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Who are you? Examining the multifaceted innovation roles of municipal governments in AI governance

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ABSTRACT

Our study advances theoretical understanding of the diverse roles municipal governments play in governing the development and deployment of artificial intelligence (AI) technologies within their administrative boundaries. While existing literature typically frames municipalities as regulators or adopters of AI, it tends to overlook the broader set of responsibilities they assume in shaping AI governance. To address this gap, we map traditional innovation roles onto the multiple functions that municipal governments perform in the emerging domain of AI technologies. Drawing from innovation management theory and AI governance literature examining the agency of governments and public sector organizations in AI governance, we identify core continuities and contextual adaptations in these roles. These insights illustrate how the foundational logic of traditional innovation roles is preserved but recalibrated to reflect the specific demands of AI governance at the municipal level. This theoretical contribution extends innovation role typologies into the field of AI governance, laying the groundwork for future empirical research and policy development.

1. Introduction

Artificial intelligence (AI) technologies are increasingly being deployed to address a wide range of challenges across municipal jurisdictions (Cugurullo et al., 2023; Herath and Mittal, 2022). As local governments content with growing populations and sustainability concerns, AIoffers new tools for optimizing service delivery, supporting real-time decision-making, and enabling data-driven management of public services (Bayraktar and Çelikyay, 2024). Many municipal governments are experimenting with AI across domains such as land-use planning, environmental monitoring, public health, transportation networks, and infrastructure maintenance (Yigitcanlar et al., 2024; Tonnarelli and Mora, 2024). These applications are not only reshaping how services are provided but also influencing the way local authorities govern and interact with their constituents (Cugurullo et al., 2024; Lartey and Law, 2025; Son et al., 2023).

In parallel, AI adoption in public sector organizations has become a prominent topic in recent academic literature (Cath et al., 2018; Desouza et al., 2020; Kuziemski and Misuraca, 2020a; Mergel et al., 2023; Mikhaylov et al., 2018; Pencheva et al., 2020; Selten and Klievink, 2024; Wirtz et al., 2019; Zuiderwijk et al., 2021). Much of this work highlights the potential of AI to enhance the day-to-day functioning of services and systems that are managed or delivered by public authorities (Kulal et al., 2024; Mikhaylov et al., 2018; Yigitcanlar et al., 2021). However, existing research often lacks sufficient grounding in the organizational and contextual challenges that local governments face in governing AI-related transformations[1] (Wirtz et al., 2019; Zuiderwijk et al., 2021). Consequently, scholars have called for deeper inquiry into the institutional, technical, and managerial capacities that shape how municipalities influence AI governance (Mikalef et al., 2022; Mora et al., 2025; Selten and Klievink, 2024).

One particularly underexplored area concerns the range of

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[1] AI refers to the technologies designed to replicate human abilities in perception, reasoning, and action (Mariani et al., 2023). The concept of AI governance can be explained as the set of processes that impact the development of AI solutions, including setting norms, ethical principles, exploring the impacts of AI use, raising awareness among the relevant stakeholders, developing technical applications, deploying regulations, and establishing legal entities who have the authority to manage the technology (Butcher and Beridze, 2019).

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innovation-related functions that municipal governments perform in the context of AI governance. Existing literature primarily characterizes municipalities as either *regulators* or *users* of AI technologies (Guenduez and Mettler, 2023). As regulators, municipal governments ensure that local-level AI deployments align with legal standards, public values, and societal expectations (Selten and Klievink, 2024), mitigating risks such as bias, discrimination, and privacy violations (Fatima et al., 2020; Guenduez and Mettler, 2023; Kuziemski and Misuraca, 2020b; Ulnicane et al., 2021). As users, they adopt AIsystems to enhance service efficiency, automate routine tasks, allocate resources more effectively, support policymaking, and foster community engagement (Guenduez and Mettler, 2023; Yigitcanlar et al., 2024).

While these roles capture key functions, they omit the broader spectrum of responsibilities that municipal governments must undertake to shape ethically sound and equitable AI technologies (Kuziemski and Misuraca, 2020b). Emerging evidence indicates that local governments are increasingly engaged in functions beyond this user-regulator binary – such as co-developing AI tools in partnership with external partners, auditing third-party algorithms for fairness, and establishing mechanisms for long-term oversight and adaptability of AI solutions (Kuziemski and Misuraca, 2020b; van Noordt and Tangi, 2023a). Such activities are central to municipal involvement in AI governance, yet they remain conceptually undertheorized despite growing indications that municipalities bear far greater responsibility than is typically acknowledged (Papyshev and Yarime, 2023).

To address this gap, we pose the following research question: *How can the range of roles and responsibilities undertaken by municipal governments in AI governance be comprehensively conceptualized?* This question carries both theoretical and practical significance. From a theoretical perspective, neglecting the full scope of municipal government engagement limits the development of robust AI governance models, resulting in fragmented conceptual frameworks and incomplete empirical insights. From a practical perspective, municipal governments occupy a critical position in ensuring the ethical deployment of AI – directly influencing infrastructure development, public services, and the everyday lives of residents (Mikalef et al., 2022). A lack of conceptual clarity risks leaving local governments uncertain about the interconnected tasks required to uphold trustworthy and equitable technology governance in the age of AI, weakening the legitimacy and effectiveness of their interventions.

