DOCTORAL THESIS

Public Value Creation in the Smart City: Governance, Decentralization, and Socio-Technical Assemblages

Sara Thabit Gonzalez

TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY
TALLINN 2026

TALLINN UNIVERSITY OF TECHNOLOGY
DOCTORAL THESIS
78/2026

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TAL TECH PRESS

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Declaration:
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

Sara Thabit Gonzalez

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ISSN 2585-6898 (paperback)
ISBN 978-9916-80-584-8 (paperback)
ISSN 2585-6901 (PDF)
ISBN 978-9916-80-585-5 (PDF)
https://doi.org/10.23658/taltech.78/2026
Printed by EVG Print

Thabit Gonzalez, S. (2026). *Public Value Creation in the Smart City: Governance, Decentralization, and Socio-Technical Assemblages* [TalTech Press]. https://doi.org/10.23658/taltech.78/2026

TALLINNA TEHNIKAÜLIKOOL
DOKTORITÖÖ
78/2026

Avaliku väärtuse loomine Targas linnas: valitsemine, detsentraliseerimine ja sotsiaal-tehnilised kooslused

SARA THABIT GONZALEZ

TAL TECH
KIRJASTUS

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List of Publications

The list of author's publications, on the basis of which the thesis has been prepared:

I **Thabit, S.,** & Mora, L. (2023). The collaboration dilemma in smart city projects: Time to ask the right questions. *Organization*, 31(7), 1058–1069. https://doi.org/10.1177/13505084231183949

II **Thabit, S.,** Sancino, A., & Mora, L. (2024). Strategic public value(s) governance: A systematic literature review and framework for analysis. *Public Administration Review*, 1–22. https://doi.org/10.1111/puar.13877

III **Thabit, S.,** Degkwitz, T., Fadmastuti, M., & Mora, L. (2026). Decentralisation in public sector data platforms: A pathway to enhancing public value? *Government Information Quarterly*, 43(3), 102149. https://doi.org/10.1016/j.giq.2026.102149

Additional publications:

IV Mora, L., Gerli, P., Beckers, D., **Thabit, S**., & Tonnarelli, F. (Eds.). (2025). Smart City Code. Governance Handbook for Digital Transformation Managers in the Public Sector. *Elsevier*. https://doi.org/10.1016/B978-0-443-13402-9.00026-9

Author's Contribution to the Publications

Contribution to the papers in this thesis are:

I In Article I, the author of the thesis contributed by conceptualizing the study, conducting the critical literature review, and formulating the central theoretical framework. Specifically, this involved synthesizing mainstream models of smart city collaboration and systematically reconceptualizing these collaborative dynamics through the theoretical lens of assemblage thinking. Additionally, the author took the lead role in managing the manuscript's revision and response processes throughout the formal submission and peer-review phases.

II For Article II, the author's contributions included the conceptualization of the study and the development of its theoretical framework. The author conducted the primary analysis of the data gathered from the Systematic Literature Review, subsequently synthesizing and consolidating these findings to construct the expanded Strategic Public Value(s) Governance (PVsG) framework. Finally, the author led the writing of the final draft and managed the manuscript's revisions and resubmissions throughout the journal peer-review process.

III For Article III, the author's contributions encompassed designing the study and defining the analytical framework. In addition, the author led the empirical data collection—conducting the majority of the interviews and document analyses—and directed the subsequent qualitative data analysis. Furthermore, the author coordinated the integration of co-authors' contributions, spearheaded the writing of the final manuscript, and managed all revisions and responses during the journal submission and peer-review process.

"Thus the assemblage's only unity is that of a co-functioning: it is a symbiosis, a 'sympathy'. It is never filiations which are important, but alliances, alloys; these are not successions, lines of descent, but contagions, epidemics, the wind."

(Deleuze & Parnet, 2002, p. 69)

1 Focus and Aim

1.1 Research objectives and questions

This thesis focuses on the intersection between multi-actor collaboration, technology, and public value creation, placing the study of smart city projects at its centre. In an era defined by complex planetary challenges, achieving a sustainable future requires collective action and the mobilization of diverse societal resources (Le Pennec & Raufflet, 2018). Smart city projects have emerged as key vehicles for this endeavour, designed as cross-sector initiatives that aim to trigger a wide range of public benefits, such as climate change mitigation and enhanced public sector efficiency (Neumann et al., 2019).

However, a fundamental dilemma persists at the heart of these initiatives: the rhetoric of smart city collaboration frequently clashes with its practical reality. Smart city projects do not always deliver the public value they are expected to create; instead, they can sometimes exacerbate social divides, deplete public administrative resources, and lead to an excessive outsourcing of municipal power to private technology providers (Di Feliciantonio, 2019; Taylor Buck & While, 2016). This disconnect stems from a twofold challenge. First, there is a lack of knowledge regarding how to appropriately organize smart city cross-sector collaborations to effectively serve the public good, where commonly recommended collaborative models fail to match the specific, contextual demands of local value creation processes (Meijer et al., 2016; Taylor Shelton et al., 2015). Second, the broader theoretical understanding of public value creation remains fragmented, often struggling to bridge action-oriented managerial approaches with societally oriented policy evaluations (J. Bryson et al., 2017; J. M. Bryson et al., 2015; J. de-Jong et al., 2021).

Furthermore, as local governments increasingly rely on digital public infrastructures to enhance public sector efficiency, transparency, collaboration and accountability, technology decentralization is increasingly gaining importance as a promising approach for public administrations (Eaves & Rao, 2025; UNDP, 2023). Yet, there is a lack of empirical knowledge regarding how decentralized technological architectures actually influence public value creation in public sector settings (Bodó & Giannopoulou, 2019).

Motivated by these theoretical and practical gaps, this thesis seeks to untangle the complex dynamics between smart city collaboration and public value creation. The main objective is to move beyond traditional paradigms to explore how multi-actor collaborations in smart city projects influence public value creation in practice. Ultimately, **this study investigates the interplay between governance practices, technological design, and social and institutional contexts to understand how public value is co-created**. In doing so, it seeks to answer the following overarching Research Questions (RQs):

- How does the interplay between governance, technology and actor configurations influence public value creation in complex, decentralised, or multi-actor systems? (**Articles I, II, II**)

- How do context-specific factors and individual and collective capabilities constrain or enable the creation of different public values in collaborative projects? (**Articles I, II, III**)

- How can “public value” be translated and operationalized to study the impacts of various technological and governance choices in collaborative projects? (**Articles II, III**)

1.2 Structure of the thesis

The articles of this thesis collectively trace the progression of a cohesive research project, which moves from identifying critical theoretical and practical gaps around smart city collaboration and public value creation to developing a comprehensive public value(s) framework for multi-actor collaborations, and finally applying that framework within a representative smart city case study.

Specifically, the research is built upon three interconnected academic articles, each investigating the public value creation in multi-actor, collaborative projects through different units of analysis and employing different analytical frames. First, Article I explores the overarching challenges of smart city collaborations and identifies what is missing in current research. Building on these insights, Article II gathers evidence from existing empirical studies to build an integrated framework that explains how multiple actors can influence multiple dimensions of public value creation. Finally, Article III takes this new framework and tests it in an in-depth case study of a decentralized urban data platform. The thesis is structured as follows:

Article I explores the topic of smart city collaboration and public value, revealing a significant disconnection between theoretical models and real-world practices. The research critiques the prevailing academic reliance on static, sector-based collaborative frameworks—such as the double-, triple-, or quadruple-helix models—which fail to properly account for the contextual, social, and political complexities of actual urban projects. It highlights that smart city collaborations are frequently promoted through rhetorical, one-size-fits-all technological solutions that risk prioritizing private interests over the public good. To resolve this theoretical limitation, the article introduces an "assemblage-thinking" perspective (DeLanda, 2006). This approach argues that collaborations should be understood as dynamic, fluid arrangements driven by procedural, relational, and diversity factors, rather than merely by the aggregate properties of the societal sectors involved.

Article II builds upon the need for better collaborative models by providing a systematic analysis of existing empirical studies on public value generation in multi-actor settings. The study bridges two foundational theories by integrating Mark Moore's managerial, action-focused approach to public value with Barry Bozeman's societally oriented framework of "public values". It develops the novel Public Value(s) Governance (PVsG) framework, which updates the traditional strategic triangle to integrate a multiplicity of public value components. Crucially, this framework draws upon Bozeman (2007) conceptualisations to categorize instrumental public values (process-oriented values like procedural legitimacy, relational value, and democratic accountability) and prime public values (output-oriented values like effective performance and problem-solving capacity). This structured framework provides the thesis’ theoretical and practical foundation to study public value creation in multi-actor smart city projects.

Article III grounds the preceding theoretical work by undertaking an in-depth case study to put the PVsG framework into practice. The article focuses on technology

decentralization, which is increasingly proposed as a successful collaborative architecture for building trustworthy and inclusive digital public infrastructure in smart cities. Through an exploratory case study of Hamburg's Urban Data Platform (UDP), the research applies a public values framework across three overlapping dimensions of data platforms (Klievink et al., 2016): the structural layer (technology design), the organizational layer (governance mechanisms), and the functional layer (societal applications). The study demonstrates that a decentralized technical architecture does not automatically generate public value; instead, value creation is determined by specific architecture-governance configurations. It concludes that both decentralized and centralized practices often co-occur, revealing that a leading central orchestrator remains crucial to drive trust, engagement, and overall public value in a decentralized system.

Table 1. Focus of each article.

	Article I	**Article II**	**Article III**
Title	The collaboration dilemma in smart city projects: time to ask the right questions.	Strategic public value(s) governance: A systematic literature review and framework for analysis.	Decentralisation in public sector data platforms: A pathway to enhancing public value?
Focus	Theoretical perspective on smart city collaboration, based on assemblage thinking, organisation studies, and public value creation literature.	Integrated Public Value(s) Governance Framework (PVsG) for multi-actor collaborations.	Empirical application of the thesis theoretical frameworks in a representative smart city project (decentralised urban data platform)
Knowledge gaps	Misalignment between practice and academic literature: Need for a more flexible and coherent approach to theorising cross-sector collaborations in smart city projects.	Lack of accepted tools and frameworks for the empirical assessment of public value creation, and disconnection between the two leading approaches in public value theorizing (Moore's managerial action-focused approach and Bozeman's policy or societally oriented public values).	Lack of empirical evidence on the actual implementation of decentralized data platforms in the public sector, especially regarding governance approaches and public value outcomes.

	Article I	**Article II**	**Article III**
Article research question	How can smart city collaborations be theorised to account for real-world complexities and drive public value creation?	How do multi-actor collaborations generate public value(s)? What types of public value(s) are created by these collaborative endeavours?	How is technology decentralisation implemented in public sector data platforms, and how does it influence public value creation?
Theoretical base	Smart city literature, Assemblage theory, Organisation theory, Public administration	Public Value, Cross-sector collaboration, New Public Management, Collaborative Governance	Technology decentralisation, Open Data Platforms, Data Assemblages, Public Value
Methodological Approach & Data	Literature review of conceptual and empirical literature, complemented with participant observation field notes on smart city projects between 2018 and 2021.	Systematic literature review of empirical research published in peer-reviewed journals within the field of public administration, resulting in a total of 87 cases of multi-actor collaboration analysed.	In-depth single case study based on semi-structured interviews, archival documents, and observational data between 2018 and 2022.

The rest of the thesis is structured as follows. Section 2 presents the analytical framework, beginning with the collaboration dilemmas inherent in smart city ecosystems and building toward a synthesis of assemblage thinking and the Strategic Public Value(s) Governance (PVsG) framework, which is then operationalized for decentralized data platforms. Section 3 details the methodology, explaining the research designs used as well as the data collection, analysis strategies, and research limitations. Section 4 synthesizes the main findings, organized to answer the three overarching research questions regarding the interplay of governance and technology, the role of actor capabilities, and the operationalization of public values. Section 5 discusses the theoretical and practical implications of the thesis. Section 6 concludes with suggesting directions for future research.

2 Analytical Framework

2.1 Cross-sector collaboration in the Smart City

Smart city projects have emerged as highly prominent multi-actor initiatives that “aim to create the conditions needed for smart city innovations and the existing sociotechnical configuration of [urban] local practices to mutually adapt” (Mora et al., 2021, p. 4). They are conceived to leverage the sustainability potential of digital technology to trigger a wide array of public benefits, ranging from optimized public services and reduced energy consumption, to enhanced public sector efficiency and transparency (Kutty et al., 2020). However, a fundamental dilemma exists within these collaborative ecosystems: smart city initiatives do not consistently or automatically lead to the public value outcomes they are expected to create. Instead, they frequently produce unintended and adverse consequences, such as exacerbating existing social divides, leading to an excessive outsourcing of municipal power in favour of private-sector technology providers, and depleting resources of public administrations (Taylor Buck & While, 2016).

To navigate these challenges, academic literature and urban policymakers have traditionally relied on prescriptive, sector-based models of collaboration to structure stakeholder participation. Early critical scholarship warned against the dominance of a "double-helix" model, in which technology providers and local governments operate in isolation from the rest of society (L. Mora & M. Deakin, 2019). This exclusionary approach often promotes techno-utopian expectations and implements one-size-fits-all technological solutions that prioritize private corporate interests and market logic over genuine public benefits. In an attempt to rectify these democratic deficits, the dominant discourse shifted toward more inclusive frameworks, promoting the "triple-helix" model, which integrates university-industry-government connections, and subsequently the "quadruple-helix" model, which explicitly adds civil society to the collaborative coalition (Leydesdorff & Deakin, 2011; Vallance et al., 2020).

Despite the widespread adoption of these multi-sector models, a critical knowledge gap persists regarding their actual efficacy in generating public value, revealing a disconnect between the idealized rhetoric of these models and the complex realities of urban practices. Critical urban scholarship argues that the primary motivation behind adopting triple- or quadruple-helix models is often merely rhetorical, serving as a performative tool rather than a structural reform (Grossi & Pianezzi, 2017; Taylor Shelton et al., 2015). The inclusion of multiple societal sectors does not inherently prevent the permeation of neoliberal discourses, nor does it automatically halt the creation of business-led technology utopias. Empirical evidence suggests that engaging multiple sectors is sometimes utilized as a facade to convince the public that decision-making processes are inclusive and democratic, while the actual underlying mechanisms remain entirely at the service of technocracy and control (Ghosh & Arora, 2022).

Furthermore, these sector-based models entail additional limitations. First, they overlook the fact that societal sectors are highly heterogenous. For example, the private sector encompasses a broad range of entities from small startups to vast multinational tech companies, each possessing vastly different resources, power dynamics, and scales of action (The SDG Partnership Guidebook, 2020). Second, the static nature of helix models also tends to omit same-sector collaborations, such as intergovernmental partnerships across different tiers of administration, or private-to-private agreements,

which are often indispensable for the success of complex urban data initiatives and public value creation (J. M. Bryson et al., 2015).

The complexities of stakeholder participation further highlight the shortcomings of these traditional models. While the voice of the citizen is an essential asset for public value creation, participatory processes can be misused in ways that deepen reliance on dominant actors. In many smart city projects, public and private partners associate citizen engagement strictly with entrepreneurial or consumer roles, relegating citizens to mere creators or testers of applications rather than granting them the decision-making power required to ensure truly democratic outcomes (Mello Rose, 2021). Ultimately, relying on predefined, sector-based collaborative models fails to respond to the need for contextualized smart city practices, neglecting the deep embeddedness of social processes and the nonlinear emergence of public value (J. Bryson et al., 2017; Selsky & Parker, 2005).

2.2 An Assemblage Thinking Perspective

To move beyond the limitations of static, sector-based models, this research adopts assemblage thinking as its primary theoretical lens for analysing the structural formations of smart city collaborations. Originating from the broader domains of sociology and organization theory, assemblage theory fundamentally refuses any fixed forms of processes or relations (DeLanda, 2006). Instead, it conceptualizes cross-sector collaborations as highly dynamic, non-static arrangements comprised of a fluid mix of social and material elements (Hanseth & Modol, 2021). This perspective deliberately maintains an intentional openness (Anderson & McFarlane, 2011), allowing researchers to observe smart city projects not as rigid administrative structures, but as ecosystems in a continuous state of "becoming" (Kamalipour & Peimani, 2015).

By adopting this theoretical lens, the analytical focus shifts from asking merely what sectors are involved in a project, to investigating who and what actually possesses the capacity to assemble the smart city. It questions how these specific collaborations perform, evolve, and enact the creation of public benefits over time (Dovey, 2012), effectively demystifying the influence of powerful actors and unveiling how urban environments might be assembled differently (McFarlane, 2011b). This thesis characterizes assemblage thinking by three main analytical dimensions that provide a nuanced understanding of urban governance and structural formation.

First, it emphasizes the multiplicity and heterogeneity of actors rather than relying on broad, homogeneous sectoral aggregates. Cross-sector assemblages are structured upon the multiplicity of resources that individual actors pool together in collaboration (Kamalipour & Peimani, 2015). This dimension requires distinguishing actors by their varying legal statuses, political authority, economic capacities, and specific scales of action—ranging from grassroots local neighbourhood initiatives to transnational corporate deployments (Varró & Bunders, 2020). It also accounts for the rising presence of hybrid organizations that blur traditional boundaries between the public, private, and non-profit sectors, acknowledging that a single organization can simultaneously embody multiple sectoral characteristics and societal objectives (Selsky & Parker, 2011).

Second, assemblage theory highlights the continuously evolving nature of collaborations (McFarlane, 2011a). Smart city projects are not static arenas; rather, collaborations form, adapt, and dissolve in response to the shifting requirements of different project lifecycle phases. The governance structures that facilitate a project's inception may become obsolete or restrictive during its execution. For example, the agile

and experimental mindsets required during the piloting phase of an urban technology significantly differ from the large-scale production, regulatory compliance, and replication capabilities demanded during the scale-up phase, necessitating entirely different configurations of collaborating actors and institutional support mechanisms as the project matures (Castelnovo et al., 2016).

Third, the assemblage thinking focuses on the fluid roles and interrelations between actors (Kamalipour & Peimani, 2015). Actors can assume varying roles throughout the lifespan of a smart city initiative, actively influencing an actor's access to cultural, social, and material resources, as well as their capacity to exert decision-making power (Wittmayer et al., 2017). Recognizing and recalibrating these roles is essential for navigating power imbalances, establishing trust, and facilitating public value co-creation.

2.3 Strategic Public Value(s) Governance

While assemblage thinking provides the theoretical apparatus to understand how smart city collaborations unfold, evaluating public value creation in these initiatives requires an operational framework for assessing public value outcomes and the governance factors that influence them.

The concept of public value is foundational to modern public administration, emerging as a direct response to New Public Management (NPM) paradigms (Moore, 2013; Wallmeier et al., 2018). Public value theory highlights the distinctive nature of public value beyond mere economic efficiency to capture broad societal benefits, recently conceived as a shared responsibility of all societal sectors (Sancino, 2022). However, despite its growing popularity, the theoretical landscape of public value has historically suffered from two main limitations. First, the challenge in creating operational tools and frameworks for the empirical assessment of public value creation. Second, a lack of integration between the two leading voices in public value theorizing: Mark Moore's (1995) managerial, action-focused approach, which centres on the strategic processes of creating public value, and Barry Bozeman's (2007) policy and societally oriented approach, which focuses on identifying and assessing normative public values.

To overcome these limitations, this thesis aligns with and is influenced by the literature on collaborative governance and networked governance (Ansell & Gash, 2007; Emerson et al., 2011; Osborne, 2006) and proposes an integrative framework for Strategic Public Value(s) Governance (PVsG), with specific emphasis on the places emphasis on the outcomes of collaborative governance processes by integrating Moore's strategic triangle with key frameworks for the assessment of public value and public values (See Figure 1). This unifying framework fundamentally updates Moore's original Strategic Triangle, adapting it for a multi-actor world by expanding its pillars and mapping 12 strategic public value governance components.

The updated PVsG framework expands the traditional "pillars of the triangle" by drawing on research from public value governance (J. Bryson et al., 2017; J. M. Bryson et al., 2015; Sancino, 2022), collaborative governance (Ansell & Gash, 2007; Emerson et al., 2011), and strategic public management (J. Bryson, 2023; Torfing et al., 2021) to address a twofold purpose: offering strategic guidance to the governance of multi-actor collaborations, while enabling the study and operationalization of the plurality of public values.

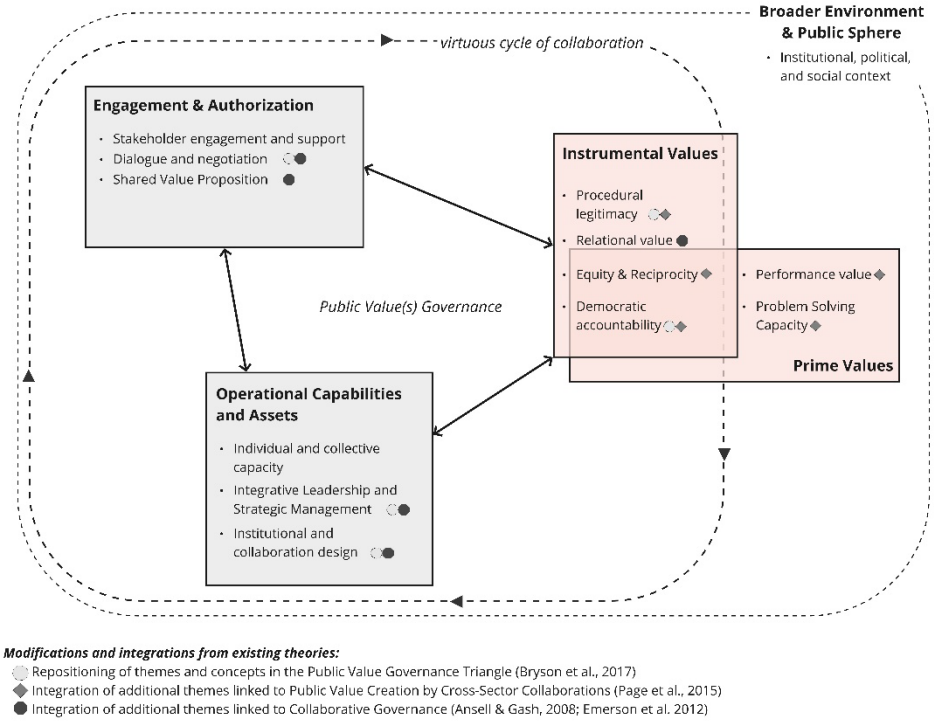


Figure 1. Unifying framework for strategic public value(s) governance (Thabit et al., 2024)

The primary contribution of the new PVsG framework lies in its explicit incorporation of Bozeman's public values approach, applying a dynamic, process-oriented lens. To achieve this, the framework embeds the concepts of instrumental values and prime values (Bozeman, 2007) into a dual-layered pillar within the public value triangle:

- **Instrumental Public Values:** These are process-oriented values that are not pursued solely as ends in themselves, but are employed as a means or vehicle to achieve other outcomes. They include procedural legitimacy (rationality, justice, and operational control), relational value (trust, social networks, and social cohesion), democratic accountability (vertical and horizontal responsiveness), and equity and reciprocity (equity of benefits and payments).
- **Prime Public Values**: These are output-oriented values that are pursued as ends in themselves, representing the ultimate goals of a collaborative endeavour. They include performance value (effectiveness, efficiency, and the durability of solutions) and problem-solving capacity (behavioural shifts, innovation, skills development, and increased knowledge and awareness).

By situating the plurality of public values within the PVsG framework, it facilitates the incorporation of existing research on public value assessment frameworks—such as the one proposed by Page et al. (2015)—and to deploy the Public Value Mapping tool for identifying areas of public value success or failure (Welch et al., 2015). Furthermore, this perspective places public values within the realm of strategizing; each decision made and

resultant outcome forms a continuum of public values, emphasizing that value creation is an ongoing strategic process rather than a passive outcome of collaboration.

2.4 Technology Decentralization and Data Assemblages

The theoretical perspectives of assemblage thinking and the PVsG framework become a central element of this thesis when evaluating the digital infrastructures that underpin smart city collaborations, such as government data platforms.

Data platforms are integrated digital infrastructures that support the storage, management, and exchange of data across various systems and actors to foster collaborative, data-driven innovation (Klievink et al., 2016; Mora et al., 2025). In recent years, local and national governments have been shifting from centralised data warehouses and data lakes, to integrated data platforms that can have different technological approaches—from centralised designs to distributed platform architectures (Fadmastuti et al., 2024; Gupta et al., 2020). While centralized systems aimed to streamline information, they often struggle to accommodate the complex, multi-actor demands of data-driven collaboration. Consequently, technology decentralization has increasingly been proposed as a transformative solution (Eaves & Rao, 2025). It is conceptualized as an architectural approach that allows autonomous organizations to participate in a shared data network while retaining sovereignty and governance control over their digital assets (Kud, 2023). By relying on the horizontal self-organization of networks, decentralized technologies theoretically enable the removal of central points of failure and facilitate alternative configurations of power, wherein participating actors can enjoy greater autonomy and control (Ramachandran et al., 2018).

However, the study of decentralised data platforms in the public sector remains under-analysed, as existing research has mainly focused on the technical innovations that enable decentralization—such as platform architecture, decentralized learning, and interoperability protocols—while largely ignoring how these complex innovations are actually governed in practice (Bodó & Giannopoulou, 2019). Furthermore, academic literature public sector data platforms has mostly addressed this phenomena from the perspective of open data (centralised) platforms, leaving a prominent knowledge gap about the actual benefits that multi-actor decentralised data platforms would create from the perspective of local and national governments (Chen et al., 2021).

Under the lenses of open data, conceptual understandings of public sector data platforms have predominantly revolved around the linear dichotomy of data "supply" and data "demand" (e.g., Bonina & Eaton, 2020). This traditional perspective suggests a unidirectional flow of information that fails to capture the complexity, fluidity, and multi-directionality of modern decentralized data ecosystems (Tonnarelli & Mora, 2025).

Moving beyond their technical architecture, they are increasingly conceptualized as complex socio-technical assemblages—comprising numerous apparatuses, actors, and practices—whose central concern is the production, management, analysis, and sharing of information.

To overcome these limitations, this thesis applies the theoretical lens of assemblage thinking to study decentralised data platforms. By applying this lens, it expands the definition of public sector data platforms as "complex sociotechnical arrangements composed of many apparatuses, actors and practices whose central concern is the production, management, analysis and sharing of data" (Kitchin et al., 2025, p. 2). Viewing data platforms through this perspective frames data platforms as dynamic,

constantly evolving arrangements of social and material components rather than fixed entities (Anderson & McFarlane, 2011; DeLanda, 2006; Kamalipour & Peimani, 2015), and allows to study different levels of (de)centralisation influenced by a variety of architecture-governance configurations (Hanseth & Modol, 2021), embedded in a particular societal context (A. Meijer & Boon, 2021).

Importantly, decoupling a platform's technical architecture from its governance mechanisms illustrates that a decentralized technical design does not necessarily imply decentralized governance. Consequently, data platforms can be categorized into various configurations, such as systems with a decentralized architecture and centralized governance (e.g., common data spaces), or systems with a centralized infrastructure and decentralized governance (e.g., data cooperatives) (Micheli et al., 2020; Vergne, 2020). The creation of public value in these data assemblages is not determined solely by the technological design. Instead, it emerges from the dynamic interplay between the platform's architecture, its governance practices, and context-specific factors.

2.5 A Public Values Framework for Data Platforms

As data platforms become increasingly central to the operations and governance of smart cities, there is a pressing need to conceptualize how they generate public value. Following the PVsG framework presented above, this thesis addresses this need by undertaking a "search for public-values" (Bozeman & Sarewitz, 2011) that identifies a multiplicity of public value dimensions across the main layers of data platforms.

This methodological approach serves as a systematic bridge, connecting broad, abstract theories of public value to the specific, context-relevant realities of smart city ecosystems. By pursuing a multiplicity of public values, this approach allows the study of causality and proximity relations among the different values generated by technological development (Bozeman & Jørgensen, 2007). Acknowledging the socio-technical nature of data platforms—which function simultaneously as information technology infrastructures and governance mechanisms embedded in specific societal contexts—this search is guided by a multilayer analysis (Klievink et al., 2016). This framework maps specific public values across three distinct but highly interrelated dimensions:

The Structural Layer (Technology Design and Infrastructure): This layer encompasses the values that depend directly on the technology itself to be enacted. The specific public values mapped in this layer include:

- *Data Quality, Reliability, and Inclusiveness:* Ensuring that data and analytic tools are valid, reliable, and representative of various dimensions of reality (Antoniou & Skopeliti, 2015; Herfort et al., 2023).
- *Accessibility, Interoperability, and Integration:* The extent to which platform tools and data can be seamlessly accessed, integrated, and utilized by diverse actors without requiring further modifications (Quek et al., 2023; Yu et al., 2019).
- *Security and Privacy:* Guaranteeing that the information infrastructure preserves the security and privacy requirements of all shared and stored data (Samaneh Bagheri et al., 2021).
- *Digital Sovereignty*: Ensuring that organizations and entities maintain autonomy, ownership, and meaningful control over data and technology infrastructures, avoiding technological dependencies (Hummel et al., 2021; Lambach & Monsees, 2024).

