data in PA – state of art, use and effects	Scholl in Scholl (2014)
1.3.1.1. Transformation of (traditional) data warehouses into an efficient data warehouse	Dibouliya (2023); Bouaziz et al. (2017)
1.3.1.2. Data administrators' skills and expertise in handling big data	Abuljadail et al. (2023); Campion et al. (2022); Kreuter et al. (2019); Sarker et al. (2018); Fridriksson (2018)
1.3.1.3. The impact of big data on the policy cycle – from process orientation toward performance orientation	Van Noordt & Misuraca (2022); Pencheva et al. (2020); Veale & Brass (2019); Mikalef et al. (2019);

Attribute (criteria)	Source
	Vydra & Klievink (2019); Höchtl et al. (2018); Lin (2018); Bolivar & Meijer (2016)
1.3.1.4. The use of data analytics as support in decision-making	Valle-Cruz & Garcia-Contreras (2023); Van Noordt & Misuraca (2022); Okuyucu & Yavuz (2020); Pencheva et al. (2020); Vydra & Klievink (2019); Fridriksson (2018); Höchtl et al. (2018); Janssen et al. (2017); Šiugzdiniene et al. (2017); Becker (2016); Margel et al. (2016); Bolivar & Meijer (2016); Desouza & Jacob (2014)
1.3.2. Open and accessible data in PA	Scholl in Scholl (2014)
1.3.2.1. Country open data policies and strategies	Page et al. (2023)
1.3.2.2. Monitoring and measuring open data reuse and impact	Page et al. (2023)
1.3.2.3. Assessing portal functions and features that enable users to access open data	Page et al. (2023)
1.3.2.4. The quality of the (meta)data	Page et al. (2023)
1.4. Privacy and cyber security	Willems et al. (2023); Ruijer et al. (2023); Campion et al. (2022); Romansky & Noninska (2020); Lin (2018); Angelopoulos et al. (2017); Bolivar & Meijer (2016); Margel et al. (2016); Janssen & Hoven (2015); Scholl & Scholl (2014); Bertot & Choi (2013)
2. Inter-organisational changes	Giest & Klievink (2024); Newman et al. (2022); Wimmer et al. (2020); Lin (2018); Bolivar & Meijer (2016); Scholl & Scholl (2014); Andersen et al. (2010)
2.1. Renewal of structural arrangements	Ruijer et al (2023); Ruhlandt (2018); Lin (2018); Bolivar & Meijer (2016); Scholl & AlAwadhi (2016); Milakovich (2011)
2.1.1. Establishment of connected organisational structure and dismantling old structures – institutional/department silos	Giest & Klievink (2024); Newman et al. (2022); Meuleman (2021); Scott & Gong (2021); Scott (2020); Šiugzdiniene et al. (2017); Hansen (2014); Navarra & Cornford (2005); Marche & McNiven (2003); Bovens & Zouridis (2002); Bannister (2001)
2.1.2. Collaborative culture – passage of mental silos "state of mind"	Ruijer et al. (2023); Meuleman (2021); Tett (2014); Cilliers & Greyvenstein (2012)
2.2. Streamlining intra-organisational processes – inter-departmental and inter-institutional collaboration	Ruijer et al. (2023); Yahia et al. (2021); Ruhlandt (2018); Söderström et al. (2018); Lin (2018); Šiugzdiniene et al. (2017); Pereira et al. (2017); Scholl & AlAwadhi (2016); Nam & Pardo (2014); Scholl & Scholl (2014); Xiao et al. (2013); Chun et al. (2012)
2.2.1. Established interoperable digital environment (or platform) for inter-institutional and inter-departmental collaboration	Interoperable Europe Academy (IOPEU Academy); Ruijer et al. (2023); Šiugzdiniene et al. (2017); Bolivar & Meijer (2016); Scholl & Scholl (2014)
2.2.2. Training and education opportunities for civil servants to develop collaborative skills	Ruijer et al. (2023); Šiugzdiniene et al. (2017); Scholl & Scholl (2014); Bouckaert et al. (2010)
2.2.3. Facilitate leadership – leaders act like policy entrepreneurs – they promote new ideas, encourage innovations, and build trust in the team	Rackwitz et al. (2024); Ruijer et al. (2023); Sørensen et al. (2021); Giulio & Vecchi (2021); Meerkerk (2019); Sørensen & Torfing (2019); Šiugzdiniene et al. (2017); Torfing & Ansell (2016); Ansell & Gash (2012, 2008)
3. Changes in citizen-government interaction	Wimmer et al. (2020); Lin (2018); Šiugzdiniene et al. (2017); Bolivar & Meijer (2016); Scholl & Scholl (2014); Andersen et al. (2010)
3.1. Streamlining of external processes – collaboration and participation	Ruijer et al. (2023); Meerkerk (2019); Ruhlandt (2018); Lin (2018); Šiugzdiniene et al. (2017); Pereira et al. (2017); Bolivar & Meijer (2016); Scholl & Scholl

Attribute (criteria)	Source
	(2014); Nam & Pardo (2014); Cano (2014); Chun et al. (2012)
3.1.1. Established collaboration tools for participation with external stakeholders	Ruijer et al. (2023); Šiugzdiniene et al. (2017); Bolivar & Meijer (2016); Scholl & Scholl (2014)
3.1.2. Collaborative decision-making –taking into account citizens' opinions and proposals	Riduan (2024); Guillaumie et al. (2024); Van Noordt & Misuraca (2022); Meerkerk (2019); Cardullo & Kitchin (2019); Chen & Aitamurto (2019); Lin (2018); Šiugzdiniene et al. (2017); Bolivar & Meijer (2016); Scholl & Scholl (2014); Cunha et al. (2013)
4. Outcome – public value creation	Meynhardt (2022); Hartley et al. (2019); Neumann et al. (2019); Ruhlandt (2018); Lin (2018); Faulkner & Kaufman (2017); Scott et al. (2016); Bolivar in Meijer (2016); Pang et al. (2014); Benington & Moore (2011); Williams & Shearer (2011); Meynhardt (2009); Moore & Khagram (2004); Moore (1995)
4.1. Public service quality provision capability – improved efficiency and effectiveness of public service production	Šiugzdiniene et al. (2017); Scott et al. (2016); Pang et al. (2014); Alford & Hughes (2008); Moore (1995)
4.2. Citizen engagement capability – public administrations identify and respond more quickly to citizens' aspirations	Rasmussen & Rehe (2023); Wilson & Knighton (2021); Faulkner & Kaufman (2017); Pang et al. (2014); Talbot & Wiggan (2010); Stoker (2006)
4.2.1. Citizen participation in policy-making and improved democracy	Rasmussen & Rehe (2023); Wilson & Knighton (2021); Faulkner & Kaufman (2017); Šiugzdiniene et al. (2017); Pang et al. (2014); Talbot & Wiggan (2010); Stoker (2006)
4.2.2. Increased transparency of public administration operations – citizens have better access to government information	Twizeyimanaa & Andersson (2019); Castro & Lopes (2022); Lin (2018); Šiugzdiniene et al. (2017); Bolivar & Meijer (2016)
4.2.3 Co-creation capability delivering more inclusive public services that are citizen-centred and tailored to citizens' needs	Regal et al. (2024); Li & Shang (2023); Vrbek & Jukić (2023); Jukić & Vrbek (2023); Jukić et al. (2021); Torfing et al. (2021); Sørensen et al. (2021); Meerkerk (2019); Torfing et al. (2019); Twizeyimanaa & Andersson (2019); Lindsay et al. (2018); Voorberg et al. (2014); Bovaird et al. (2014); Alves (2013); Hellang & Flak (2012); Jansen (2012); Bason (2010)
4.2.4. Trust and legitimacy – increase citizens' trust in public administration operations and recognition of legitimacy	Castro & Lopes (2022); Wilson & Knighton (2021); Twizeyimanaa & Andersson (2019); Pereira et al. (2017); Šiugzdiniene et al. (2017); Faulkner & Kaufman (2017); Talbot & Wiggan (2010); Stoker (2006)

Once the list of SPG attributes (criteria) was completed, we identified the common denominator of attributes (criteria), namely the subject/area (e.g., the role of ICT and emerging technologies, the evolving nature of data, internal structural and procedural adjustments, changes in public administration interactions with citizens, and outcomes). Hence, this aspect (i.e. the subject/area) was taken as the key criterion for the categorization of the SPG attributes (criteria) in the following four categories:

- (ICT)-enabled governance innovation in the public sector;
- inter-organisational changes;
- changes in citizen-government interaction;
- outcome – public value creation.

3 Preliminary Results and Discussion

3.1 Summary of attributes based on four categories

3.1.1 (ICT)-enabled governance innovation in the public sector

In the general discourse on public administration (PA) transformation, the development of information and communication technology (ICT) is seen as an enabler or even a driver of (digital) transformation (Lindgren & Veenstra, 2018). To discuss what this means in practice in the case of PA, 'current IT infrastructure, the use of new emerging "disruptive" technologies, data, privacy and cyber security' have been identified as attributes (criteria) of the first category '(ICT)-supported innovation in public sector'.

In the past, the public sector has lagged behind the private sector in ICT adoption (Wimmer et al., 2020; Ndou, 2004). Therefore, despite some technological advances in PA (both in research and in practice), knowledge of the actual effects of digitisation on changes in PA (resulting from the development and use of ICT) remains scarce. In this regard, Meijer (2014) noted that most scholars from the social science domain do not pay enough attention to the role of ICTs in PA. They seem to be rather reserved in this context, and research on the impact of ICTs on PA remained limited.