In this study, we address this gap by drawing on AI governance studies to conceptualize the diverse innovation roles and functions that municipalities perform in governing AI. We begin by reviewing relevant innovation management studies to identify and examine the traditional roles that actors play in innovation processes. We then explore how these roles manifest in municipal AI governance, synthetizing insights from studies examining the agency of governments and public sector organizations in AI governance. These studies are primarily situated at the intersection of public administration, urban studies, and innovation management. Our main contribution lies in showing how these roles undergo contextual adaptations to meet the unique demands of AI governance at the municipal level. By explicitly identifying these adaptations, we extend innovation management theory to better account for the governance of AI and the functions of public sector actors in shaping and sustaining responsible AI implementation within local administrative boundaries.

The paper is organized as follows. Section 2 reviews literature on innovation roles, establishing the theoretical foundations of our conceptual work. Section 3 integrate these insights, which builds on innovation management theory, with municipal AI governance literature, exploring the functions and roles undertaken by municipal governments in AI governance. Section 4 reflects on the theoretical and practical implications of our study and outlines recommendations for future research and policy development.

2. An overview of traditional innovation roles

To lay the foundation for our theoretical framework, we identified and examined key innovation roles commonly discussed in the innovation management literature. We conducted a comprehensive review of studies that describe the roles actors assume throughout innovation processes. After an initial broad search, each role uncovered was then used as a keyword to retrieve additional relevant studies, expanding our coverage and supporting a more holistic understanding of innovation-related responsibilities.

Our examination focused on how these roles contribute to distinct phases of innovation processes and on how they interact within broader innovation ecosystems. For each role, we mapped the core functions, responsibilities, and patterns of engagement, emphasizing their interplay across institutional and sectoral boundaries. This mapping establishes the theoretical basis for interpreting municipal activities in the governance of AI technologies. Table 1 provides a synthesis of our findings.

2.1. Initiators

The role of initiators is centered on problem identification, and they operate at a strategic and visionary level. Initiators are individuals or organizations that recognize a gap or inefficiency within their operations and identify opportunities for innovation. While they typically lack the specialized expertise, technical knowledge, or resources needed to independently develop or sustain innovative solutions, their strength lies in their capacity to catalyze the innovation process. What distinguishes initiators is their ability to recognize innovation needs and actively seek out collaborators – whether technical experts, investors, or strategic partners – who can help realize innovation goals (Rosenzweig, 2017). Initiators ignite the innovation process by leveraging their existing resources to build partnerships and networks. In doing so, they play the role of network builders, fostering collaboration among diverse innovation actors, including experts, policymakers, and market players (Borrás and Edler, 2020; Heikkinen et al., 2007; Nyström et al., 2014; Rosenzweig, 2017). Through strategic relationship-building, initiators help convert abstract ideas or inventions into implementable and impactful innovations by bringing together the right mix of capabilities, resources, and expertise.

2.2. Facilitators

Facilitators support innovation by fostering collaboration and enabling the dissemination of new ideas, technologies, and practices (Goduscheit, 2014; Hurmelinna-Laukkanen and Nätti, 2018). Their primary function is to create environments that encourage interaction among diverse stakeholders, such as public and private sector actors, enabling cross-sectoral knowledge exchange and joint problem-solving (Borrás and Edler, 2020). Moreover, facilitators help reduce institutional and procedural barriers by providing access to necessary resources and by assisting stakeholders in articulating and aligning their innovation goals (Nyström et al., 2014; Zakoth et al., 2024). Through the organization of collaborative initiatives and the cultivation of open communication, they help maintain focus and momentum in innovation projects, ensuring that efforts remain coordinated and productive (Osorio et al., 2024). However, existing research highlights a common limitation in the scope of traditional technology collaborations: these efforts have often concentrated on the commercialization phase while neglecting earlier stages such as research, experimentation, and problem framing. This underscores the importance of facilitators being actively involved not only in coordinating later-stage partnerships but also in shaping early-stage collaboration, where innovation trajectories and shared goals are initially defined (Bertello et al., 2022).

Table 1
Traditional roles in innovation processes.