The Organizational Layer (Governance Mechanisms and Practices): This layer refers to the values embedded in the processes of governance, collaboration, and data sharing surrounding the platform:

- *Accountability, Ethics, and Transparency:* Ensuring platform governance and operations are transparent, traceable, explainable, and based on ethical principles aligned with existing laws (Bannister & Connolly, 2014; König, 2021).
- *Reciprocity and Equity:* Principles ensuring the equitable distribution of benefits and costs among collaborating organizations and individuals (Samaneh Bagheri et al., 2021).
- *Cross-sector and Intra-sector Data Collaboration:* Facilitating voluntary data sharing within and across different societal sectors to achieve public interest objectives (Ruijer, 2021; Susha et al., 2023; Verhulst, 2023).
- *Efficiency and Sustainability:* The extent to which platform operations remain cost-effective, efficient, and long-term sustainable from financial, technical, and environmental perspectives (Hofmann et al., 2019; Ponti et al., 2024).

The Functional Layer (Uses and Applications at the Societal Level): This third layer captures the prime, output-oriented values generated from the actual utilization and functioning of the data platform by society. It maps the ultimate ends of the technological deployment, including:

- *Improved Public Services:* Enhancing the capacity of the public sector to deliver better services and enabling improved decision-making (Brown et al., 2017).
- *Economic Growth and Innovation:* Promoting the creation of new economic activities, improving existing operations, and enhancing academic research and innovation (Pereira et al., 2017).
- *Informed Society:* Improving the capacity of the general public to oversee policy outcomes, public decisions, and the delivery of public services (Mora et al., 2025; Muhhina, 2024).
- *Cooperation and Participation:* Fostering and enabling ongoing collaboration, partnerships, and co-creation between public, private, academia, and citizen sectors (Sancino et al., 2018).

By translating the PVsG framework into these specific categories, this practical application broadens the normative understanding of the diverse outcomes data platforms can deliver. It provides the analytical framework required to move beyond purely technical assessments of platform decentralization, allowing researchers to empirically evaluate how the interplay of structural architecture, organizational governance, and functional application actively shapes public value creation in smart cities.

3 Methodology

3.1 Methodological Approach

Article I adopts a critical and conceptual methodological approach to examine the theoretical foundations of smart city collaborations. To expose the limitations of prevailing sector-based models, the study synthesizes multidisciplinary literature encompassing smart city research, assemblage theory, organization studies, and public administration. This is empirically grounded and complemented by field notes were collected through participant observation between 2018 and 2021, during which one of the authors served as a United Nations strategic advisor on smart city projects. This observational data was systematically gathered by examining project reports, technical discussions, project events, and both formal and informal interactions among project partners. The focus of the argumentation is the smart city collaborative ecosystem itself, examined as a conceptual construct, to answer the research question "How can smart city collaborations be theorised to account for real-world complexities and drive public value creation?"

Article II employs a Systematic Literature Review (SLR) to consolidate the fragmented knowledge surrounding public value creation (Thome et al., 2016), guided by two primary questions: "How do multi-actor collaborations generate public value(s)? What types of public value(s) are created by these collaborative endeavours?". An SLR is a structured and replicable research method designed to systematically identify, select, and critically appraise all relevant existing research pertaining to specific research questions. This approach was chosen to move beyond isolated examples and build an evidence-based consensus on how multi-actor collaborations function. The unit of analysis for this study comprises the empirical cases of multi-actor collaborations extracted from peer-reviewed articles within the public administration field. Analysing this broad set of cases enabled the research to systematically map the diverse governance components and value outcomes necessary to construct the unified PVsG framework.

Article III utilizes a single exploratory qualitative case study design (Yin, 2009) to investigate the practical implementation of technology decentralization in public sector data platforms. Because the implementation of decentralized data architectures in the public sector is still in its nascent stages, a single exploratory case study was chosen due to the unprecedented characteristics of the case (McBride et al., 2019). The research question, "How is technology decentralisation implemented in public sector data platforms, and how does it influence public value creation?" was carefully formulated based on an analysis of existing literature. The unit of analysis is Hamburg's Urban Data Platform (UDP), conceptualized as a complex socio-technical "data assemblage". This specific unit encompasses not only the platform's technological infrastructure, but also its interacting stakeholders, institutional frameworks, and the surrounding local legislative context. To ensure data triangulation, the research draws upon three primary data sources: semi-structured interviews, archival documents, and observational data.

3.2 Data Collection and analysis

The data collection methods applied across the individual articles include:

- **Systematic Literature Retrieval**: Employed in Article II, data was gathered through comprehensive searches of the Scopus and Web of Science databases, targeting empirical research in peer-reviewed public

administration journals. To ensure a robust dataset, this was supplemented by consultations with 10 academic experts to identify potentially overlooked articles, ultimately yielding a final sample of 59 relevant empirical studies, comprising a total of 87 cases of multi-actor collaborations.

- **Semi-Structured Interviews**: Serving as the primary empirical data source in Article III, 18 in-depth interviews were conducted. These interviews targeted a diverse spectrum of stakeholders—including municipal authorities, publicly owned city companies, federal government entities, and external urban stakeholders (such as academics and private sector representatives)—to capture varied perspectives on decentralization and platform governance.
- **Participant Observation**: Utilized in both Articles I and III to capture the nuanced, real-world complexities of urban projects. For Article I, field notes were collected between 2018 and 2021 by an author serving as a United Nations strategic advisor, capturing formal and informal interactions, project events, and technical discussions. In Article III, observational data was gathered between 2018 and 2022 through active involvement in the design and implementation of Hamburg's Urban Data Platform (UDP).
- **Document Analysis:** To triangulate findings and contrast formal policy discourse against practical realities, Articles I and III relied on the systematic review of documentation. In Article III, a total of 13 archival documents were analysed, including internal working documents, conceptual notes, technical specifications, and official communications. Article we drew upon project reports to contextualize the collaborative ecosystems.

For data analysis, the articles forming the core of the thesis adopted qualitative approaches, primarily utilizing thematic analysis (Gioia et al., 2012). Particularly, in Articles II and III theory played a central role for analysis and explanation of the findings, applying an abductive method that allowed the identification of codes and concepts, conducting an equal engagement with empirical data and the existing theoretical knowledge (Thompson, 2022). In Article II, the thematic analysis of the 59 selected studies began with a collaborative calibration phase among the co-authors to synchronize interpretations, mitigate subjective biases, and establish strict intercoder reliability. This was followed by an iterative, dual-coding procedure where discrepancies were resolved through joint consultation, eventually structuring the data into actionable strategic governance components. In Article III, the thematic analysis of interview transcripts and archival documents unfolded in iterative stages: it began by inductively identifying first-order concepts directly from the data, which were then periodically discussed and mapped against the predefined public values theoretical framework to establish higher-order theoretical dimensions.

3.3 Limitations

While the publications forming the core of this thesis utilized qualitative and systematic methodologies designed to provide in-depth analyses of public value creation in multi-actor and smart city collaborations, certain limitations inherent to these approaches must be acknowledged. These constraints pertain primarily to the scope of the empirical data, the boundaries of the selected case studies, and the specific search parameters used for literature selection.

Regarding **Article I**, the integration of participant observation data inherently carries the risk of researcher bias, as the insights were drawn from a single author's perspective

while acting as a strategic advisor. Furthermore, while the conceptual critique provides a robust theoretical intervention, its broad multidisciplinary claims require further empirical validation across a wider variety of global smart city contexts to fully capture how assemblage thinking operates in practice.

In **Article II**, the Systematic Literature Review (SLR) was subject to specific boundary constraints. The sample was strictly limited to peer-reviewed articles published in English within the public administration field. This exclusion parameter suggests that relevant insights from literature in other languages, as well as from interconnected disciplines such as information systems, business management, or urban planning, were not captured. Additionally, the review deliberately focused on empirical cases documenting successful public value creation, intentionally excluding literature addressing public value failures or destruction. This narrow focus limits the framework's current capacity to fully explain the negative consequences and deep trade-offs inherent in multi-actor collaborations.

Finally, the exploratory methodology of **Article III** is limited by its reliance on a single case study of Hamburg's Urban Data Platform, which inherently restricts the external validity and generalizability of the findings. The unique socio-political, economic, and legal context of Hamburg means these results may not be easily translatable to municipalities with different institutional realities. The data collection also relied heavily on semi-structured interviews predominantly involving stakeholders directly engaged with the platform, which introduces the potential for response bias or the reflection of vested interests. The lack of perspectives from broader end-users or marginalized civil society groups somewhat limits the holistic evaluation of the platform's functional value. Moreover, the cross-sectional nature of the study captures only a specific snapshot in time, failing to track the longitudinal evolution of these decentralized systems and assessing the long-term sustainability of the observed public value outcomes.

Collectively, these methodological limitations define the boundaries of the current research while highlighting suggested avenues for future scholarly inquiry.

4 Main Findings

The following section presents a synthesis of the main findings derived from the thesis articles. By examining how smart city collaborations and public value creation are enacted in practice, this section provides answers to the research questions previously identified.

4.1 The Interplay Between Governance, Technology, and Actor Configurations *(Addressing RQ 1)*

The present thesis suggests that the generation of public value in complex, decentralised or multi-actor systems is not the direct byproduct of isolated technological deployments or concrete governance decisions. Instead, **public value emerges from the intricate and non-linear interplay between collaborative governance structures, technological architectures, and dynamic actor configurations**. Article I illustrates that academic literature in the field of smart cities has frequently approached cross-sector collaboration through static, sector-based frameworks, such as the double-, triple-, or quadruple-helix models (L. Mora & M. Deakin, 2019). These models operate under the assumption that merely aggregating specific societal sectors—such as government, private industry, academia, and civil society—will inherently lead to democratic and beneficial outcomes. However, this sector-driven mentality risks serving as a rhetorical veil that masks technocratic control and could facilitates the deployment of one-size-fits-all technological solutions, ultimately prioritizing private market interests over public value (Alan Wiig, 2016; Grossi & Pianezzi, 2017; Taylor Shelton et al., 2015).

Because of the critical importance of looking at complexity and interrelations when studying public value in complex, multi-actor ecosystems, Articles I and III advocate for the use of "assemblage thinking" (DeLanda, 2006) as a theoretical lens to address this problem. This theoretical approach rejects the notion of fixed collaborative forms, instead defining smart city projects as fluid, evolving arrangements composed of a diverse mix of social and material elements (Kamalipour & Peimani, 2015). By adopting assemblage thinking, researchers can move away from merely counting which societal sectors are involved, and instead examine how actors, technologies, and governance mechanisms continuously assemble, perform, and adapt together to enact public benefits.

By looking at interrelations, as suggested by assemblage thinking approaches, the focus shifts from who is involved to how participating actors are meaningfully engaged, directly resonating with Moore's (1995) first pillar of the public value triangle. As suggested in Article II, the active engagement and legitimate support of legal authorizers and relevant stakeholders are foundational components of generating public value. Empowering collaborating actors, forging long-term trust, and utilizing dialogue and negotiation are indispensable to allow for collective decision-making and the creation of a shared value proposition. Additionally, recognising the heterogeneity of actors in collaborative projects requires actively managing the varying *capacity to act* of different participants. In Hamburg's Urban Data Platform (Article III), findings show that a lack of stakeholders' digital literacy can hamper platform usability and data quality. To counteract this and enable meaningful participation, the UDP enacted different strategies to allow various actors to participate despite their different skill levels. For example, contributors with high technical capacity could provide decentralized data access through Application Programming Interfaces (APIs), while those lacking digital

capabilities could rely on the central orchestrator (the LGV) to upload and process their files. Recognizing and accommodating these disparate capacities to act allowed the UDP to successfully maintain engagement across a highly heterogeneous ecosystem of actors.

By analysing smart city collaborations through an assemblage lens, the thesis reveals that **collaborations and public value creation are dynamic, changing processes that require flexibility and adaptability in governance approaches**. Article II emphasizes that regulative structures and organizational configurations directly shape the collective capacity to create public value, noting that flexibility in institutional design is one of the key elements needed to achieve innovative solutions and sustain public value over time. Governance cannot be treated as a static blueprint; it must continuously recalibrate to manage the shifting roles and evolving requirements of the project lifecycle. An example of this required flexibility can be seen in the empirical findings of Article III concerning the UDP. The study shows that public value creation within the platform was not achieved through a rigid governance structure, but rather because different centrality levels, mixes of formal and informal engagement modes, and a highly flexible approach from the orchestrator were utilized.

Further, it suggests that analysing **technological decentralisation (e.g., in data platforms) as a complex socio-technical assemblage, reveals that a decentralized technical architecture does not inherently equate to decentralized governance**. For example, data platforms can be mapped across four quadrants: centrally governed with centralized architecture (e.g., data repositories), centrally governed with decentralized architecture (e.g., common data spaces), decentrally governed with centralized architecture (e.g., data cooperatives), and decentrally governed with decentralized architecture (e.g., blockchain platforms). In practical implementations, the study suggests that relying exclusively on decentralized governance within a distributed technical system can fail to generate public values such as data quality, system completeness, and overall equity.

In the UDP, while the technical architecture was decentralized, public value creation required the LGV to act as a centralized administrative orchestrator to provide technical oversight, absorb maintenance costs, and establish trust. Simultaneously, data privacy governance was decentralized, leaving individual entities legally accountable for their own shared data. To manage the emotional accountability fears triggered by this decentralization, the orchestrator utilized a flexible mix of formal engagement (such as leveraging Hamburg's binding Transparency Law) alongside informal engagement modes (such as face-to-face workshops and public information events to build trust). This dynamic blending of centralization and decentralization, along with the orchestrator's adaptable strategies, proved crucial for public value creation. Ultimately, as the three sources collectively demonstrate, **public value is generated when governance mechanisms, technological architectures, and actor capacities are treated as a unified, evolving socio-technical ecosystem capable of continuous adaptation.**

4.2 The Influence of Individual and Collective Capabilities, and Context-Specific Factors on Public Value Creation *(Addressing RQ 2)*

To fully understand how public value is created in collaborative projects, it is essential to look at the specific capabilities of the actors involved and the broader contextual environment in which they operate (J. de-Jong et al., 2021; A. Meijer & Boon, 2021; Torfing et al., 2021). A persistent limitation in existing academic literature has been the

tendency to classify collaborating entities by their broad societal sectors—such as the public sector, private industry, or civil society. Findings from Article I demonstrate that it is instrumental to rather look at the multiplicity and heterogeneity of actors rather than their sectors. Sectors are complex wholes comprising a vast diversity of actors who possess entirely different abilities, interests, economic and political assets, and scales of action (Ehnert et al., 2018; Varró & Bunders, 2020). For example, within the private sector, a small local startup can possess different interests and political authority compared to a multinational technology corporation. Similarly, actors operate on different scales of action; the localized knowledge of community members engaged in a neighbourhood project is fundamentally different from the transnational practices of international service providers (Meijer et al., 2016; Soe & Drechsler, 2018).

Therefore**, smart city collaborations should be defined by the assemblage of individual and collective assets and resources that diverse actors pool together in a collaboration**. This theoretical perspective is illustrated by the analysis of empirical cases in Article II, which identifies individual and collective assets and resources as fundamental pillars for generating public value. At the individual level, personal skills—such as active listening, empathy, curiosity, and humility—are critical assets needed to recognize competing value priorities and negotiate effectively (Patel et al., 2017). At the collective level, resources such as social prestige, neutrality, credibility, and previous collaborative experience form the foundation of trusting relationships (Page et al., 2018).

A successful collaborative environment requires a suitable **"capacity mix,"** blending technical and institutional capacities, as well as specialized expert knowledge with the lived, everyday experiences of citizens (Torfing et al., 2021). However, empirical evidence reveals that in real-world technological deployments, these ideal capacity mixes are rarely present from the outset. While capacity mixes are an important element of collaboration, there is also a critical need to address the notion of a "lack of capacity" mix. Article III explains how oftentimes collaborating actors lack the necessary technical capacity needed to engage with a decentralized system. In the UDP case, many municipal departments and stakeholders providing data suffered from a lack of digital literacy and insufficient personnel capacity. This lack of capacity constrained the creation of public value, manifesting as metadata errors, confusing data descriptions, and an inability to provide timely data updates through decentralized APIs. Consequently, this capability gap needed to be tackled by different managerial and governance approaches. The central orchestrator (LGV) had to step in, centralizing the processing burden for these actors and establishing internal working groups and training programs to build their digital literacy over time.

In addition to technical and institutional capability gaps, **human and psychological factors** heavily constrain value creation. Individual factors such as emotional fears are common elements that can create participation paralysis within multi-actor projects. Article III shows that the decentralization of data privacy in the UDP—which left individual entities legally accountable for the data they shared—generated accountability fears and emotional reluctance to share their data. Similarly, it highlights fears from city departments regarding public participation; some administrations hesitated to involve the public out of a fear that excessive transparency would generate a volume of citizen requests that they lacked the capacity to fulfil.

This underscores the critical importance of what Article II defines as **"relational value"—an instrumental public value encompassing three key dimensions**: (i) the development of trusting and respectful relationships among individuals and

organizations (Uhl-Bien & Ospina, 2012), (ii) the creation of social networks and capital through collective action (Ostrom & Ahn, 2011), and (iii) the overarching social cohesion that binds diverse actors together within a society (Bozeman & Jørgensen, 2007). As the findings suggest, overcoming these tensions requires integrative leadership, where facilitators use boundary-spanning experiences and dialogue to navigate paradoxes and build psychological safety among partners (Crosby & Bryson, 2018; Emerson et al., 2011; Sørensen et al., 2021). By establishing relational value, collaborations create a virtuous cycle of mutual respect and commitment. In the UDP, the orchestrator actively cultivated this relational value by utilizing periodic communication, face-to-face engagement workshops, and the highlighting of reputation wins to slowly alleviate these emotional fears and motivate stakeholders to share their data.

Ultimately, smart city collaborations are inherently **context-specific practices** (Meijer et al., 2016). Public value creation in smart cities is inevitably influenced by geographical proximity, historical dynamics, and specific power dynamics of the local environment (Ongaro et al., 2021). As explained in Article II, the "broader environment and public sphere" is a core component of the Public Value(s) strategic framework, noting that the macro-level administrative architecture, political support, and legislative frameworks dictate the boundaries of what a collaboration can achieve. The empirical findings from Article III provide concrete examples of the elements at contextual level that successfully created public value in the UDP. To overcome the emotional reluctance and capability gaps of individual actors, legislative and political factors were required. Hamburg's local Transparency Law acted as a crucial legislative mandate; by establishing a binding legal obligation for public sector entities to share data, it forced hesitant departments to embrace their collaborative roles. Furthermore, strong political support for the "Digital First" and "Digital City" strategies at the municipal level encouraged an ecosystem-wide push toward open-source software and open standards, which directly reinforced the structural value of digital sovereignty. Finally, the presence of specific local institutional partnerships—such as the collaboration between the LGV and the City Science Lab at HafenCity University—provided the necessary academic and technical assistance to develop open-source participation tools and conduct citizen workshops. These context-specific institutional, political, and legal elements acted as the overarching catalyst that enabled the heterogeneous actors to pool their varying capabilities and successfully generate public value in the smart city ecosystem.

4.3 Operationalizing the Multiplicity of Public Values *(Addressing RQ3)*

To study the effects of various technological and governance choices, the thesis suggests that a focus on public values (Bozeman & Jørgensen, 2007) can help overcome the often ambiguous and unbounded concept of public value and facilitate empirical assessments. This is particularly important in multi-actor collaborations, where diverse and often contested values come into play, creating a complex system of trade-offs and different levels of achievement around various public values. This logic also resonates with an assemblage thinking perspective that focuses on tackling complexity and shifting from studying a generalized notion of public good to analysing the multiplicity of and interrelations among distinct public values.

Article II illustrates how this conceptual shift can be achieved by integrating Mark Moore's (1995) managerial, action-focused approach to creating public value, with Barry Bozeman's (2007) policy-oriented focus on the plurality of public values. This theoretical integration forms the foundation of the **Public Value(s) Governance (PVsG) framework**,

which structurally operationalizes the overarching concept of public value into specific, observable public value categories. By looking at the variety of empirical cases analysed in existing literature, the findings suggest that public value outcomes can be primarily separated into two distinct domains: instrumental values (process-oriented) and prime values (output-oriented). **By translating public value into specific categories or values, researchers and practitioners can map causal relationships and understand how different governance and technological choices can influence public value within multi-actor collaborations**. For instance, establishing clear rules and fair procedures (procedural justice) directly enhances relational trust among previously siloed actors. This instrumental trust subsequently reduces information asymmetry and encourages resource sharing, which ultimately drives the prime value of improved, cost-effective performance.

Operationalizing these values proves that public values are not passive outcomes but actionable elements of strategic public governance that must be deliberately managed. Findings from Article II also illustrate that actors may prioritize different, opposing values depending on the requirements and contextual needs of each collaboration. For example, some collaborations deliberately choose informal, decentralized structures to maintain agility (efficient performance), while others mandate formal delivery and monitoring mechanisms to mitigate risks and consolidate collective agendas (operational control). Furthermore, it suggests that technological instruments are not neutral; digital technologies and data act simultaneously as objects of collaborative exchange and as tools to enable the value of operational control. The use of digital platforms to oversee budgets, schedules, and requirements directly influences procedural legitimacy and vertical democratic accountability, proving that technological choices are intrinsically linked to the governance mechanisms necessary to realize both instrumental and prime public values.

Building upon this theoretical foundation, Article III demonstrates how **a multiplicity of public values can be explicitly operationalized to study complex technological ecosystems**. To assess the impacts of technology decentralization, the article undertakes a systematic "search for public-values" (Bozeman and Sarewitz, 2011) tailored specifically to data platforms. The research breaks down the abstract outcomes of digital infrastructure into twelve specific values, categorized across three overlapping layers: the structural layer, the organizational layer, and the functional layer (Klievink et al., 2016). Guided by these twelve values, the empirical analysis of the UDP reveals that technological and governance choices do not impact all values equally; in fact, they frequently create unavoidable trade-offs. Furthermore, by looking at the multiplicity of values, it was possible to unveil causal relationships and observe how technological, governance, and contextual factors were influencing each value.

Findings from Article III suggest that public value creation, far from being a monolithic concept, operates across a spectrum where not all values are fully achieved, and where they are **differently influenced by context specific technology-governance configurations**. While decentralized architecture inherently enhanced structural accessibility and digital sovereignty, the realization of values like data quality, completeness, and trust relied heavily on centralized governance provided by the orchestrator, alongside contextual enablers like data-sharing obligations.

Furthermore, analysing this multiplicity of values uncovers **discrepancies in how much some outcomes are realized**. For example, stakeholders frequently disagreed on the extent to which economic growth, innovation, and an informed society were actually

achieved. Additionally, it highlights that prioritizing the specific values of one layer—such as optimizing the structural technology design—can create trade-offs that negatively impact values in other layers. Prioritizing the structural value of decentralized data privacy—where every stakeholder retains control and legal liability over their own datasets—can negatively impact the organizational value of cross-sector data collaboration. Similarly, optimizing a platform's structural interoperability and digital sovereignty through the exclusive use of specialized open-source standards inadvertently compromised the participation of external stakeholders using proprietary software in the smart city ecosystem.

By explicitly mapping these uneven outcomes, causal relationships, and trade-offs, the findings suggest that **treating public value as a multiplicity of distinct, interacting categories provides a relevant analytical lens to evaluate how, why, and for whom public value is created**. This comprehensive operationalization allows public managers to make informed, strategic decisions that balance the competing demands of complex, multi-actor ecosystems.

5 Discussion

5.1 Theoretical Implications

5.1.1 Reconceptualizing Smart City Collaborations through Assemblage Thinking

A foundational theoretical contribution of this thesis is the application of assemblage thinking to conceptualize the smart city across multiple analytical scales. This theoretical lens enables new conceptual approaches capable of capturing the complexity, continuous evolution, and intricate interconnections inherent in urban ecosystems (Gupta et al., 2020), ranging from the broader collaborative ecosystem down to the specific technological infrastructures that support it, while also contributing to recent literature framing contemporary data systems and ecosystems as dynamic 'data assemblages' (Kitchin et al., 2025).

Originating from sociology and organization studies, assemblage theory actively refuses any fixed forms of processes or relations (DeLanda, 2006). By defining smart city collaborations under the assumptions of assemblage theory, this research conceptualizes urban projects not as static structures, but as highly dynamic, socio-technical arrangements in a fluid state of "becoming" (Kamalipour & Peimani, 2015). This approach facilitates a critical shift in theoretical focus: rather than evaluating collaborations based on the aggregate properties of participating sectors, the analytical lens is redirected toward the dynamic interplay of diverse actors, technologies, and evolving project lifecycles.

Assemblage thinking prompts researchers to move beyond asking what sectors are involved, and instead investigate who and what possesses the capacity to assemble the smart city, and how these collaborative ecosystems perform and adapt over time to enact public benefits. This reconceptualization allows for the demystification of power dynamics (McFarlane, 2011b) and highlights the necessity of context-specific, flexible governance structures capable of managing the shifting roles and multiplicity of resources that heterogeneous actors bring to urban innovation (Dovey, 2012).

5.1.2 From public value to public value(s) governance: The PVsG Framework

A second key theoretical advancement of this thesis is the development of the Strategic Public Value(s) Governance (PVsG) framework, which successfully bridges a longstanding fragmentation within public administration literature: Mark Moore’s managerial, action-focused approach, which centres on the strategic triangle and the practical processes of creating public value, and Barry Bozeman’s normative, policy-oriented focus on identifying and mapping distinct public values. By unifying these paradigms, the PVsG framework provides a comprehensive theoretical structure capable of guiding strategic governance while operationalizing the plurality of public values within collaborative ecosystems. Central to this integration is the theoretical advancement of mapping collaborative outcomes into two distinct categories—instrumental values and prime values (Bozeman & Jørgensen, 2007)—and embedding them within an expanded Public Value triangle, the PVsG framework.

The PVsG framework updates Moore's original model by repositioning and integrating research from public value governance (J. Bryson et al., 2017; J. M. Bryson et al., 2015; Sancino, 2022) collaborative governance (Ansell & Gash, 2007; Emerson et al., 2011) and

strategic public management (J. Bryson, 2023; Torfing et al., 2021). The "Engagement and Authorization" pillar is reconceptualized to emphasize engagement, deliberation, and the necessity of forging a shared value proposition to align competing logics. The "Operational Capabilities and Assets" pillar is expanded to incorporate integrative leadership, strategic management, and flexible institutional designs as foundational capacities for joint action. Finally, the "Broader Environment and Public Sphere" pillar highlights the systemic, institutional, and political contexts that boundary collaborative efforts. Further, the PVsG framework enriches existing theorising on public value attributes—such as the framework developed by Page et al. (2015)—by introducing a newly defined "relational value" dimension capturing the individual relationships, social capital, and social cohesion generated through collaborative governance processes (Ostrom & Ahn, 2011; Uhl-Bien & Ospina, 2012).

The PVsG contribution suggests a paradigm shift, conceptualizing public values not as passive outcomes of collaboration, but as actionable elements of strategic public governance (J. M. Bryson et al., 2023; Sørensen et al., 2021; Torfing et al., 2021). By incorporating instrumental values, the framework brings causal reasoning into strategic management, allowing researchers to trace how process-embedded values actively drive or hinder the achievement of prime values.

Finally, the thesis application of the PVsG principles into the localized domain of data platforms (Article III), demonstrates how abstract public values materialize as observable outcomes, validating the framework's utility in studying trade-offs and causal relationships that define public value creation (Cui & Osborne, 2021). Furthermore, the practical application of this unified framework to digital public infrastructures expands the theoretical understanding of these value categories within specific socio-technical contexts (A. Meijer & Boon, 2021).

5.1.3 Advancing theoretical understandings of public sector data platforms

The application of the above-mentioned theories to digital infrastructures yields significant advancements in the theoretical understanding of public sector data platforms. Existing academic literature has predominantly analysed government data platforms from the lens of open data, building upon the dichotomy between data supply and demand (Bonina & Eaton, 2020) which suggests a linear understanding of data flows that fails to capture the complexity and multi-directionality of decentralised ecosystems (Tonnarelli & Mora, 2025).

By building upon theories on assemblage thinking and data assemblages (DeLanda, 2006; Kamalipour & Peimani, 2015; Kitchin & Lauriault, 2014) this thesis expands the conceptualization of public sector data platforms by defining them as “complex sociotechnical arrangements composed of many apparatuses, actors and practices whose central concern is the production, management, analysis and sharing of data” (Kitchin et al., 2025, p. 2) where data suppliers can at the same time demand and use data from other actors, in a constantly evolving ecosystem (Susha et al., 2023).

Recognizing data platforms as data assemblages allows for a deeper articulation of the role played by architecture-governance configurations embedded in specific societal contexts (Hanseth & Modol, 2021) and challenges existing definitions of technology decentralization as a purely technology design concept. By theoretically decoupling platform architecture from platform governance, the thesis reveals that a decentralized technical infrastructure does not inherently dictate or necessitate a decentralized governance model (Vergne, 2020). Consequently, this decoupling expands upon

theoretical concepts of semi-decentralization (Chen et al., 2021), illustrating that practical implementation of centralized governance practices, such as strong technical orchestration and administrative oversight, can co-occur with decentralized data architectures to successfully manage actor heterogeneity, bridge digital literacy gaps, and safeguard public value.

Finally, this thesis provides a theoretical contribution through the development of a normative framework for public values specifically tailored to data platforms. By systematically mapping the multiplicity of public values across structural, organizational, and functional layers (Klievink et al., 2016), the framework provides a comprehensive definition of multiple public values in data platforms. This public values framework demonstrates how the structural layer translates procedural legitimacy into technical prerequisites, evaluating technology-dependent values such as digital sovereignty, interoperability, and data quality. The organizational layer contextualizes instrumental values, assessing the reciprocity, ethics, cross-sector collaboration, and transparency embedded within platform governance mechanisms. Ultimately, the functional layer captures the prime values realized by society at large, including economic growth, democratic participation, and the overall improvement of public services.