But the development of new emerging "disruptive" technologies – which have emerged in recent years – has forced PA to transform (Ronzhyn et al., 2019). Examples of technologies that "disrupt"[1] the traditional or bureaucratic (hierarchical) approach of public sector operations most commonly includes artificial intelligence (AI), machine learning and big data (Brennan et al., 2019). For

[1] "disrupt" means causing major technology-related shifts and, therefore, interrupting established processes and operations. This may be caused because of a new combination of existing technologies or entirely new technologies that are becoming integrated into PA (Brennan et al., 2019; Kostoff et al., 2004).

public sector organisations, this means changes in internal structures and processes and changes in the way PA interact with citizens (Wimmer et al., 2020; Andersen et al., 2010). Changes in the public sector are, therefore, very much linked to the development of ICT. Although the use of ICT in PA is becoming more common, from the relatively simple automation of routine work by civil servants (screen-level bureaucrats) to more sophisticated and complex applications that support the performance of administrative tasks (Danziger & Andersen, 2002; Bovens & Zouridis, 2002), both scholars and practitioners commonly agree that the evidence of actual improvements in the performance of PA remains still rather scarce (Misuraca & Viscusi, 2015).

An important task of all PA organisations is the collection, processing, storage and sharing of information (Janssen et al., 2017; Janssen & Hoven, 2015). And, while public sector information is the main source of big data, PA is the main storehouse of such data. Citizens, in turn, play the role of big data generators (Abuljadail et al., 2023). It is important to note that the public sector had been collecting, storing, and processing data for at least a decade before the development of ICT. However, the rapid development of ICT (and the rise of emerging "disruptive" technologies) has increased the amount of this data, bringing new challenges to the public sector (Fredriksson et al., 2017). And while the private sector is making significant progress in the use and analysis of big data, the public sector seems to be falling behind once again (Rogge et al., 2017; Munne, 2016; Desouza & Jacob, 2014).

However, public sector stakeholders have already recognised that better use of big data would bring many benefits to the public sector (Klievink et al., 2017; Munne, 2016). Key ones include improving the efficiency and effectiveness of PA organisations, improving public service delivery and better support in data-driven decision-making (Pencheva et al., 2020; Okuyucu & Yavuz, 2020; Veenstra et al., 2019; Kim & Cho, 2017). However, the major problem that big data brings to the public sector seems to be its governance (Chen & Hsieh, 2014). PA organisations face the challenges of a lack of analysts who know how to process and analyse information in real-time and outdated technological equipment for processing and storing big data (Abuljadail et al., 2023; Sarker et al., 2018). In addition, the huge amounts of data collected within the public sector are typically fragmented (or localised) within PA institutions and their departments. And because PA organisations operate as separate departmental and functional bureaucratic units

(silos), the fragmentation of data sources (and the related lack of data sharing) hinders the use of big data for modelling, real-time problem analysis and support for data-driven decision-making (Okuyucu & Yavuz, 2020; Janssen et al., 2017; Becker, 2016; Margel et al., 2016; Desouza & Jacob, 2014).

In addition, the rapid growth of ICT has changed (i.e., transformed) access to information. Whereas in the past, public records were available and not exactly accessible to the general public, today, we live in an era where data is freely accessible (Margel et al., 2016; Janssen & Hover, 2015). This shift towards open data enables new ways of collaboration between governmental and non-governmental stakeholders, as well as civil society (citizens), which in the digital age expects public services to be more efficient and PA organisations to be more responsive and transparent in their operations. However, despite the public sector opening up its databases to the public and thereby contributing to democratic principles, understanding the impact of open data on the public sector remains surprisingly narrow (Meijer et al., 2014).

Recently, breakthroughs in machine learning and the amount and availability of data have encouraged PA organisations to consider integrating (or adopting) AI into their processes and activities (Mergel et al., 2023; Craglia et al., 2018). Yet, although several fields are involved in AI research, very little is known about the use of AI in PA (Bailey & Barley, 2019). As Van Noordt and Misuraca (2022) note, a negligible number of public sector organisations in Europe have already started to use AI. And while this is partly due to the challenges of introducing new "disruptive" technologies into established work processes (Kolkman, 2020), Margetts and Dorobantu (2019), on the other hand, argue that PAs have not even begun to engage with AI in a comprehensive and consistent way.

The situation is different in the academic realm, where "optimism" prevails about the impact of AI on PA, as its implementation is expected to bring tangible improvements in the functioning of PA organisations. The biggest advances are expected to be in the large-scale automation of routine processes, more efficient delivery of public services, increased efficiency in data-driven decision-making and related improvements in public policymaking (Van Noordt & Misuraca, 2022; Veale & Brass, 2019; Mikalef et al., 2019). Indeed, AI technology in public policymaking follows the traditional public policy-making cycle, with the difference that public

policymaking is data-based and policy decision-making, therefore, becomes more data-driven and based on better analytics that is accurate and less uncertain (Van Noordt & Misuraca, 2022; Vydra & Klievink, 2019). Key benefits of using AI in this context include not only increased efficiency and effectiveness of PA organisations but also increased legitimacy in public policymaking processes (Van Noordt & Misuraca, 2022; Pencheva et al., 2020). As AI also enables new ways of collaboration (participation) between government stakeholders and civil society (citizens), its use is expected to contribute to a more open and participatory policymaking process. This would, therefore, facilitate the analysis and consideration of public opinions, views and demands of citizens, allowing policymakers to better address societal needs and preferences (Van Noordt & Misuraca, 2022; Cardullo & Kitchin, 2019; Chen & Aitamurto, 2019).

Although we have discussed some promising theoretical perspectives on AI in PA, we should point out that there is currently still no solid empirical basis to support these theories (Van Noordt & Misuraca, 2022; Kuziemski & Misuraca, 2020). The problems and challenges associated with using AI often overshadow its benefits (Zuiderwijk et al., 2021). Theoretical studies on AI that dominate the public sector governance literature (Mergel et al., 2023), therefore, often focus on specific AI applications, such as the use of virtual assistants (e.g., chatbots/talkbot/interactive agent) that provide information and assistance to users of government platforms (Androutsopoulou et al., 2019). Or on discussions about the potential challenges that surround the adoption of AI, including gaps in the skills required and risks to data privacy and security (Campion et al., 2022).

Therefore, with the obvious development of ICT and the associated benefits, privacy and security concerns should not be overlooked (Margel et al., 2016; Bertot & Choi, 2013). Privacy and security are constantly in motion due to the development of emerging "disruptive" technologies (Romansky & Noninska, 2020). While privacy represents a fundamental value for maintaining democracy, unrestricted data collection can threaten democratic principles (Romansky & Noninska, 2020; Janssen & Hoven, 2015). In light of this, PA organisations must follow privacy and security policies that align with legislation when processing data collected from citizens (Angelopoulos et al., 2017). And if the fragmentation (or localisation) of the PA into separate departmental and functional units (silos), on the one hand, hinders the use of big data for modelling, real-time problem analysis and (policy) decision support

in terms of privacy and security, it allows storing data in isolated departments – commonly referred to as silos. This prevents unauthorised access by civil servants to all the information collected (i.e., citizen's data), further enhancing data security (Janssen & Hoven, 2015).

Table 2: Attributes (criteria) of the model based on the first category, '(ICT)-enabled governance innovation in the public sector'

Attributes deriving from the (ICT)-enabled governance innovation in the public sector	Attribute number
Present IT infrastructure – the basis for the use of emerging technologies in PA)	1.1.
The use of emerging technologies in PA)	1.2.
Artificial intelligence in PA – impact, use and presence)	1.2.1.
The impact of artificial intelligence to automate routine processes)	1.2.1.1.
Using artificial intelligence to improve public services)	1.2.1.2.
Using artificial intelligence for decision-making)	1.2.1.3.
Use of virtual assistants (chatbots/talkbot/interactive agent) to support the provision of information)	1.2.1.4.
Cloud computing utilization in PA organisations – data lakes for data collection)	1.2.2.
Presence of innovation labs for testing emerging technologies)	1.2.3.
Using data for the transformation of traditional PA to smart PA)	1.3.
Big data in PA – state of art, use and effects)	1.3.1.
Transformation of (traditional) data warehouses into an efficient data warehouses)	1.3.1.1.
Data administrators' skills and expertise in handling big data)	1.3.1.2.
The impact of big data on the policy cycle – from process orientation toward performance orientation)	1.3.1.3.
The use of data analytics as support in decision-making)	1.3.1.4.
Open and accessible data in PA)	1.3.2.
Country open data policies and strategies)	1.3.2.1.
Monitoring and measuring open data reuse and impact)	1.3.2.2.
Assessing portal functions and features that enable users to access open data)	1.3.2.3.
The quality of the (meta)data)	1.3.2.4.
Privacy and cyber security)	1.4.

It is true, however, that we live in a digital age where data can be accessed from many sources. The volume of information collected about individuals and organisations is changing "traditional" understandings of privacy and security. As a result, privacy and security are being transformed, with younger generations now revealing much more about their lives than older generations, which in turn leads to a changed perception of what is considered private and secure in the digital age (Janssen & Hoven, 2015).

3.1.2 Inter-organisational changes

'Renewal of structural arrangements' and 'streamlining intra-organisational processes – inter-departmental and inter-institutional collaboration' have been identified as attributes (criteria) of the second category of 'intra-organisational change' (Ruhlandt, 2018; Scholl & AlAwadhi, 2016).