Innovation Roles	Main functions and responsibilities	References
Initiators	Identifying opportunities for innovation and helping to convert innovative ideas or inventions into tangible innovations by bringing together the right mix of capabilities, resources, and expertise.	Borrás and Edler (2020); Heikkinen et al. (2007); Nyström et al. (2014); Rosenzweig (2017)
Facilitators	Creating opportunities for collaboration, disseminating ideas, and reducing barriers to innovation through resources provision, while focusing on commercialization for technology collaborations.	Bertello et al. (2022); Borrás and Edler (2020); Goduscheit (2014); Hurmelinna-Laukkanen and Nätti (2018); Nyström et al. (2014); Osorio et al. (2024); Zakoth et al. (2024)
Promoters	Advocating for innovation across various dimensions (process, power, expertise, and relationship) to overcome resistance.	Borrás and Edler (2020); Gemünden et al. (2007); Goduscheit (2014); Hauschildt and Kirchmann (2001); Sergeeva and Trifilova (2018)
Leaders	Guiding innovation processes by setting objectives, fostering connections, providing feedback, managing financial and technical resources, establishing teams and roles, and motivating actors to drive innovation.	Berson et al. (2016); Cusumano and Gawer (2002); Dedehayir et al. (2018); Hemlin and Olsson (2011); Mumford et al., 2002; Parker et al. (2003); Steele and Watts (2022); Watts et al. (2017)
Regulators	Establishing policies and regulatory frameworks that influence innovation processes.	Dedehayir et al. (2018); Finch et al. (2017)
Entrepreneurs	Selecting innovations that align with their objectives and establishing collaborative networks that help support the commercialization process.	Bartlett and Dibben (2002); Dedehayir et al. (2018); Markham et al. (2010); Silva et al. (2024)
Gatekeepers	Overseeing access to technological infrastructure and knowledge in an organization, and determining which innovations should advance by setting standards and directing resources toward those with high commercialization potential.	Allen (1970); Allen and Cohen (1969); Ardito et al. (2019); Borrás and Edler (2020); Heikkinen et al. (2007); Katz and Tushman, 1981; Markham et al. (2010); Morrison (2008); Nyström et al. (2014)
Knowledge providers	Serving as sources of knowledge for innovation, generating technical and scientific insights, contributing to innovation through research.	Ardito et al. (2019); Díez-Vial and Montoro-Sánchez (2016); Salavisa et al. (2012); Tether and Tajar (2008); Tödtling et al. (2009)
Solution architects	Turning ideas into practical, implementable solutions.	Balthasar et al. (2000); Borrás and Edler (2020); Granato et al. (2022); Nazarenko et al. (2022); Zhang et al. (2024); Borrás and Edler (2020); Granato et al. (2022)
Buyers	Establishing procurement criteria, evaluating market options, and influencing supplier innovation	Benzidia et al. (2021); Cannavacciuolo et al. (2023); Carr and Kaynak (2007); Dalpé et al. (1992); Ellis et al., 2012; Howells (2024); Lanzolla et al. (2020); Obwegeser and Müller (2018); Rullan et al. (2012); Saghiri and Wilding (2021); Talluri et al. (2010); Uyarra et al. (2014)
Users	Setting the demand for innovation, consuming the value it generates, and contributing to its development by articulating needs and sharing experiences.	Borner et al. (2023); Borrás and Edler (2020); Bugshan (2015); Bäcklund et al. (2024); Dalpé et al. (1992); Guo et al. (2017); Henfridsson et al. (2018); Kim et al. (2008); Nyström et al. (2014); Ranjan and Read (2016); Wang et al. (2024); Zhang et al. (2024)
Warners	Identifying potential risks associated with innovations and communicating these risks to their users.	Borrás and Edler (2020)
Mitigators	Managing and reducing the negative impacts of innovation.	Amann et al. (2022); Borrás and Edler (2020); Doyle et al. (2024); Martínez Görbig et al. (2024)

2.3. Promoters

Promoters play a key role in advancing innovation by overcoming resistance to change and championing the adoption of new ideas, technologies, and solutions (Borrás and Edler, 2020; Sergeeva and Trifilova, 2018). Their contribution lies in their ability to generate support for innovation efforts, particularly in organizational contexts where inertia, uncertainty, or skepticism may hinder progress. Promoters contribute through several distinct forms of influence. *Process promoters* coordinate innovation actors and drive engagement through persuasive actions. *Power promoters* draw on hierarchical authority to secure resources and remove institutional barriers. *Expert promoters* provide technical legitimacy by offering specialized knowledge and skills. *Relationship promoters* cultivate and manage external partnerships, connecting organizations with customers, suppliers, and research collaborators to ensure alignment with broader innovation ecosystems (Gemünden et al., 2007; Goduscheit, 2014; Hauschildt and Kirchmann, 2001). Together, these promoter types contribute to mobilizing support, aligning stakeholders, and sustaining momentum throughout the innovation process.

2.4. Leaders

Leaders are responsible for setting direction, enabling coordination, and fostering collaboration across diverse stakeholder groups. They define strategic objectives, align efforts among participants, and ensure that innovation activities remain coherent and goal-oriented (Berson et al., 2016; Parker et al., 2003; Steele and Watts, 2022). Leaders also play a critical evaluative role, assessing innovations based on technical feasibility, market potential, and alignment with broader organizational goals (Steele and Watts, 2022; Watts et al., 2017). In addition, they are tasked with managing key resources – these include funding, expertise, and technological infrastructure (Cusumano and Gawer, 2002; Dedehayir et al., 2018) – and with assembling teams that bring together the right mix of knowledge and skills (Steele and Watts, 2022). Beyond strategic oversight, leaders are also expected to cultivate a productive innovation environment by clearly defining roles and encouraging creativity, while motivating contributors through autonomy and appropriate reward structures (Dedehayir et al., 2018; Hemlin and Olsson, 2011).

2.5. Regulators

Regulators help shape the conditions under which innovation occurs, by establishing the policies, rules, and frameworks that either enable or

constrain innovation activities (Finch et al., 2017). For example, they may promote innovation by lowering regulatory barriers, introducing targeted incentives, or developing adaptive frameworks that align innovation with sociocultural and environmental standards (Dedehayir et al., 2018). Conversely, they can impose restrictions when innovations present ethical, legal, or societal risks. A growing body of literature emphasizes the importance of regulatory agility in the face of rapid technological change. Traditional legal frameworks often struggle to keep pace with the complexity and speed of emerging technologies, leaving regulators challenged to address their broader implications (Lucas et al., 2022). These challenges are especially pronounced when overseeing novel business models and unforeseen societal impacts, requiring regulators to develop anticipatory capacities and maintain close oversight of evolving innovation landscapes (Berkowitz and Souchaud, 2024).