5.2 Practical Implications

5.2.1 Shifting Focus from "Who" to "How" in Smart City Collaborations

A central practical implication of the thesis is the need to transition from static stakeholder representation toward the active, continuous management of collaborative processes. Rather than treating ecosystem inclusion based on predefined societal sectors, practitioners should focus on designing and facilitating how diverse actors interact and co-create value over time (Sørensen et al., 2021). An overreliance on predefined sectoral categorizations can risk the exclusion of heterogeneous actors that transcend traditional organizational definitions (Mukhtar-Landgren, 2021; Selsky & Parker, 2011) and sidelining public value oriented partnerships such as locally embedded, socially focused public-private initiatives, or inter-municipal or cross-agency networks, which are fundamental to smart city development (Ehnert et al., 2018).

Operationally, this also requires dynamic role calibration (Wittmayer et al., 2017), structured to match the evolving needs of a project's lifecycle (Ooms et al., 2020). Stakeholders possess disparate capacity that can fluctuate over time, and practitioners must structure collaborative environments that can adapt to these shifts (Källström et al., 2021). Furthermore, practitioners must ensure genuine “capacity to act” across the collaborative ecosystem. By enabling context-specific modes of engagement, project leaders can empower continuous co-creation and more effectively leverage the diverse, shifting capacities of all participating actors.

Further, insights derived from the analysis of data platforms demonstrate that practitioners must decouple a system's technological design from its governance practices (Vergne, 2020). A critical pitfall is the assumption that deploying decentralized infrastructure—such as common data spaces—will inherently produce more equitable, fair collaboration. However, a focus on the how this technology is deployed is required to understand its capacity to deliver public value (Kud, 2023; Manny et al., 2022). By actively establishing clear rules of engagement, accountability protocols, and distributed decision-making rights independently of the underlying technical infrastructure,

managers can ensure that the governance model matches the intended public value outcomes and effectively leverages the diverse capacities of all participating actors.

5.2.2 Instrumentalizing the Multiplicity of Public Values

Another practical implication for the effective governance of smart city initiatives is the necessity to transition away from monolithic conceptions of the public good and instead embrace the multiplicity of public values. Operationally, the Strategic Public Value(s) Governance (PVsG) framework offers significant utility by enabling an explicit classification of values as instrumental tools designed to strategically unlock other prime societal outcomes (Bozeman & Jørgensen, 2007).

By distinguishing between process-oriented instrumental values and output-oriented prime values, collaborative processes can be intentionally designed as mechanisms for broader public value creation. For example, establishing clear rules and fair procedures generates procedural justice, which in turn acts as an instrumental vehicle to build relational trust among previously siloed stakeholders (Page et al., 2015). To successfully operationalize these values, Article II provides a compendium of practices and factors proved successful for public value creation in extant empirical literature, across the pillars of the PVsG triangle.

Within the Engagement and Authorization pillar, managers must create meaningful spaces for participation and utilize "boundary objects" to navigate paradoxes, facilitate dialogue, and ultimately forge a shared value proposition (Morse, 2010; Ospina & Saz-Carranza, 2010; Parker et al., 2021; Sorensen & Torfing, 2022). Under the Operational Capabilities and Assets pillar, mobilizing tangible resources—such as technical infrastructures, secure data-sharing mechanisms, and sustained funding—must be coupled with the development of intangible organizational capacities (Kattel & Mazzucato, 2018). This includes the deliberate cultivation of individual relational skills, such as active listening and empathy, alongside the implementation of flexible institutional designs that balance bottom-up autonomy with clear accountability (Ongaro et al., 2021; Page et al., 2021; Scupola & Mergel, 2022). Finally, recognizing the Broader Environment and Public Sphere necessitates leveraging historical contexts, community demands, and legislative reforms to anchor collaborative efforts (Sancino, 2022; Sørensen & Torfing, 2016).

Ultimately, by conceptualizing public values as actionable elements, practitioners can deploy targeted governance practices to navigate collaborations in smart city ecosystems. This approach allows administrators to map explicit causal relationships between collaborative processes and desired societal outcomes, intentionally designing governance mechanisms that improve collaborative performance, durable solutions, and enhanced problem-solving capacity (Bozeman & Sarewitz, 2011). By making these dynamics explicit managers can navigate value trade-offs that emerge in multi-actor collaborations (Cui & Osborne, 2021). For instance, as demonstrated in Article II, efforts to maximize operational values—such as administrative efficiency or rapid technological innovation—may frequently conflict with democratic and social values, including broad citizen participation, transparency, or data privacy. Acknowledging and actively managing these tensions is central to design governance mechanisms that balance competing demands and achieve collaborative advantage (Ansell & Gash, 2007; J. Bryson et al., 2017). Furthermore, establishing these clear linkages provides a robust foundation for assessing smart city initiatives beyond conventional technical, operational, or financial metrics (Grossi & Pianezzi, 2017).

5.2.3 Central Orchestration and Institutional Enablers in Decentralized Systems

When deploying decentralized digital infrastructures, such as urban data platforms, this thesis suggests that decentralized technology does not automatically resolve governance challenges or guarantee public value creation. Instead, relying exclusively on decentralized governance within a distributed technical system can fail to generate public value (Chen et al., 2021), primarily due to deficits in actors' capacity to act and lack of trust.

In decentralized platforms, individual entities are frequently made responsible for providing data, ensuring topicality, and managing legal liabilities (Jarosz et al., 2023). However, municipal departments and external stakeholders can suffer from a lack of digital literacy and insufficient personnel capacity, which can lead to metadata errors, lack of updates, and system fragmentation. To overcome these barriers, the thesis suggests that a central orchestrator with technological and political capabilities becomes critical to provide technical oversight, absorb maintenance costs, and manage the digital literacy gaps of heterogeneous actors (Ongaro et al., 2021).

Furthermore, decentralization often triggers psychological and emotional barriers; for instance, making individual stakeholders legally accountable for their own shared data can generate intense accountability fears and participation paralysis. Flexible governance strategies—blending formal mandates with informal engagement, such as face-to-face workshops and periodic communication—to mitigate these fears, build psychological safety, and foster the relational trust necessary to motivate actors to share their resources (Haug & Mergel, 2021; Sørensen & Torfing, 2016).

In addition, the strategic application of top-down regulations—such as local transparency directives or open data laws—combined with the above-mentioned informal engagement that directly addresses cultural and contextual issues, establishes formal pressure that compels potentially hesitant municipal departments to share data, effectively transforming institutional inertia or individual fears into structural compliance (Morse, 2010). From a practical standpoint, bridging the gap between technological potential and societal impact is contingent upon the deliberate anchoring of collaboration and digital infrastructures within these overarching institutional, legal, and cultural contexts.

6 Conclusions and Future Research Directions

This thesis addresses a critical challenge at the intersection of public administration, urban innovation, and technology deployment: the disconnect between the idealized rhetoric of smart city collaborative models and the complex, real-world practice of generating public value.

Traditionally, academic literature and urban policymakers have relied on rigid, prescriptive, and sector-based frameworks—such as the double-, triple-, or quadruple-helix models—to govern stakeholder participation (Leydesdorff & Deakin, 2011; Vallance et al., 2020). This research demonstrates that such static approaches frequently act as a rhetorical facade that risks prioritizing private market interests over genuine public value (Grossi & Pianezzi, 2017; Taylor Shelton et al., 2015). To overcome these limitations, this thesis contributes to advance theoretical and practical understandings around how multi-actor collaborations can be conceptualized, structured, and implemented in smart city ecosystems.

By introducing an assemblage-thinking perspective, this work moves away from fixed organizational structures and instead reframes smart city collaborations as dynamic, fluid socio-technical ecosystems in a constant state of "becoming" (DeLanda, 2006; Kamalipour & Peimani, 2015). This paradigm shift redirects the analytical focus toward the intricate interrelations of diverse actors, technologies, and evolving project lifecycles. Furthermore, this theoretical foundation is operationalized through the development of the novel Public Value(s) Governance (PVsG) framework. By successfully bridging Moore's managerial, action-focused approach with Bozeman's normative public values approach, the PVsG framework provides public managers with an actionable tool to map outcomes across process-oriented instrumental values and output-oriented prime values.

When put into practice through the empirical study of Hamburg's Urban Data Platform (UDP), these theoretical frameworks prove useful to study the complexity of public value(s) creation in multi-actor decentralised contexts. The case illustrates how distributed systems depend on complex architecture-governance configurations (Hanseth & Modol, 2021) where central orchestration remains indispensable. Leading central entities are required to provide technical oversight, absorb distributed operational costs, and actively deploy a flexible mix of formal and informal engagement modes to mitigate stakeholders' accountability fears and capacity gaps (Chen et al., 2021). Ultimately, this thesis suggests that public value in the smart city is not a byproduct of digital infrastructure, but the result of an active, continuous, and context-dependent socio-technical assemblage.

The theoretical and practical insights open several paths for future scholarly inquiry. To build upon these findings, future research should prioritize expanding the empirical and geographical scope of study. Deploying multi-case comparative designs across diverse socio-political, economic, and regional settings is necessary to validate the conclusions of this thesis and to evaluate how different local institutional realities influence the implementation and outcomes of decentralized data assemblages.

Furthermore, given that smart city initiatives are dynamic ecosystems characterized by shifting actor roles across their lifecycles, cross-sectional snapshots are insufficient (Audet & Roy, 2016). Future research should utilize longitudinal research designs to track how technology decentralization, role calibrations, and public value outcomes evolve, adapt, and sustain their institutional viability over extended temporal horizons

(Kallstrom et al., 2021). Scholarly inquiry could also deepen its investigation into public value dynamics by further exploring the intricate trade-offs, positive reinforcements, and negative conflicts that occur within multiple public value constellations. Future studies could look beyond successful co-creation to systematically analyse scenarios of "public value destruction" or collaborative failures, which were deliberately excluded from the current framework's systematic literature review (Cui & Osborne, 2021).

Finally, researchers could build upon the current PVsG framework by driving cross-disciplinary theoretical integration. Merging public value governance concepts with insights from neighbouring fields—such as information systems, organization studies, and innovation management—will enrich the theoretical definition of data platforms from a public value(s) lens.

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Acknowledgements

My PhD journey, far from being a solitary path, opened me up to a group of amazing people and places to whom I will always be grateful—and keep in my heart for the years to come.

First and foremost, I want to thank Francesco, who encouraged me to start this PhD. Thank you for following literally every step of my journey, leaving behind tropical lands and accompanying me across countries. I am deeply grateful to you for always being by my side, for helping me every time I got stuck with my papers, for making me believe I could do this, and for supporting me along the way.

I must also express my deepest gratitude to my supervisor, without whom this would not have been possible. Thank you for believing in me, for helping me, and for your engaged, active guidance through every single part of this process.

I extend my deepest thanks to my co-authors, collaborators, and opponents. A special thank you to Alessandro Sancino, whose invaluable guidance profoundly enriched my work, and to Paolo Gerli, for simply being such a fantastic colleague and a joy to work with.

I am grateful to Kimmo Lylykangas for his support and guidance, to Fabian Dembski for his kind openness, and to the entire Academy of Architecture and Urban Studies for making me feel so welcome. I especially want to thank Ralf-Martin Soe and the team at the FinEst Centre for Smart Cities; your incredible work environment made me feel at home in Estonia. Particular thanks go to Anne Ilu, Anna Suzdalev, Kaija Veskioja, and Sille Sepp for making my experience there the warmest and most enjoyable I could have ever imagined.

I also want to thank my colleagues from HafenCity University, who made my stay in Hamburg an invaluable experience. Thank you deeply to Joanna, in whom I found both a friend and an inspiration. Thanks to Gesa for her guidance and support, as well as to Sarah, Hilke, Heike, Rico, Till, and my UNITAC colleagues Livia, Pontus, and Sophie.

Beyond my immediate academic circle, many colleagues have become dear friends over the years. First and most especially, I want to thank Dominik, Ioannis, Pille, Dika, and Steven, whom I consider part of my extended family; thank you for always being there. Thanks also to Farah, Olli, Laura, Modupe, Marc, Nasim, and Abel for making these years so nice and enjoyable.

Beyond academia, my deepest love and thanks go to my family—especially my parents, Basi and Karim, my brother, Samir, and my son, Aldo, who brought both peace and beautiful chaos to this journey. I want to thank Manolo and Santiago, as well as Nane, Antonio, and Moises, for being the most amazing family that could exist. Thank you to Klau and Alfalfa for being exactly as you are: perfect in every way. I am also profoundly grateful to Edgar; without you, I could never have come this far, kept smiling, and continued growing as a person every day.

I would also like to thank my JRC colleagues. A special thanks to Alex, who has been both a leader and an inspiration—thank you for your amazing support. Thanks also to Marco, Anders, and especially Diletta, for always making me feel like I can succeed.

Finally, I gratefully acknowledge the support and funding provided by the Republic of Estonia and the European Commission, which played a crucial role in bringing this dissertation to completion. I am sincerely indebted for the trust placed in me and proud to repay it with the completion and submission of this doctoral thesis.

Abstract

Public Value Creation in the Smart City: Governance, Decentralization, and Socio-Technical Assemblages

This thesis focuses on the intersection between multi-actor collaboration, technology, and public value creation, placing the study of smart city projects at its centre. In an era defined by complex planetary challenges, smart city projects have emerged as key vehicles for to achieve a sustainable urban future, designed as cross-sector initiatives that aim to trigger a wide range of public benefits, such as climate change mitigation and enhanced public sector efficiency. However, smart city development remains an under-theorised social challenge where diverse and often contested values come into play. Further, smart city projects do not always deliver the public value they are expected to create; instead, they can sometimes exacerbate social divides, deplete public administrative resources, and lead to an excessive outsourcing of municipal power to private technology providers.

In this context, a disconnect can be observed between extant theoretical models of smart city collaboration and its practical reality. This gap stems from a prevailing reliance on static, sector-based collaborative frameworks—such as the double-, triple-, or quadruple-helix models—which fail to properly account for the contextual, social, and political complexities of urban projects. Furthermore, the broader theoretical understanding of public value creation remains fragmented, often struggling to bridge action-oriented managerial approaches with societally oriented policy evaluations. Finally, as local governments increasingly rely on digital public infrastructures to enhance public sector efficiency, collaboration, and accountability, there is a lack of empirical knowledge regarding how decentralized technological architectures actually influence public value creation in public sector settings.

To address these theoretical and practical gaps, this thesis brings together theories on assemblage thinking, organisation, and public administration to untangle the complex dynamics between smart city collaboration and public value creation. Methodologically, the thesis is structured around three interconnected qualitative studies. The first article presents a conceptual critique informed by a critical literature review and participant observation field notes gathered from a smart city advisory role, and formulates a new theoretical perspective that expands the academic debate initiated by critical smart city studies. The second article conducts a systematic literature review across eighty-seven cases of multi-actor collaboration to develop the novel Strategic Public Value(s) Governance (PVsG) framework. This framework integrates Moore's (1995) managerial approach with Bozeman's (2007) normative focus on the plurality of public values, explicitly categorizing public value into process-oriented instrumental values and output-oriented prime values. The third article grounds the previous contributions by applying the PvsG framework through a single exploratory qualitative case study of Hamburg's Urban Data Platform.

The findings demonstrate that public value in complex, decentralised, or multi-actor systems emerges from a non-linear interplay between collaborative governance structures, technological architectures, and dynamic actor configurations. Specifically, the empirical analysis reveals that generating public value within a decentralized technological ecosystem required a central orchestrator to provide technical oversight, absorb maintenance costs, and manage trust through a flexible blend of formal and

informal engagement. Furthermore, individual and collective capabilities, such as digital literacy, alongside psychological barriers like accountability fears, heavily constrain value creation. Overcoming these barriers requires the deliberate cultivation of relational value and the utilization of context-specific institutional enablers, such as local transparency laws, to enforce structural compliance. By operationalizing the PVsG framework across structural, organizational, and functional layers, the research uncovers public value trade-offs, demonstrating that public values should not be treated as passive outcomes but as actionable elements of strategic public governance that must be deliberately managed. Ultimately, the thesis concludes that public value creation is proven to be an active, context-dependent socio-technical assemblage of distinct, interacting values, influenced by context specific technology-governance configurations.

Lühikokkuvõte

Avaliku väärtuse loomine Targas linnas: valitsemine, detsentraliseerimine ja sotsiaal-tehnilised kooslused

Käesolev väitekiri keskendub mitme osapoole koostöö, tehnoloogia ja avaliku väärtuse loomise kokkupuutepunktile, asetades oma keskmesse nutilinna projektide uurimise. Ajastul, mida iseloomustavad keerulised planetaarsed väljakutsed, on nutilinna projektid esile kerkinud peamiste vahenditena jätkusuutliku linnalise tuleviku saavutamiseks, olles kavandatud sektoritevaheliste algatustena, mille eesmärk on tuua kaasa laialdasi avalikke hüvesid, nagu kliimamuutuste leevendamine ja avaliku sektori suurem tõhusus. Siiski jääb nutilinnade arendamine alateoretiseeritud sotsiaalseks väljakutseks, kus mängu tulevad mitmekesised ja sageli vastandlikud väärtused. Lisaks ei anna nutilinna projektid alati edasi seda avalikku väärtust, mida neilt luua oodatakse; selle asemel võivad need mõnikord süvendada sotsiaalseid lõhesid, kurnata avaliku halduse ressursse ning viia munitsipaalvõimu ülemäärase loovutamiseni eratehnoloogia pakkujatele.

Selles kontekstis võib täheldada ebakõla nutilinna koostöö olemasolevate teoreetiliste mudelite ja selle praktilise reaalsuse vahel. See lõhe tuleneb valdavast tuginemisest staatilistele, sektoripõhistele koostööraamistikele — nagu kaksik-, kolmik- või nelikheeliksi mudelid —, mis ei suuda piisavalt arvesse võtta linnaprojektide kontekstuaalset, sotsiaalset ja poliitilist keerukust. Lisaks jääb laiem teoreetiline arusaam avaliku väärtuse loomisest kildustatuks, olles sageli raskustes tegevuspõhiste juhtimislähenemiste ja ühiskonnale suunatud poliitikahinnangute ühendamisega. Lõpuks, kuna kohalikud omavalitsused tuginevad avaliku sektori tõhususe, koostöö ja aruandekohustuse suurendamiseks üha enam digitaalsetele avalikele taristutele, on puudus empiirilistest teadmistest selle kohta, kuidas detsentraliseeritud tehnoloogilised arhitektuurid avaliku sektori kontekstis avaliku väärtuse loomist tegelikult mõjutavad.

Nende teoreetiliste ja praktiliste lünkade täitmiseks koondab käesolev väitekiri assamblaažimõtlemise (*assemblage thinking*), organisatsiooni- ja avaliku halduse teooriad, et lahti harutada nutilinna koostöö ja avaliku väärtuse loomise vahelist keerulist dünaamikat. Metodoloogiliselt on väitekiri üles ehitatud kolmele omavahel seotud kvalitatiivsele uuringule. Esimene artikkel esitab kontseptuaalse kriitika, mis tugineb kriitilisele kirjanduse ülevaatele ja nutilinna nõustaja rollis kogutud osalusvaatluse välimärkmetele, ning sõnastab uue teoreetilise perspektiivi, mis laiendab kriitiliste nutilinna uuringute algatatud akadeemilist arutelu. Teises artiklis viiakse läbi süstemaatiline kirjanduse ülevaade kaheksakümne seitsme mitme osapoole koostöö juhtumi põhjal, et töötada välja uudne strateegilise avaliku väärtuse (või väärtuste) valitsemise (PVsG) raamistik. See raamistik integreerib Moore'i (1995) juhtimislähenemise Bozemani (2007) normatiivse fookusega avalike väärtuste paljususele, liigitades avaliku väärtuse selgesõnaliselt protsessile suunatud instrumentaalseteks väärtusteks ja väljundile suunatud põhiväärtusteks. Kolmas artikkel annab eelnevatele panustele praktilise aluse, rakendades PVsG raamistikku Hamburgi linna andmeplatvormi (*Urban Data Platform*) uuriva kvalitatiivse üksikjuhtumi uuringu kaudu.

Tulemused näitavad, et avalik väärtus keerulistes, detsentraliseeritud või mitme osalejaga süsteemides tekib koostööpõhiste valitsemisstruktuuride, tehnoloogiliste arhitektuuride ja dünaamiliste osalejate konfiguratsioonide mittelineaarse vastasmõju tulemusena. Täpsemalt toob empiiriline analüüs esile, et avaliku väärtuse loomine detsentraliseeritud tehnoloogilises ökosüsteemis nõudis keskset koordinaatorit, kes tagaks tehnilise järelevalve, kataks hoolduskulud ning juhiks usaldust formaalse ja

informaalse kaasamise paindliku kombineerimise kaudu. Lisaks piiravad väärtuse loomist oluliselt nii individuaalsed ja kollektiivsed võimekused, nagu digitaalne kirjaoskus, kui ka psühholoogilised barjäärid, näiteks hirm vastutuse ees. Nende barjääride ületamine nõuab suhtepõhise väärtuse teadlikku kujundamist ja kontekstispetsiifiliste institutsionaalsete võimaldajate, näiteks kohalike läbipaistvusseaduste kasutamist, et tagada struktuurne vastavus. Rakendades PVsG raamistikku struktuursel, organisatsioonilisel ja funktsionaalsel tasandil, toob uurimus esile avaliku väärtusega seotud kompromissid, näidates, et avalikke väärtusi ei tohiks käsitleda passiivsete tulemitena, vaid strateegilise avaliku valitsemise rakendatavate elementidena, mida tuleb teadlikult juhtida. Lõppkokkuvõttes järeldab väitekiri, et avaliku väärtuse loomine on tõestatult aktiivne, kontekstist sõltuv eraldiseisvate ja vastastikku toimivate väärtuste sotsiotehniline kooslus, mida mõjutavad kontekstispetsiifilised tehnoloogia ja valitsemise konfiguratsioonid.

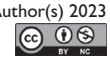
Appendix 1

Publication I

Thabit, S., & Mora, L. (2023). The collaboration dilemma in smart city projects: Time to ask the right questions. *Organization*, 31(7), 1058–1069. https://doi.org/10.1177/13505084231183949 (ETIS Category: 1.1)

Check for updates

Special Issue: Public Value

Organization
2024, Vol. 31(7) 1058–1069
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DOI: 10.1177/13505084231183949
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The collaboration dilemma in smart city projects: Time to ask the right questions

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Abstract

This *Connexions* article links collaboration in smart city projects, a contemporary and undertheorised social challenge, with theories on assemblage thinking, organisation, and public value creation. Using this multidisciplinary lens, we critically analyse smart city theory and expose the inability of prevailing collaborative models to properly account for the complexities of real-world practices. Building on our observations, we formulate a new and more robust theoretical perspective on smart city collaboration, which helps us trigger new research questions that focus on procedural, relational and diversity factors previously ignored.

Keywords

Assemblage theory, cross-sector collaboration, public value, reorganising, smart city projects, urban innovation

Introduction

Achieving a more sustainable urban future requires collective action (Le Pennec and Raufflet, 2018; Mervyn et al., 2019). This requirement is emphasised in the United Nations (UN) Agenda 2030, which recommends local and national governments to enhance cross-sector collaborations 'that mobilize and share knowledge, expertise, technology, and financial resources, to support the achievement of the Sustainable Development Goals' (IAEG-SDGs, 2021: 22). However, mobilising

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collaborations that involve multiple sectors of society is challenging; they entail elaborate forms of governance (Armistead et al., 2007; Page et al., 2015) and various difficulties that can hinder the effective creation of public value (Hartley et al., 2019b). As a relevant example of cross-sector collaborations, where diverse stakeholders influence the creation (or depletion) of public value, smart city projects perfectly showcase this critical challenge (Neumann et al., 2019).

Smart city projects 'are cross-sector projects which aim to create the conditions needed for smart city innovations and the existing sociotechnical configuration of [urban] local practices to mutually adapt' (Mora et al., 2021: 4). They are forged to trigger a large range of public benefits such as climate change mitigation and improved public sector efficiency (Kutty et al., 2020). Over the past three decades, policymakers in the public sector, private companies, and other urban development actors have increasingly relied on smart city projects to leverage the sustainability potential of digital technology. Data released in the UN World Cities Report 2020 reveals that this interest has fuelled a growing technology market, which reached US$1 trillion in 2019 and is expected to expand to US$3.48 trillion by 2026 (Knudsen et al., 2020).

However, smart city projects do not always lead to the benefits that they are expected to create (Mora et al., 2021). On many occasions, these collaborative endeavours have generated undesired outcomes; for example, they might exacerbate existing social divides, lead to excessive outsourcing of power in favour of private-sector technology providers, and waste the already shrinking resources of public administrations (Taylor Buck and While, 2017). The primary challenge of smart city projects is twofold. First, limited information is available regarding how to organise these cross-sector partnerships towards the public good adequately (Meijer and Bolívar, 2016). Second, few studies attempt to overcome this gap, and they propose collaborative models based on configurations that do not align with the requirements of context-specific value creation processes (Shelton et al., 2015).

In this *Connexions* article, we unveil the collaboration dilemma inherent in smart city literature, together with the need for a more flexible and coherent approach to theorising cross-sector collaborations in smart city projects, which is currently missing. The remainder of this article is organised into six sections. First, we present the key limitations of the prevailing smart city collaborative models, indicating their inability to properly account for the complexities of real-world practices (Castelnovo et al., 2016). Next, building on these limitations, we introduce a new and more robust theoretical perspective on smart city collaboration, which we root in assemblage thinking. Thereafter, we elaborate on this perspective by focusing on three critical matters: the multiplicity and heterogeneity of actors rather than sectors, evolving nature of collaborations, and roles and interrelations among actors. Finally, we discuss our considerations to develop future research directions.

The theoretical perspective that we present draws upon the empirical and conceptual literature on smart city projects, assemblage theory, organisation studies, and public administration. Moreover, these sources have been complemented with data on smart city projects in which one of the authors acted as a UN strategic advisor. Between 2018 and 2021, field notes were collected through participant observation, by examining project reports, formal and informal interactions among project partners, project events, and technical discussions. In this study, we used these data as additional evidence to strengthen the main claims that shape our critical examination.

When theory fails practice: The case of smart city collaboration

Prevailing models: A sector-based mentality

Collaborative dynamics are among the most relevant factors in smart city projects and strongly influence their ability to deliver public value (van Winden and van Den Buuse, 2017). Notwithstanding

this critical role, smart city scholars have raised concerns about the lack of cogent theories elucidating how cross-sector collaboration functions in smart city practices (Ruhlandt, 2018).

The existing literature flags the risk of promoting smart city projects in which technology providers and governments work in isolation from other societal actors – in a *double-helix* model (Mora and Deakin, 2019). On many occasions, this collaborative model has proven to promote techno-utopian expectations and one-size-fits-all technological solutions that prioritise private interests over public benefits (e.g. see Söderström et al., 2014). In response to this limitation, scholars have developed two dominant research streams that propose alternative collaborative models based on the active participation of additional societal sectors. Some scholars recommend relying on university-industry-government connections, which form *triple-helix* coalitions (Leydesdorff and Deakin, 2011), whereas others consider these collaborative arrangements insufficient and have emphasised the need to add civil society, moving to a *quadruple-helix* model of collaboration (Vallance et al., 2020).

However, few studies have examined the causal connections between the aforementioned collaborative models and their actual outcomes, posing a risk of confusion about the components that influence public value creation in the smart city context (Ruhlandt, 2018). In examining how neoliberal discourses can permeate in smart city projects (Hollands, 2015), critical urban scholarship has raised questions about the efficacy of triple- and quadruple-helix models to truly prevent the creation of business-led technology utopias (Grossi and Pianezzi, 2017). Empirical studies have demonstrated that the primary motivation behind the implementation of these collaborative models can be merely rhetorical (Shelton et al., 2015), and their adoption does not necessarily increase the public value of smart city projects (Wiig, 2016). Triple- and quadruple-helix collaborative processes in smart city projects can be introduced as a vehicle to convince the public that decision-making processes are developed in an inclusive and democratic manner (Nguyen et al., 2022), but in reality they are 'put at the service of technocracy and control' (Ghosh and Arora, 2022: 333).

Contextualising collaboration practices

To 'move beyond the neoliberal smart city idea' and its rhetoric (Di Feliciantonio, 2019: 107), more attention should be drawn to *how* collaborations are actually enacted rather than *what* type of actors and sectors are involved. A theorising based on predefined, sector-based collaborative models falls far from responding to the need for contextualised smart city practices. Moreover, it overlooks the longstanding theoretical considerations developed in research fields that examine the processes of organising and organisations in society. Public administration literature has already warned us about the risks of relying on one-size-fits-all models for cross-sector collaborations, advising that they 'tend to neglect the embeddedness of social processes within the larger institutional structures studied in institutional theory, as well as processes of nonlinear emergence as studied in complexity theory' (Selsky and Parker, 2005: 865). Similarly, organisation theory emphasises that cross-sector collaborations are dynamic rather than static settings that 'take different forms according to various contexts' (Audet and Roy, 2016: 879). In these collaborative arenas, actors often play changing roles in value-creation processes and are highly influenced by the social and relational processes in which they are embedded (Le Ber and Branzei, 2010b).