Many PA organisations typically operate as traditional bureaucracies, organising their tasks by breaking down complex issues into simpler sub-problems. These sub-problems are then handled by separate departmental and functional units (silos). Civil servants usually remain confined within a single silo, which, while providing a structured work environment, can hinder effective collaboration both internally and externally. The latter is why the word 'silo' generally has a negative connotation (Meuleman, 2021; Scott & Gong, 2021; Hansen, 2014; Bannister, 2001). It is important to note that 'silo' is not limited only to physical structures (department) but can also refer to a mental attitude (Tett, 2014), leading to tunnel vision and resistance to change among civil servants who believe their approach is not only the best but also the sole solution to the problem (Meuleman, 2021). In Europe, recognising the issues arising from silos has been a driving force behind PA reforms (Scott, 2020; Navarra & Cornford, 2005). Therefore, structural change represents a shift from the traditional 'silo' approach, fostering the creation of connected organisational structures and promoting a culture of collaboration (passage of mental silos ″state of mind″).

Intra-organisational change is also linked in the literature to the streamlining (or improvement) of processes. It illustrates the response of public sector organisations to modernisation, including digitisation (i.e. changes, transformations or improvements implemented within the public organisation itself) and its consequences (i.e. innovations in the way public services are delivered, as well as changes in the way citizens interact with public sector organisations).

Table 3: Attributes of the model based on the second category, 'inter-organisational change'

Attributes deriving from the inter-organisational change	Attribute number
Renewal of structural arrangements	2.1.
Establishment of connected organisational structure and dismantling old structures – institutional/department silos	2.1.1.
Collaborative culture – passage of mental silos ″state of mind″	2.1.2.
Streamlining intra-organisational processes – inter-departmental and inter-institutional collaboration	2.2.
Established interoperable digital environment (or platform) for inter-institutional and inter-departmental collaboration	2.2.1.
Training and education opportunities for civil servants to develop collaborative skills	2.2.2.

When considering organisational change within the public sector, it is essential to highlight the significance of collaboration among different departments and organisations within the sector. This form of collaboration, known as internal collaboration, involves coordinated and cooperative efforts between various departments within an organisation (inter-departmental collaboration) or between different PA organisations (inter-institutional collaboration) (Pereira et al., 2017). Similarly, Yahia et al. (2021) use the term "collaborative networks" to describe various forms of internal collaboration. The government (as executive authority) plays a crucial role in pursuing streamlining (or improving) these collaborative efforts. By establishing a digital environment or platforms, the government can facilitate and encourage mutual collaboration and the exchange of information and knowledge between PA organisations and their departments (Šiugzdiniene et al., 2017). As Bouckaert et al. (2010) pointed out over a decade ago, successful internal collaboration also hinges on adopting collaborative approaches and cohesive working methods among civil servants. Consequently, it is imperative to organise

regular education and training programs for civil servants, particularly developing collaborative competencies (skills), as highlighted in recent literature (Šiugzdiniene et al., 2017).

3.1.3 Changes in citizen-government interaction

'Streamlining of external processes – collaboration and participation' has been identified as an attribute (criteria) of the third category of 'changes in citizen-government interaction' (Šiugzdiniene et al., 2017).

External collaboration involves the participation of governmental and non-governmental stakeholders, such as private stakeholders, academic institutions, and civil society (Ruhlandt, 2018; Pereira et al., 2018). External participation, therefore, refers to the participation of citizens – as individual forms of participation (citizens who are either individually participating) or in more or less organised groups (associative forms) (Meerkerk, 2019). External participation is considered a (dynamic) process (Ruhlandt, 2018; Bolivar & Meijer, 2016; Cano, 2014) that has been shaped or created by technology for a decade. It has enabled new ways of consultation and dialogue (or reflection) between government and citizens and changed (or transformed) citizen participation in consultation and decision-making processes (Cunha et al., 2013).

Collaboration between government and citizens can be initiated from both top-down (government-driven) and bottom-up (citizen-driven) approaches, as explained by Meerkerk (2019). Regarding top-down collaboration, the literature frequently discusses two primary directions, (i) direct involvement of citizens in the design, implementation, and decision-making processes of public policies, and (ii) co-creation of public services, where citizens take on roles as co-implementers, co-designers, or initiators (Voorberg et al., 2014; Bovaird et al., 2014). In the context of top-down collaboration, the critical factors are citizens' trust, willingness, and motivation to participate.

Conversely, bottom-up collaboration centres on community-led initiatives to address common needs. While Meerkerk (2019) emphasises the importance of facilitative leadership in this context, Šiugzdiniene et al. (2017) frame this process more regarding internal collaboration. According to them, facilitative leadership

involves supporting and enabling public servants to develop and apply their skills and competencies. Leaders in this role act as "political entrepreneurs" by encouraging innovation, promoting new ideas, tolerating mistakes, facilitating dialogue, and fostering trust within their teams.

Table 4: Model's attributes based on the third category, 'changes in citizen-government interaction'

Attributes deriving from changes in citizen-government interaction	Attribute number
Streamlining of external processes – collaboration and participation	3.1.
Established collaboration tools for participation with external stakeholders	3.1.1.
Collaborative decision-making –taking into account citizens' opinions and proposals	3.1.2.
Facilitate leadership – leaders act like policy entrepreneurs – they promote new ideas, encourage innovations, and build trust in the team	2.2.3.

3.1.4 Outcomes – creating public value

The concept of public value (PV) was initiated by Moore (1995), or rather by his idea of how to guide public managers in creating public value. His thinking was that public organisations should be equivalent to private organizations, where private managers create private (economic) value for their customers (Hartley et al., 2019; Benington & Moore, 2011). The symbol of this idea became a "strategic triangle", which helps public managers focus their attention on three complex issues they need to consider before committing themselves and their organizations to a particular course of action (Benington & Moore, 2011; Moore & Khagram, 2004):

- first, what is the "public value" that the public organization wants to create (present to civil society)?
- second, on which "sources of legitimacy and support" could they rely to empower the public organization to act and provide the resources needed to create this public value?
- third, on which "operational capabilities" (including innovations and improvements) would the public organization rely to deliver the desired outcomes?

However, since Moore formulated his idea in the mid-1990s, it has understandably already been criticised. First, as Rhodes and Wanna (2007) note, it is not clear whether Moore is proposing a theoretical framework, a concept, or a strategic tool for public managers. Second, because Moore does not provide a definition of the term public value (but uses it anyway), some scholars argue that public value can, therefore, be considered as a paradigm (e.g. Stoker, 2006; Benington, 2005), concept (e.g. Kelly et al., 2002), model (O'Flynn, 2005), heuristic device or even a story (Smith, 2004). Third, Oakley et al. (2006) note that Moore sometimes appears to be talking about public goods and, at other times, about the public interest or even the public domain. Later, therefore, critically point out that public value is another "fuzzy" term which seems to be a messy hybrid of all three. In other words, where the term 'public value' has any meaning, it generally refers to public goods, the public interest or the public domain while offering nothing new to any of them.

Regardless, Moore remains the so-called father of public value creation (Meynhardt, 2022), although it remains unknown how to empirically measure the extent to which public organisations actually create public value (Faulkner & Kaufman, 2017; Williams & Shearer, 2011; Talbot & Wiggan, 2010). This is partly due to the fact that the term public value remains conceptually unresolved, as there is no universally accepted definition among scholars (Pang et al., 2014). Nevertheless, the creation of public value should remain a goal of public organisations, as public organisations use public value to meet the needs and wishes of the public – citizens (Brown et al., 2021; Neumann et al., 2019; Jørgensen & Bozeman, 2007).

For the purposes of this paper, we have defined public value creation as the outcomes that are the results of the previous three categories. On this basis, 'public service quality provision capability – improved efficiency and effectiveness of public service production' and 'citizen engagement capability – public administrations identify and respond more quickly to citizens' aspirations' were identified as attributes (criteria) of the fourth category 'outcomes – public value creation' (Twizeyimanaa & Andersson, 2019; Faulkner & Kaufman, 2017; Scott et al., 2016; Spano, 2014; Pang et al., 2014). In this paper, outcomes – public value creation are written as verbs - e.g. 'efficiency' is not a public value in itself, whereas 'doing or performing something in an efficient way' becomes one. While this way of defining public value may seem unusual, it proves extremely useful, especially in the context

of different views on what public value is and how to measure it (Twizeyimanaa & Andersson, 2019).

The ability to deliver quality public services is key to creating public value. Delivering public services more efficiently and effectively, with minimal use of public resources and in a faster (more responsive) time, makes a significant contribution to improving quality (Scott et al., 2016; Pang et al., 2014). This was already highlighted three decades ago by Moore (1995), who pointed out that it is not enough for public managers to produce results that are supported by the public (citizens or civil society at large). Public managers need to demonstrate that these results justify public spending, as only then can it be argued that public value has been created. Alford and Hughes (2008) further state that if the desired results are achieved with minimal public expenditure and within a reasonable period, it can be concluded that PA is also efficient and effective.