2.6. Entrepreneurs

Entrepreneurs are distinguished by an ability to identify, pursue, and commercialize opportunities that align with their strategic objectives. They link vision with execution. While similar to leaders, entrepreneurs typically do not hold formal governance responsibilities, focusing instead on initiating and advancing innovations through strategic decision-making and risk-taking (Silva et al., 2024). A central task of entrepreneurs is the formation of collaborative networks that support the development and commercialization of innovations, including the mobilization of technical, financial, and human resources (Dedehayir et al., 2018). At the local level, entrepreneurs may act as *champions*, initiating and promoting change within organizations or communities, or as sponsors who provide the regulatory, financial, and managerial support required to sustain innovation processes (Bartlett and Dibben, 2002; Dedehayir et al., 2018; Markham et al., 2010).

2.7. Gatekeepers

Gatekeepers possess substantial institutional, financial, or technical resources (Heikkinen et al., 2007; Markham et al., 2010; Nyström et al., 2014) and exert influence by determining which innovations are prioritized, approved, or supported. They establish criteria to assess innovation potential and direct resources toward those initiatives deemed most viable or strategically aligned with commercialization goals (Markham et al., 2010; Son et al., 2022). By regulating access to key technologies, gatekeepers help maintain security, enforce quality standards, and ensure efficient allocation of limited resources (Borrás and Edler, 2020).

Beyond resource control, gatekeepers serve as crucial information brokers. They filter extensive external information, select data that aligns with organizational goals, and ensure its effective internal use to inform innovation strategies (Ardito et al., 2019; Morrison, 2008). Acting as conduits between internal teams and external knowledge sources – such as universities, industry experts, and research consortia – they facilitate strategic knowledge exchange. They also translate technical knowledge for broader organizational use through both formal mechanisms (e.g., meetings, reports) and informal networks (Allen, 1970; Heikkinen et al., 2007; Nyström et al., 2014). Additionally, gatekeepers often maintain informal ties to the wider technological community to remain abreast of emerging trends and developments. This expertise is frequently sought internal and external stakeholders, reflecting gatekeepers' status as trusted sources of domain-specific knowledge and judgment (Allen and Cohen, 1969).

2.8. Knowledge providers

Knowledge providers contribute to innovation processes by supplying scientific and technical insights that enhance the innovation capacity of other actors (Díez-Vial and Montoro-Sánchez, 2016; Tödtling et al., 2009). They facilitate access to critical knowledge resources that inform the design and development of innovative products and services (Ardito et al., 2019; Díez-Vial and Montoro-Sánchez, 2016; Salavisa et al., 2012). Given that many organizations face limitations in internal expertise, they frequently rely on external sources to support innovation (Ozer and Zhang, 2019). External knowledge providers may include private consultancies, industry-focused research organizations, and public institutions such as universities and government-funded research centers. These entities can be engaged through formal innovation partnerships or accessed as informal sources of expertise and information (Tether and Tajar, 2008). Research indicates that organizations adopting open innovation strategies are particularly well-positioned to integrate diverse knowledge inputs from multiple providers, enabling them to better tailor solutions to their specific technological and strategic needs (Fernández-Esquinas et al., 2010).

2.9. Solution architects

Solution architects transform innovative concepts into functional and scalable solutions by leveraging both their technical and business expertise. Their primary task is to translate strategic innovation objectives into technical designs, ensuring that the resulting solutions are feasible and aligned with both organizational goals and user needs. Within this role, two subtypes can be distinguished: *developers* and *designers*. Developers address the technical dimensions of innovation by solving engineering problems (Balthasar et al., 2000; Zhang et al., 2024), while enhancing the reliability and sustainability of products or services (Nazarenko et al., 2022). Designers, by contrast, focus on the user interface and market viability of innovations. They ensure that solutions meet user expectations, are intuitive and accessible, and are capable of achieving broad market adoption (Borrás and Edler, 2020; Granato et al., 2022). Together, developers and designers bridge the gap between visionary ideas and real-world implementation, helping to ensure that innovations are both technically robust and socially relevant.

2.10. Buyers

Buyers contribute to innovation by shaping procurement strategies that influence supplier behavior and technology adoption. They are responsible for setting procurement criteria and evaluating available market options. Moreover, they define technical specifications and performance standards for products or services (Dalpé et al., 1992; Howells, 2024; Lanzolla et al., 2020). Beyond selecting what to procure and from whom, buyers also assess how procurement should be structured to support innovation objectives. Their strategic choices can stimulate supplier innovation by creating conditions that reward creativity and performance. For instance, buyers may offer longer-term contracts and harmonize technical requirements across clients, and they can also aggregate demand to provide suppliers with greater economies of scale (Rullan et al., 2012; Uyarra et al., 2014). Additionally, buyers can identify and encourage innovative proposals from suppliers, fostering co-development opportunities (Obwegeser and Müller, 2018). Effective buyers align procurement with technical innovation and build relationships that balance both technological capacity and social capital (Benzidia et al., 2021; Cannavacciuolo et al., 2023). To ensure expectations are met, they may issue implementation guidelines and detailed action plans that clarify performance metrics and support supplier compliance (Carr and Kaynak, 2007; Saghiri and Wilding, 2021; Talluri et al., 2010).

2.11. Users

The role of users in innovation processes has been extensively examined in the literature. Far from being passive recipients of innovation outcomes, users can actively contribute by generating ideas,

suggesting improvements, addressing their own challenges, and offering feedback that informs iterative development (Bugshan, 2015; Guo et al., 2017; Kim et al., 2008; Ranjan and Read, 2016; Wang et al., 2024; Zhang et al., 2024). Their input is particularly valuable in integrating multiple innovation systems, where users help connect outputs across platforms or services, guiding innovators toward greater technical compatibility and coherence (Borner et al., 2023; Henfridsson et al., 2018). During implementation stages, users provide essential insights by articulating product requirements and participating in testing and validation processes (Bäcklund et al., 2024; Kim et al., 2008). As both demand-drivers and co-creators, users influence innovation trajectories by expressing preferences (Borrás and Edler, 2020; Dalpé et al., 1992) and by sharing experiences and knowledge that shape how products and services are refined and delivered (Nyström et al., 2014).