The engagement or non-engagement of societal sectors cannot be mainstreamed as a golden rule for assessing the quality of collaborative conditions; the inclusion of two, three, or even four societal sectors in smart city projects cannot be seen as a condition *sine qua non* to effectively manage public value creation efforts. Social, organisational, and cultural conditions influence the ability of collaborative models to create public value (Meijer et al., 2016) and call for different types of cross-sector collaborations, shaped in accordance with various factors – such as power

imbalances (Vangen and Huxham, 2003), actors compatibility (Brown et al., 2019), geographical proximity (Di Domenico et al., 2009), and material and immaterial resources (Oliver and Ebers, 1998).

For example, urban and organisation studies have exposed the many challenges that lie behind civil society participation processes aimed at enhancing public value creation (Cowley et al., 2018; Kornberger et al., 2017). While the voice of the beneficiary represents an essential asset for public value creation, participatory processes can be misused, 'in ways that deepen and reify their dependence by the dominant actors' (Le Ber and Branzei, 2010b: 607). Cases of urban development projects have revealed that using the input of citizens can be rather difficult, and in some situations, deploying such input has resulted in a reduced opportunity to positively influence intended outcomes (Källström et al., 2021).

Towards more dynamic and diverse collaborative approaches

It is also important to accept that different types of partnerships may be required, including double-helix collaborations, which cannot be stigmatised as opponents of public benefits. In fact, empirical studies on public value creation offer examples of public-private collaborations that have led to social outcomes in the context of smart city projects, such as the *Integreen* and *Real-time Bus* initiatives implemented in the Italian cities of Bolzano and Merano, respectively (Sancino et al., 2018).

As organisational studies emphasise, all societal sectors have public value obligations (Jørgensen and Bozeman, 2007), and business organisations can and do play prosocial roles (Di Domenico et al., 2009). Decades of research connecting organisation theory to strategic management have helped understand that assuming prosocial responsibilities 'has become an accepted operational and managerial [practice] that is widely implemented in organizations' (Gond and Nyberg, 2017: 1127), triggering debates on how this construct reconciles with market practices (Crouch, 2006). This interrelation can also be found in the smart city context; for instance, in Abidjan, Côte d'Ivoire, a large telecommunication company released 2.5 billion anonymised telephone data in 2012 (Talbot, 2013). The data were used by a multinational technology firm to identify the most frequently used bus routes. Despite being implemented by a private actor and without deliberate citizen engagement or triple-helix collaborative models, the action sustained public value creation, providing the city government with actionable information on how to improve its public transport network (Knudsen et al., 2020). However, questions remain regarding whether and how these open data habits can be effectively integrated into urban governance practices.

Another fundamental aspect that has been overlooked is collaboration among entities belonging to the same sector (e.g. public-to-public or private-to-private partnerships). Smart city research is overly focused on defining what cross-sector configurations lead to successful smart city projects. As a result, it ignores that complex collaborative processes tend to 'include both cross- and same-sector partnerships' (Gutiérrez et al., 2016: 55). Intergovernmental partnerships are recognised as exemplary cases of same-sector collaborations with a high potential for public value creation (Bryson et al., 2015). Moreover, the lack of collaboration among different tiers of the government can prevent smart city projects from occurring. For example, in Durban, South Africa, the implementation of a data management system to improve service delivery in informal settlements was undermined by the lack of data sharing practices among different municipal departments and fragmented data and information scattered across government tiers.[1] Similarly, the city of Lyon, France, has attempted to leverage private sector-owned data to enhance urban sustainability by building the MyData platform. Data sharing among industry partners has been indispensable to implementing this smart city project: the more private entities join this collaborative project, the larger the dataset and the possibility of generating public value. However, encouraging private companies to pool

their data and engage in same-sector collaborations has proven challenging, putting the project at risk (Gupta and Mora, 2021).

An assemblage-thinking perspective in smart city research

Conceiving cross-sector collaboration in smart city projects requires acknowledging the myriad of diverse collaborative models that simultaneously coexist in practice as well as the social and political processes underpinning them (Anderson and McFarlane, 2011). To advance theorising, we suggest observing smart city research from the perspective of assemblage theory, which refuses 'any fixed forms [. . .] of processes or relations' (Kamalipour and Peimani, 2015: 403) and help move towards 'a rather common sense fashion to refer to arrangements of any mix of social and material elements' (Hanseth and Rodon Modol, 2021: 12).

Unlike extant approaches to examining smart city collaborations, which mainly revolve around preconceived collaborative models, assemblage thinking helps 'remain deliberately open' (Anderson and McFarlane, 2011: 124) and appreciate the depth of smart city transformation processes. Research on smart city projects primarily focuses on what sectors constitute a collaboration, whereas we impel to address the questions of 'who and what has the capacity to assemble [smart] city' projects (McFarlane, 2011a: 668), and how smart city collaborations perform, evolve, and enact the creation of public benefits (Dovey, 2011). Assemblage thinking allows to 'demystify the power of the powerful' (McFarlane, 2011b: 734) and unveil alternative configurations on 'how the city might be assembled differently' (McFarlane, 2011a: 668).

By adopting assemblage thinking, smart city researchers can create a common dialogue between loosely connected streams of research (urban, public administration, and organisation studies) that possess 'different theoretical, activist, and marginalized knowledge' (McFarlane, 2011b: 738) while being part of a common effort to theorise smart city-related phenomena.

Building on Kamalipour and Peimani's (2015) contribution to assemblage theory, this *Connexions* article introduces an assemblage-thinking perspective in the study of smart city projects. This perspective is based on procedural, relational, and diversity factors, which we consider indispensable for examining public value creation in cross-sector collaborations. Smart city projects should be understood as the result of non-static collaborative arrangements (DeLanda, 2006) that follow a 'fluid status of becoming rather than being' (Kamalipour and Peimani, 2015: 404). Multiple and heterogeneous actors from local, national, and international spheres (Dovey, 2011; Varró and Bunders, 2020) engage in collaborative ventures that evolve substantially over time in response to different project phases (Aaltonen and Kujala, 2010; Allen, 2011).

This theoretical understanding of smart city projects is further elaborated in the following sections of this article, where we focus on three critical matters: the multiplicity and heterogeneity of actors rather than sectors, the evolving nature of collaborations, and the roles and interrelations among actors.

Multiplicity and heterogeneity of actors rather than sectors

Cross-sector assemblages cannot be defined by the aggregate properties of the societal sectors involved; rather, they are structured upon the multiplicity of resources that individual actors pool in collaboration (Kamalipour and Peimani, 2015). Therefore, a focus on actor abilities, rather than sectors, is key to unveiling how organisations respond to and engage with social problems. Moreover, this focus in instrumental in understanding what collaborative dynamics regulate smart city project development.

Societal sectors are complex wholes comprising a multiplicity of actors with diverse abilities, interests, and objectives. For example, the UN advises to not consider 'the private sector [as a] homogeneous entity' (Stibbe and Prescott, 2020: 20), because it includes a broad 'range of commercial entities, from smallholder farmers, through small and medium-sized businesses to vast multinational companies' (p. 20). Additionally, hybrid organisations are increasingly emerging at the intersection between sectors, where 'spillovers of concerns for social needs have led to a blurring of the traditional roles and functions of the [public, private, and non-profit] sectors' (Selsky and Parker, 2011: 23).

Belonging to the societal sector is a relevant characteristic of actors collaborating in smart city projects; however, it is not sufficient to fully define them. As organisation studies highlight, actors from the same sector can be influenced differently by political and economic authority and may have diverse legal statuses (Bozeman, 2013). These aspects influence the readiness of individual organisations to create public value through smart city projects. Taylor Buck and While (2017), for example, noted that local governments in major cities in the United Kingdom possess greater policy and investment capacities than in smaller urban contexts. The analysis has revealed that larger cities are more prepared to orchestrate urban digital innovations in collaboration with private sector partners, whereas smaller urban entities have reported conflicts that undermine their track-record of local-government-led smart city projects. Similarly, comparative studies in Hungary and the Netherlands have indicated that various levels of government centralisation can lead to diverse collaborative configurations in smart city projects. Moreover, they can affect how national governments contribute to sustaining or hindering smart city development at the local level (Varró and Bunders, 2020).

In addition to the economic and political aspects, the functionality of a collaborative ecosystem is dependent upon its multilevel configuration. The practices of collaborating actors reproduce scales of action (Varró and Bunders, 2020) that move 'in both vertical and horizontal directions across international, transnational, [. . .] national, regional, and local levels' (Ehnert et al., 2018: 2). Actors possess different types of knowledge that materialise during collaboration, and this knowledge is directly connected with their scales of action; the knowledge of an organisation operating at the city level, for example, is different from the knowledge of individuals who only engage with an urban neighbourhood (Durose et al., 2022). Smart city projects require connecting these knowledge types in a multi-level process where 'grand visions in city hall need to go hand in hand with practices in local neighbourhoos' (Meijer et al., 2016: 653), and where transnational practices flourish beyond a 'one-city [or] one-country game' (Soe and Drechsler, 2018: 331).

Place-specific smart city projects are indispensable to ensure that digital technology is directed towards the service of public value creation and urban sustainability enhancement (Taylor Buck and While, 2017). Therefore, the presence of local actors who possess such knowledge represents a key element of smart city collaborative ecosystems (Ehnert et al., 2018). Smart city initiatives can become ineffective and inhibit public value creation if the collaborative ecosystem is dominated by international actors and prevents local actors from contributing to project development (Mukhtar-Landgren, 2021). Considering that developments in smart city technologies are driven primarily by powerful global corporations having strong financial and technical resources, local-level knowledge tends to be overshadowed, and research on smart cities overlooks this challenge.

How and to what extent the combination of abilities of local and international actors should be balanced in smart city projects remains largely underexplored. Further research is required to inform the design of collaborative models that respond to a balanced assemblage of economic, political, and knowledge potentials of collaborating actors. However, these matters cannot be investigated using the static and sector-driven models that the current research builds on. A stronger focus on the multiplicity and heterogeneity of actors rather than sectors is required, as well as a

more in-depth understanding of how these actors' abilities respond to the evolving collaborative dynamics that arise from each phase of a smart city project.

Evolving nature of collaborations

Organisation theory suggests interpreting cross-sector collaborations as dynamic processes whose configuration changes over time (Audet and Roy, 2016). Accordingly, smart city projects cannot be interpreted as static arenas; they should be considered as endeavours where collaborations form and dissolve in response to the needs that emerge during the different stages of a project lifecycle (McFarlane, 2011b). However, smart city research has paid minimal attention to these evolving collaborative dynamics (Ooms et al., 2020).

The common phases of smart city projects (i.e. design, implementation, and maintenance) have different characteristics (Aaltonen and Kujala, 2010). Therefore, the configurations of collaborating actors are expected to align with the varying requirements emerging from each project activity. For example, developing the project specifications of a smart mobility system for the city of Iskandar, Malaysia required a cooperation between regional government agencies, international donors, UN agencies, non-profit professional groups, and academic partners. This collaborative configuration changed during the implementation phase, when a private-sector consortium became the central actor responsible for developing the smart mobility system, whereas the academic partners left the project and citizens became involved in periodic consultations (see Note 1).

Instead of embracing a project lifecycle perspective, research examining smart city projects primarily focuses on design and implementation, leaving unexplored obstacles that often arise in the post-implementation stages (Castelnovo et al., 2016). In the Iskandar project, for instance, the adoption phase of the smart mobility system was identified as a challenge considering the many different parties and jurisdictions that had to be involved. The complexity of these new collaborations was not initially addressed, undermining the data-sharing and integration requirements necessary to ensure the functioning of the system.

The experience of Iskandar emphasises the importance of aligning actor configurations with the requirements of different project phases and activities, which is pivotal to maximising public value creation in smart city projects (Le Ber and Branzei, 2010b). This condition calls for adaptations in collaborative configurations, a requirement that becomes evident when examining the tension between the piloting and scaling stages (Bundgaard and Borrás, 2021). Activities related to the piloting of smart city solutions should prioritise adaptive abilities, agility, openness, and experimental mindsets (Soe and Drechsler, 2018), whereas scale-up operations require a different set of abilities related to large-scale production, replication, and exploitation (van Winden and van Den Buuse, 2017). Research reveals that small and local technology companies (like startups) often struggle to effectively scale up smart city solutions, although they have the agility required to sustain niche innovation and fuel many smart city developments (Sarma and Sunny, 2017). Conversely, multinational companies and international service providers, whose rigid structures may inhibit niche innovation efforts, are able to combine their local presence in various cities and more easily replicate possible smart city solutions, while achieving economies of scale faster than their smaller competitors (van Winden and van Den Buuse, 2017).

Roles and interrelations between actors

Smart city project development requires 'a set of interconnected actors', who interact formally and informally (Sarma and Sunny, 2017: 6). These interactions are shaped by the diverse roles each actor plays during the collaborative process (Hanseth and Rodon Modol, 2021). Citizens and

organisations can assume various roles across different smart city projects and within the same project. These roles represent a tool for obtaining access to cultural, social, and material resources as well as power (Wittmayer et al., 2017), and they affect the ability of actors to influence public value creation (Borrás and Edler, 2020).

Studies on roles and interrelations among actors belong to a longstanding line of enquiry in organisation studies (see Armistead et al., 2007; Oliver and Ebers, 1998), which has also increased in relevance to the public value creation literature (Hartley et al., 2019a) and research on cross-sector collaborations (Selsky and Parker, 2011). Current theorising stresses the importance of examining 'what role different actors, often from different sectors, can and do play in the processes of value production' (Bryson et al., 2017: 642).

Smart city research has accorded limited consideration to the varying roles that organisations play in smart city projects (Ruhlandt, 2018), with a major gap in the examination of the relationship between actor-role configurations and public value creation. To the best of our knowledge, only a few exceptions exist, like the study by Neumann et al. (2019). By examining a sample of Swiss smart city projects, they concluded that smart city collaborations are more likely to produce public value when local governments play a stewardship rather than a bureaucratic role. However, no additional studies have been conducted to generalise these findings.

Roles have also been explored in relation to civil society engagement, where smart city research has only recently started to highlight that citizens can have different roles (Mello Rose, 2022), indicating the need to move beyond one-size-fits-all and generic interpretations of citizen participation. For instance, Cowley et al. (2018) suggested some of the roles that citizens can play during smart city initiatives (e.g. consumers, entrepreneurs, civic agents, or political actors) and their correlation with actual project outcomes. The findings of their multiple-case study reveal that in some smart city projects, citizens act as decision-makers, enhance democratic outcomes, and help managers to place smart city technology at the service of public interests (Royo et al., 2020). However, in many situations, public and private project partners associate citizen engagement with entrepreneurial roles, in which citizens only become creators of applications and services (Kornberger et al., 2017). Consequently, they are deprived of the decision-making power required to ensure that smart city projects would deliver truly democratic outcomes (Cowley et al., 2018).

The aforementioned studies demonstrate that roles and interrelations influence the level of decision-making power that actors can exert in smart city projects and their ability to influence collaboration outcomes. Enhancing the processes of public value co-creation in smart city projects implies improved evidence based on how to (re)calibrate roles (Le Ber and Branzei, 2010a). To advance theorising, a deeper understanding is required of the combination of roles and abilities – in the form of resources, skills, and competences (Crosby et al., 2017) – that are most appropriate for coping with the requirements of each project-related situation. This is a context-specific matter rather than the result of a standardised scheme (Meijer et al., 2016).

Conclusions

Smart city projects have become a global phenomenon, and their enactment requires place-specific collaborative processes involving multiple actors who operate in multiple sectors and scales (Audet and Roy, 2016; Varró and Bunders, 2020), where diverse and often contested values come into play (Neumann et al., 2019). In this *Connexions* article, we linked smart city development, a contemporary and under-theorised social challenge, with theories on assemblage thinking, organisation, and public value creation. By using this multi-disciplinary lens, we examined collaboration in smart city projects and formulated a new theoretical perspective that expands the academic debate initiated by critical smart city studies. This perspective introduces neglected lines of

enquiry that focus on relevant factors previously overlooked – processes, multiplicities, interrelations, and how they relate to the conceptualisation of power in a pluralistic form (Anderson and McFarlane, 2011; Parks, 2019).

Our arguments prove that more research is required to determine how collaborative conditions influence public value creation in smart city projects. Central to this research efforts is the need for adopting a more flexible and dynamic approach to investigate smart city collaboration. Based on our analysis, we recommend prioritising the following research questions:

1. *What abilities characterise the multiplicity of collaborating actors in smart city projects?* Future research should investigate the types of competencies, skills, and resources that enact public value co-creation, beyond and within sector boundaries.
2. *How do collaborative configurations change and adapt to the different phases of a smart city project lifecycle?* More research is required to understand how collaborations succeed in overcoming temporal barriers, creating long-term value, and adapting to the changing requirements of the project phases and contextual conditions.
3. *How do actor-role configurations influence the capacity of individual actors to perform in the collaborative arenas of smart city projects?* We also call for further research on the distribution of roles and responsibilities among collaborating actors, and the interdependence between their scales of action. This knowledge can help better understand power imbalances, alternative assemblages, and public value creation processes.

These questions are important for exploring smart city development by examining the value frames within and across organisational and sectoral boundaries, the non-linear and multi-scalar processes of public value creation, and the heterogeneous ecosystems of actors to materialise public value outcomes by leveraging joint capacities.

By proposing these questions, we provide a means for untangling the intricacies of the collaborative puzzle in smart city projects. They imply a more realistic approach to theorising smart city collaboration, and they can help articulate alternative models for governing public value co-creation in urban communities. However, this contribution represents an onset, which is not sufficient to ensure a proper response to a complex challenge facing societies in sustainable urban development. Advancing theory and informing practice require smart city scholars to change their mindset towards a more flexible and context-specific understanding of collaborative spaces (Schreyögg and Sydow, 2010). Equally important is the need to raise awareness among practitioners of the risk of interpreting smart city collaborations as static and pre-defined models, which can leave unequal power games and neoliberal logics hidden in rhetorical rather than factual academic debates.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work has been supported by the European Commission through the Horizon 2020 project FinEst Twins (Grant Agreement No. 856602).

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Note

1. This data was sourced from participant observation. Please see the introduction section for more details.

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Publication II

Thabit, S., Sancino, A., & Mora, L. (2024). Strategic public value(s) governance: A systematic literature review and framework for analysis. *Public Administration Review*, 1–22. https://doi.org/10.1111/puar.13877 (ETIS Category: 1.1.)

Check for updates

Received: 11 June 2023 | Revised: 14 August 2024 | Accepted: 23 August 2024

DOI: 10.1111/puar.13877

RESEARCH ARTICLE

PAR Public Administration Review ASPA

Strategic public value(s) governance: A systematic literature review and framework for analysis

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Abstract

This article offers evidence-based understanding of public value creation in multi-actor collaborations by presenting the results of a systematic literature review of empirical studies published within the public administration field. Specifically, it focuses on two primary research questions: How do multi-actor collaborations generate public value(s)? What types of public value(s) are created by these collaborative endeavors? Our results shed light on 12 strategic governance components for enacting public value(s) governance (PVsG) in multi-actor collaborations, including six key public values to be considered for discerning and assessing processes of public value generation. We contribute to theory and practice by providing a unifying framework to PVsG which updates the public value strategic triangle combining Moore's managerial action-focused approach with Bozeman's policy or societally oriented public values approach.

Evidence for Practice

- Public value creation in multi-actor collaborations happens because of several strategic governance practices, such as identifying a shared value proposition or defining an adequate collaboration design.
- The performance of public value creation in multi-actor collaborations should be framed and assessed in terms of public values generation.
- The public value(s) governance (PVsG) framework provides the space necessary to situate strategic practices for PVsG.
- Investments in developing integrative leadership and strategic management skills and capabilities within organizations can effectively guide collaborative efforts and enhance public value creation efforts.
- Public values should be conceived as an actionable element of strategic public governance to provide a public values foundation to policy analysis, design, and implementation.

INTRODUCTION

At a time of planetary challenges such as climate change, economic and social inequalities, and technological changes, the importance of public values and the creation of public value calls on all sectors of society to take action and engage in problem solving (Stibbe & Prescott, 2020; Thabit & Mora, 2023). As such, public administration scholarship and practice recognize a shift in the role of government and public organizations; they are increasingly required to engage with different types of organizations and citizen groups to address societal challenges (Bryson, Crosby, & Stone, 2015; Thomas, 2013).

Growing literature on co-creation, collaborative governance, co-production, and cross-sectoral collaboration, describes the emergence of a new portfolio of strategic activities in the mission of public organizations to enhance the creation of public value through collaboration

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(Douglas & Ansell, 2023). Yet, research within these domains is largely based on small samples, resulting in limited applicability of findings and a lack of comprehensive understanding of how multi-actor collaboration affects public value creation (e.g., Page et al., 2015).

This article seeks to address this gap with a systematic literature review that examines existing empirical studies in the field of public administration, to answer the following research questions: How do multi-actor collaborations generate public value(s)? What types of public value(s) are created by these collaborative endeavors?

By focusing on public value(s) governance (PVsG) in multi-actor collaborations, our findings inform public managers and policymakers on how to design and lead collaborative efforts to deal with wicked problems and societal challenges. Conceptually, we also build a bridge between the academic debates on public value (Moore, 1995) and public values (Bozeman & Jørgensen, 2007). Based on the public value strategic triangle developed by Moore, and more recently adapted to a multi-actor world (Bryson et al., 2017), we advance strategic guidance for the governance and operationalization of the instrumental (process-oriented) and prime (output-oriented) public values conceptualized by Bozeman.

The article is organized as follows. The next section provides our theoretical backdrop. The third section describes the methodology and all the steps taken to conduct our systematic literature review. Findings are presented in the fourth section, which details the main elements of PVsG, including what type of public values are created in multi-actor collaborations. A unifying framework for PVsG is presented and discussed in the fifth section of the article, followed by the final concluding remarks.

THEORETICAL BACKDROP

The concept of public value is foundational to public administration (Wallmeier et al., 2018), and since the nineties of the last century, it has gained increasing popularity within and beyond the public administration field (e.g., Mazzucato & Ryan-Collins, 2022). It has emerged as a response to New Public Management ideas and to claim the distinctive nature of the value generated by public organizations (Moore, 2013). What is considered as public value and by whom, who is co-creating it (considering issues of inclusion, representativeness, and value capture), and how public value is produced are indeed crucial questions for public administration (O'Flynn, 2021). There are at least four main approaches to public value theorizing (Bryson, Crosby, & Bloomberg, 2015; Hartley et al., 2019; van Gestel et al., 2024): a managerially focused concept of creating public value (e.g., Moore, 1995); a policy and societally focused conception of public values (e.g., Bozeman, 2007); a psychological theory of basic human needs and objectified values (e.g., Meynhardt, 2009); and a focus on the public sphere where public value(s) become an aspect of contested democratic practice (e.g., Benington & Moore, 2011).

Whatever the approach taken, recent developments in the theory of public value have recognized that its development is no longer a duty that public managers can perform in an isolated manner; the creation of public value is a shared responsibility of all societal sectors (Sancino, 2022). For modern public administration, a "holistic" and multi-actor view of public value should prevail over the "efficiency" and "inward oriented" mentality of the New Public Management approach (Bryson et al., 2017). As "public value is rooted, ultimately, in society and culture, in individuals and groups, and not just in government" (Bozeman & Jørgensen, 2007, 374), a range of actors, including social entrepreneurs, third sector organizations, citizens, and volunteers, are increasingly responding to public demands. Together, these multiple actors provide new ways to deal with social challenges and provide public services that respond to the need of creating public value at various levels (Osborne et al., 2022).

The acknowledgment of the multi-actor nature of public value creation fostered the emergence of public value governance as a new approach to public administration (Bryson et al., 2014). Thus, building on Moore's research, scholars have started to adapt the strategic triangle to a multi-actor world. The main rationale behind this conceptual move is the following: if the three main dimensions of the strategic triangle (obtaining legitimacy and authorization, ensuring operational capabilities, and defining public value) are still valid, they need to be adapted to a multi-actor world. Accordingly, multi-actor collaborations and coalitions should be put at the center of the triangle, and a range of governance practices should be considered to address societal and wicked challenges (Bryson et al., 2017; de-Jong et al., 2021, see Figure 1).

However, the public value literature has been suffering from two main limitations. First, the difficulty in developing accepted tools and frameworks for the empirical assessment of public value creation. Second, the rare attempts of connecting two leading voices in the public value theorizing: Moore's managerial action-focused approach and Bozeman's policy or societally oriented public values (Bryson, Crosby, & Bloomberg, 2015).

Our exploration of PVsG in multi-actor collaborations is closely aligned with and influenced by the literature on collaborative governance and networked governance. The roots of collaborative governance research can be traced back to the seminal contributions of Ansell and Gash (2008) and Emerson et al. (2011), while network governance emerges from studies on policy networks and inter-organizational collaborations (e.g., Kickert et al., 1997). All these approaches share a common philosophy of public administration that situates public organizations, along with their procedures, tools, and mechanisms, within the broader context of society and of

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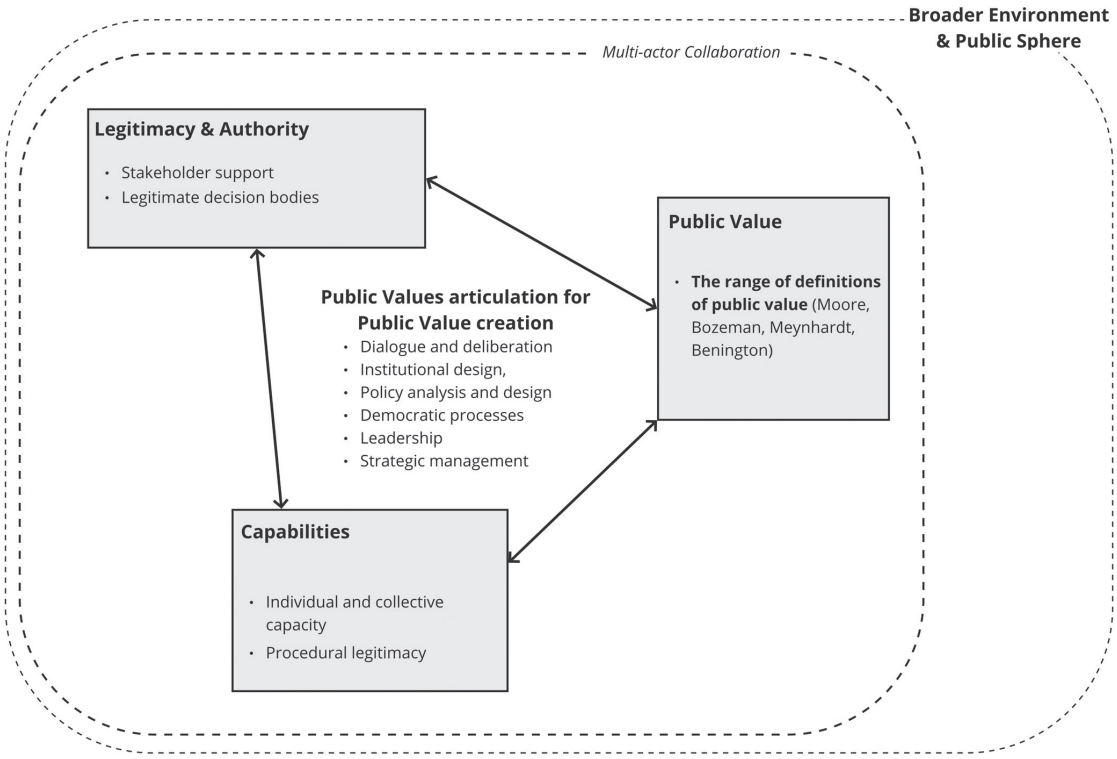


FIGURE 1 Public value governance triangle, adapted from Bryson et al. (2015).

a plural and pluralist State (Osborne, 2006). In essence, the collaborative governance stream focuses more on the organizational implications and philosophical underpinnings of collaborative processes through the lens of pragmatism and a logic of evolutionary learning by the actors involved in collaborative endeavors (Ansell, 2011), whereas network governance concentrates on the structures necessary for facilitating public value governance (e.g., Provan & Brinton Milward, 2001; Provan & Kenis, 2008).

Our perspective on PVsG in multi-actor collaborations acknowledges the conceptual foundations of the vast range of literature on networked and collaborative governance, but it places emphasis on the outcomes of collaborative governance processes by integrating Moore's strategic triangle with key frameworks for the assessment of public value and public values. On the one hand, we draw on the framework developed by Page et al. (2015) to assess public value creation in cross-sector collaborations (Table 1). This framework classifies three main dimensions of public value in line with Moore's triangle, and provides a set of public value attributes for assessment (see Figure 1). On the other hand, we bring Bozeman and Jørgensen (2007) rationale about causal reasoning ("instrumental values") and moral reasoning ("prime values") as a necessary approach to identifying and measuring public value.

Our main inspiration from Bozeman (2007) is based on his dynamic approach to public values, which captures both process-embedded values and output-oriented values. According to Jørgensen and Bozeman (2007), "prime values are those that are ends in themselves […] whereas an instrumental value is valued for its ability to achieve other values (which may or may not themselves be prime values)" (p. 373). Therefore, we consider instrumental values as processual public values, given that the creation of public value crucially depends on the processes through which this materializes, and we see prime values as the ultimate goals of any operationalization of a public value proposition.

This perspective provides an opportunity for integration with the more managerial (and process-oriented) approach of Moore. Drawing upon this theorizing, we integrate the differentiation between instrumental and prime public values from Bozeman into the strategic triangle adapted to cross-sector collaborations. Then, we test this unifying theoretical perspective to investigate the nature and the type of public value(s) created in multi-actor collaborations, considering the results of

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TABLE 1 Public value creation by cross-sector collaborations: Attributes framework. Adapted from Page et al. (2015).