In addition to providing quality public services, citizens' ability (or capacity) to engage in the public policymaking process is also crucial for creating public value (Rasmussen & Rehe, 2023; Pang et al., 2014). Stoker (2006) points out that the paradigm of public value creation relies on citizens' trust in PA and the recognition of its legitimacy. Therefore, for public value creation to be supported and responsive to citizens' needs and desires, it is imperative that the government facilitates and supports active citizen participation. Without citizen participation and consent, public values cannot be created, no matter how good the government considers the quality of the outcomes created, as citizens may not consider them to be so (Wilson & Knighton, 2021; Faulkner & Kaufman, 2017; Pang et al., 2014; Talbot & Wiggan, 2010). In the digital age, where more and more tools for two-way communication are available, PAs are even more expected to foster citizen participation, which will increase the trust and legitimacy of their actions. Accountable and transparent PA means better access to government information and improves the transparency of PA while reducing the risks of corruption (Castro & Lopes, 2022). This is considered in an increasingly dynamic environment where ICTs are transforming the design of public services, and it is becoming increasingly clear that PA alone can no longer respond effectively to the changing needs and demands of citizens (Pang et al., 2014). However, as ICTs enable two-way communication more than ever before, PA is also expected to work more closely with citizens in the co-creation of public services. This mutual collaboration enables public services to become truly citizen-

centred and tailored to citizens' needs (Li & Shang, 2023; Scott et al., 2016; Hellang & Flak, 2012; Jansen, 2012).

Table 5: Model's attributes based on the fourth category, 'outcomes – creating public value'

Attributes deriving from outcomes – creating public value	Attribute number
Public service quality provision capability – improved efficiency and effectiveness of public service production	4.1.
Citizen engagement capability – public administrations identify and respond more quickly to citizens' aspirations	4.2.
Citizen participation in policy-making and improved democracy	4.2.1.
Increased transparency of public administration operations – citizens have better access to government information	4.2.2.
Co-creation capability delivering more inclusive public services that are citizen-centred and tailored to citizens' needs	4.2.3.
Trust and legitimacy – increase citizens' trust in public administration operations and recognision of legitimacy	4.2.4.

3.2 Hierarchical structure of the decision support model

With the help of the content analysis, we identified 29 subordinate and 13 single-parent – see Table 1. These attributes represent the foundation for the development of the structure of the multi-attribute model, designed to measure the maturity of SPG in public administration institutions presented in this section. Figure 1 represents the tree-like structure of the multi-attribute model consisting of four level attributes (criteria), which support the SPG maturity measurement in public administration institutions. In the tree-like structure, each subordinate attribute affects a single parent attribute (Bohanec, 2012).

In this structure, there are basic and derived attributes. An example of a basic (subordinate) attribute is 'the impact of artificial intelligence to automate routine processes' (1.2.1.1.) since it has no subordinated attributes. In the model, it represents the final node or "leaf". Such attributes are the model's input (operational attributes). Other attributes are derived (superior or single parent attribute); an example is 'the use of emerging technologies in PA' (1.2.), meaning they are aggregated nodes within the model (also called aggregated attributes). The superior

attributes are calculated based on the values assigned to the basic attributes by the interview group.

The highest attribute, i.e., the final maturity of SPG in public administration institutions, is the main output attribute – the root of the tree-like structure (Bohanec, 2012).

It should be stressed, however, that the attributes within the multi-attribute model are treated as being non-redundant (avoiding unnecessary attributes that could impact the model's size and complexity), mutually independent (one attribute for a specific decision factor), and operable (applicable in practice) (Bohanec, 2012).

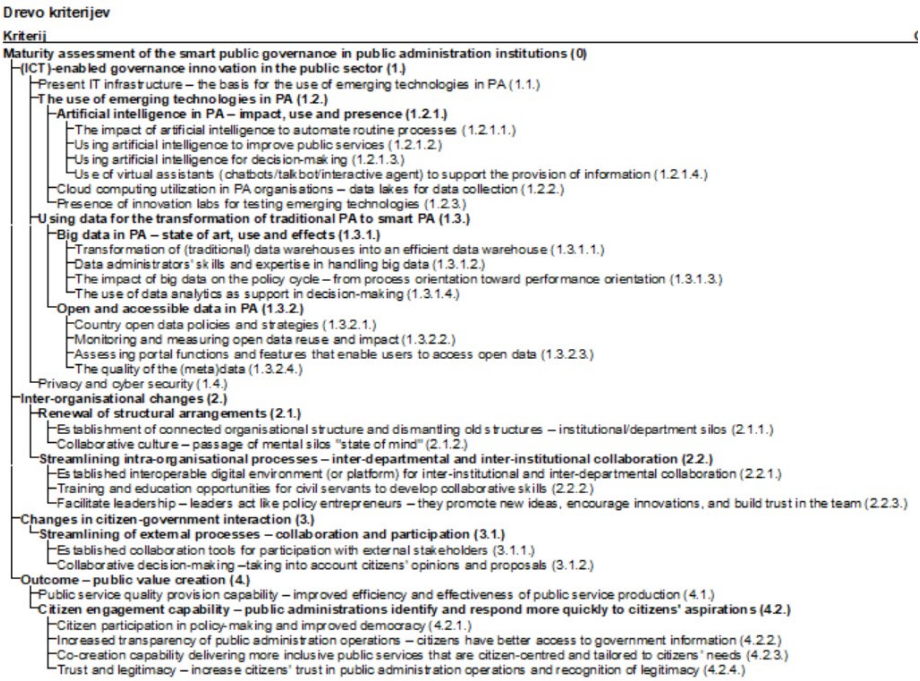

Figure 1: Multi-attribute model for measuring smart public governance maturity in public administration institutions

4 Future research development

The paper makes a pioneering step aiming to stimulate a broader academic debate about which attributes (criteria) corresponding to the subject/area should be considered when measuring the maturity of SPG in public administration institutions.

The multi-attribute model creation is based on several iterations, using the DSR approach (Dresch et al., 2015) and the DEX method, belonging to a multi-attribute utility theory method group. Prior research findings obtained through content analysis played a crucial role in identifying attributes (criteria) essential for measuring the maturity of SPG. Considering what we already learned, we can argue that maturity in SPG is not only about the use of technology but also about changes that public sector organisations face internally, as well as evolving dynamics of citizen interaction with public sector organisations in order to create public value (outcomes) for society.

Further research should focus on the practical application and validation of the multi-attribute model introduced in this paper. Future studies are encouraged to test and refine the identified attributes (criteria), enhancing the model's robustness and applicability.

References

Abuljadail, M., Khalil, A., Talwar, S., & Kaur, P. (2023). Big data analytics and e-governance: Actors, opportunities, tensions, and applications. *Technological Forecasting and Social Change*, 193:22612, 1-17. doi: 10.1016/j.techfore.2023.122612

Albino, V., Berardi, U., & Dangelico, M.R. (2015). Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology*, 22(1), 3-21. doi: 10.1080/10630732.2014.942092

Alford, J. & Hughes, O. (2008). Public Value Pragmatism as the Next Phase of Public Management. *The American Review of Public Administration*, 38(2), 130–148. doi:10.1177/0275074008314203

Alves, H. (2013). Co-creation and innovation in public services. *The Service Industries Journal*, 33:7-8, 671-682, doi: 10.1080/02642069.2013.740468

Andersen, N.K., Henriksen, Z.H., Medalia, R., Danziger, N.J., Sannarsen, K.M., & Enemærke, M. (2010). Fads and Facts of E-Government: A Review of Impacts of E-government (2003–2009). *International Journal of Public Administration*, 33(11), 564-579. doi: 10.1080/01900692.2010.517724

Androutsopoulou, A., N. Karacapilidis, E. Loukis, & Y. Charalabidis. (2019). Transforming the Communication Between Citizens and Government Through AI-Guided Chatbots. *Government Information Quarterly*, 36(2), 358–367. doi: 10.1016/j.giq.2018.10.001

Angelopoulos, K., Diamantopoulou, V., Mouratidis, H., Pavlidis, M., Salnitri, M., Giorgini, P., & Ruiz, J.F. (2017). A Holistic Approach for Privacy Protection in E-Government. In *Proceedings of the 12th International Conference on Availability, Reliability and Security* (pp. 1-17). doi: 10.1145/3098954.3098960

Ansell, C & Gash, A. (2012). Stewards, Mediators, and Catalysts: Toward a Model of Collaborative Leadership. *The Innovation Journal: The Public Sector Innovation Journal*, 17(1), 1-20. Dostopno na: https://innovation.cc/wp-content/uploads/2012_17_1_7_ansell_gash_innovate-leadrship.pdf

Ansell, C. & Gash, A. (2008). Collaborative Governance in Theory and Practice. *Journal of Public Administration Research and Theory*, 18(4), 543–571. doi: 10.1093/jopart/mum032

Anthopoulos, L., Reddick, C., & Sirakoulis, K. (2021). Conceptualizing Smart Government: Interrelations and Reciprocities with Smart City. *Digital Government: Research and Practice*, 2(4), 33:2-33:28. doi: 10.1145/3465061

Arntz, M., Gregory, T., & Zierahn, U. (2016). *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis*. OECD Publishing, Paris.

Babić, A., Soklić, D., & Antonić, J.J. (2022). Development of Smart Governance in Croatian Cities - the Size of a City as a Determinant of Smart Governance. *Ekonomski vjesnik*, 35(2), 315-335. doi: 10.51680/ev.35.2.7

Bannister, F. (2001). Dismantling the silos: extracting new value from IT investments in public administration. *Information Systems Journal*, 11, 65–84. doi: 10.1046/j.1365-2575.2001.00094.x

Bailey, E.D. & Barley, R.S. (2019). Beyond design and use: How scholars should study intelligent technologies. *Information and Organization*, 30(2), 100286. doi: 10.1016/j.infoandorg.2019.100286

Bartelt, L.V., Urbaczewski, A., Mueller, G.A., & Sarker, S. (2020) Enabling collaboration and innovation in Denver's smart city through a living lab: a social capital perspective. *European Journal of Information Systems*, 29(4) 369-387. doi: 10.1080/0960085X.2020.1762127

Bason, C. (2010). *Leading public sector innovation*. Bristol: Policy Press.