2.12. Warners and mitigators

Warners and mitigators are concerned with the responsible management of innovation risks. Warners focus on identifying and communicating potential harms or unintended consequences associated with new technologies or practices, helping users and stakeholders anticipate and address challenges early in the innovation process. Mitigators, in turn, are tasked with managing and reducing these negative impacts. Both roles help maximize the potential of innovative solutions while minimizing their drawbacks (Borrás and Edler, 2020). Their responsibilities involve organizing innovation activities, mapping interdependencies among actors and processes, and aligning efforts through the establishment of new roles or the selection of appropriate partners (Amann et al., 2022; Martínez Görbig et al., 2024). Effective mitigation requires coordination among stakeholders to harmonize innovation objectives. This helps clarify the underlying rationale of initiatives and foster shared ownership that minimizes conflict and enhances commitment. Additional tasks include supplying timely and relevant information to strengthen the quality of innovation strategies and identifying potential synergies and trade-offs among competing goals (Amann et al., 2022; Martínez Görbig et al., 2024). Mitigators also address operational challenges by focusing on compliance, investment planning, funding, cost control, and time management. In doing so, they work to pre-empt typical vulnerabilities such as weak oversight, miscommunication, and insufficient long-term planning (Doyle et al., 2024).

3. The roles of municipal governments in AI governance

Drawing from AI governance literature, we map municipal functions and responsibilities in AI governance onto the roles emerging from innovation management theory. The result is an observation of traditional innovation roles in light of the multiple functions that municipalities undertake to govern AI systems under their administrative power. In other words, we show how local governments act as innovation actors in AI-related governance processes (see Table 2). Importantly, these roles are not mutually exclusive; municipal governments may adopt multiple roles simultaneously, depending on their institutional capacity, strategic priorities, and the specific characteristics of their jurisdiction.

Our conceptualization mainly draws from two intersecting strands of AI governance scholarship, each offering distinct yet complementary insights into the role of municipal governments. First, public administration research, which is characterized by a strong focus on data governance, AI-enabled public service delivery, and the legal and ethical oversight of AI applications. Second urban studies exploring how AI technologies integrate into urban systems. This stream of literature mainly relates to urban AI governance.

Table 2
The roles and responsibilities of municipal governments in AI governance.

Innovation Roles	Main functions and responsibilities	References
Initiators	Identifying local challenges that can benefit from AI solutions and driving collaborations with academia, industry, and other stakeholders to address those challenges.	Chen and Wen (2021); Guenduez and Mettler (2023); Yigitcanlar et al. (2023)
Facilitators	Coordinating collaborations by connecting municipal authorities with researchers, industry experts, and community groups; organizing matchmaking and networking events; and supporting early-stage experimentation.	Bertello et al. (2022); Deshpande and Sharp (2022); Füller et al. (2024); Kim et al. (2024); Pantanowitz et al. (2022); Son et al. (2023)
Promoters	Advocating for the positive contributions of AI technologies to municipal operations; fostering policy development, local data ecosystems, and public–private partnerships; and encouraging shared standards to coordinate action across sectors.	Chen and Wen (2021); Guenduez and Mettler (2023); Manoharan et al. (2023); Mikhaylov et al. (2018); Müür and Karo (2023); van Noordt and Tangi (2023b)
Leaders	Orchestrating local AI ecosystems by directing AI teams in the municipality and overseeing external projects; aligning local AI initiatives with broader development goals; setting objectives; and overseeing data collaborations across departments and partners to maintain municipal oversight and tackle data fragmentation.	Allam and Dhunny (2019); Borrás and Edler (2020); Campion et al. (2022); Considine and Lewis (2007); David et al. (2024); Hashem et al. (2016); Janssen et al. (2020); Son et al. (2023); Voda and Radu (2019); Yigitcanlar et al. (2023)
Regulators	Establishing rules and guidelines for AI and data governance within municipal departments and for external actors; exploring flexible regulatory approaches (e.g., sandboxes) to balance innovation with public-interest oversight.	Alaassar et al. (2021); Andrews (2019); Cho (1992); Guenduez and Mettler (2023); Janssen et al. (2020); Joyce and Javidroozi (2024); Lnenicka et al. (2022); Mittelstadt et al. (2016); Son et al. (2023); van Noordt and Tangi (2023b); Vayena et al. (2018); Wirtz et al. (2020); Yang et al. (2018); Zhang et al. (2024)
Entrepreneurs	Providing financial and strategic support for AI initiatives that align with municipal objectives; investing in digital infrastructure and workforce upskilling; and accepting calculated risks to generate social and economic value.	Agarwal (2018); David et al. (2024); Doctorow (2008); Guenduez and Mettler (2023); Gupta et al. (2020); Janssen et al. (2020); Mergel et al. (2016); Neumann et al. (2022); Pencheva et al. (2020); Ryser et al. (2023); Tether and Tajar (2008); van Noordt and Tangi (2023b); Yigitcanlar et al. (2023); Yigitcanlar et al. (2021)
Gatekeepers	Managing access to municipal resources – including funding programs, testing facilities, infrastructure, and data – by defining eligibility and usage protocols to ensure responsible and efficient AI development.	Balland et al. (2020); Cugurullo et al. (2023); David et al. (2024); Dowling and McGuirk (2022); Goodspeed (2011); Kalampokis et al. (2011); Mikalef et al. (2022)
Knowledge Providers	Leveraging municipal data assets and local expertise to support AI research and innovation; curating, annotating, and sharing	Ardito et al. (2019); Balland et al. (2020); Cugurullo et al. (2023); Engin et al. (2020); Goodspeed (2011);