Public value dimension	Public value attribute	Definition
Democratic accountability	Vertical democratic accountability	Extent to which decisions and implementation are legal and responsive to authorizers
	Horizontal democratic accountability	Extent to which decisions and implementation respond to collaboration partners and other stakeholders
Procedural legitimacy	Procedural rationality	Extent to which decisions are based on technically and administratively sound data, analysis, and planning
	Procedural justice	Extent to which stakeholders perceive collaboration decisions and activities to be fair and transparent
	Operational control	Extent to which collaboration uses requirements, budgets, and schedules to oversee projects and activities
Substantive outputs	Effective performance	Extent to which collaboration achieves its goals
	Efficient performance	Extent to which collaboration achieves its goals at reasonable costs
	Equity of benefits	Extent to which benefits of collaboration are spread appropriately among stakeholders and the public
	Equity of payment	Extent to which costs of collaboration are spread appropriately among stakeholders and the public
	Problem-solving capacity	New behaviors or norms that increase the potential to address complex problems

empirical studies focused on this topic and published in the public administration field.

METHODOLOGY

Literature search and filtering process

The present systematic literature review consolidates findings from previous empirical research (Thome et al., 2016) focused on public value creation in multi-actor collaborations. The analysis is guided by two primary questions: How do multi-actor collaborations generate public value(s)? What types of public value(s) are created by these collaborative endeavors?

To answer these questions, the review assesses empirical research published in peer-reviewed journals within the field of public administration (Ospina et al., 2018), targeting on collaborations that had a focus on public value creation. Following the PRISMA methodology, we applied two search strategies (Ruijer et al., 2023). First, we considered literature written in English, which was retrieved from Scopus and Web of Science (Paul & Criado, 2020). No restrictions on the publication date were set. The search terms were left deliberately broad to encompass the variety of articles to multi-actor collaborations and public value in existing research. Second, to ensure a comprehensive review, 10 experts were consulted to identify potentially overlooked articles (Hansen & Tummers, 2020). Further details of the search terms and eligibility criteria are provided in Appendix A.

The initial search resulted in 291 studies, which were screened for relevance (Figure 2). Titles, abstracts, and keywords were analyzed to ascertain alignment with the inclusion criteria, resulting in the exclusion of 127 records. The full text of the remaining 184 studies was then examined. During this phase, 125 studies were removed due to three main reasons. First, nonempirical articles were excluded, as the goal was to construct an evidence-based understanding of public value creation (Voorberg et al., 2015). Second, articles that did not provide any information on the governance practices, dynamics, actions, or outcomes described in the previous section were removed. Third, a total of 22 articles that focused on public value failures were also excluded, since the focus of the research question was limited to types of public value(s) successfully generated, and the governance practices that led to their achievement.

Throughout the selection process, internal reliability checks were conducted periodically among the authors (Muka et al., 2020). Any disagreements about the eligibility of studies were resolved through discussion and consultation, and documented through written explanations on the reasoning and alignment with inclusion and exclusion criteria (Thome et al., 2016). The final samples of selected articles consisted of 59 publications, which are listed in Appendix B.

Data collection and analysis

Since the evidence collected from the articles was qualitative, we conducted the analysis by using thematic coding (Linnenluecke et al., 2019). Before commencing the thematic coding, we initiated a calibration phase, involving all co-authors of this study. The primary aim was to align our interpretations with the theoretical framework outlined in Section 2 of this article. During this phase, we collectively reviewed and practiced coding on the full texts of six articles, encompassing 10% of the entire sample. This preliminary exercise was instrumental in achieving intercoder reliability and conducted in alignment with Campbell et al. (2013) recommendations. The calibration phase served to synchronize our understanding of the data, mitigate subjective biases, and ensure consistent

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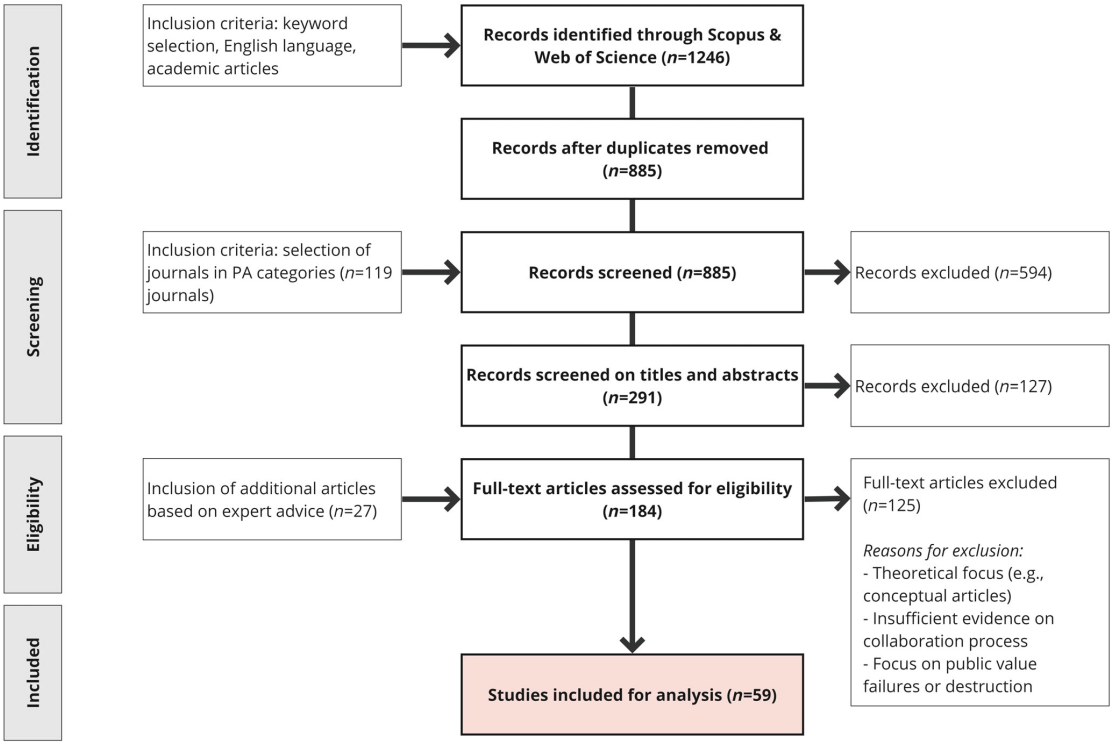


FIGURE 2 PRISMA diagram of the literature review process.

application of coding standards across coders (MacQueen et al., 1998).

Subsequent to the calibration phase, we adopted an iterative coding approach (Saldaña, 2013). This involved independent coding of data by multiple coders, followed by collective discussions to address and reconcile any differences, thereby enhancing the coding scheme's refinement and validity. The lead author took the responsibility for coding all 59 articles, while the remaining two co-authors independently coded 50% of the sample each, ensuring dual coding for each article. Regular meetings were convened to resolve coding discrepancies, refine the coding framework, and cultivate a shared understanding among coders. In instances of disagreement, the co-author that was not directly involved in the coding of the article under scrutiny, was consulted to facilitate a collaborative resolution. This iterative and collaborative approach bolstered the internal validity of our analysis and the reliability of our findings.

Equal engagement with both empirical data and extant theoretical knowledge was ensured by adopting an abductive approach to the analysis (Thompson, 2022). This approach enabled the identification of new concepts, while still being guided by the theoretical dimensions defined in the theoretical framework for this study (see section Theoretical Backdrop). The journey from articles to first-level coding followed an inductive approach through the coding of any type of governance practice, action, dynamic, outcome, or value in the cases studied. A process of recoding and recategorizing led to the identification of 37 key concepts. Subsequently, an in-depth analysis of key theoretical frameworks (see previous section, Theoretical Backdrop) guided the definition of higher-level coding resulting in 13 components, six themes, and one aggregate dimension, as shown in Table 2.

The following two sections illustrate the findings from the analysis of the data extracted in the thematic coding, and provide further explanation of the novel framework suggested, respectively. In addition, Appendix C provides further information about the categorization of the data with reference to the articles selected in the systematic literature review.

FINDINGS

Engagement and authorization

The "Engagement and authorization" theme refers to the active engagement and legitimate support of legal authorizers and relevant stakeholders and individuals (Bryson,

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TABLE 2 Data structure: Overview of themes, components, and key concepts.

Aggregate dimension	Theme	Component	Key concepts
Strategic public value(s) governance	Engagement and authorization	Meaningful participation and engagement	Spaces and channels for engagement
			Empowerment of actors and community groups
			Number and type of stakeholders
		Dialogue and negotiation	Dialogue and deliberation
			Negotiation and decision making
		Shared value proposition	Joint value definitions
			Value tensions and coping strategies
	Operational capabilities and assets	Individual and collective assets and resources	Individual assets and resources
			Collective assets and resources
			Capacity mixes
		Integrative leadership and strategic management	Integrative leadership capabilities
			Strategic management capabilities
		Institutional and collaboration design	Flexibility and autonomy levels
			Hierarchy and (de)centrality levels
			Formality levels
	Broader environment and public sphere	Broader political and social context	Broader administrative architecture
			Legislative and policy context
			Historical and cultural context
	Instrumental public values (process-oriented)	Procedural legitimacy	Procedural rationality
			Procedural justice
			Operational control
		Relational value	Trust
			Social networks and social capital
			Social cohesion
	Instrumental and prime public values	Democratic accountability	Vertical democratic accountability
			Horizontal democratic accountability
			Equal representation and inclusion
		Equity and reciprocity	Equity of benefits
			Equity of payment
	Prime public values (output-oriented)	Performance value	Efficient performance
			Effective performance
			Durable solutions
		Problem-solving capacity	Behavioral shifts
			Innovation
			Skills development and learning
			Increased knowledge and awareness
			Data and information

Crosby, & Bloomberg, 2015). Its main components comprise aspects on *meaningful participation and engagement* (i.e., spaces and channels for engagement, empowerment of actors and communities, number and type of stakeholders), the importance of *dialogue and negotiation* to allow collective decision making (Ansell & Gash, 2008), and the creation of a *shared value proposition* based on collective agreements and the strategic alignment of competing value logics (Klijn & Koppenjan, 2020).

Meaningful participation and engagement

Forging the engagement of relevant stakeholders and individuals has emerged as a key topic across most of the empirical cases studied in this review. A variety of spaces and channels for engagement across all phases of the collaboration are needed to reach different population groups and bring in organizations (Sicilia et al., 2016). When working with lay actors, both online tools (e.

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g., social media platforms) and face-to-face encounters (e.g., neighborhood meetings) may serve as spaces for engagement. However, the latter are shown more effective to ensure active participation and strengthen trust relationships. Similarly, the engagement with broad stakeholder groups is encouraged in neutral, in-person spaces, such as full-day workshops, while in intra-organizational institutional environments, spontaneous meetings and activities outside regular settings reinforce horizontal relationships across different departments, facilitating collaboration (Sorensen & Torfing, 2022).

Additionally, the empowerment of collaborating actors constitutes a key factor to encourage stakeholders in voicing their opinion and providing genuine support. Building long-term trust and mutual esteem are central elements to motivate participation and facilitate legitimate authorization, as "all participants [can] express themselves without fear" (Peso et al., 2020, 6).

Regarding the number and type of stakeholders needed to ensure a legitimate process, high variations are found among the cases studied. Some articles affirm that securing the support of a broad and heterogenous group of stakeholders enhances the credibility of collaboration outputs. However, Cristofoli et al. (2022) demonstrates that the creation of both legitimacy and accountability values does not merely depend on the number and type of stakeholders engaged. Rather, these public values are a result of various conditions; for example, when a large group of heterogenous actors collaborate with both a distributed leadership structure and the establishment of clear rules.

Dialogue and negotiation

Dialogue and negotiation practices provide a space for individuals to express concerns, offer support, and reach agreements on key issues of the collaboration (Clark, 2021). They stand as key practices to guide accountable and legitimate decision making that is responsive to stakeholders, authorizers, and lay actors (Page et al., 2015).

Several cases in our sample illustrate the importance of facilitator and leadership roles to bridge and connect stakeholders, empower participants, and manage difficult conversations. In addition, they play a critical role in exposing competing value logics, and addressing confrontation through the moral power given by their authority and reputation (Bolden et al., 2020). Likewise, leadership capabilities of political astuteness are shown instrumental to navigate diverse and competing interests towards a common goal (Parker et al., 2021).

Dealing with paradoxes is part of the negotiation process, where "integration does not mean everyone agrees with each other all the time" (Morse, 2010, 241), and "agreeing to disagree" is often needed to create unanimous acceptance (Ospina & Saz-Carranza, 2010, 416). Decision-making structures based on consensus highly depend on trust as the main driver to achieve success. In addition, they usually imply long time and additional resources. Despite their complexity, consensus agreements have been the main approach followed by most of the cases in our study. The second most cited approach focuses on centralized decision making by project leads or experienced facilitators. This modality allows for greater autonomy and faster decision-making processes, but should be informed by the input from partners and collaborators (Haug & Mergel, 2021).

Shared value proposition

Ultimately, achieving legitimate support relies upon the common understanding of what is being supported and authorized, that is, the clear articulation of a shared value proposition (Moreno-Serna et al., 2021). Research on collaborative governance showcases the foundational importance of collectively assessing what collaborators value since the formation phase, such as, for example, what behaviors and goals are important, unimportant, right, or wrong (Susha, 2020). Governance practices should enable the pluralism of values to be surfaced in a collaboration and capitalize on them to generate support and acceptance of partners to commit to the collaboration, reinforcing its long-term sustainability.

Value congruence is also a result of the deliberation and negotiation processes described in the previous section. Being aware of diverse coping and balancing strategies can allow collaborators to opt for various conflicting values to be upheld at the same time (Jaspers & Steen, 2018). Individual attributes of curiosity, humility, and generosity are also required to mutually recognize each party's value priorities. Successful experiences report that "boundary objects" (e.g., formal agreements), "boundary experiences" (e.g., joint activities), and "boundary spanners" (e.g., facilitators), help negotiate between competing value logics, and bring partners together around a shared challenge (Bolden et al., 2020; Mariani et al., 2022; Morse, 2010). Thus, the notion of shared value proposition is underpinned by the achievement of a collaborative advantage by the parties involved (Bryson et al., 2016; Huxham & Vangen, 2000). In this respect, for the public organizations involved the development of a shared value proposition should balance the use of collectively owned assets and associated financial and social costs with the achievement of collectively valued social outcomes as illustrated by Moore in the public value account (Moore, 2013).

Operational capabilities and assets

The second theme of the review comprises the collective mobilization of *operational capabilities and assets*. Its

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definition connects key capacity elements identified by collaborative governance frameworks (i.e., procedural arrangements, leadership, knowledge, and resources) (Emerson et al., 2011), and the literature from public sector innovation, which frames operational capabilities as "the key role of strategic management in appropriately adapting, integrating, and re-configuring internal and external organizational skills, resources, and functional competencies toward changing environment" (Kattel & Mazzucato, 2018, 15). As a result, the conceptualization of this theme embraces three main components: *individual and collective assets and resources*, *leadership and strategic management*, and *institutional and collaboration design*.

Individual and collective assets and resources

In our sample, individual relational skills such as active listening, empathy, curiosity, humility, generosity, and charisma, are the most highlighted personal capabilities for public value creation. Furthermore, credibility, neutrality, and social prestige constitute key collective assets in collaborations, as they help incentivizing and maintaining productive relationships, overcoming conflicts, and creating trust (Page et al., 2021). In addition, previous experience in collaborations and network connections are decisive social skills for bringing partners together and developing trusting relationships (Patel et al., 2017).

As multi-actor collaborations pool together various types of knowledge, skills, and resources, a suitable blend is needed to enrich the exchange of ideas while improving the feasibility of solutions. A mix of technical and institutional capacities is often required, as well as a combination of both specialized expertise and citizens' life experiences (Jaspers & Steen, 2021). Within this capacity mixture, geographic proximity has appeared as a key asset to ensure public value creation (Torfing et al., 2024). In addition, the collective access to financial and material resources, and the ability to execute policies, have been shown crucial to enable effective performance (Scupola & Mergel, 2022).

Integrative leadership and strategic management

Multi-actor collaboration requires a wide range of managerial and leadership skills and abilities. Although public value leadership is often associated with public officials, it is exercised by actors from all sectors and groups. Particularly, integrative leadership and strategic management have appeared as the main approaches for public value generation in multi-actor collaborations (Ongaro et al., 2021).

Our sample reveals that process management skills are key to manage networks, facilitate joint work, and ensure partners accountability. Likewise, sufficient autonomy vis-à-vis policy makers is important for strategic managers to successfully exercise their role (Sorensen & Torfing, 2022).

In addition, leaders require the capacity to mobilize partners and collective resources, the ability to cultivate trusting relationships, and communication and negotiation skills (Morse, 2010). Political astuteness and integrative abilities stand as key leadership capabilities for public value creation in complex collaborative environments (Parker et al., 2021). Finally, substantial knowledge and experience has also appeared as an important leadership skill in several collaborations.

Institutional and collaboration design

Regulative structures, organizational configurations, and collaborations designs directly shape actors' collective capacity to create public value (Bryson et al., 2015). Sufficient flexibility in collaborative and institutional structures appears as one of the key elements to achieve innovative solutions and sustain public value creation over time. Likewise, bottom-up autonomy and freedom of decision making are highlighted as enablers of successful collaboration in several cases (Haug & Mergel, 2021).

However, the compromise between flexibility-control, and autonomy-accountability must be considered. Several cases show a combination of central and decentralized collaboration structures, where formal delivery and monitoring mechanisms are used to balance more flexible and autonomous bottom-up joint action (Scupola & Mergel, 2022). In the cases where non-hierarchical and bottom-up structures are dominant, impartial facilitators, distributed leadership structures, and monitoring and transparency instruments are used to hold actors accountable.

The levels of formality of collaborations also vary. Some collaborations deliberately choose to remain informal, aiming at more room to negotiate, higher flexibility, and increased focus on objectives rather than contract targets (Bano, 2019). Nonetheless, several collaborations tend towards formalization and institutionalization to mitigate risks, reinforce long-term continuity, and consolidate collective agendas.

Broader environment and public sphere

Public value(s) governance is, nonetheless, situated within specific democratic contexts and environments (Bolden et al., 2020; Sancino, 2022). Our review defines the theme of "Broader environment and public sphere" in relation to macro-level administrative and institutional architectures, existing legal frameworks and policies, and historical and cultural contexts.

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Institutional, political, and social context

The broader administrative architecture, existing institutions, legislative frameworks, and policies in place, shape the environment where public value collaborations operate. Higher levels of devolution of decision-making power to local entities such as municipalities and neighborhood councils evidence greater engagement of lay actors in public governance (Sørensen & Torfing, 2016; Sancino et al., 2022). Legislation reforms towards less-market driven, and more partnership-based public management, are another key factor to spur collaboration initiatives. Furthermore, the existence of institutionalized platforms or collaboration programs has appeared as a precondition to enable some of the collaborative cases in our study (Morse, 2010).

Several collaborations identified their alignment with local, national, regional, and even global policy frameworks and agendas, as a driver of the collaboration success. Other key factors relate to the presence of political support, along with social pressure and sectoral demands to address an urgent societal problem (Susha, 2020). Moreover, public demand from a variety of partners and the community has evidenced to secure collaborative efforts over changing political interests.

Finally, historical and cultural context has been another aspect highlighted in collaborations. Collaboration is shown more effective "when there is a history, culture and an ecosystem oriented to active participation and engagement" (Ongaro et al., 2021, 18). Similarly, organizational culture towards inclusiveness, trust, and transparency allows the successful implementation of distributed leadership approaches, as well as the participation and engagement of diverse actors.

INSTRUMENTAL PUBLIC VALUES

The findings of our study show that certain public values are not pursued as an end in themselves, but for their ability to realize other values. "Instrumental Public Values" are, therefore, understood as a vehicle to achieve other outcomes, regardless whether they are also instrumental or prime values (Bozeman & Jørgensen, 2007). These values comprise the themes of *procedural legitimacy* (including operational rationality, justice, and control), and *relational value* (trust, social networks, and social cohesion).

Procedural legitimacy

This public value component comprises aspects of procedural rationality, procedural justice, and operational control. In our analysis these values are generally approached as instrumental values; they are employed as means or tools to enhance the creation of other dimensions of public value, such as democratic accountability, efficiency, and equity.

Procedural rationality implies the collection and analysis of information to understand the multiple realities influencing a collaboration. Diverse types of information are relevant in this process, such as community-sourced knowledge, scientific advice, and expert input (Sedgwick et al., 2022). Rationally grounded approaches are instrumental to achieve more equitable solutions, and facilitate dialogue and consensus practices in authorization and legitimation processes (Waardenburg et al., 2019).

Procedural justice refers to "the extent to which a decision is seen as fair and transparent" (Page et al., 2015, 719). It can be a vehicle to spur collaborations efficiency, as it encourages actors to share resources and information, and positively impact relational value by increasing trust and positive perceptions. Procedural rationality and procedural justice can be mutually reinforcing too. For example, enabling public access to partnership-related information enables stakeholders to evaluate whether operations and decisions are undertaken in a fair manner (Onyoin & Bovis, 2022). However, transparency of operations is not a necessary condition to achieve procedural justice. Reputation and credibility values also increase partners' perception of legitimacy, and can be highly effective when collaborations lack transparency tools (Hong & Ryu, 2019).

Lastly, operational control focuses on the degree to which collaborators follow jointly planned solutions and activities, and are closely connected with democratic accountability values. Particular relevance has been found around the role of data and digital technologies, which are "both an object and a tool for control" (Klievink et al., 2018, 382) but also hold great potentials to increase transparency, reduce information asymmetry, and improve the quality of evidence-based decision making. Additionally, setting clear rules from the onset is a mostly unanimous condition to hold partners accountable, and a motivation for collaborators to get involved (Cristofoli et al., 2022). Nonetheless, collaborations often struggle with the trade-offs that rigid control instruments cause to partners' autonomy and agile implementation. More flexible and innovative approaches, such as intermediary entities, have been shown as alternative instruments to ensure control and accountability while allowing more autonomy and adaptation.

Relational value

Although relational public value was not part of the public value framework from Page et al. (2015), it has emerged as a central component in most cases of this

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review, reinforcing linkages with collaborative governance (Ansell & Gash, 2008) and cross-sector collaboration (Bryson, Crosby, & Stone, 2015).

Our definition of relational value brings together three main concepts. First, the acknowledgment of the relational dimension among individuals or organizations highlighted by leadership studies—embracing, for example, trusting relationships and mutual respect (Uhl-Bien & Ospina, 2012). Second, the existence and creation of social networks and social capital from collective-action theories (Ostrom & Ahn, 2011), and third, the concept of social cohesion as the bond that unite various individuals in a society (Bozeman & Jørgensen, 2007).

The creation and consolidation of long-lasting trust appears as a key condition to enable actors' genuine engagement, manage conflicts, and encourage resource and information sharing in a collaboration (Agusdinata, 2022). Trust-based collaborations create a virtuous cycle where relational value is progressively enhanced, as stakeholders get to know each other and perform joint activities, ultimately leading to build and maintain high levels of commitment and ownership over time (Clark, 2021). Furthermore, trust reinforces mutual respect and recognition among public, private, and community stakeholders, advancing reputational and credibility gains of both institutional and non-institutional actors.

Relational public value is also related to the creation of social capital and social cohesion outcomes (Jaspers & Steen, 2018). The active collaboration of lay actors can enhance the empowerment of vulnerable and community groups, as they feel comfortable to express their voice with other collaborators, and develop a purpose and feeling of belonging. In addition, collaborative endeavors spur the creation of new networks and meaningful connections across various societal groups, setting the foundations for subsequent successful collaborations.

Instrumental and Prime Values

Certain values analyzed in our review have been identified as both "Instrumental and Prime Values." While they are explicitly established as a desired outcome of collaborations, they also constitute a means to achieve effective and efficient implementation. These themes comprise *democratic accountability* (vertical accountability, horizontal accountability, and equal representation) and *equity and reciprocity* (equity of benefits and equity of payments).

Democratic accountability

Democratic accountability is usually understood as a prime value in collaborations; a prerequisite to guarantee that a collaboration is responsive to democratic institutions, stakeholders, and individuals. However, it also constitutes a means to effective implementation (instrumental value), as several cases evidence how it increases credibility and reinforces implementation.

On the one hand, vertical accountability addresses the levels at which a collaboration is responsive to authorizing laws and organizations (Page et al., 2015). Several collaborations approached it beyond the minimum legal requirements, and opted to engage various public administration entities and authorities from different tiers. In those cases, evidence shows the creation of additional public values related to credibility gains and effective implementation (Ospina & Saz-Carranza, 2010).

On the other hand, horizontal accountability focuses on responding to the needs and preferences of non-authorizing actors such as citizens and non-public organizations. It has been found as a driver for other values such as problem-solving capacity, learning, and effectiveness, and a vehicle to develop a genuine sense of responsibility and purpose. Listening to the needs of broad stakeholders and community members "can lead to a better end result" (Jaspers & Steen, 2021, 635), as more relevant solutions are identified, and services meet the needs and preferences of the population.

However, not all processes enable true participation, and power imbalances and inefficient engagement strategies can undermine the realization of horizontal accountability. Equal representation, inclusion, and empowerment emerged as additional instrumental values closely related to horizontal accountability. As such, they enhance democratic accountability by bringing voice to underrepresented groups, and setting spaces where all relevant stakeholders interact under equal conditions (Clark, 2021).

Equity and reciprocity

Equity of benefits and equity of payment are often defined as *prime values* of collaborations. However, they also constitute a vehicle to allow feasible partnerships, engage stakeholders, and achieve more efficient results.

A collaboration where "everybody benefits" presents an appealing motivation for stakeholders to join and share their resources (Parker et al., 2021). The distribution of benefits should be tailored to the capacities and needs of the various collaborators, ensuring that hierarchical and power structures do not undermine a fair compromise. Yet, when partners have competing priorities, deliberation processes, and coping strategies can be used to achieve reciprocity and equally distributed benefits (Page et al., 2018).

Similarly, sharing costs among partners is a commonly used approach to leverage the resources needed for implementation and create long-term sustainability based on local ownership (Scupola & Mergel, 2022). Equity of payment can consist of the sharing of financial contributions, human resources and specialist knowledge, and materials and hands-on work.

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Prime values

Lastly, "Prime Values" are those that are pursued for their own sake, recognized as primary objectives for most collaborations. Most of the cases analyzed identify *performance value* (effectiveness, efficiency, and durability) as one of the most highlighted outcomes of a collaboration; the extent to which collaborations deliver long-lasting positive results at a reasonable cost. Similarly, several cases pursue enhanced *problem-solving capacity* to tackle future wicked problems: from behavioral shifts to innovation methods, skills development and learning, increased knowledge and awareness, and improved data and information.

Performance value

This public value component constitutes a pursued end in itself; a prime value that seeks the achievement of long-lasting positive impacts at a reasonable cost. It comprises three main aspects: effectiveness, efficiency, and durability.

Effectiveness refers to the accomplishment of collaboration goals, is influenced by various instrumental values. The participation and support of a large number of actors (democratic accountability) can increase the effectiveness of a collaboration and is notably leveraged by the presence of trust and long-standing relationships (relational value) (Waardenburg et al., 2019). Rational processes (procedural legitimacy) are also related to this public value dimension, where feedback mechanisms and continuous evaluation also increase group efficacy.

The concept of durability appeared during the review as an additional aspect of performance value, as collaboration efforts based on continuity are more able to adapt to new conditions and deliver long-lasting solutions (Klievink et al., 2018). Long-term collaborative action can be sustained through institutional arrangements. However, the creation of long-term relationships, trust, and a collaborative mentality are also relevant factors.

Efficiency concerns the costs required to achieve intended outcomes of a collaboration. Relevant insights were found around the links between (vertical) centralized decision making and efficiency gains, the use of technology to save time and build upon economies of scale, and the importance of a "low cost" mentality to enable successful co-production efforts with communities (Sørensen & Torfing, 2016).

Problem-solving capacity

Page et al. (2015, 722) define the value of problem-solving capacity as the "new behaviours or norms that increase the potential [of individual and collective actors] to address complex problems." It represents the ability of collaborations to make future desired changes in the long run. Most collaborations of our study report public value gains within this component, with particular emphasis on behavioral shifts, innovation approaches, skills development and learning, increased knowledge and awareness, and creation and sharing of data and information.

Positive collaborative experiences foster behavioral shifts towards more collaborative and innovative approaches, and often turn into spin-off collaborations as an outcome of the process (Torfing et al., 2024). New problem-solving approaches such as of co-creation, co-production, and collective experimentation have become more widely accepted among partners and administrators, and sometimes integrated in organizations ways of work. Additionally, several cases show innovation outcomes as a result of collective approaches to address complex problems (Hansen & Fuglsang, 2020).

Direct engagement with other actors also evidenced learning outcomes in a high number of collaborations. Collaborations can act as "laboratories of learning" (Conteh & Harding, 2021, 16) where collaborators develop skills and capabilities as a result of their active participation in cross-sector projects. Likewise, the increased awareness of knowledge gaps related to relevant issues is a common outcome in several cases.

Finally, the creation and release of relevant information has appeared as an additional capacity asset for problem solving and collective agency (Scupola & Mergel, 2022). Valuable data are often a recognized outcome of collaborations, while strengthening information sharing practices improve long-term collaboration to solve social problems.