Batagan, L. (2011). Smart Cities and Sustainability Models. *Informatica Economica*, 15(0), 80-87. Available on IE Paper Template (ase.ro)

Becker, T. (2016). Big Data Usage. In J.M. Cavanillas, E. Curry, & W. Wahlster (eds.), *New Horizons for a Data-Driven Economy: A Roadmap for Usage and Exploitation of Big Data in Europe* (pp. 143-165). doi: 10.1007/978-3-319-21569-3_8

Benington, J. & Moore, M.H. (2011). Public value in complex and changing times. In J. Benington & M.H. Moore (eds.), Public value theory & practice (str. 1–30). doi: 10.1007/978-0-230-36431-8_1

Benington, J. (2005). *From Private Choice to Public Value*. Paper presented to the Public Management and Policy Association. London: PMPA. doi: 10.1007/978-0-230-36431-8_2

Bertot, J.C. & Choi, H. (2013). Big data and e-government: Issues, policies, and recommendations. In *Proceedings of the 14th Annual International Conference on Digital Government Research* (pp. 1-10). doi: 10.1145/2479724.2479730

Bohanec, M. (2012). *Odločanje in modeli*. Ljubljana: DMFA založništvo.

Bolivar, P.M.R. & Meijer, A. (2016). Smart Governance: Using a Literature Review and Empirical Analysis to Build a Research Model. *Social Science Computer Review*, 34(6), 1-20. doi: 10.1177/0894439315611088

Bouaziz, S., Nabli, A., & Gargouri, F. (2017). From Traditional Data Warehouse to Real-Time Data Warehouse. V J. Kacprzyk (ur.), *Advances in Intelligent Systems and Computing* (str. 467-477). doi: 10.1007/978-3-319-53480-0_46

Bouckaert, G., Peters, B.G., & Verhoest, K. (2010). *The Coordination of Public Sector Organizations: Shifting Patterns of Public Management*. London: Palgrave Macmillan.

Bovaird, T., Ryzin, V.G.G., Loeffler, E., & Parrado, S. (2014). Activating Citizens to Participate in Collective Co-Production of Public Services. *Journal of Social Policy*, 44(1), 1-23. doi: 10.1017/S0047279414000567

Bovens, M. & Zouridis, S. (2002). From Street-Level to System-Level Bureaucracies: How Information and Communication Technology Is Transforming Administrative Discretion and Constitutional Control. *Public Administration Review*, 62(2), 174-184. doi: 10.1111/0033-3352.00168

Brennan, M.N., Subramaniam, N., & Staden, J.C. (2019). Corporate governance implications of disruptive technology: An overview. *The British Accounting Review*, 51(6), 1-15. doi: 10.1016/j.bar.2019.100860

Campion, A., M. Gasco-Hernandez, M. Esteve, and S. Mikhaylov. (2022). Overcoming the Challenges of Collaboratively Adopting Artificial Intelligence in the Public Sector. *Social Science Computer Review*, 40(2), 462–477. doi: 10.1177/0894439320979953

Cano, J., Ros, S., & Hernandez, R. (2014). Distributed Framework for Electronic Democracy in Smart Cities. *Computer*, 47(10), 65-71. doi: 10.1109/MC.2014.280

Cardullo, P., & Kitchin, R. (2019). Being a 'citizen' in the smart city: Up and down the scaffold of smart citizen participation in Dublin, Ireland. *GeoJournal*, 84(1), 1–13. doi: 10.1007/s10708-018-9845-8

Castro, C. & Lopes, C.I. (2022). E-Government as a Tool in Controlling Corruption. *International Journal of Public Administration*, 46(1), 1-14. doi: 10.1080/01900692.2022.2076695

Chen, K., & Aitamurto, T. (2019). Barriers for crowd's impact in Crowdsourced policymaking: Civic data overload and filter hierarchy. *International Public Management Journal*, 22(1), 99–126. doi: 10.1080/10967494.2018.1488780

Chen, C.Y. & Hsieh, C.T. (2014). Big Data for Digital Government: Opportunities, Challenges, and Strategies. *International Journal of Public Administration in the Digital Age*, 1(1), 1-14. doi: 10.4018/ijpada.2014010101

Choi, Y., Gil-Garcia, R.J., Burke, G.B, Costello, J., Werthmuller, A., & Aranay, O. (2021). Towards data-driven decision-making in government: Identifying opportunities and challenges for data use and analytics. V Proceedings of the 54th Hawaii international conference on system sciences (str. 2183-2192). Dostopno na: http://hdl.handle.net/10125/70881

Chun, A.S., Luna-Reyes, F.L., & Sandoval-Almazán, R. (2012. Collaborative e-government. *Transforming Government: People, Process and Policy*, 6(1), 5 – 12. doi: 10.1108/17506161211214868

Cilliers, F., & Greyvenstein, H. (2012). The impact of silo mentality on team identity: An organisational case study. *Journal of Industrial Psychology*, 38(2), 1-9. doi:10.4102/sajip.v38i2.993

Cooper, A.L., Holderness Jr, K.D., Sorensen, L.T., & Wood, A.D. (2018). Robotic Process Automation in Public Accounting. *Accounting Horizons*, 33(4), 1-62. doi: 10.2308/acch-52466

Craglia, M., Annoni, A., Benczur, P., Bertoldi, P., Delipetrev, P., De Prato, G., … Vesnic Alujevic, L. (2018). In M. Craglia (eds.), *Artificial Intelligence: A European perspective*. European Commission Publications Office. Available on:https://op.europa.eu/en/publication-detail/-/publication/ed2148f3-0288-11e9-adde-01aa75ed71a1/language-en

Criado, J.I. & Gil-Garcia, J.R. (2019). Creating public value through smart technologies and strategies: From digital services to artificial intelligence and beyond. *International Journal of Public Sector Management*, 32(5), 438-450. doi: 10.1108/IJPSM-07-2019-0178

Cunha, A.M., Coelho, R.T., & Pozzebon, M. (2013). The Use Of ICT In Public Decision-Making Participation. In *Proceedings of the 21st European Conference on Information Systems* (pp. 22-26). Available on http://aisel.aisnet.org/ecis2013/22

Danziger, N.J. & Andersen, V.K. (2002). The impacts of information technology on public administration: an analysis of empirical research from the "golden age" of transformation. *International Journal of Public Administration*, 25(5), 591-627. doi: 10.1081/PAD-120003292

Demirel, D., & Mülazımoglu, E. M. (2021). How the smart governance model shapes cities? Cases from Europe. *Journal of Enterprising Communities: People and Places in the Global Economy*, 16(1), 8-25. doi:10.1108/JEC-08-2021-0115

Desouza, C.K. & Jacob, B. (2014). Big Data in the Public Sector: Lessons for Practitioners and Scholars. *Administration & Society*, 49(7) 1043–1064. doi: 10.1177/0095399714555751

Dibouliya, A. (2023). Review on: Modern Data Warehouse & how is it accelerating digital transformation. *International journal of advance research, ideas, and innovations in technology*, 9(2), V912-1224. Available on: https://www.ijariit.com

Dresch, A., Lacerda, P. D., & Antunes, V. A. J. (2015). *Design Science Research*. London: Springer.

Faulkner, N. & Kaufman, S. (2017). Avoiding Theoretical Stagnation: A Systematic Review and Framework for Measuring Public Value. *Australian Journal of Public Administration*, 77(2), 1-18. doi:10.1111/1467-8500.12251

Fredriksson, C., Mubarak, F., Tuohimaa, M., & Zhan, M. (2017). Big Data in the Public Sector: A Systematic Literature Review. *Scandinavian Journal of Public Administration*, 21(3), 39-61. doi: 10.58235/sjpa.v21i3.11563

Favoreu, C., Maurel, C., & Queyroi, X. (2024). Influence of public innovation laboratories on the development of public sector ambidexterity. *Public Management Review*, 88(2), 1-27. doi: 10.1080/14719037.2024.2322720

Giest, N.S. & Klievink, B. (2024) More than a digital system: how AI is changing the role of bureaucrats in different organizational contexts. *Public Management Review*, 26(2), 379-398. doi: 10.1080/14719037.2022.2095001

Gil-Garcia, J. R. (2012). Towards a smart State? Inter-agency collaboration, information integration, and beyond. *Information Polity,* 17(0), 269–280. doi: 10.5555/2656990.2656996

Giuliodori, A., Berrone, P., & Ricart, E.J. (2023). Where smart meets sustainability: The role of Smart Governance in achieving the Sustainable Development Goals in cities. *Business Research Quarterly*, 26(1), 27-44. doi: 10.1177/23409444221091281

Giulio, D.M. & Vecchi, G. (2021). Implementing digitalization in the public sector. Technologies, agency, and governance. *Public Policy and Administration,* (0)0, 1-15. doi:10.1177/09520767211023283

Guillaumie, L., Vezina-Im, L.A., Bourque, L., Boiral, O., Talbot, D., & Harb, E. (2024). Best Practices for Municipalities to Promote Online Citizen Participation and Engagement on Facebook: A Narrative Review of the Literature. *Social Sciences*, 13(127), 1-16. doi: 10.3390/socsci13030127

Hansen, A. (2014). *Dismantling Silos – From Creative Collaboration to Collaborative Creativity*. [Master thesis]. University of Washington, Science in Construction Management.