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Table 2 (*continued*)

Innovation Roles	Main functions and responsibilities	References
	datasets while explaining contextual factors and potential biases.	Guenduez and Mettler (2023); Gupta et al. (2020)
Solution Architects	Co-designing AI systems in collaboration with external partners; defining technical standards (e.g., metadata, interoperability) and embedding ethical criteria into system architectures to meet municipal priorities.	Butcher and Beridze (2019); Chen and Lee (2018); Hsu et al. (2022); Manoharan et al. (2023); Mergel et al. (2016); Mikhaylov et al. (2018); Pencheva et al. (2020); Son et al. (2023); Watson and Ryan (2020)
Buyers	Adopting agile procurement practices – such as pilots, parallel testing, and iterative purchasing – to manage AI risks and ensure solutions deliver public value; ensuring legal and ethical access to necessary data in procurement.	Guenduez and Mettler (2023); Hickok (2024); Mergel et al. (2018); Mikhaylov et al. (2018); Nagitta et al. (2022); Soe and Drechsler (2018); Son et al. (2023)
Users	Ensuring the responsible use of AI and data, demanding ethical AI solutions, and providing feedback to guide the development and refinement of AI technologies.	Brand (2022); Butcher and Beridze (2019); Fatima et al. (2020); Guenduez and Mettler (2023); Javed et al. (2022); Son et al. (2023); Yigitcanlar et al. (2021); Yigitcanlar et al. (2024)
Warners	Communicating both benefits and risks of AI to the public through engagements initiatives – such as participatory forums, showcase events, risk-awareness campaigns, and data-literacy programs – to build trust and informed engagement.	Chen et al. (2021); Gesk and Leyer (2022); Hsu et al. (2022); Son et al. (2023); Wolff et al. (2019); Yigitcanlar et al. (2023)
Mitigators	Auditing AI systems and conducting impact assessments to detect and address biases or harms; enforcing accountability measures and promoting data justice by ensuring datasets are representative and ethically sourced.	Agarwal (2018); Engin et al. (2020); Guenduez and Mettler (2023); Janssen et al. (2020); Manoharan et al. (2023); Palladino (2023); Rodrigues (2020); Tan (2023); Taylor (2017); van Zoonen (2016); Wieringa (2020); Yigitcanlar et al. (2021)

3.1. Initiators

Research indicates that municipal governments often act as initiators by pinpointing critical local challenges amenable to AI-driven solutions. For example, in response to fiscal constraints and crisis, municipalities are exploring the potential of AI to streamline administrative workflows, optimize resource allocation, and bolster the responsiveness of public programs (Yigitcanlar et al., 2023). Yet, they frequently encounter technical and financial limitations. To address these gaps, some municipalities partner with external actors whose capabilities can support the development and deployment of AIsystems. In this catalytic role, municipal authorities reframe complex governance problems as opportunities for collaborative innovation (Chen and Wen, 2021). Strategic alliances, for instance, can enhance data interoperability and foster experimentation with AI tools, thereby accelerating the translation of research insights into practical applications (Guenduez and Mettler, 2023).

3.2. Facilitators

Existing studies show that local governments frequently serve as facilitators of AI innovations by coordinating collaborations across multiple sectors. In this capacity, they extend beyond internal administrative structures to cultivate and sustain relationships with key external stakeholders. Typically, this is accomplished by organizing matchmaking events, cross-sector forums, networking workshops, and other stakeholder engagement initiatives (Deshpande and Sharp, 2022; Füller et al., 2024; Kim et al., 2024; Son et al., 2023).

Recognizing that conventional funding mechanisms (e.g., fixed-term grants, inflexible procurement) often fail to accommodate the iterative nature of AIdevelopment, municipalities bridge institutional gaps by fostering partnerships between academic researchers and industry. These alliances support the commercialization of AIsolutions (Pantanowitz et al., 2022) and encourage ethical reflection and public-value alignment from the earliest experimental phases. Early stakeholder engagement helps ensure that AI applications address genuine community needs and generate meaningful social benefits (Bertello et al., 2022).

To lower procedural and structural barriers to cooperation, local governments might also promote the creation of dedicated AI innovation hubs – joint ventures between universities, private-sector actors, and public entities – that act as focal points for cross-disciplinary research, prototype testing, and joint problem-solving (Kim et al., 2024).

3.3. Promoters

Research shows that some municipal governments have also adopted a promoter role, actively advocating for the adoption and diffusion of AI technologies to strengthen institutional capacities for public service delivery. In this capacity, they champion organizational change by endorsing experimentation with digital tools (Manoharan et al., 2023) and by fostering public–private partnerships that pilot and scale innovative solutions (Mikhaylov et al., 2018). By convening cross-sector forums and contributing to the development of shared objectives and technical standards, municipalities can create the collaborative conditions necessary for coordinated AI implementation (Müür and Karo, 2023).