DISCUSSION: AN INTEGRATIVE APPROACH TO STRATEGIC PUBLIC VALUE(S) GOVERNANCE

Our study marks a step forward for public value theory. Drawing on existing empirical research, we provide a comprehensive overview of documented practices of public value creation in multi-actor collaborations, and integrate two main views that have characterized public value research in the last decades: public value (Moore, 1995) and public values (Bozeman & Jørgensen, 2007). This section discusses the main theoretical and practical contributions of the analysis and introduces a novel unifying framework for strategic PVsG (Figure 3).

From public value to public value(s) governance: A unifying framework

Despite growing efforts to develop a consolidated theory for public value, there is still no explicit integration of Moore's managerial approach and Bozeman's public values (Bryson, Crosby, & Bloomberg, 2015, 13). By building on our findings, we developed a unifying framework

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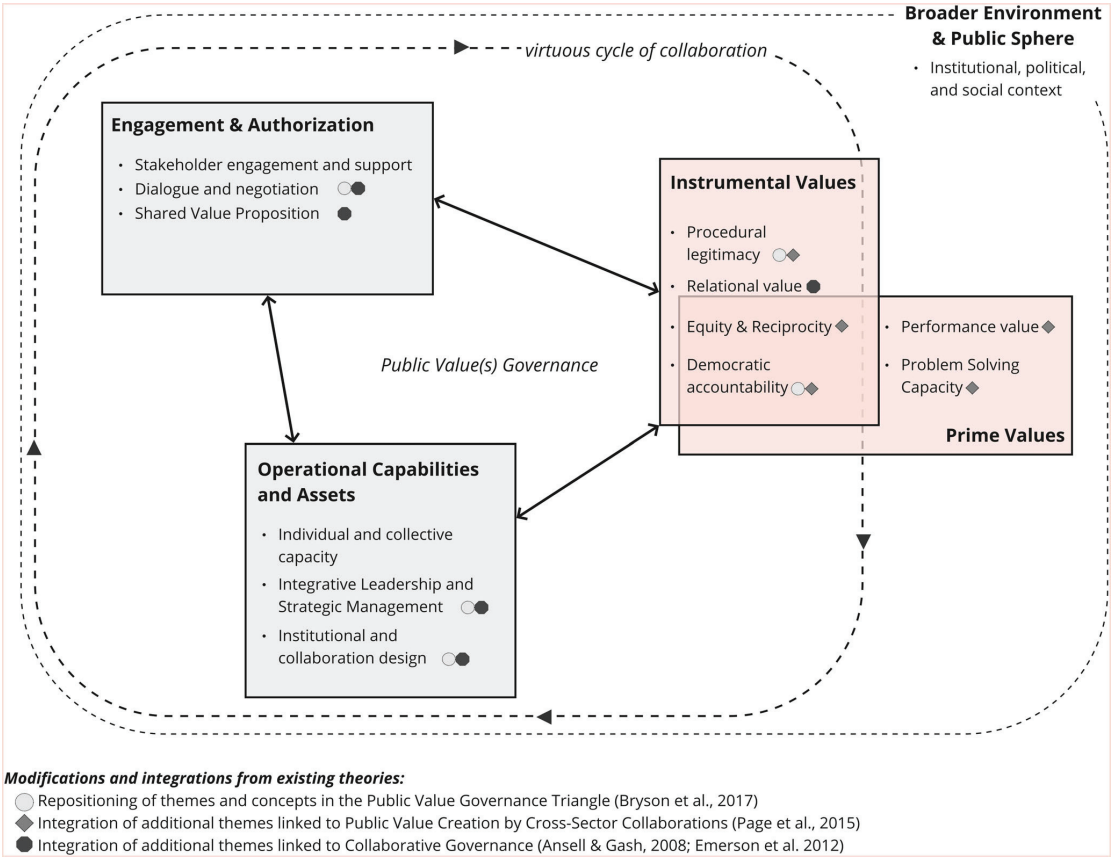


FIGURE 3 Unifying framework for strategic public value(s) governance.

that brings together these perspectives and advances theorizing on the strategic governance of public value.

This novel framework for PVsG is based on the strategic triangle designed by Moore and recently adapted to a multi-actor world (Bryson, Crosby, & Bloomberg, 2015). However, we re-conceptualized the "pillars of the triangle" by drawing on research from public value governance (Bryson et al., 2017; Bryson, Crosby, & Bloomberg, 2015; Sancino, 2022), collaborative governance (Ansell & Gash, 2008; Emerson et al., 2011), and strategic public management (Bryson et al., 2023; George et al., 2019). As a result, the novel PVsG framework responds to a twofold purpose: offering strategic guidance to the governance of multi-actor collaborations, while enabling the study and operationalization of the plurality of public values.

Integrating the plurality of public values

The first and most important contribution of the novel PVsG framework is the explicit integration of the public values approach defined by Bozeman, from a dynamic and process-view perspective. To do so, it introduces the concepts of instrumental values (e.g., incorporated in the process) and prime values (e.g., focused on final outputs) (Bozeman & Jørgensen, 2007) in a "two-folded pillar" of the public value triangle.

The recognition of both instrumental and prime public values facilitates the integration of existing research on public value assessment frameworks—such as the one provided by Page et al. (2015)—and enables the implementation of the Public Value Mapping tool to identify public value failures and successes (Welch et al., 2015). Moreover, this novel approach situates public values in the context of strategizing; every decision made, and every outcome achieved, is part of a continuum of public values that is not limited to the final output, but rather a process of (strategically) creating public value(s).

Under this perspective, public values are conceived as an actionable element of public governance instead of a passive outcome of collaboration. The concept of instrumental values, in their ability to attain other values, brings a values-driven causal reasoning to strategic public

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management (Bozeman & Jørgensen, 2007), while reinforcing the idea of collaboration as a "virtuous cycle" (Ansell & Gash, 2008). In accordance, forthcoming research upon the PVsG triangle could unfold relationships of mutually beneficial (or detrimental) public value dynamics, providing a public values foundation to policy analysis, design, and implementation.

However, the classification between prime and instrumental values in this study is not normative; it merely showcases the findings from the empirical analysis of the gathered data. The authors, rather, favor a context-dependent approach to prime values where "even with the most fundamental public values, one should not expect universal assent or immutable self-evident truths" (Bozeman & Jørgensen, 2007, 373). Further research would therefore be needed to explore the extent to which other aspects (e.g., the goals and context of a collaboration) influence these classifications.

Repositioning and integration of themes and concepts in public value(s) governance triangle

The second main theoretical contribution aims at both repositioning themes from the adapted triangle by Bryson et al. (2017), and integrating relevant concepts from collaborative governance theories, from an overarching approach highlighting strategizing; interconnecting practices to (re)align multi-actor aspirations and (re)consider the existing or new capabilities needed to authorize and operationalize the creation of public value (Bryson et al., 2023; Bryson & George, 2020).

To this date, research efforts to adapt Moore's triangle to collaborative contexts (e.g., Bryson et al., 2017; de-Jong et al., 2021) have primarily led to the addition of new elements at the center of the triangle (see Figure 1). While our study acknowledges the importance of these contributions, it takes a crucial step towards integration and simplification. Following the "strategic spirit" of the original triangle, we reposition these central elements by expanding the first two pillars of the triangle (engagement and authorization, and operational capabilities and assets) as presented below.

"Engagement and Authorization" is reconceptualized to emphasize the ideas of principled engagement—including spaces for engagement, representation, and empowerment, collective decision making, deliberation, and consensus making and negotiation (Emerson et al., 2011). Furthermore, the notion of shared value proposition is integrated as a necessary element to construct mutual understanding, identify common values, and cope with tensions and divergences to achieve collaborative advantage (Ansell & Gash, 2008; Bryson et al., 2016; Huxham & Vangen, 2000). Finally, the notion of "legitimacy" is repositioned as an instrumental value, connecting to the whole cycle of collaboration (see Figure 3).

Similarly, "Operational Capabilities and Assets" opens the space for two additional elements that have been central in current debates and theories: leadership and organizational factors. While integrative leadership and strategic management have been largely recognized as necessary capabilities for public value creation (Crosby et al., 2017; Emerson et al., 2011; Sørensen et al., 2021), capacity for joint action is also determined by procedural arrangements related to the institutional and collaboration design—such as formal and informal rules and processes, flexibility and autonomy, and levels of hierarchy and centrality (Bianchi et al., 2021).

Finally, the "Broader Environment and Public Sphere" brings together the system context (Emerson et al., 2011) and the connection with prime values, which directly influence, and are influenced by the public sphere (Bryson, Crosby, & Bloomberg, 2015). The reference to the public sphere is, furthermore, instrumental in establishing a connection with the scholarship of Benington (e.g., Benington & Moore, 2011), which offers another important approach to public value theorizing.

CONCLUSIONS AND FUTURE RESEARCH

This article presents a unifying framework for strategic PVsG and advances practical and theoretical contributions to current theorizing on the field of public value and multi-actor collaborations. Our study underscores the potential to integrate several theoretical approaches, such as for example collaborative and networked governance, with a focus on public values to assess multi-actor collaborations, avoiding assessing them from a merely managerial point of view focused on performative rather than transformative effects. Moreover, it sheds light on the importance of recognizing that within multi-actor collaborations, there exist dynamics of power and varying common objectives among different actor constellations (Bianchi et al., 2021). These dynamics necessitate strategic governance to guide, align, and secure commitment among the diverse actors involved (Bryson et al., 2023; Ysa & Greve, 2023). However, there remains a need for complementary studies that address the integration of instrumental and prime public values in the context of strategic management and public value governance.

The limitations of this study pave the path for future research. First, our sample was limited to peer-reviewed articles in English, suggesting the need for a more extensive review of literature in other languages. Additionally, our focus was solely on practices linked to public value creation. Future research should include studies on public value destruction (Cui & Osborne, 2021), and advance empirical research on the various trade-offs that public values hold among themselves.

Additional research should focus on the governance practices behind each particular type of public values, and how the plurality of public values can be strategized.

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For example, analyzing whether specific collaborative assets and resources, collaboration designs, or engagement practices, would lead to equity and reciprocity outcomes, while creating democratic accountability and performance value. Further analysis is required on the instrumental and prime values that are valued by users and publics of various levels of public service ecosystems (Ongaro et al., 2021; Osborne et al., 2022), and how a multi-level view of PVsG can connect with more grounded theories of change (Bryson et al., 2023).

Moreover, future research on the interrelationships among different public values is strongly needed. While our findings provide a preliminary understanding of instrumental and prime values, further practical and theoretical insights should strengthen this conceptualization. Shedding light on the positive and negative effects within multiple value constellations will also contribute to a better understanding of how to formulate and implement strategies to help address the public value(s) creation challenges that cross-sector collaborations confront (Bryson et al., 2023).

The concept of public value has gained increasing popularity in other fields such as innovation, business management, and organization studies (Mazzucato & Ryan-Collins, 2022; Meynhardt et al., 2019), especially as a response to New Public Management ideas and the dominance of private economic logics (Bozeman, 2007). While the current study has merely taken another step in the long journey of public value theorizing, further integration of findings from other fields beyond public administration become necessary towards an actual theory for public value(s) creation in a multi-actor world.

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How to cite this article: Thabit, Sara, Alessandro Sancino, and Luca Mora. 2025. "Strategic Public Value(s) Governance: A Systematic Literature Review and Framework for Analysis." *Public Administration Review* 85(3): 885–906. https://doi.org/10.1111/puar.13877

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APPENDIX A: Inclusion and exclusion criteria

This review selected the studies that met the following eligibility criteria:

A.1. | Inclusion

- Inclusion of articles that offer empirical evidence around collaboration practices for public value creation.
- Inclusion of articles that focus on any type of cross-sector or same-sector collaboration (e.g., formal partnerships, informal collaborations, small or large number of partners) and their contribution to public value creation.
- Inclusion of articles that focus on value creation processes among multiple actors (e.g., how democratic value was enacted, value controversies) with specific mention to collaboration mechanisms.

A.2. | Exclusion

- Exclusion of books, book chapters, conference proceedings, theses, articles not written in English.
- Exclusion of articles published in journals non-related to the public administration field.
- Exclusion of articles whose focus is not on specific collaborative mechanisms for public value creation, either in action or observed within its configuration. For example, articles that focus on general topics around collaboration without a description of specific mechanisms for PV, or those that focus on general approaches for PV creation without specific mention of collaboration mechanisms.
- Exclusion of theoretical articles that do not offer empirical evidence about collaboration mechanisms for public value creation.

The search strategy considered a first consultation in Web of Science and Scopus databases. A broad definition of search terms was chosen to embrace the variety of references to "multi-actor collaborations" and "public value" in existing research. The keywords used are described in Table A1. As a result, a total of 885 records were identified.

As a next step, the identified 885 records were filtered to select those published in journals related to the public administration field. The identification of relevant journals in the topic of public administration was based on three sources: Web of Science, Scopus, and Scimago. Based on these three databases, we extracted the journals belonging to the following categories:

a. Sociology and Political Science
b. Public administration
c. Political Science
d. Political Science and International Relations

In total, 119 journals were identified as part of the public administration field. The records that did not belong to these journals were excluded ($n = 594$), summing up a total of 291 records selected in the search.

Screening of titles and abstracts was carried out for those 291 records, to ensure the eligibility criteria set at the beginning. This process resulted in 127 records excluded and 164 included for full-text reading. To ensure that all relevant articles to the topic were selected, the authors contacted several experts in the field and gathered recommendations on additional articles to consider. This step added 27 more records to the sample, making a new total of 184 articles for full-text reading.

During this last step, 125 articles were excluded. The main reasons were the lack of empirical evidence, and the lack of focus on public value creation. As a result, 59 articles were selected as the final sample for analysis.

TABLE A1 Search terms for initial screening.

Search theme	Search terms	Academic articles, WoS	Academic articles, Scopus	Total without duplicates
Multi-actor collaborations	"cross-sector* partnership*" OR "cross-sector* project*" OR "cross-sector* collaboration*" OR "multi-sector* partnership*" OR " multi-sector* project*" OR " multi-sector* collaboration*" OR "multisector* partnership*" OR " multisector* project*" OR " multisector* collaboration*" OR "collaborative* governance*" OR "multi-agenc*" OR "multi-actor*" OR "multiactor*" OR "co-creation" OR "cocreation" OR "co-production" OR "coproduction"	682	564	**885**
[AND], Public value	"public value*" OR "public interest*" OR "public benefit*" OR "public good*" OR "common interest*" OR "common good*" OR "collective value*" OR "collective interest*" OR "collective good*" OR "societ* value*" OR "societ* goal*" OR "development goal*" OR "public* sphere*" OR "democra* value*" OR "democra* interest*" OR "democratic* accountabilit*" OR "project* outcome*" OR "project* result*"			

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APPENDIX B: List of publications considered in the systematic literature review

1. Agusdinata, D. B. 2022. "The Role of Universities in SDGs Solution Co-creation and Implementation: A Human-Centered Design and Shared-Action Learning Process." *Sustainability Science*: 1–16.
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19. Hansen A. V., Fuglsang L. 2020. "Living Labs as an Innovation Tool for Public Value Creation: Possibilities and Pitfalls." *Innovation Journal*.
20. Haug, N., and I. Mergel. 2021. "Public Value Co-Creation in Living Labs-Results from Three Case Studies." *Administrative Sciences*.
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APPENDIX C: Public value(s) governance framework: Data categorization and information sources)

(Table C1).

TABLE C1 Strategic public value(s) governance: Information sources by components and key concepts.

Theme	Component	Key concepts	# References (Appendix B)
Engagement and authorization	**Meaningful participation and engagement**	Spaces and channels for engagement	R1, R2, R4, R5, R8, R9, R11, R12, R13, R14, R17, R18, R19, R20, R22, R24, R25, R29, R31, R33, R34, R35, R37, R38, R39, R40, R41, R42, R43, R44, R45, R47, R48, R49, R50, R51, R54, R56, R59
		Empowerment of actors and community groups	R6, R9, R10, R14, R18, R19, R20, R22, R24, R28, R29, R33, R37, R38, R45, R49, R50, R51, R56
		Number and type of stakeholders	R9, R16, R18, R31, R45, R51
	Dialogue and negotiation	Dialogue and deliberation	R1, R2, R3, R5, R7, R8, R9, R10, R12, R13, R14, R15, R16, R17, R18, R23, R24, R26, R29, R29, R30, R31, R32, R33, R35, R36, R37, R38, R39, R40, R43, R45, R48, R49, R50, R51, R54, R56
		Negotiation and decision making	R2, R9, R11, R14, R16, R18, R19, R20, R21, R26, R27, R29, R29, R30, R35, R40, R41, R43, R45, R46, R47, R48, R53, R57
	Shared value proposition	Joint value definitions	R2, R7, R8, R9, R10, R11, R12, R13, R14, R16, R19, R21, R22, R23, R24, R27, R28, R29, R29, R31, R33, R34, R35, R37, R38, R40, R41, R42, R43, R46, R47, R48, R49, R51, R52, R53, R54, R55
		Value tensions and coping strategies	R3, R8, R10, R11, R14, R22, R23, R35, R41, R56, R57
Operational capabilities and assets	**Individual and collective assets and resources**	Individual assets and resources	R1, R6, R9, R12, R18, R29, R33, R43, R47, R49, R57
		Collective assets and resources	R6, R8, R10, R11, R20, R26, R32, R33, R34, R35, R38, R44, R46, R47, R48, R49, R52, R54, R55
		Capacity mixes	R4, R11, R14, R23, R29, R33, R34, R44, R54, R55
	Integrative leadership and strategic management	Integrative leadership capabilities	R6, R7, R8, R10, R11, R16, R20, R29, R30, R33, R35, R37, R38, R40, R43, R46, R49, R50, R51, R54, R56, R57
		Strategic management capabilities	R8, R10, R11, R31, R35, R38, R40, R43, R49, R50, R51, R55
	Institutional and collaboration design	Flexibility and autonomy levels	R1, R3, R6, R9, R10, R11, R14, R15, R18, R19, R20, R21, R22, R26, R28, R29, R29, R30, R32, R33, R34, R35, R38, R40, R41, R43, R44, R46, R47, R48, R50, R51, R52, R53, R55, R56, R57, R59
		Hierarchy and (de) centrality levels	R10, R11, R17, R27, R30, R31, R37, R47, R49, R50, R54
		Formality levels	R6, R11, R13, R15, R16, R28, R33, R34, R46, R47, R50, R54, R59
Broader environment and public sphere	**Broader political and social context**	Broader administrative architecture	R6, R9, R15, R28, R32, R35, R38, R50, R55, R57
		Legislative and policy context	R9, R10, R15, R16, R17, R21, R27, R28, R31, R38, R39, R46, R50, R51, R54, R55, R57
		Historical and cultural context	R3, R7, R9, R10, R28, R29, R38, R50, R57
Instrumental public values	**Procedural legitimacy**	Procedural rationality	R1, R2, R3, R6, R7, R8, R12, R13, R14, R16, R19, R20, R23, R26, R28, R29, R30, R32, R34, R35, R38, R39, R41, R42, R43, R44, R45, R46, R48, R57, R59
		Procedural justice	R1, R2, R7, R8, R9, R10, R13, R15, R16, R19, R20, R21, R23, R26, R29, R32, R37, R39, R40, R43, R45, R47, R48, R52, R53, R56, R59
		Operational control	R1, R2, R3, R6, R11, R13, R14, R16, R17, R18, R26, R27, R28, R29, R30, R33, R34, R35, R37, R38, R39, R41, R42, R43, R44, R47, R49, R51, R53, R54, R57
	Relational value	Trust	R1, R6, R7, R8, R9, R10, R13, R14, R16, R17, R18, R20, R21, R23, R24, R26, R28, R29, R29, R33, R34, R35, R37, R45, R46, R48, R49, R50, R52, R54, R56, R57
		Social networks and social capital	R5, R6, R10, R14, R18, R20, R22, R23, R24, R25, R29, R35, R44, R45, R48, R50, R54, R55, R56

(Continues)

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TABLE C1 (Continued)

Theme	Component	Key concepts	# References (Appendix B)
		Social cohesion	R4, R5, R14, R20, R23, R29, R31, R33, R40, R43, R49, R50, R56
Instrumental and prime public values	**Democratic accountability**	Vertical democratic accountability	R1, R2, R8, R15, R16, R20, R23, R26, R29, R30, R35, R39, R40, R41, R44, R47, R49, R51, R57
		Horizontal democratic accountability	R1, R3, R4, R7, R8, R11, R12, R13, R15, R16, R18, R19, R20, R22, R24, R26, R27, R29, R29, R32, R33, R34, R35, R37, R38, R39, R40, R41, R42, R43, R45, R48, R50, R51, R55
		Equal representation and inclusion	30, R10, R11, R13, R14, R16, R19, R22, R26, R29, R29, R37, R40, R41, R45, R46, R48, R49, R56
	Equity and reciprocity	Equity of benefits	R1, R5, R8, R10, R12, R17, R20, R21, R22, R23, R27, R28, R29, R29, R30, R31, R33, R35, R37, R38, R41, R43, R44, R45, R46, R50, R51, R52, R53, R54
		Equity of payment	R1, R6, R7, R8, R9, R15, R16, R17, R18, R21, R22, R23, R26, R27, R29, R31, R33, R34, R35, R41, R43, R46, R47, R49, R51, R54, R55, R59
Prime public values	**Performance value**	Efficient performance	R6, R8, R10, R17, R20, R27, R30, R31, R32, R33, R39, R42, R43, R46, R47, R50, R51, R52, R59
		Effective performance	R1, R3, R4, R6, R7, R8, R9, R10, R11, R12, R14, R15, R18, R20, R21, R22, R23, R24, R26, R27, R28, R29, R29, R30, R31, R33, R35, R36, R37, R38, R39, R40, R42, R43, R46, R47, R49, R50, R51, R52, R53, R56, R57, R59
		Durable solutions	R1, R6, R10, R11, R14, R18, R20, R24, R28, R29, R32, R38, R43, R50
	Problem-solving capacity	Behavioral shifts	R6, R10, R17, R20, R25, R31, R35, R38, R39, R43, R44, R46, R48, R49, R50, R51, R55
		Innovation	R5, R7, R11, R14, R15, R17, R18, R19, R20, R27, R28, R31, R32, R33, R34, R42, R47, R49, R50, R51, R54, R56, R57
		Skills development and learning	R1, R3, R4, R10, R15, R18, R19, R20, R25, R29, R31, R33, R34, R39, R44, R49, R50, R55, R56, R57
		Increased knowledge and awareness	R1, R4, R8, R15, R17, R19, R20, R26, R28, R29, R30, R31, R32, R34, R35, R45, R48, R49, R50, R51, R52, R54, R56, R57
		Data and information	R20, R27, R28, R32, R39, R44, R47, R48, R51, R52, R54, R57

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Publication III

Thabit, S., Degkwitz, T., Fadmastuti, M., & Mora, L. (2026). Decentralisation in public sector data platforms: A pathway to enhancing public value? *Government Information Quarterly*, 43(3), 102149. https://doi.org/10.1016/j.giq.2026.102149 (ETIS Category: 1.1.)

Government Information Quarterly 43 (2026) 102149



Contents lists available at ScienceDirect

Government Information Quarterly

journal homepage: www.elsevier.com/locate/govinf



Decentralisation in public sector data platforms: A pathway to enhancing public value?

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ARTICLE INFO

Keywords:
Technology decentralisation
Data platforms
Public value
Public sector
Assemblage theory

ABSTRACT

Technology decentralisation is increasingly proposed as a key feature to build more trustworthy, accessible, and innovative digital public infrastructure, yet there is limited empirical knowledge of the actual benefits that such decentralised approaches would create from a public sector perspective. Furthermore, existing literature often relies on a linear dichotomy between data supply and demand that fails to capture the complexity of decentralised data ecosystems. This paper addresses these gaps by adopting an assemblage thinking perspective to conceptualise data platforms as complex socio-technical arrangements, and by developing a public values framework to broaden the understanding of the various outcome that data platforms can create. We apply this approach to an exploratory case study of Hamburg's Urban Data Platform (UDP). Our findings demonstrate that public value creation is not determined by technical decentralisation alone but by specific architecture-governance configurations. We illustrate that both decentral and central practices can co-occur within the same system, where the role of a leading orchestrator is crucial to drive public value creation.

1. Introduction

In today's digital age, access and reuse of data shared by public sector entities, citizens, businesses, academia, and other organizations are of paramount importance to tackle the multifaceted challenges of our societies (UNEP, 2024). However, accessing data for the public good remains limited, due to issues such as data fragmentation, lack of trust, low digital literacy levels, and power concentration among big corporations owning large amounts of data (Rikap et al., 2024; Susha et al., 2023). To address these challenges, technology decentralisation has been proposed as a potential solution to develop more inclusive, efficient, and secure ways to share and reuse data across and within societal sectors (Jarosz et al., 2023; Manny et al., 2022; Zuziak et al., 2023).

Technology decentralisation is becoming a well-established concept in academic and grey literature, understood as an approach that allows autonomous organizations to participate in a data sharing network while retaining governance over their assets (Jarosz et al., 2023). It is conceived to address a wide range of problems, such as ageing infrastructure (Manny et al., 2022), multi-actor collaboration (Jarosz et al., 2023), democratic participation (Kud, 2023), data sharing and reusing (Ramachandran et al., 2018; Rujano et al., 2024), and cybersecurity (Bakhtina et al., 2023). Based on the horizontal self-organization of equal peers, technology decentralisation enables the removal of central points of failure (Estermann et al., 2018) and allows alternative configurations of power where participants can enjoy full governance control (Bodó & Giannopoulou, 2019; Chen et al., 2021).

However, academic literature has been mostly focused on the technological innovations that enable technology decentralisation—e.g., platform architecture (Bragard et al., 2017), decentralised learning (Zuziak et al., 2023), interoperability (Jeong et al., 2020), and blockchain technology (Sun & Zhang, 2020)—and limited empirical evidence exists regarding how these innovations are governed, and their costs and benefits from a social, political, and economic point of view (Bodó & Giannopoulou, 2019).

This knowledge gap is notably prominent in the context of public sector digital infrastructure. While academic and grey literature have

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https://doi.org/10.1016/j.giq.2026.102149
Received 12 November 2024; Received in revised form 18 May 2026; Accepted 19 May 2026
Available online 6 June 2026
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been increasingly proposing decentralisation as a key feature to build trustworthy, accessible, and innovative digital public infrastructure (Eaves & Rao, 2025; Farrell et al., 2023; UNDP, 2023), very few studies exist on how such decentralisation approaches are actually implemented and their positive impacts, moving beyond technology decentralisation as a normative ideal (Bodó & Giannopoulou, 2019).

Traditionally, governments relied on centralised repositories such as data warehouses and data lakes to overcome fragmentation of public sector data, usually siloed in different administrative units and IT systems (Mora et al., 2025). In recent years, they have been introducing data platforms that enable more decentralised designs, which do not rely on central databases or administrators (Ramachandran et al., 2018). However, the transition towards technology decentralisation in the public sector remains incipient, and little is known about the actual benefits that decentralised data platforms would create from the perspective of local and national governments (Chen et al., 2021).

Additionally, existing literature on public sector data platforms has predominantly focused on open data, often framing these platforms through a dichotomy of data supply and demand (Bonina & Eaton, 2020) that fails to capture the complexity and multi-directionality of decentralised data ecosystems (Tonnarelli & Mora, 2025). To overcome this limitation, this paper adopts a definition of data platforms as data assemblages (Kitchin et al., 2025), that allows us to study complex socio-technical artifacts, and decouple the technical architecture from governance mechanisms, revealing that a decentralised technical design does not necessarily imply decentralised governance.

Furthermore, we construct a public values-based framework for analysis, that broadens the normative understanding of the diverse outcomes that data platforms can deliver. The framework is built upon the main layers of data platforms—functional, organizational, and structural (Klievink et al., 2016)—and a "search for public values" (Bozeman & Sarewitz, 2011), constituting a foundational and systematic part of our research strategy. Conceived since the initial stages of the study, it responds to the lack of existing knowledge that brings together the intersection of theories around public value and data platforms. Subsequently, we apply the framework to explore the effects and implications of technical decentralisation in a public sector data platform at the local level. We follow a case study approach to answer the research question: *How is technology decentralisation implemented in public sector data platforms, and how does it influence public value creation?*

The paper concludes with a reflection on our contribution to theory and practice, that brings the importance of socio-technical perspectives and context-specific factors to understand the processes of public value creation in decentralised data platforms. In addition, we illustrate that both decentral and central practices can occur within the same decentralised system, where the role of a leading entity is crucial to drive public value creation at different levels.

2. Theoretical background

2.1. Technology decentralisation in public sector data platforms

In recent years, local and national governments have been shifting from centralised data warehouses and data lakes, which were implemented as a means to tackle the former fragmented and siloed data landscape, to integrated data platforms that support the storage, management, and exchange of data across systems and actors, supporting collaborative data-driven innovation (Davies & Firm, 2010; Klievink et al., 2016; Mora et al., 2025). Data platforms can have different technological approaches—from centralised designs to distributed platform architectures (Fadmastuti et al., 2024; Gupta et al., 2020). However, there is limited empirical knowledge regarding the actual benefits these decentralised approaches create from a public sector lenses.