Hartley, J., Sancino, A., Bennister, M., & Resodihardjo, S. (2019). Leadership for public value: Political astuteness as a conceptual link Symposium introduction. *Public Administration*, 0(0), 1-19. doi: 10.1111/padm.12597

Hellang, Ø. & Flak, L. (2012). Assessing effects of e-government initiatives based on a public value framework. V *International Conference on Electronic Government* (str. 246-259). doi: 10.1007/978-3-642-33489-4_21

Höchtl, H., Parycek, P. & Schöllhammer, R. (2016). Big data in the policy cycle: Policy decision making in the digital era. *Journal of Organizational Computing and Electronic Commerce*, 26(1-2), 147-169. doi: 10.1080/10919392.2015.1125187

Interoperable Europe Academy. (b.d.). https://joinup.ec.europa.eu/interoperable-europe

Janssen, M., Konopnicki, D., Snowdon, L.J., & Ojo, A. (2017). Driving public sector innovation using big and open linked data (BOLD). Information Systems Frontiers, 19(4), 189–195. doi: 10.1007/s10796-017-9746-2

Janssen, M. & Hoven, J. (2015). Big and Open Linked Data (BOLD) in government: A challenge to transparency and privacy. Government Information Quarterly, 32(4), 363-368. doi: 10.1016/j.giq.2015.11.007

Jansen, A. (2012). The Understanding of ICTs in Public Sector and Its Impact on Governance. In H.J., Scholl et al. (eds.), *Electronic Government*. Berling: Springer.

Jiang, H., Geertman, S., & Witte, P. (2022). Smart urban governance: an alternative to technocratic "smartness." *GeoJournal*, 87(0), 1639-1655. doi:10.1007/s10708-020-10326-w

Jiang, H., Geertman, S., & Witte, P. (2019). Smart urban governance: An urgent symbiosis? *Information Polity*, 24(9), 245-269. doi: 10.3233/IP-190130

Jørgensen, T. B. & Bozeman, B. (2007). Public values: An inventory. *Administration & Society*, 39(3), 354–381. doi: 10.1177/0095399707300703

Jucevicius, R. & Juceviciene, P. (2018). Knowledge dimension in smart development. In *European Conference on Knowledge Management* (pp. 369-376). Padua: University of Padua.

Jukić, T. & Vrbek, S. (2023). Co-creation service readiness model: a decision support for the selection of public services suitable for improvement through co-creation. *Transforming Government: People, Process and Policy*, 67(1), 1750-6166. doi: 10.1108/TG-03-2023-0031

Jukić, T., Pluchinotta, I., Hržica, R., Vrbek, S. (2021). Organizational maturity for co-creation: Towards a multi-attribute decision support model for public organizations. *Government Information Quarterly*, 39(1):101623. doi:10.1016/j.giq.2021.101623

Kelly, G., Mulgan, G., & Muers, S. (2002). *Creating Public Value*. London: Cabinet Office.

Kim, Y.H. & Cho, S.J. (2017). Data Governance Framework for Big Data Implementation with a Case of Korea. In *the 6th International Congress on Big Data* (pp. 384-391). doi: 10.1109/BigDataCongress.2017.56

Klievink, B., Romijn, J.B., Cunningham, S., & Bruijn, H. (2017). Big data in the public sector: Uncertainties and readiness. *Information Systems Frontiers*, 19(0), 267–283. doi: 10.1007/s10796-016-9686-2

Kolkman, D. (2020). The usefulness of algorithmic models in policy making. *Government Information Quarterly*, 37(3), 101488. doi: 10.1016/j.giq.2020.101488

Kostoff, N.R., Boylan, R., & Simons, R.G. (2004). Disruptive technology roadmap. *Technological Forecasting and Social Change*, 71(1-2), 141-159. doi: 10.1016/S0040-1625(03)00048-9

Kreuter, F., Ghani, R., & Lane, J. (2019). Change Through Data: A Data Analytics Training Program for Government Employees. *Harvard Data Science Review*, 1.2, 1-26. doi: 10.1162/99608f92.ed353ae3

Kumar, J.T.L. (2015). *E-Governance for Smart Cities*. London: Springer.

Kuziemski, M., & Misuraca, G. (2020). AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings. *Telecommunications Policy*, 44(6), 101976. doi: 10.1016/j.telpol.2020.101976

Li, Y. & Shang, H. (2023). How does e-government use affect citizens' trust in government? Empirical evidence from China. *Information & Management*, 60(7), 103844. doi:10.1016/j.im.2023.103844

Lin, Y. (2018). A comparison of selected Western and Chinese smart governance: The application of ICT in governmental management, participation and collaboration. *Telecommunications Policy*, 42(10), 800-809. doi: 10.1016/j.telpol.2018.07.003

Lindgren, I. & Veenstra, F.A. (2018). Digital government transformation: a case illustrating public e-service development as part of public sector transformation. In *19th Annual International Conference* (pp. 2-6). doi: 10.1145/3209281.3209302

Lindsay, C., Pearson, S., Batty, E., Cullen, A. M., & Eadson, W. (2018). Co-production as a route to employability: Lessons from services with lone parents. *Public Administration*, 96(2), 318–332. doi:10.1111/padm.12408

Marche, S. & McNiven, D.J. (2003). E-government and E-governance: The future is not what it used to be. *Canadian Journal of Administrative Science*, 20(1), 74.86. doi: 10.1111/j.1936-440'.2003.tb00306.x

Mergel, I., Dickinson, H., Stenvall, J., & Gasco, M. (2023). Implementing AI in the public sector. *Public Management Review*. doi: 10.1080/14719037.2023.2231950

Margetts, H., & Dorobantu, C. (2019). Rethink government with AI. *Nature*, 568(7751), 163–165. doi: 10.1038/d41586-019-01099-5

Margel, I., Rethemeyer, K.R., & Isett, K. (2016). Big Data in Public Affairs. *Public Administration Review*, 76(6), 1-19. doi: 10.1111/puar.12625

Meijer, A. & Bolivar, M.P.R. (2015). Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*, (0)0,1-17. doi:10.1177/0020852314564308

Meijer, A. (2014). Why don't they listen to us? Reasserting the role of ICT in Public Administration. *Information Polity*, 12(4) 233–242.

Meerkerk, I. (2019). Top-down versus bottom-up pathways to collaboration between governments and citizens: reflecting on different participation traps. In A. Kekez, M. Howlett & M. Ramesh (eds.), *Collaboration and Public Service Delivery: Promise and Pitfalls*, pp. 149-167. Eheltenham: Edward Elgar Publishing.

Meynhardt, T. (2022). Public Value. V H.K., Anheier & S. Toepler (ur.), *International Encyclopedia of Civil Society*. New York, NY: Springer.

Meynhardt, T. (2009). Public Value Inside: What is Public Value Creation? *International Journal of Public Administration*, 32(3-4), 192–219. doi: 10.1080/01900690902732632

Meuleman L. (2021). Public Administration and Governance for the SDGs: Navigating between Change and Stability. *Sustainability*,13(11):5914. doi: 10.3390/su13115914

Mikalef, P., Fjørtoft, S. O., & Torvatn, H. Y. (2019). Artificial Intelligence in the Public Sector: A Study of Challenges and Opportunities for Norwegian Municipalities. In *18th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society* (pp. 267–277). doi: 10.1007/978-3-030-29374-1

Milakovich, E.M. (2011). *Digital Governance: New Technologies for Improving Public Service and Participation*. New York (NY): Routledge.

Miloslavskaya, N. & Tolstoy, A. (2016). Big Data, Fast Data and Data Lake Concepts. *Procedia Computer Science*, 88(0), 300–305. doi: 10.1016/j.procs.2016.07.439

Misuraca, G. & Van Noordt, C. (2020). Overview of the use and impact of AI in public services in the EU. Publications Office of the European Union: Luxembourg. doi:10.2760/039619, JRC120399

Misuraca, G. & Viscusi, G. (2015). Shaping public sector innovation theory: an interpretative framework for ICT-enabled governance innovation. *Electronic Commerce Research*, 15(0), 303–322. doi: 10.1007/s10660-015-9184-5

Moore, M.H. & Khagram, S. (2004). *On creating public value: What Business May Learn from Government about Strategic Management*. Corporate Social Responsibility Initiative Working paper. Cambridge, MA: Harvard University

Moore, M.H. (1995). *Creating public value: Strategic management in government*. Cambridge: Harvard University Press.