Promotional efforts often extend to the enhancement of local data ecosystems: municipal governments can also deploy financial and regulatory incentives, crafting targeted strategies to attract AI firms and talent, subsidize experimentation, and facilitate investment in the local technology sector (van Noordt and Tangi, 2023b). Moreover, AI governance studies show that some municipalities also advocate for enabling legislation that dismantles legal and procedural barriers, promote a competitive yet inclusive environment, and align technological advancement with societal norms and ethical standards (Guenduez and Mettler, 2023).

Finally, some municipalities also promote AI innovation by cultivating knowledge-sharing networks. This includes forming partnerships with universities, research institutions, and private sector actors to foster dialogue and cooperation on AI initiatives (Chen and Wen, 2021). Establishing or supporting dedicated research centers in AIand data science further solidifies these networks, ensuring that insights and best practices diffuse broadly across organizational boundaries (Guenduez and Mettler, 2023).

3.4. Leaders

AI governance literature emphasizes that municipal governments are expected to lead and coordinate complex AI ecosystems within their administrative boundaries (David et al., 2024). This leadership entails a dual focus: directing internal organizational efforts and overseeing external partnerships to ensure that AI technologies align with local regulatory frameworks. Local authorities are also well-positioned to set priorities for AIdevelopments, encouraging deployment that supports broader local development goals, such as sustainability, inclusion, and economic resilience (Allam and Dhunny, 2019; Yigitcanlar et al., 2023). But evidence shows that realizing this vision requires articulating coherent municipal-level AI strategies that address service and infrastructure needs while building future innovation capacity (David et al.,

2024).

In their leadership role, municipal governments define AI objectives, determine stakeholders' engagement processes, and allocate financial and technical resources to advance implementation. Internally, they cultivate a culture of experimentation and adapt administrative to support AIadoption across policy domains (Considine and Lewis, 2007). Externally, they facilitate cross-sector collaboration – bringing together other government agencies, private firms, academic institutions, and community groups – to co-develop AI solutions that respond to local priorities (Borrás and Edler, 2020; Voda and Radu, 2019). These collaborative networks serve as platforms for knowledge exchange and shared investment, both essential for effective AI implementation (Campion et al., 2022).

A core leadership responsibility highlighted in the AI governance literature involves establishing robust data governance frameworks to overcome data fragmentation and foster interoperability, while ensuring secure and ethical data sharing across departments and partner organizations (Janssen et al., 2020; Son et al., 2023). Integrated, high-quality data sources are critical to the performance and reliability of AI systems serving the municipality and local community (Hashem et al., 2016).

At the same time, municipal governments are recommended to balance collaboration with public oversight. Partnerships with private-sector actors offer technical expertise and innovation capacity but may risk outsourcing key governance functions and diluting municipal control over ethical standards. To mitigate this risk, some local governments are defining clear boundaries for private involvement, preserving authority over critical AI governance decisions (Agarwal, 2018; Manoharan et al., 2023).

3.5. Regulators

Local governments are widely recognized as rule-setters in AI ecosystems, tasked with developing and enforcing regulatory frameworks to mitigate AI-related risks (Cho, 1992; Guenduez and Mettler, 2023). Their authority spans both internal operations and external stakeholders, with a strong emphasis on areas like data governance, AI ethics, privacy protection, and cybersecurity (Janssen et al., 2020; Wirtz et al., 2020). For example, as data underpins AI functionality, robust regulations have become critical to prevent privacy infringements and uphold public trust (Son et al., 2023).

Drawing from existing studies, it is evident that municipalities adopt a dual approach to data governance. Internally, they tend to establish standards for data handling, defining how information is collected, stored, shared, and secured across departments. These efforts often include setting data-quality requirements, interoperability protocols, and limits on the collection of sensitive personal information where legal or ethical concerns arise (Joyce and Javidroozi, 2024; Lnenicka et al., 2022). In some cases, regulatory frameworks may even restrict the collection of certain types of citizen-related data when such practices pose legal or ethical risks (van Noordt and Tangi, 2023b). Additional safeguards such as anonymization, encryption, and access control mechanisms might be employed to protect sensitive datasets (Yang et al., 2018).

Externally, municipalities may regulate what data can be gathered and shared, by whom, and for what purposes, shaping both public and private data practices (Janssen et al., 2020). In addition, studies emphasize the ethical considerations surrounding the use of *digital exhaust* – data repurposed beyond its original intent (Andrews, 2019) – and call for comprehensive data governance that spans the entire lifecycle from collection to disposal (Zhang et al., 2024). This includes obtaining consent for data usage (Vayena et al., 2018) and ensuring accountability and transparency in AI decision-making systems (Mittelstadt et al., 2016).

To keep pace with the rapid evolution of AI technologies, some municipalities are also experimenting with agile regulatory mechanisms that enable developers to pilot AI applications under controlled conditions without being subject to full regulatory compliance from the outset. Regulatory sandboxes, in particular, facilitate responsible experimentation while helping to manage legal uncertainty and align technological innovation with public-interest objectives (Alaassar et al., 2021). Additionally, studies show that municipal governments can also co-develop regulatory frameworks in collaboration with stakeholders to ensure that emerging standards reflect diverse societal expectations and values (Wirtz et al., 2020).