To date, academic literature has mostly focused on public sector data platforms from the perspective of open data, providing relevant insights around platform and data requirements, and the main limitations and challenges that can affect public value creation (e.g., Attard et al., 2015; Ferreira et al., 2025). Recent studies explain that despite the expectations of open data platforms to foster democratic processes, they have mostly failed to achieve such outcomes (Ruijer, Grimmelikhuijsen, & Meijer, 2017). Empirical analysis illustrate how context-specificity and ecosystem orchestration are key requirements to achieve transparency, civic engagement, economic growth, and better government offerings (Ruijer, Grimmelikhuijsen, Hogan, et al., 2017; Vetrò et al., 2016). Furthermore, platform architecture is seen as a key construct for the innovation of public services using open data (Bonina & Eaton, 2020), requiring a malleable approach that allows continuous adaptation and organic expansion (Hein et al., 2023). However, a comprehensive understanding of the impacts of decentralisation in public sector data platforms, as well as the implementation mechanisms required to adopt these technological approaches, is largely missing in research. Additionally, existing conceptualisations of open data platforms emphasise the dichotomy between supply and demand (e.g., Bonina & Eaton, 2020), suggesting a linear understanding of data flows that fails to capture the complexity and multi-directionality of decentralised ecosystems (Tonnarelli & Mora, 2025).

To overcome this limitation, we adopt a data assemblage approach to expand the definition of public sector data platforms as "complex socio-technical arrangements composed of many apparatuses, actors and practices whose central concern is the production, management, analysis and sharing of data" (Kitchin et al., 2025, p.2). By looking at data platforms under an assemblage-thinking perspective, we reject predefined definitions of processes or relations (DeLanda, 2006) to focus on arrangements comprised of various social and material components (Kamalipour & Peimani, 2015). This perspective allows maintaining an intentional openness, viewing data platforms as non-static arrangements with a dynamic state of constant evolution rather than a fixed existence (Anderson & McFarlane, 2011; Thabit & Mora, 2023). This approach allows us to study different levels of (de)centralisation, influenced by a variety of architecture-governance configurations (Hanseth & Rodon Modol, 2021), embedded in a particular societal context (Meijer & Boon, 2021).

Following existing literature, decentralised data platforms are characterised by a distributed architecture, where data processing, control, and storage are dispersed among multiple stakeholders, rather than being managed by a single central authority (Otto & Jarke, 2019). They are built upon a modularity approach based on interoperability and extensibility, allowing different elements of a system to be put together or broken apart as necessary (Eaves & Rao, 2025). When looking at decentralised data platforms, they are often associated with a community of independent users having equal rights in terms of governance and control of data (Kud, 2023), where "data owners have the right to decide whether, whom and when to share their data" facilitating increased autonomy and encouraging participation (Ramachandran et al., 2018, p. 1).

However, decentralised data platforms do not necessarily imply that governance and decision making are also decentralised (Vergne, 2020). For example, configurations where the infrastructure is centralised (for efficiency, security, or ease of management) but the governance is decentralised or community-driven (for trust and sovereignty) can be seen in platforms for data cooperatives and data trusts (Micheli et al., 2020). Similarly, platforms with a decentralised architecture and centralised governance exist, such as common data spaces (Otto & Jarke, 2019) or the X-Road data exchange layer in public administrations (Puura et al., 2026). Yet little is known about how technology decentralisation is governed, and its impacts on public value creation from a public sector perspective.

2.2. A public values framework for data platforms

During the last decades, theoretical and conceptual frameworks

based on the concept of public value have gained exponential importance across many contexts and countries (Bryson et al., 2017). Rooted in Mark Moore's 1995 book "Creating Public Value", academic research has expanded theoretical and conceptual understandings around public value creation in various fields - from public administration (Bryson et al., 2015; Osborne et al., 2022), to public sector and business innovation (Clarke & Crane, 2018; Mazzucato & Ryan-Collins, 2022), and organization studies (Le Ber & Branzei, 2010; Meynhardt et al., 2019)- with a growing emphasis on dynamics of collaboration and co-creation across various societal sectors (Sancino, 2022; Thabit et al., 2024). Furthermore, particular attention on public value literature has been drawn from scholars working on topics around digital government (Panagiotopoulos et al., 2019), smart cities (Meijer & Boon, 2021; Neumann et al., 2019; Thabit & Mora, 2023), and public sector innovation (Bannister & Connolly, 2014; Scupola & Mergel, 2022).

A particularly relevant stream within this ample body of literature is the focus on public values (Bozeman, 2007), that aims to overcome the often ambiguous and unbounded status of public value conceptualisations to facilitate empirical assessments and practical purposes. Accordingly, we undertake a contextualisation and mapping exercise following "*a search for public-values*", as described by Bozeman and Sarewitz (2011, p. 18), to systematically identify and analyse public values pertaining to data platforms. By looking at the multiplicity of public values, we mitigate the risk of easily quantifiable values, such as economic efficiency, dominating the public debate (Bryson et al., 2015), and instead, focus on a more comprehensive understanding of the complex interplay between data platforms and public value creation. Furthermore, this approach shows fundamental to advance current theorising, as it helps conceptualising public value concepts in technology development by providing normative and societal insights (Bozeman, 2007) and shedding light on the significance of causality and proximity relations among different public values (Bozeman & Jørgensen, 2007).

Our search is guided by a multilayer analysis (Bozeman & Sarewitz, 2011) that responds to the socio-technical nature of data platforms as both information technology infrastructures and governance mechanisms, that are embedded in a particular societal context (Klievink et al., 2016). Accordingly, we adopt three main overlapping perspectives to map public values in data platforms: (i) the structural layer (technology design and infrastructure), (ii) the organizational layer (governance mechanisms and practices) and (iii) the functional layer (uses and applications at societal level). For the purpose of this study, we conceptualise public values as any positive outcomes and impacts that can result from the use of data platforms, considering that public value can be both process-oriented and outcome-oriented, following existing theorising of public value as a strategic element of public management and multi-actor governance (Thabit et al., 2024).

To guide the analysis, we take the public values framework developed by Thabit et al. (2024) as a starting point, for two main reasons. First, it provides a comprehensive review of the public values literature up to date, and offers an actionable framework composed of 6 different public value themes that serve to localise more specific public values in a given field. Second, it recognises the multi-actor nature of public value creation in alignment with our conceptualisation of data platforms as complex assemblages. Building on this, we performed the mapping of public values in data platforms by looking at each of the 6 themes of the previously mentioned framework, and contextualising them in view of existing research in the specific field of study (e.g., Bannister & Connolly, 2014; Twizeyimana & Andersson, 2019). To ensure conceptual consistency, we draw on the further conceptualisation of each of the original 6 public value themes—in components and concepts, respectively—as the inclusion/exclusion criteria to define our final list of public values, and overcome the challenge of having potentially different classifications and definitions of public values in data platforms.

As a result, a total of 12 public values were identified and conceptualised. Table 1 presents the results of the mapping exercise, providing a summary of the main references identified throughout the comprehensive literature review across the fields of public value, data governance, information platforms, and public sector innovation. The classification of the values into the three main layers of data platforms (structural, organizational, and functional) was done in accordance to how the contextualised public values were mostly described in existing research.

2.2.1. Structural layer

The structural layer comprises the technical components and design of data platforms, including technical specifications, standards, and design rules (Cordella & Paletti, 2019; Klievink et al., 2016). It encompasses the values that depend on the technology itself to be enacted, which are directly dependent on design choices related to technological components and data governance protocols. These values are categorised into four main blocks: (i) data quality, reliability and inclusiveness, (ii) accessibility and integration, (iii) privacy and security, and (iv) digital sovereignty.

Data quality, reliability, and inclusiveness values respond to the capacity of the data platform to ensure procedural legitimacy, and equitable and fair decision-making based on technically and administratively sound data and analysis (Antoniou & Skopeliti, 2015; Thabit et al., 2024). These values are directly related to the extent to which the data and analytic tools provided by the platform are considered valid, reliable, and representative of various dimensions of reality in an inclusive way (Herfort et al., 2023).

Second, *accessibility, interoperability and integration* are key values in technology designs. They define the extent to which platform tools and data can be accessed, integrated, and used by various actors and organizations without further modifications (Quek et al., 2023). These aspects are usually influenced by design choices about the openness of the platform software and information standards (Yu et al., 2019), and have spillover effects on efficiency and effectiveness values as "the public sector can become much more efficient and effective if all parts of it share and pool the assets, resources, data, etc., which each needs" (Millard, 2018, p. S80).

Third, *security and privacy* related values entail the provision of secure data exchanges within a platform ecosystem. They require that sensitive data is protected along the full cycle of data—from collection to storing, processing, and sharing (Samaneh Bagheri et al., 2021)—, and are essential to safeguard procedural legitimacy values related to control and justice (Page et al., 2015).

Last, *digital sovereignty* responds to the need of building long-term stakeholder capacities that are grounded on values of autonomy, ownership, and meaningful control over data and technology infrastructures (Bria et al., 2023; Hummel et al., 2021; Weigl et al., 2023). It relates to the avoidance of technological dependencies (Lambach & Monsees, 2024), as well as to the extent to which authorised actors, such as public administrations, have access and control over the data that are relevant for the public interest (Fernandez-Monge et al., 2024; Micheli et al., 2024).

2.2.2. Organizational layer

The organizational layer refers to the values embedded in the processes of governance (roles, responsibilities, etc.) and collaboration (data sharing) around the data platform (Ansell & Miura, 2020; Meijer & Boon, 2021). The values of this layer are directly related to governance arrangements and rules to ensure an accountable, transparent, fair, and efficient collaboration around the operations of the platform (Bagheri et al., 2021).

The first group of values refers to *accountability, ethics and transparency*. Transparency and ethics, on the one hand, relate to the extent to which platform operations respond to procedural justice values and the level to which stakeholders perceive platform operations to be fair and transparent (Thabit et al., 2024). While data platforms can deliver new

Table 1
Public Values Mapping in Data Platforms.

Layers (theoretical dimensions)	Public Values	Definition	Main references
Structural (technology design and infrastructure)	Data Quality, Reliability and Inclusiveness	Data and analytic tools provided by the platform are considered valid, reliable, and representative of various dimensions of reality.	Antoniou and Skopeliti (2015); Herfort et al. (2023)
	Accessibility, interoperability and integration	Data and analytic tools provided by the platform can be easily accessed, integrated, and used by various actors and organizations without further modifications.	Quek et al. (2023); Yu et al. (2019)
	Security and Privacy	The information infrastructure preserves security and privacy requirements of data shared and stored.	Samaneh Bagheri et al. (2021)
	Digital Sovereignty	Organizations and entities have autonomy, ownership, and meaningful control over data and technology infrastructures.	Bria et al. (2023); Hummel et al. (2021); Lambach and Monsees (2024),
Organizational (governance mechanisms and practices)	Accountability, ethics and transparency	Platform governance and operations are transparent, traceable, explainable, and based on ethical principles in line with existing laws and regulations at all jurisdiction levels.	Bannister and Connolly (2014); König (2021)
	Reciprocity and equity	Platform governance and collaboration are based on principles of equitable distribution of benefits and costs.	Samaneh Bagheri et al. (2021)
	Cross-sector and intra-sector data collaboration	The (data) governance umbrella provided by the platform facilitates voluntary data sharing across different actors.	Ruijer (2021); Susha, van den Broek, et al. (2023); Verhulst (2023)
	Efficiency and Sustainability	Platform operations are cost-effective, efficient, and long-term sustainable from a financial, operational, and environmental perspective.	Hofmann et al. (2019), Ponti et al. (2024)
Functional (uses and applications at societal level)	Improved public services	The use of the platform enables better decision-making and improved public service provision.	Brown et al. (2017)
	Economic growth and innovation	The use of the platform promotes the creation of new economic activities, improved operations of existing ones, and enhanced innovation and academic research.	Pereira et al. (2017)
	Informed society	The use of the platform improves the capacity of the general public to oversee and contribute to policy outcomes, plans, public decisions, etc.	Beckers et al. (2023), Muhhina (2024)
	Cooperation and participation	The use of the platform fosters and enables collaboration, partnerships, and co-creation between various societal sectors (public, private, academia, citizens).	Thabit and Mora (2023)

ways of transparency in the public sector (Bannister & Connolly, 2014), developing and operating data analytics and algorithm systems in those platforms also require an ethics-based approach to ensure fairness and justice (König, 2021). In addition, accountability relates to the extent to which platform operations and collaboration are responsive to laws and authorisers, in line with vertical democratic accountability values (Page et al., 2015). Different rules of engagement set by a platform controller would determine the levels to which accountability is (de)centralised and responsibilities distributed among various co-creators (Meijer & Boon, 2021).

Reciprocity and equity are based on principles of equitable distribution of benefits and costs among the organizations and individuals engaged in a platform (Thabit et al., 2024). They relate to logics of sustainable co-creation and incentives among different stakeholder groups (Samaneh Bagheri et al., 2021).

Cross-sector and intra-sector data sharing (data collaboration) refers to a form of collaborative value that entails data sharing within and across societal sectors to achieve objectives of the public interest (Bria et al., 2023; Micheli et al., 2024). It builds upon logics of voluntary data sharing and is closely related to the increasingly recognised concept of "data collaboratives" where different actors share and use data to address complex societal problems (Ruijer, 2021; Susha et al., 2023; Verhulst, 2023).

Finally, *efficiency and sustainability* values represent the extent to which platform operations are cost-effective, efficient, and long-term sustainable from a financial, technical, and environmental perspective. Although several studies claim the public sectors increased potential to reduce transaction costs by engaging in digital platforms, questions remain on their capacity to sustain these initiatives in the long-term on the one hand (Hofmann et al., 2019), and the environmental costs that these initiatives create, on the other (Ponti et al., 2024).

2.2.3. Functional layer

The third and last layer, conceives the values created from the utilization and functioning of a data platform -from its use as a tool to improve the provision of public services, to its application as a foundation for external actors and industry players to leverage innovation, and the provision of a publicly accessible infrastructure of information

to citizens and the general public.

Four main values are mapped in this component. First, the ones related to an increased capacity of the public sector to deliver *better public services*. Through better access to data, policymakers and public managers can have improved decision-making skills and develop innovative tools and infrastructures to respond to the needs of citizens (Brown et al., 2017).

In addition, data platforms can also leverage the creation of *economic growth and innovation* value from various actors, such as industry or academic stakeholders. To achieve that, platform resources should be accessible and useful for the creation of new economic activities, improving operations of existing ones, and enhancing innovation and research (Pereira et al., 2017).

Furthermore, the presence of data platforms in the public sector entails the possibility of transforming government-citizen relations and increase democratic accountability (Muhhina, 2024). Values related to a more *informed society* can be achieved as citizens are able to oversee and better understand policy outcomes, plans, public decisions, and delivery of public services (Beckers et al., 2023; Slaviero et al., 2010).

Finally, *cooperation and participation* depend on the presence of common and accessible data infrastructures that can enhance the creation of new partnerships and co-creation initiatives among various stakeholders – from citizens to academic stakeholders, semi-public entities, businesses, etc. (Beckers et al., 2023; Thabit & Mora, 2023). Additionally, the presence of digital participation tools connected with urban data platforms can enhance citizens capacity to share feedback, lead to higher representation of marginalised groups, and develop social capital value from the bottom-up (Ziehl et al., 2023). The main focus of the cooperation and participation value goes beyond the sharing of data as it centers on the creation of broader societal benefits among various stakeholders and organizations.

3. Methodology

3.1. Research design and empirical setting

Our research methodology follows a case study approach focusing on an urban data platform. Urban data platforms constitute the main digital infrastructure of local governments, acting as the backbone for subsequent development of other services (Hernández et al., 2020; Royall, 2021). They allow to effectively utilise and share data from multiple city networks, systems, devices, and components in an accessible and interoperable manner (Jeong et al., 2020; Wolf et al., 2025), enhancing the capacity of local entities to create public value (Haveri & Anttiroiko, 2023). As other types of data platforms, they allow decentralised architecture designs that could improve inclusivity, efficiency, and security, among other benefits (Fadmastuti, Karo, & Soe, 2024; Ramachandran et al., 2018). However, the adoption of such decentralised systems by public sector entities has yet to become widespread (Liva et al., 2023) and no empirical studies exist around the effects of decentralised urban data platforms in the creation of public value.

In this context, the city of Hamburg stood out as a unique empirical setting where a decentralised design was chosen to develop and implement the city's data platform. Hamburg's Urban Data Platform (UDP) diverges from the predominant centralised approaches of local data ecosystems identified by recent research (Liva et al., 2023). Instead, it employs a system of systems approach acting as a decentralised data broker that connects heterogeneous, distributed databases via standardised APIs.

Accordingly, a single exploratory case study was chosen due to the unprecedented characteristics of the case (McBride et al., 2019). The unit of analysis comprises Hamburg's Urban Data Platform (UDP)—including its interacting stakeholders, the technological elements of the platform, and the policy and legislative context in which it is situated—serving as the empirical setting to assess our proposed theoretical framework (Quintão et al., 2020).

Our research question *"How is technology decentralisation implemented in public sector data platforms, and how does it influence public value creation?"* was carefully formulated based on an analysis of existing literature (Robert K. Yin, 2009), which highlighted a research gap around the implementation of decentralisation in public sector data platforms and its benefits beyond a normative discourse (Bodó & Giannopoulou, 2019). Particularly, theory played a central role in the research design (Yin, 2012). The public values framework developed in Section 2.2 was used as the theory for analysis and explanation of the phenomena studied in our case study (Gregor., 2006), which thoughtfully guided the approach for data collection and analysis, as further explained in Section 3.3.

3.2. Case description

Hamburg's Urban Data Platform (UDP) was conceptualised in the wake of the Transparency Act of 2012 (Hamburg, 2012) as well as the strategies for 'Digital City' of 2015 (Hamburg, 2015) and 'Digital First' of 2016 (Hamburg, 2016). The central administrative authority managing and orchestrating the UDP is the Agency for Geoinformation and Surveying (LGV). It provides technical support to other city departments, coordinates technical and organizational needs, and develops digital tools and applications related to the UDP. The UDP is based on a predominantly open-source technology stack through which the integration and interconnection of urban data is realised via standardised APIs. This approach connects existing IT systems avoiding the necessity to store the data in a central data warehouse or –lake. Though the centralised storage of data is an option, the UDP acts as a decentralised data broker, connecting existing systems and accommodating the existing heterogeneity of the public sector. This system of systems approach avoids a monolithic single point of truth solution and relies on the standardised technical linking of the city's distributed systems and databases (Fischer et al., 2021). Here, decentralisation refers primarily to the technical architecture of data exchange, while the governance surrounding the platform remains within the LGV as the central steward. The UDP is framed by the digital strategy of 2020 through principles of participation, innovation and data protection and results in a holistic approach that focuses on Hamburg's digital sovereignty (Hamburg, 2020). The UDP's approach does not limit its focus to the public administration but also attempts to include citizens, civil society organizations, research institutions, and the private sector.

3.3. Data collection and analysis

The main data source employed to address the research question were semi-structured interviews that targeted the main stakeholders and users of the platform. The theoretical framework guided the design of the interview protocol, which nonetheless followed a flexible approach to admit changes with the progression of the research (Gioia et al., 2013). A total of 18 interviews were undertaken with an average duration of 50 min. They targeted four main groups: (1) entities from Hamburg's local authority, (2) publicly owned companies at the city level, (3) entities from the Federal Government Authority, and (4) external stakeholders from at the urban level. As only local public entities and, in a few exceptions, academic institutions, currently have full access to the data in the UDP, they comprised most of the interviewees in the sample. However, key external stakeholders were also included to ensure a diverse range of views in the analysis (see Appendix B, Table 3 for further details).

Data triangulation (Johansson, 2007) was carried out analysing two additional data sources. On one side, a total of 13 archival documents were gathered and analysed. They included reports, internal working documents, workshop minutes, conceptual notes, presentations, official communications, and technical specifications. On the other side, one of the authors gathered observational data in their active involvement in the design and implementation of the UDP between 2018 and 2022.

While observation data allowed to improve sensemaking and provide clarifications of the findings, the author mentioned above did not participate in the primary data analysis to minimise potential bias (Yin, 2012). This approach allowed us to more contextually understand the characteristics of the platform, its operations, and the main outcomes and challenges mentioned in the interviews.

The interviews and the archival documents were analysed using the Atlas.ti tool, by adopting a thematic coding approach (Skjott Linneberg & Korsgaard, 2019). An abductive method of analysis allowed the identification of codes and concepts, conducting an equal engagement with empirical data and the existing theoretical knowledge (Thompson, 2022). Accordingly, the coding process was done following an iterative process in various stages. First, one author identified key concepts by engaging directly with the data in an inductive manner, and coding all relevant aspects mentioned in the interviews. Additionally, the codes were periodically discussed with a second author by engaging with the theoretical framework developed in Section 2.3. This process helped interpreting the data and using existing theories to find new codes and concepts that were not immediately apparent from the data alone. Last, a third author engaged in periodic reviews and discussions to refine the overall coding results and data structure (Saldaña, 2011). Table 2 outlines the final structure of data grouped by aggregate dimensions, which, in alignment with the theoretical framework, evidence how various aspects related to the implementation of the platform (first order) influenced the creation of public values (second order) at structural, organizational, and functional levels (third order).

Table 2
Data structure.

Concepts	Themes	Aggregate (theoretical) Dimensions
First order	*Second order*	*Third order*
[+] Orchestrator technical oversight reinforces data reliability and trust	Data Quality, completeness, and coverage	Structural layer
[+] Feedback channels improve data quality		
[+] Multiple and varied use cases (demand-driven approach) increase data completeness and coverage		
[−] Lack of stakeholders' digital literacy and capacity hampers data quality		
[−] Lack of legitimacy mechanisms for non-governmental data limit data completeness and coverage		
[−] Complex platform usability (i.e., non-user-friendly) hamper decentralised access	Accessibility, interoperability and integration	
[+] Storytelling and visual tools improve data access and usability		
[+] Open-source software and standards increase accessibility, interoperability and integration		
[−] Tensions among data accountability, ownership and privacy hamper integration		
[+] An independent, specialised entity assure platform security	Security and Privacy	
[+] Strong regulations guarantee privacy		
[−] Individual accountability fears around privacy requirements limit data sharing and quality		
[+] Political support encourages sovereignty over software and data	Digital Sovereignty	
[+] Open-source software and open standards reinforce digital sovereignty		
[−] Misalignment between platform open approaches and "closed" practices from stakeholders hampers overall platform functioning		
[−] Unclear data ownership and accountability agreements hinder data sovereignty		
[+] Periodic communication and trainings improve decentralised accountability	Accountable, ethical and transparent operations	**Organizational layer**
[+] Strong regulations ensure ethical and transparent use of data		
[+] Clear roles and responsibilities contribute to platform transparency		
[+] Open-source technology enhances transparency		
[+] Orchestrator efforts maintain stakeholders' motivation and engagement	Reciprocity and equity	
[+] Platform use among time creates reinforcing feedback loops and clearer perception of benefits		

(*continued on next page*)

4. Findings

4.1. Structural layer

4.1.1. Data quality, reliability, and inclusiveness

Most interviewees agreed on the fact that UDP provides overall reliable, inclusive, quality data across a range of sectors and domains. Three main aspects were identified as crucial for this to be achieved. First, the presence of a central coordinating entity that undertakes data quality checks and establishes trust among data users. In other words, while the data provision and exchange in the UDP technically worked in a decentralised manner, the Agency for Geoinformation and Surveying *(Landesbetrieb Geoinformation und Vermessung - LGV)* acted as an orchestrator, which increased reliability and trust in the data infrastructure (I.13). Second, the presence of feedback channels among stakeholders to identify gaps and errors that appeared during the use of data. Reporting these issues to either the LGV or the entities providing data was essential to improve data quality (I.06, I.07, I.11). Third, data inclusiveness was influenced by the presence of multiple and varied use cases. Instead of taking a repository approach, the decentralised system was driven by demand. As such, the more use cases were generated, and the more varied they were, the more data were included or identified as a data need (I.04).

However, issues were also highlighted. Several stakeholders identified barriers regarding lack of granularity, spatial reference, frequent updates, and integration beyond the city administrative boundaries (I.02, I.07, I.08). One main factor that influenced these challenges was the lack of capacity and digital literacy among the stakeholders providing data to the UDP. As a decentralised system, each entity is in charge of providing access and descriptions as well as guarantee the topicality of their data, in a timely and consistent manner. However, insufficient personal and knowledge capacity in some city departments generated metadata errors (e.g., confusing data descriptions) and a lack of updates (I.10, I.11). Furthermore, the lack of appropriate governance frameworks to legitimate data from non-governmental sources (citizen sensors, crowdsourcing, businesses, etc.) remained a barrier to provide more comprehensive and inclusive data in the UDP (I.14).

Table 2 (*continued*)

Concepts	Themes	Aggregate (theoretical) Dimensions
First order	*Second order*	*Third order*
[−] Decentralised technology design alone is not sufficient to enable data collaboration	Cross-sector and intra-sector data collaboration	
[−] Fears related to privacy liabilities prevent decentralised data sharing		
[+] Data sharing obligations positively influence data collaboration loops		
[−] Lack of data ownership options prevent data collaboration		
[−] Misalignment between open-source platform design and the use of privately sourced sensors hampers data sharing		
[−] Conversion costs limit data collaboration		
[+] Decentralised data collaboration, integration and sovereignty contribute to platform efficiency and sustainability	Efficiency and Sustainability	
[+] Combined decentralised data access (APIs) with central operations maintenance contribute to overall efficiency		
[−] Lack of stakeholders' capacity results in central requests and low levels of efficiency		
[+] An interconnected knowledge base among diverse stakeholders contribute to improve public services	Improved public services	Functional layer
[+] Data communication and visualization tools positively influence policy making and service delivery		
[+] Open access to data enhances economic growth and innovation	Economic growth and innovation	
[−] Lack of stakeholders' capacity hamper the platform's impact on economic growth and innovation		
[−] Complex platform usability (i.e., non-user-friendly) hamper economic growth and innovation		
[+] Face-to-face engagement increase awareness and foster economic growth and innovation		
[+] Data communication and visualization tools facilitate informing society	Informed society	
[−] Non-user-friendly access to the data and the platform tools hampers informing society		
[+] Public information events increase awareness and use of the platform by the public		
[+] An interconnected knowledge base among independent stakeholders fosters new partnerships	Cooperation and participation	
[+] Face-to-face workshops increase participation		
[−] Participation fears from city departments limit participation		

4.1.2. Accessibility, interoperability, and integration

The fact that multiple entities could access, use, and provide data (or data access) in a seamless and interoperable manner, was one of the main objectives behind the decentralised architecture of the UDP. Regarding accessibility, the main factors highlighted in the interviews related to the concept of usability, responding to "the capability of the (software) product to be understood, learned, used and be attractive to the user, when used under specified conditions" (Heo, J. et al., 2009., as cited in Osagie et al., 2017, p. 2).

While most interviewees confirmed that the usability of the platform was high, two of them highlighted that it was relatively low when accessed by non-specialised stakeholders (I.11, I.12). They described the interface as very technical, not attractive, and not intuitive, which hampered decentralised access and use by the general public, small companies, and city specialists without a geodata profile; "*If you look at smaller startups or private citizen ideas, if there is one person who wants to explore the data, but is not able to use the citygml very specific format, the person will never be able to work on the data*" (I.11). Regarding the usability of the data, interviewees found it overall good, despite some issues regarding different naming conventions and categorization. Particularly, one interviewee highlighted the need of making data understandable through maps and storytelling tools, a task was mostly driven by the LGV (I.14).

Furthermore, the decentralised design of the UDP is characterised by the use of open standards and open-source technologies, resulting in a wide variety of interoperable standardised apps, graphical interfaces, and APIs that each entity could use to make their data accessible. However, several interviewees identified governance-related aspects—namely accountability, ownership and privacy issues—as main barriers for the integration of data from various stakeholders (I.05, I.10). On the one hand, the lack of administrative procedures to integrate data from third parties, such as civil society data, were related to accountability fears on the validity of these data which resulted in insufficient integration and use. On the other hand, the fact that the UDP did not provide multiple ownership options—UDP data has only been conceived as municipally-owned—hampered the integration of data from third parties with commercial interests or privately managed sensors. In addition, the conception of the UDP as a platform for public data provision, impeded the provision of various access levels (e.g., restricted data access rights to specific stakeholders), creating privacy concerns for sensitive citizen data (I.10).

4.1.3. Security and privacy

Security and privacy are two central values differently managed in the UDP. On the one hand, security is ensured at the platform level through an external service provider (Dataport) entitled to the protection of the IT system. On the other hand, data privacy is addressed in a decentralised manner; each entity is responsible for any legal liability regarding data privacy. As such, stakeholders must independently ensure that they have addressed any privacy issues before a dataset can be integrated into the UDP. Together with the presence of strong regulations (e.g., at national and European levels), this approach ensures an effective strategy to respect privacy aspects (I.06). While no interviewee raised any objection about the achievement of these values, some of them claimed the trade-offs that these values have on other aspects. For example, the fact that responsibility over data privacy is decentralised,

generates accountability fears among various stakeholders, deriving in avoiding sharing data, or even making data "a bit more complicated so then at least nobody can understand it" (I.05) negatively impacting data quality and usability explained above.

4.1.4. Digital sovereignty

The value of sovereignty was related to the design of the UDP since its conception, both regarding the independence from proprietary software and the importance of data sovereignty at the city level, as underscored during the interviews: "*There is a risk that third parties will take over this role or parts of its tasks and that the city will lose sovereignty over the data, its interpretation and ultimately a large degree of controllability within the digital city*" (I.06).

Overall, interviewees identified that this value was only partially achieved. While the main technology provider (Dataport) was German, the UDP remained dependent on foreign tech companies in critical aspects such as cloud infrastructure (I.04). Additionally, when looking at data sovereignty there were some discrepancies among respondents. Some claimed that data sovereignty was highly achieved, some that was only partially achieved, and others claimed that it was in its early stages as the public data managed in the UDP was only a small portion of the actual urban data, and existing governance structures were not mature enough to integrate the use of third-party data.