Munne, R. (2016). Big Data in the Public Sector. In J.M. Cavanillas, E. Curry, & W. Wahlster (eds.), *New Horizons for a Data-Driven Economy: A Roadmap for Usage and Exploitation of Big Data in Europe* (pp. 195-208). doi: 10.1007/978-3-319-21569-3_11

Nam, T., & Pardo, T. A. (2014). The changing face of a city government: A case study of Philly311. *Government Information Quarterly*, 31, S1–S9. doi: 10.1016/j.giq.2014.01.002

Navarra, D.D. & Cornford, T. (2005). ICT, Innovation and Public Management: Governance, Models and Alternatives for eGovernment Infrastructures. In *ECIS 2005 Proceedings* (pp. 121-133). Available on http://aisel.aisnet.org/ecis2005

Nesti, G. (2020). Defining and assessing the transformational nature of smart city governance: insights from four European cases. *International Review of Administrative Sciences*, 86(1) 20–37. doi: 10.1177/0020852318757063

Ndou, D.V. (2004). E-government for developing countries: opportunities and challenges. *The Electronic Journal of Information Systems in Developing Countries*, 18(1), 1-24. doi: 10.1002/j.1681-4835.2004.tb00117.x

Neumanna, O., Mattb, C., Hitz-Gamperb, S.B., Schmidthuberc, l., & Stürmer, M. (2019). Joining forces for public value creation? Exploring collaborative innovation in smart city initiatives. *Government Information Quarterly*, 36(4), 101411. doi: 10.1016/j.giq.2019.101411

Newman, J., Mintrom, M., O'Neill, D. (2022). Digital technologies, artificial intelligence, and bureaucratic transformation. Futures, 136, 102886. doi: 10.1016/j.futures.2021.102886

Oakley, K., Naylor, R., & Lee, D. (2006). *Giving them what they want: the construction of the public in 'public value'*. London: BOP Consulting.

Okuyucu, A. & Yavuz, N. (2020). Big data maturity models for the public sector: a review of state and organizational level models. Transforming Government: *People, Process and Policy*, 14(4), 681-699. doi: 10.1108/TG-09-2019-0085

O'Flynn, J. (2005). Adding Public Value: A New Era of Contractual Governance. In *IPAA National Conference*, (pp. /). Canberra, Australia

Örselli, E., Bayrakci, E., & Bilici, Z. (2022). Analysis of smart city projects in Turkey in the context of smart people and smart governance. *Lex Humana*, 14(1), 328-399.

Page, M., Hajduk, M., Arriëns, L.N.E., Cecconi, G., & Brinkhuis, S. (2023). *Open data maturity report 2023*. Luxembourg: Publications Office of the European Union.

Pang, M.S., Lee, G., & DeLone, W.H. (2014). IT resources, organizational capabilities, and value creation in public-sector organizations: a public-value management perspective. *Journal of Information Technology*, 29(3), 187–205. doi:10.1057/jit.2014.2

Pencheva, I., Esteve, M., & Mikhaylov, J.S. (2020). Big Data and AI – A transformational shift for government: So, what next for research. *Public Policy and Administration*, 35(1), 24–44. doi: 10.1177/0952076718780537

Pereira, G. V., Parycek, P., Falco, E., & Kleinhans, R. (2018). Smart governance in the context of smart cities: A literature review. *Information Polity*, 23(2), 143–162. doi: 10.3233/IP-170067

Pereira, V.G., Cunha, M.A., Lampoltshammer, T.J., Parycek, P., & Testa, M.G. (2017). Increasing collaboration and participation in smart city governance: A cross-case analysis of smart city initiatives. *Information Technology for Development*, 23(3), 526-553. doi: 10.1080/02681102.2017.1353946

Popova, Y. & Popovs, S. (2023). Effects and Externalities of Smart Governance. *Smart Cities*, 6(0),1109–1131. doi: 10.3390/smartcities6020053

Rackwitz, M., Breaugh, J., & Hammerschmid, G. (2024). Leadership for intergovernmental collaboration towards digital transformation. V K. Verhoest idr. (ur.), *Collaborating for Digital Transformation*. Cheltenham: Edward Elgar Publishing.

Ramos, G., Fernandes, D., Coelho, J., & Aquino, A. (2023). Toward Data Lake Technologies for Intelligent Societies and Cities. V C.F.S., Portela (ur.), *Sustainable, Innovative and Intelligent Societies and Cities* (str. 3-29). doi: 10.1007/978-3-031-30514-6_1.

Rasmussen, A. & Rehe, S. (2023). (Inequality in) Interest Group Involvement and the Legitimacy of Policy Making. *British Journal of Political Science*, 53(0), 45–64. doi:10.1017/S0007123422000242

Regal, B., Ferlie, E., Aagaard, P., & Vrbek, S. (2024). Governance modes, mayoral leadership and transitions to public sector co-creation across Europe. *Public Policy and Administration*, 0(0) 1–25. doi: 10.1177/09520767241231598

Rhodes, R.A.W. & Wanna, J. (2007). The limits of public value or rescuing responsible government from the platonic guardians. *Australian Journal of Public Administration*, 66(4), 406-421. doi: 10.1111/j.1467-8500.2007.00553.x

Riduan, A. (2024). Citizen participation in Policy Decision-Making. *International Journal of Multidisciplinary Approach Sciences and Technologies*, 1(1), 65-74. doi: 10.62207

Rogge, N., Agasisti, T., & Witte, K. (2017). Big data and the measurement of public organisations' performance and efficiency: the state-of-the-art. *Public Policy and Administration*, 32(4), 263–281. doi: 10.1177/0952076716687355

Romansky P.R. & Noninska, S.I. (2020). Challenges of the digital age for privacy and personal data protection. *Mathematical Biosciences and Engineering*, 17(5), 5288-5393. doi: 10.3934/mbe.2020286

Ronzhyn, A., Wimmer, A.M., Spitzer, V., Pereirs, V.G., & Alexopoulos, C. (2019). Using Disruptive Technologies in Government: Identification of Research and Training. In *18th International Conference on Electronic Government* (pp. 276-287). doi: 10.1007/978-3-030-27325-5_21f

Ruhlandt, S. W. R. (2018). The governance of smart cities: A systematic literature review. *Cities*, 81(0), 1-23. doi: 10.1016/j.cities.2018.02.014

Ruijer, E., Twist, A., Haaker, T., Tartarin, T., Schuurman, N., Melenhorst, M., & Meijer, A. (2023). A Systematic Literature Review. *Smart Cities*, 6, 878–896. doi: 10.3390/smartcities6020042

Sarker, I.N.M., Wu, M., & Hossin, A.M. (2018). Smart Governance through Bigdata: Digital Transformation of Public Agencies. In *International Conference on AI and big data* (pp. 62-70). doi: 10.1109/ICAIBD.2018.8396168

Savignon, B.A., Zecchinelli, R., Costumato, L., & Scalabrini, F. (2024). Automation in public sector jobs and services: a framework to analyze public digital transformation's impact in a data-constrained environment. Transforming Government: People, Process and Policy, 18(1), 49-70. doi: 10.1108/TG-04-2023-0044

Scholl, J.H. & Alawadhi, S. (2016). Creating Smart Governance: The key to radical ICT overhaul at the City of Munich. *Information Polity*, 21-42. doi: 10.3233/IP-150369

Scholl., H. J. & Scholl, M. (2014). Smart Governance: A Roadmap for Research and Practice. In *iConference 2014 Proceeding* (pp. 163–176). doi:10.9776/14060

Scott, I. & Gong, T. (2021). Coordinating government silos: challenges and opportunities. *Global Public Policy and Governance*, 1:20-23. doi: 10.1007/s43508-021-00004-z

Scott, I. (2020). Governing by Silos. *Oxford Research Encyclopedia of Politics*, 1-23. doi: 10.1093/acrefore/9780190228637.013.1414

Scott, M., DeLone, W., & Golden, W. (2016). Measuring eGovernment success: a public value approach. *European Journal of Information Systems*, 25(3), 187–208. doi:10.1057/ejis.2015.11

Smith, R.F.I. (2004). Focusing on Public Value: Something New and Something Old. *Australian Journal of Public Administration*, 63(4), 68–79. doi: 10.1111/j.1467-8500.2004.00403.x

Söderström, F., Melin, U., Lindgren, I., & Galzie, Z. (2018). Coordinating Public E-services – Investigating Mechanisms and Practices in a Government Agency. In P. Parycek (eds.), *Electronic Government* (pp. 85-97). Cham: Springer.

Sørensen, E., Bryson, J., & Crosby, B. (2021). How public leaders can promote public value through co-creation. *Policy and Politics*, 49(2), 267-286. doi: 10.1332/030557321X16119271739728

Sørensen, E. & Torfing, J. (2019). Designing institutional platforms and arenas for interactive political leadership. *Public Management Review*, 21:10, 1443-1463. doi: 10.1080/14719037.2018.1559342

Stoker, G. (2006). Public value management - A new narrative for networked governance? *American Review of Public Administration*, 36 (1):41–57. doi: 10.1177/0275074005282583

Šiugždinienė, J., Gaule, E., & Rauleckas, R. (2017). In search of smart public governance: the case of Lithuania. *International Review of Administrative Sciences*, 85(0), 1-20. doi:1177/0020852317707814

Talbot, C. & Wiggan, C. (2010). The public value of the National Audit Office. *International Journal of Public Sector Management*, 23(1), 54-70. doi: 10.1108/09513551011012321

Tett, G. (2014). *The Silo Effect: The Peril of Expertise and the Promise of Breaking Down Barriers*. New York, NY: Simon & Schuster.