Nonetheless, it was a common agreement among respondents around the extensive use of open-source software and standards— "*the first step is to use open standards, and the second one is that we try to use open-source software as often as we could*" (I.06)—as a key aspect that positively contributed to achieve digital sovereignty. This aspect was achieved thanks to the presence of political support, and influenced collaboration among various entities as it improved accessibility and interoperability by enhancing an open innovation environment at the city level (I.14). However, it also created barriers when engaging with external stakeholders, as many actors at the urban level use proprietary software due to the lack of internal capacity and knowledge on how to use open-source alternatives (I.11).

4.2. Organizational layer

4.2.1. Accountability, ethics and transparency

From an organizational point of view, a decentralisation approach to accountability presents multiple benefits, as each entity or data holder has a higher capacity to determine the liabilities of their data (I.06). In general, most interviewees agreed that the UDP achieved values of accountability, ethics and transparency.

However, they indicated that achieving these values required high resources and the action of a central orchestrator, to overcome barriers related to accountability fears from the collaborating entities, who felt a burden in the decentralisation of responsibilities:

"*At the very beginning, when we started this process, people always said no, I cannot be responsible for this. They had kind of anxiety, fear, to be responsible for something that probably they are not working on alone […] but of course we need one person or one department who's responsible for it.*" (I.05).

In accordance, internal working groups, regular communication channels, and trainings were established, with the aim to ensure that the different stakeholders had the capacity to undertake their assigned responsibilities (I.10). The presence of strong regulations for the ethical and transparent use of data were also crucial (I.16). Particularly, the city's Transparency Law was an important driver in this process, as it established the mandate of sharing data, pushing entities to open-up to the UDP and embrace their responsibilities (I.06). In addition, the presence of online tools with detailed information on the processes, roles and responsibilities contributed to the overall transparency of the system; "*about transparency, there is this website with all the roles and responsibilities for [data] owners and providers and everything*" (I.05). Finally, taking an open-source approach to technology design was highlighted as another key factor for this group of values, as it increases free access and transparency (I.15).

4.2.2. Reciprocity and equity

The realisation of this value was not entirely clear from the interviewees' responses. Several answers highlighted that the costs of the UDP were not equitably distributed, as most of the maintenance and operations burdens were centralised by the orchestrator (I.06). This is explained as the mandatory data sharing established by the city's Transparency Law initially created reluctance among contributing entities due to the distributed costs of this obligation. As a result, the orchestrator centralised most of the indirect costs of the platforms to incentivise participation (I.14).

Particularly, the LGV played a crucial role in maintaining motivation and engagement, and in finding a balance point between costs and perceived benefits. In addition, it took time for the different actors to understand the benefits derived from their participation in the UDP, and collaboration among time acted as a reinforcing feedback loop. The more stakeholders were using the UDP, the more they could see their benefits:

"I think the collaboration was like a reinforcing feedback loop, so that once they started seeing best practices, and that it works, and actually brings the real benefit and complete and added value, then that was the point where more and more people started opening up." (I.14).

Also, reputation wins acted as an incentive to participate and share data, *"it is also a means to sort of present yourself in the city or in in the management of the city, When you are an entity which is very open with the data, you sort of get recognition and reputation from all over the city."* (I.16). Finally, most interviewees that did not belong to the LGV, agreed on the aspect that this "unbalanced" distribution of cost was a positive aspect benefiting them:

"Maybe I should mention that I was a bit skeptical in the first place or the first time we heard about the urban data platform, because of course you need to establish rules and there is an established process for publishing data and you need to follow rules and there is cost distribution and all these aspects of running such a complex thing. But with all the experiences I've made so far, I am very happy with the whole thing." (I.10).

4.2.3. Cross-sector and intra-sector data sharing

Data sharing and exchange constitutes one of the main objectives of the UDP. The choice of a decentralised infrastructure was meant to serve this purpose, as it offers multiple options for data holders—e.g., from sharing the datasets to the LGV, to providing decentralised data access through APIs. However, various interviewees highlighted that this value was not completely achieved, underlying that the technology design alone was not sufficient to enable data sharing among different stakeholders.

Emotional reluctance prevented data sharing in several cases. Fears related to privacy liabilities, or the sense of protecting your secrets and information, were common barriers among UDP users (I.04, I.06, I.11, I.14). The presence of data sharing obligations (i.e., Hamburg's Transparency Law) helped to address some of these challenges (I.06, I.15). However, these obligations initially applied to public sector entities only, so the sharing of data from external stakeholders and even publicly owned companies, continued to be influenced solely by their willingness and motivations. The reformed transparency law from 2020 now includes publicly owned companies, but its enforcement has been insufficient (I.04). The lack of mechanisms to maintain data ownership (see Section 4.1.2) discouraged private sector stakeholders from sharing their data with the UDP and created the presence of parallel data agreements operating outside the platform. Regarding data from urban sensors, which are particularly complex, the common use of proprietary software by non-public actors, created another barrier to share data in the open-source UDP (I.11).

Furthermore, public sector stakeholders demonstrated a diverse attitude towards data sharing. While some were highly motivated by the

benefits their data could bring to the city, there was also scepticism due to the impossibility to know how and by whom data are used. Additionally, some entities cited conversion costs to the UDP formats as a reason for not exposing all of their data (I.05).

4.2.4. Efficiency and sustainability

Efficiency and sustainability were highly related to values of data collaboration, data integration, and data sovereignty, as they relate to the need to reusing existing stakeholders' data and avoiding redundant data collection processes.

In the UDP, most interviewees agreed that the platform was highly efficient, and that having both a central entity that maintains and operates the platform and a decentralised system positively contributed to it: "*the way it is set up, with a central institution who maintains and operates, but leaving the data sovereignty and actual data processing with the individual partners responsible, that kind of split works reasonably well and reasonably effective*" (I.14).

Nonetheless, two respondents explained that decentralisation was not completely achieved regarding data sharing and integration (I.05, I.07). Due to capacity imbalances, data contributors had the option of either providing an API to their data premises or sending their data to the LGV—who would provide capacity support and integrate them in the platform. The former proved to be more efficient, as the latter resulted in bottlenecks of central requests (I.05). However, most of the data in the UDP is still delivered via sending or uploading files to the LGV resulting in low levels of efficiency.

4.3. Functional layer

4.3.1. Improved public services

Most interviewees agreed on the fact that the UDP contributed to improve public services. The UDP created a common knowledge base of trusted and reliable data, across often disconnected city departments. It contributed to improving inter-departmental collaboration and negotiations, by helping to fact-check arguments and decisions (I.15, I.16). Additionally, data visualization and communication tools were highlighted as key elements to transform data into actionable knowledge to influence policy making and service delivery (I.14).

"*We really have a large number of very nice use cases which provide better public services internally and externally.*" (I.04).

However, two respondents highlighted that this value was only partially achieved. They explained that as not all public services are digitalised, they cannot benefit from the platform, limiting the impacts it can create on the overall public service delivery (I.05, I.10).

4.3.2. Economic growth and innovation

Different, sometimes opposing opinions were shared regarding this value. Some respondents claimed that it was highly achieved, others that it was not fully achieved, and most of them agreed on the fact that it was very difficult to know the actual impacts of the UDP in the city's economic growth and innovation ecosystem.

More specifically, interviewees identified the provision of high-quality open data as one of the main drivers for economic growth and innovation (I.05, I.12). While the UDP enhanced the city's reputation as an innovation hub, it allowed any stakeholder at the urban level to access and use city data without associated costs: "*When you are settled as a company with a local focus in Hamburg, you have the necessary data without having to pay for that. You have [them] quickly accessible and so this is quite a good start for startups or so to deal with that data or research*" (I.12).

Yet two aspects influenced the capacity of urban actors to use these open data: their capacity and digital literacy and the platform usability (I.11, I.15). Interviewees explained that only big companies and institutions in the city were utilizing the UDP, as smaller entities and citizens were not yet prepared for such specialised technology: "*at some point it was the idea that everybody uses it, and right now I think mostly the big companies or institutions in Hamburg use it, but the smallest startups sometimes don't even know which data set is available to them and how they can use it. Maybe it is a bit of a marketing issue, maybe the public isn't there yet to use such specific datasets or specialized systems.*" (I.11).

In addition, the low usability of the platform (e.g., described as not attractive or intuitive, as further explained in Section 4.1.2) hindered their use among the general public. Nonetheless, meetings and face-to-face encounters with urban stakeholders (e.g., startups) were demonstrated as highly important to increase awareness and receive feedback on the UDP functionality.

4.3.3. Informed society

The opinions of the interviewees also differed regarding this value. Some respondents highlighted that it was generally achieved, as the presence of a data platform in a city generates additional tools for citizens to be informed about ongoing city projects, activities, policies, etc. (I.04, I.14). However, others claimed that the presence of a platform has only partial influence in the public's capacity to be informed, as it needs to be accompanied of clear communication and data visualization tailored to the general public (I.15).

Interviewees also highlighted the need for data curation and knowledge tools that could be accessible to all (I.15). As explained in Section 4.1.2, the UDP design mostly focused on specialised user profiles, which made the platform's usability low for regular citizens. The role of the orchestrator was identified as highly relevant in this regard, organizing public information events to increase awareness and promoting the UDP tools among the public (I.05).

4.3.4. Cooperation and participation

Most interviewees agreed that the UDP actively contributed to spur cooperation among various stakeholders. During the development and implementation of the UDP, partnerships and collaborations took place with various actors in the city, from companies to universities, public entities, etc. (I.04, I.06, I.10). The presence of a common knowledge base (see also Section 4.3.1) facilitated new collaborations among city entities that had not worked together in the past and boosted new partnerships with stakeholders at the urban level (I.16). A key partnership was the one between the LGV and the City Science Lab (CSL) of the HafenCity University, who provided technical assistance on various matters, and leveraged the UDP capacity to promote citizen engagement. Among others, the CSL developed open-source participation tools and apps implemented in conjunction with face-to-face workshops and co-creation sessions with citizens and civil society organizations (I.03).

However, interviewees also highlighted some reluctance from city departments to involve the public too much, due to fears of creating too many requests that they could not fulfil (I.14). Furthermore, critiques were raised around the lack of engagement of civil society organizations in the development of the platform and the inclusion of additional data (I.11).

"*There is a certain hesitation and reservation to actually involving the public too much because they often feel, the departments or the administration, fear that too much transparency will create too many requests from the audience.*" (I.14).

5. Discussion

Our study examines the factors influencing the creation of public values in a decentralised public sector data platform. To do so, we build on the definition of data platforms as data assemblages, allowing us to uncouple platform architecture from platform governance (see Fig. 1), revealing how different types and levels of centralisation can coexist and interact. Additionally, we guide our analysis through a theoretical framework that incorporates the main layers of data platforms—functional, organizational, and structural (Klievink et al., 2016)—and "a search for public values" (Bozeman & Sarewitz, 2011) based on a review of existing literature on both data platforms and public value creation. The framework provides a normative approach on

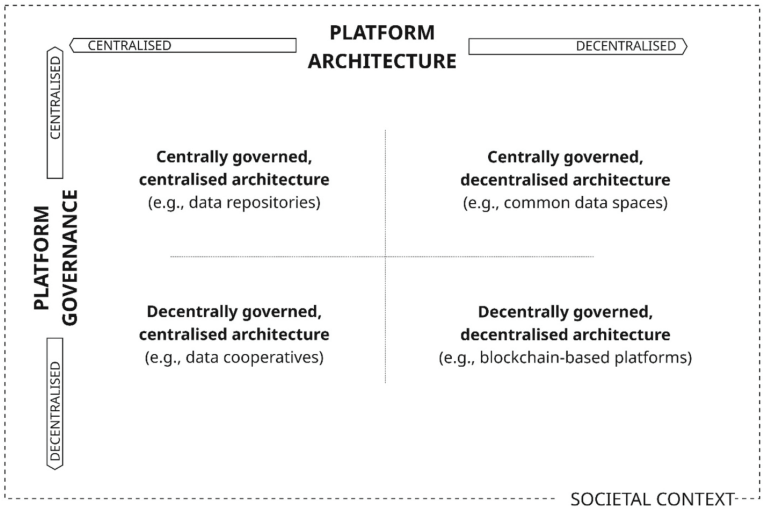


Fig. 1. Architecture-governance configurations in Data Platforms.

the different public values that data platforms can enhance from a socio-technical perspective, constituting a key contribution to literature. Further, it showcases how the "search for public-values" methodology serves as a systematic bridge connecting the broad theories of public value to the specific, context-relevant components identified in the framework. Finally, the findings of the empirical analysis helped enhance our framework by providing further insights on how different centralised and decentralised articulations of architecture-governance configurations influence the realisation of each public value.

In this section, we provide a transversal analysis of our findings in light of existing theories and knowledge and present the main theoretical and practical contributions of the study. We explain how platform decentralisation cannot be understood and explained separately from platform governance, as they are the intermeshed components framing a data assemblage (Kitchin et al., 2025). Further, the realisation of public value cannot be determined by one or the other alone, but by the resulting combination of technology, governance, and contextual aspects depending of the specific value at play.

5.1. *Theoretical contribution*

Our study offers two primary contributions to the theoretical understanding of public sector data platforms. First, we expand the conceptualisation of these platforms by moving beyond the traditional dichotomy between data supply and demand that characterises much of the existing open government data literature (e.g., Bonina & Eaton, 2020). Instead, we advance a **data assemblage perspective**, viewing technical decentralisation in data platforms as a complex socio-technical arrangement composed of diverse actors, apparatuses, and practices (Kitchin et al., 2025), where data suppliers can at the same time demand and use data from other actors, in a constantly evolving ecosystem (Susha et al., 2023).

This perspective allows us to articulate the crucial role of architecture-governance configurations embedded in a particular context (Hanseth & Rodon Modol, 2021), in explaining how data platforms are implemented and how they deliver public value. Specifically, we illustrate that platform architecture and governance cannot be understood and explained separately, as they are intermeshed components of the same data assemblage (Kitchin et al., 2025). Additionally, we illustrate that both architecture and governance can operate at different levels of centralisation within the same system.

We provide an analytical framework to classify data platforms across four quadrants, which helps both advancing theorising on the field and operationalising potential future research to further compare approaches among different platforms and public administrations. Particularly, our case study reveals that the urban data platform in Hamburg falls under the second quadrant "centrally governed, decentralised architecture" despite being conceptualised as a decentralised system (Fischer et al., 2021). This illustrates that the actual design and functioning of a decentralised technical architecture in a public sector data platform is far from an ideal or normative approach (Bodó & Giannopoulou, 2019) and that it does not require—and may not even function effectively with—a purely decentralised governance model. Rather, we identify that both decentral and central governance practices can occur in the same system, where the role of a leading entity is crucial to drive public value creation. Furthermore, both decentral and central architectures co-exist when looking at specific functions, as with the case of data sharing in the UDP. This expands the concept of semi-decentralisation (Chen et al., 2021) by showing that practical implementations often require architecture-governance configurations where central orchestration and decentralised designs can adopt flexible approaches. Additionally, our analysis reinforces the importance of a context-specific perspective to study the impacts of technology decentralisation (Meijer & Boon, 2021).

Second, our study contributes to the theoretical and normative knowledge on data platforms through the development of the public values framework presented in Section 2. The framework integrates the structural, organizational, and functional layers of data platforms (Klievink et al., 2016) with a "search for public values" (Bozeman & Sarewitz, 2011), providing a normative lens that helps future research to capture the broader societal implications of data platforms. It adopts a comprehensive, predefined public values framework (Thabit et al., 2024) as the starting point to map and contextualise public value themes into concrete values that are relevant to data platforms, providing conceptual consistency. By systematically mapping values, this framework addresses the lack of existing knowledge bridging theories of public values and data platforms.

Future research should explore diverse data platform assemblage configurations across both local and national public sector infrastructures. Comparative studies would be essential to validate our findings and understand how different governance models perform in varied technological settings. Specifically, scholars should further

elaborate on the concept of semi-decentralisation (Chen et al., 2021), investigating how different implementations of architecture-governance configurations co-exist and how the interplay of central and decentral practices evolves to drive public value. This inquiry should echo current claims regarding the importance of legal and policy frameworks—such as data sharing obligations—and challenge the assumption that all stakeholders possess the capacity to engage with decentralised systems (Mora et al., 2025). Additionally, the emotional reactions of individuals towards distributed accountability should be examined as a key factor influencing the success of these architecture-governance configurations. Also, further empirical research is needed to understand the dynamic capabilities (Kattel & Mazzucato, 2018) required from leading entities to manage these complex assemblages effectively. Finally, longitudinal research would be beneficial to track the dynamic adaptation of these configurations over time, capturing the evolving nature of technology decentralisation and assessing the long-term sustainability of public value outcomes (Källström et al., 2021).

5.2. Practical contribution

Existing studies about data platforms and public value creation claim that the positive outcomes that these technological systems can deliver are influenced by technological, governance, individual users, and societal aspects (Meijer & Boon, 2021). Our analysis reinforces these arguments and provides further details on how these aspects can be further articulated in a decentralised system.

Throughout our study, the interviews showed discrepancies regarding the actual realisation of certain public values, but participants generally found common ground on the factors influencing those values. Not all values were fully achieved, and not all values were equally influenced by technology decentralisation. This variability makes it difficult to definitively assess whether this technological approach inherently provides higher overall benefits compared to centralised alternatives but provides relevant insights on how different approaches to governance and technical designs—more centralised in some cases, more decentralised in others—were needed to achieve specific values in the decentralised platform. Fig. 2 provides a summary of the main aspects influencing public value creation in the UDP, classified in accordance with their centralisation or decentralisation levels, as further explained below.

At the **structural layer** (technology design and infrastructure), the decentralised design of the platform, based on open-source software and standards, positively influenced aspects of accessibility, interoperability, integration, and digital sovereignty. However, the realisation of values like data quality, completeness, and trust was heavily reliant on the centralised governance provided by the LGV acting as an orchestrator and the possibility to have centralised alternatives to data sharing. Conversely, a decentralised governance approach to data privacy—where each entity was responsible for legal liabilities—created accountability fears that negatively impacted data sharing and integration. Furthermore, a lack of administrative procedures (governance frameworks) to legitimate non-governmental data hindered the completeness of the decentralised system.

At the **organizational layer** (governance mechanisms and practices), the decentral approach to accountability—resulting from the technology design—raised stakeholders' emotional barriers (e.g., accountability fears) that hindered data sharing. Nonetheless, the presence of data sharing obligations, together with the active role of the central administrative authority managing and orchestrating the platform (LGV) helped overcoming participation paralysis, and reinforced overall system efficiency. Moreover, while the costs of the platform were not equitably distributed, the LGV centralised most of the indirect costs (maintenance and operations burdens) to incentivise participation from decentralised entities.

Lastly, at the **functional layer** (uses and applications at societal level), most interviewees explained that the decentralised system positively contributed to various public values, especially as it constituted an interconnected knowledge base among diverse stakeholders. However, respondents frequently disagreed on the extent to which these values were actually achieved, highlighting that not all values reached their full potential. Face-to-face workshops and public events usually organised by the orchestrator positively influenced several values in the functional layer. However, the complexity of the platform (low usability levels) was identified as a barrier that, despite being a technology aspect, it was independent of the decentralisation factor.

These aspects partially reinforce existing knowledge around technology decentralisation, to the extent that the decentralised technical design of a data-sharing system can positively influence public value outcomes at multiple levels (Kud, 2023; Manny et al., 2022). However, we evidence that some centralisation approaches (both at the architecture and governance levels) were needed to ensure the positive functioning of the platform. Also, we illustrate that there was no single public value that depended solely on the technical design. Rather, our study shows that public value in decentralised data platforms is the result of

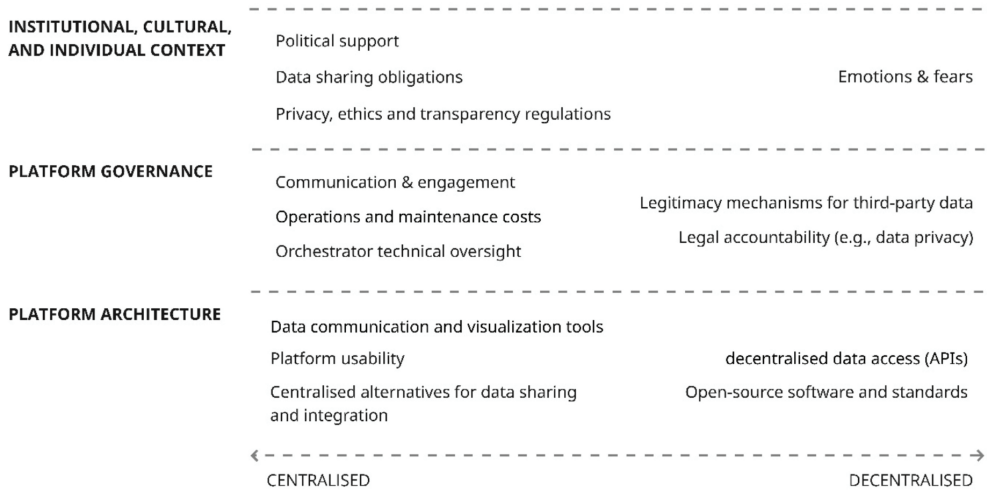


Fig. 2. Main aspects influencing public value creation in the UDP.

the interplay among different architecture, governance, and contextual factors. Furthermore, we illustrate that the realisation of some values in a decentralised system can be independent of the technology itself. For example, when looking at the structural layer, our study explains that the quality and completeness of data were not directly influenced by the decentralised architecture of the platform. Rather, they depended on the presence of data sharing obligations at the local level and the role of a central entity that maintained stakeholders' engagement and motivation to share their data.

5.3. Limitations

The main limitations of our work refer to the selection of a single case study, which inherently restricts the generalizability of our findings. While the case of Hamburg's Urban Data Platform provides valuable insights into the dynamics of decentralised public sector data platforms, the unique characteristics of this case may not be representative of other contexts. Consequently, further research comparing governance approaches of different decentralised data platforms in varied socio-political and economic settings would be necessary to confirm or counter our findings and propositions. A multi-case study approach could enrich the understanding of how different contexts influence the outcomes of decentralised platforms, thereby enhancing the external validity of the results.

Additionally, the data collection relied heavily on semi-structured interviews, predominantly involving stakeholders directly engaged with the UDP. This approach may have introduced a degree of response bias, as participants might have been influenced by their involvement or vested interests in the platform. Incorporating a broader range of perspectives, including those of external stakeholders and end-users of public services, would provide a more comprehensive view of the platform's impacts and challenges.

The cross-sectional nature of the study is another limitation, as it captures a snapshot in time without accounting for the evolving nature of technology decentralisation and public sector innovations. Longitudinal studies would be beneficial to understand the dynamic processes and long-term effects of implementing decentralised data platforms, as well as to assess the sustainability of the observed public value outcomes over time (Källström et al., 2021).

These limitations suggest potential avenues for further research, such as exploring comparative case studies across different jurisdictions, incorporating diverse stakeholder perspectives, and conducting longitudinal analyses to track changes and developments in decentralised data platforms. Such studies would contribute to a deeper and more nuanced understanding of the complex socio-technical systems involved in public sector data decentralisation.

6. Conclusion

This paper addressed the limited empirical knowledge regarding the impacts of technology decentralisation in the public sector by developing and applying a public values framework to an urban data platform. By moving beyond the traditional dichotomy of data supply and demand dominating discourses on open data public sector platforms (Bonina & Eaton, 2020), we advanced a conceptualisation of data platforms as complex socio-technical assemblages (Kitchin et al., 2025). This perspective allowed us to identify architecture-governance configurations as a critical lens for analysis, revealing that technical decentralisation does not inherently imply decentralised governance.

Our findings illustrate that successful implementation often relies on the co-existence of central and decentral practices within the same system. While the decentralised architecture enhanced accessibility and digital sovereignty, the role of a leading entity proved crucial in compensating for distributed accountability gaps and driving public value creation. We conclude that public value in decentralised ecosystems is not determined by technology design alone but emerges from the dynamic interplay between the platform's architecture, governance practices, and context-specific aspects regarding legal regulations and stakeholder emotions and culture. Future research should further explore these socio-technical dynamics across different political and legal contexts to better guide the transition towards more inclusive and efficient digital public infrastructure.

CRediT authorship contribution statement

Sara Thabit: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Till Degkwitz:** Writing – review & editing, Writing – original draft, Validation, Investigation. **Mahardika Fadmastuti:** Writing – review & editing, Writing – original draft, Investigation. **Luca Mora:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Author statement

We certify that all authors have seen and approved the final version of the manuscript being submitted. They warrant that the article is the authors' original work, hasn't received prior publication and isn't under consideration for publication elsewhere.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the first author used GPT@JRC in order to improve the readability and language of some excerpts in the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Funding sources

This project has received funding from the European Commission through the Horizon 2020 project FinEst Twins (Grant Agreement No. 856602) and the ZEIT-Stiftung Fellowship.

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.

Acknowledgements

The authors would like to thank the teams of the FinEst Centre (Tallinn University of Technology), the CityScienceLab in Hamburg (HafenCity University), and the European Commission Joint Research Centre (JRC) for their support. In addition, we thank Francesco Tonnarelli for his insightful contributions and rich discussions that undoubtedly contributed to improve the paper, the interviewees for their time and valuable inputs, and the anonymous reviewers for their helpful feedback. The views expressed in this article are solely the responsibility of the authors and do not reflect the official opinion of the European Commission.

Appendix A

Table 3
Details of the interviews.

Code	Organization	Duration
I.01	Authority for Urban Development and Housing (BSW)	0:53:00
I.02	Authority for Urban Development and Housing (BSW)	0:49:00
I.03	Senate Chancellery State Office	0:39:00
I.04	Senate Office for IT and Digitalization (ITD)	0:46:00
I.05	State Office for Geoinformation and Surveying (LGV)	1:04:00
I.06	State Office for Geoinformation and Surveying (LGV)	0:41:00
I.07	State Office of Roads, Bridges and Waterways (LSBG)	0:47:00
I.08	State Real Estate Management and Real Estate Office (LIG)	0:45:00
I.09	State Real Estate Management and Real Estate Office (LIG)	0:41:00
I.10	State Transport Authority (LBV)	1:03:00
I.11	Hamburg Port Authority (HPA)	0:48:00
I.12	Autobahn (Federal Road Authority)	0:34:00
I.13	External stakeholder (private sector)	1:05:00
I.14	HafenCity University	1:14:00
I.15	HafenCity University	1:00:00
I.16	HafenCity University	0:33:00
I.17	HafenCity University	0:45:00
I.18	Code for Hamburg e.V.	0:51:00

Appendix B. Interview protocol

The design of the interview protocol was directly guided by the public values framework developed in Section 2.2. The protocol followed the question "*What factors have allowed (or constrained) the realization the following outputs?*" for each public value, mirroring the structural, organizational, and functional layers of the framework. While this structure ensured systematic data collection, the protocol maintained a flexible approach to allow for emergent themes. The interview questions are presented below:

- What factors have allowed (or constrained) the realisation of the following outputs?

Data reliability & inclusiveness	UDP data is valid, reliable, inclusive, and representative.
Accessibility & interoperability of data	UDP data is accessible, interoperable and easily integrated throughout various organizations
Security & Privacy	UDP preserves security and privacy requirements of data
Data sovereignty	UDP allows to determine and execute usage rights over the data
Technology sovereignty	UDP avoids technology dependency of proprietary software
Transparent and ethical operations	UDP operations are transparent, traceable, explainable, and based on ethical principles
Justice & reciprocity	UDP governance is based on justice and reciprocity among the entities involved (internal and external)
Accountability & responsibility	UDP is responsive to existing laws and regulations
Efficiency & sustainability	UDP operations are cost-effective, efficient, and long-term sustainable (from an ownership and financial perspective)
Economic growth & innovation	UDP promotes the creation of new companies, services, enhanced innovation and research, etc.
Improved public services	UDP enables better decision-making, and improved public services (socially and environmentally responsive)
Informed society	UDP improves the capacity of the general public to oversee policy outcomes, plans, public decisions, etc.
Cooperation and social cohesion	UDP fosters and enables partnerships and collaboration between public, private, academia, and citizens
Equity of benefits	The benefits of the UDP are equitably distributed and can be equally accessed by all population groups

- Are there any important values that we haven't discussed?
- Any additional comment about the collaboration process?
- Can you suggest anyone else whom you think would provide insightful input for our interview series?

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Additional publications

This appendix presents supplementary material consisting of the co-authored book cited below, to which the author actively contributed during the course of the doctoral journey. The author's primary contributions included supporting the book's data collection and analysis through thematic coding. Furthermore, the author of this thesis led the writing of the section focused on smart city collaborative ecosystems, specifically Chapter 5, "Innovation partnerships," and Chapter 6, "Innovation partnership formation". By translating theoretical insights into practical recommendations for digital transformation managers, these chapters complement the focus of this thesis on the governance and structuring of smart city collaborations.

Publication IV

Mora, L., Gerli, P., Beckers, D., **Thabit, S**., & Tonnarelli, F. (Eds.). (2025). Smart City Code. Governance Handbook for Digital Transformation Managers in the Public Sector. *Elsevier*. https://doi.org/10.1016/B978-0-443-13402-9.00026-9 (ETIS Category: 2.1)

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ISSN 2585-6901
ISBN 978-9916-80-585-5