Torfing, J., Ferlie, E., & Jukić, T. (2021). A theoretical framework for studying the co-creation of innovative solutions and public value. *Policy & Politics*, 49(2), 189–209. doi: 10.1332/030557321X16108172803520

Torfing, J., Sørensen, E., & Røiseland, A. (2019). Transforming the Public Sector into an Arena for Co-Creation: Barriers, Drivers, Benefits, and Ways Forward. *Administration & Society*, 51(5), 795–825. doi: 10.1177/0095399716680057

Torfing, J. & Ansell, C. (2016): Strengthening political leadership and policy innovation through the expansion of collaborative forms of governance. *Public Management Review*, 0(0), 1-18. doi: 10.1080/14719037.2016.1200662

Voorberg, H.W., Bekkers, M.J.J.V., & Tummers, G.L. (2014). A systematic review of co-creation and co-production: Embarking on the social innovation journey. *Public Management Review*, 1-39. doi: 10.1080/14719037.2014.930505

Tõnurist, P., Kattel, R., & Lember, V. (2017). Innovation labs in the public sector: what they are and what they do? *Public Management Review*, (0)0, 1–25. doi:10.1080/14719037.2017.128

Twizeyimanaa, D. J. & Andersson, A. (2019). The public value of E-Government – A literature review. *Government Information Quarterly,* 36(2), 167-178. doi: 10.1016/j.giq.2019.01.001

Zhao, W. & Zou, Y. (2021). Smart Urban Governance in Epidemic Control: Practices and Implications of Hangzhou. *CPAR*, 12(1), 51-60. doi: 10.1177/153967542101200104

Zhu, Y. & Kou, G. (2019). Linking Smart Governance to Future Generations: A Study on the Use of Local E-Government Service among Undergraduate Students in a Chinese Municipality. *Informatics*, 6(4), 45. doi:10.3390/informatics6040045

Valle-Cruz, D. & Garcia-Contreras, R. (2023). Towards AI-driven transformation and smart data management: Emerging technological change in the public sector value chain. *Public Policy and Administration*, 0(0) 1–22. doi: 10.1177/09520767231188401

Veale, M., & Brass, I. (2019). Administration by algorithm? Public management meets public sector machine learning. *Algorithmic Regulation*, 1–30. doi: 10.31235/OSF.IO/MWHNB

Van Noordt, C. & Misuraca, G. (2022). Artificial intelligence for the public sector: results of landscaping the use of AI in government across the European Union. *Government Information Quarterly*, 39(9), 101714. doi: 10.1016/j.giq.2022.101714

Veenstra, F.A., Gromme, F., & Djafari, S. (2019). The use of public sector data analytics in the Netherlands. *Transforming Government: People, Process and Policy*, 15(4), 396-419. doi: 10.1108/TG-09-2019-0095

Vrbek, S. & Jukić, T. (2023). Co-creation service readiness model: a decision support for the selection of public services suitable for improvement through co-creation. *Transforming Government: People, Process and Policy*, 18(1), 13-32. doi: 10.1108/TG-03-2023-0031

Vujković, P. & Jukić, T. (2023). Towards understanding smart public governance: a literature review. In *31st NISPAcee Annual Conference – The future of public administration enabled through emerging technologies* (pp. 1-16).

Vydra, S. & Klievink, B. (2019). Techno-optimism and policy-pessimism in the public sector big data debate. *Government Information Quarterly*, 36(4), 101383. doi: 10.1016/j.giq.2019.05.010

Zuiderwijk, A., Chen, Y., & Salem, F. (2021). Implications of the use of artificial intelligence in public governance: A systematic literature review and a research agenda. *Government Information Quarterly*, 38(3), 101577. doi: 10.1016/j.giq.2021.101577

Webster, C. W. R. & Leleux, C. (2018). Smart governance: Opportunities for technologically-mediated citizen co-production. *Information Polity,* 23(1), 95–110. doi: 10.3233/IP-170065

Wilson, C. & Knighton, D. (2021). Legitimacy, autonomy, and trust: a recipe for organizations to operate in the public interest. *Corporate Communications: an International Journal*, 26(4), 773-792. doi: 10.1108/CCIJ-03-2021-0029

Willems, J., Schmid, J.M., Vanderelst, D., Vogel, D., & Ebinger, F. (2023). AI-driven public services and the privacy paradox: do citizens really care about their privacy? *Public Management Review*, 25(11), 2116-2134. doi: 10.1080/14719037.2022.2063934

Williams, I. & Shearer, H. (2011). Appraising public value: Past, present and futures. *Public Administration*, 89(4), 1367 – 1384. doi: 10.1111/j.1467-9299.2011.01942.x

Willke, H. (2007). *Smart governance: Governing the global knowledge society*. New York, NY, USA. Campus Verlag.

Wimmer, A.M., Pereira, V.G., Ronzhyn, A., & Spitzer, V. (2020). Transforming Government by Leveraging Disruptive Technologies: Identification of Research and Training Needs. *Journal of e-Democracy*, 12(1), 87-113. doi: 10.29379/jedem.v12i1.594

Xiao, X., Califf, B.C., Sarker, S., & Sarker, S. (2013). ICT innovation in emerging economics: a review of the existing literature and framework for future research. *Journal of Information Technology*, 1-15. doi: 10.1057/jit. 2013.20

Yahia, B.N., Eljaoued, W. Saoud, B.B.N., & Colomo-Palacios, R. (2021). Towards sustainable collaborative networks for smart cities co-governance, *International Journal of Information Management*, 56(0), 1-16. doi:10.1016/j.ijinfomgt.2019.11.005

Yolles, M. (2016). Governance through Political Bureaucracy: An Agency Approach. *Kybernetes*, 48(1), 1-29. doi: 10.1108/K-09-2017-0329

Appendix

Table 1: Selection of various SPG definitions

Author	SPG definition
Pereira et al., 2018 (in Demirel & Mülazımoglu (2021, p. 8)	SPG "*emphasizes participation in decision-making processes, and is closely related to the transparency of administrative systems and the availability of public services*"
Örselli et al. (2022, p. 388)	SPG is "*a new model of administration, which includes changing and reshaping the roles of local government, central government, citizens and other social actors in the administrative mechanism, new communication structures and a new relational process*"
Giuliodori et al. (2022, p. 32)	SPG is "*a multidimensional and multilevel construct that includes aspects such as transparency, stakeholder collaboration, the ability to secure social infrastructure through public-private partnerships, a citizen-centric approach to solving problems, a long-term perspective, a proactive management style, sensible use of public resources and a strong willingness to innovate*"
Nesti (2020, p. 20)	SPG is "*the adoption of a new approach based on experimentation, collaboration with all stakeholders and the reorganisation of existing government structures. Public actors should drive this process and should be supported by appropriate tools to manage interactions, foster coordination, enhance democratic legitimacy and accountability, and ensure tangible results for citizens*"
Jiang et al. (2019, p. 246)	SPG is "*a way to take advantage of various ICTs, aimed at bringing changes in public policy and government institutions from a public administration perspective*"
Jiang et al. (2019, p. 246)	SPG is "the importance of technology-based tools in transforming government institutions from a public administration perspective (i.e., technology interaction with the institution)"
Zhu & Kou (2019, p. 2)	SPG is "*applying ICTs in the processing of information and decision-making in order to improve the capacity of governance*"
IRI, 2015 (in Yolles, 2019, p. 1)	SPG is "*the combining of digital technologies with innovative practices to improve government service delivery and citizen inclusion in developing and implementing policy. This enables responsive, transparent, and inclusive policy decisions that build citizen trust in government institutions at all levels, and create a dialogue between supply (government) and demand (citizen)*"
Giffinger et al., 2007 (in Ruhlandt, 2018, p. 13)	SPG "*comprises aspects of political participation, services for citizens as well as the functioning of the administration*"
Andermatt & Göldi, 2018 (in Babić et al., 2022, p. 317)	SPG is "*not only about digitising existing processes and services but also about developing and establishing entirely new processes and public services in a participatory way for citizens*"
Šiugzdiniene et al. (2017, pp. 589-590)	SPG is "*a mode of governance that relies on rationally utilizing internal and external resources, making adequate progress, and making advanced decisions relevant to specific circumstances to create shared value to make a social system (country, region or city) and its actors (government, citizens, communities, businesses and non-governmental organizations) operate effectively in a fast-changing and complex environment*"
Scholl & AlAwadhi (2016, p. 22)	SPG is "*the capacity of employing intelligent and adaptive acts and activities of looking after and making decisions about something*"
Meijer & Bolivar, 2016 (in Babić et al., 2022, p. 317)	SPG is "*make the right policy decisions and implement them effectively, and the need for smart decision making that includes the processes and implementation of*

Author	SPG definition
	those decisions. The new technologies are used to strengthen the rationality of management through the use of more complete and better information in the decision-making process"
Gil-Garcia, 2014 (in Orselli et al., 2022, p. 388)	SPG is "*the foundation of smart, open, and participatory administration. It is important to use ICT frequently to utilize these areas more effectively*"
Gil-Garcia, 2012 (in Kumar, 2015, p. 36)	SPG is "*a new form of electronic governance that uses sophisticated information technologies to interconnect and integrate information, processes, institutions, and physical infrastructure to better serve citizens and communities. This type of smart governance is at a higher level of transformation in administration since it requires the restructuring of the internal organization of government*"
Batagan, 2011 (in Kumar, 2015, p. 40; Boliver & Meijer, 2016, p. 4)	SPG is "*collaborating across departments and with communities, helping to promote economic growth and, at the most important level, making operations and services truly citizen-centric. It may be noted that smart governance is the widespread adoption of a more community-based model of governance with greater connectivity being facilitated by new technologies*"
Willke (2007, p. 7)	SPG is "*the ensemble of principles, factors and capacities that constitute a form of governance able to cope with the conditions and exigencies of the knowledge society*"