3.6. Entrepreneurs

Municipal governments frequently assume an entrepreneurial role by providing financial and strategic support to AIinitiatives that align with local development objectives. This role encompasses directing investments toward digital infrastructure, research and development, business initiatives, and workforce development. For example, municipalities may offer grants and tax incentives to attract technology entrepreneurs and AIstartups (Yigitcanlar et al., 2021). They also invest in human capital through training programs aimed at closing data-literacy gaps (Neumann et al., 2022) and ensuring that public servants are equipped to manage AI systems (Agarwal, 2018; Guenduez and Mettler, 2023). Such programs typically target competencies in data creation, processing, and sharing, as well as analytical and engineering skills that enhance data governance, interoperability, and open government practices (Janssen et al., 2020).

In some cases, municipalities have funded the development of innovation labs and research centers to enable experimentation and integration of AItechnologies in public organizations (Gupta et al., 2020; Tether and Tajar, 2008; Timeus and Gascó, 2018). Entrepreneurial local governments may also extend their support by offering financial subsidies or venture capital funding to early-stage AIinitiatives (David et al., 2024). In doing so, they invest directly in private enterprises or establish municipally owned entities that underpin local innovation ecosystems, strategically leveraging public assets to generate revenue and foster collaborative networks (Ryser et al., 2023).

However, research indicates that most municipal AIfunding remains confined to early-stage experimentation and prototyping, with the majority of resources sourced from temporary or external programs such as national innovation grants (van Noordt and Tangi, 2023b). Consequently, many promising AIinitiatives stall before full implementation due to the absence of structural budgets for long-term support. To address this limitation, initial evidence recommends establishing ring-fenced innovation budgets to fund ongoing staffing and the scaling of AIsystems once external grants expire (van Noordt and Tangi, 2023b; Yigitcanlar et al., 2023).

Despite these potential benefits, municipalities often hesitate to move beyond pilot projects due to concerns over costs and the risks posed by uncertain outcomes. Scaling AI solutions demands additional staff, heightened accountability, and long-term commitment. These factors can foster institutional risk-aversion (Ryser et al., 2023; van Noordt and Tangi, 2023b). Adopting an entrepreneurial mindset requires accepting and managing these risks while ensuring that innovation serves the public interest, balancing both ethical and financial considerations (Doctorow, 2008; Mergel et al., 2016; Pencheva et al., 2020).

3.7. Gatekeepers

Municipal governments fulfill a gatekeeping role by regulating access to key resources for AI development and deployment. They determine who may use these resources and under what conditions, balancing the promotion of innovation with ethical and security considerations. In the financial domain, this role intersects with their entrepreneurial functions: municipalities manage financial accessibility and oversee public funding programs and set eligibility criteria for AIinitiatives, ensuring that investments are allocated strategically and responsibly

(David et al., 2024). Moreover, they also control access to physical infrastructure – such as testing facilities and pilot sites in urban contexts – which enables real-world experimentation and helps accelerate the integration of AI solutions into the public operations (Cugurullo et al., 2023; Dowling and McGuirk, 2022).

Equally important is their stewardship of technological infrastructure, particularly large, proprietary datasets under municipal jurisdiction (Balland et al., 2020; Cugurullo et al., 2023; Mikalef et al., 2022). To manage data access, some municipal governments have implemented classification schemes, usage protocols, and restrictions on sensitive information. These measures are expected to protect privacy, ensure compliance with legal standards, and promote secure, ethical data use (Goodspeed, 2011; Kalampokis et al., 2011).

3.8. Knowledge providers

In addition to regulating access, municipal governments are increasingly expected to serve as knowledge providers by contributing both data resources and contextual expertise critical to AI development (Ardito et al., 2019). AI governance literature underscores their role as stewards of large and diverse datasets, ranging from real-time sensor data (e.g., mobility flows, energy consumption) to historical records stored in administrative databases and service platforms (Balland et al., 2020; Cugurullo et al., 2023; Gupta et al., 2020). Through the curation and dissemination of these datasets via structured and interoperable repositories, municipalities can enable external actors to develop AI-based applications that are responsive to local policy objectives and community needs (Guenduez and Mettler, 2023).

Equally important is the contextual insight that municipal authorities can bring: a nuanced understanding of why, how, and under what conditions datasets were created. This insight can help to assess data suitability and detect quality deficiencies and systematic biases, and is instrumental in creating safeguards to ensure that AI systems are both ethically sound and technically robust (Engin et al., 2020).

To facilitate knowledge exchange, municipalities might also set up streamlined data-request protocols and open data portals that make their own datasets readily accessible (Goodspeed, 2011). In addition, some local governments require private-sector partners – for example, transit operators or utility companies – to contribute their own data to these portals. Incorporating these external datasets into a single repository can broaden the evidence base available to decision-makers, allowing them to combine multiple sources to develop AI applications that are better trained (Guenduez and Mettler, 2023).

3.9. Solution architects

Research emphasizes that municipal governments should actively contribute to both the technical and ethical design of AI systems. Their responsibilities include strengthening computational and data infrastructures while embedding core governance principles – such as fairness, accountability, and transparency – directly into system architectures (Butcher and Beridze, 2019). This engagement frequently begins with the formulation of impact assessment frameworks, which are used to evaluate the societal implications of AI deployments and to prioritize applications that address critical concerns such as social inequality and environmental risk (Son et al., 2023).

In practice, municipalities do not tend to build AI solutions independently. Instead, they typically co-develop systems in collaboration with external partners to ensure that the resulting technologies align with operational realities and service delivery goals (Mikhaylov et al., 2018).

Within these partnerships, municipal authorities contribute domain-specific expertise to support the design of integrated data pipelines that bridge departmental silos. Their role includes specifying analytical techniques for harmonizing diverse datasets and establishing technical protocols – such as interoperability standards, metadata frameworks, and data-quality controls – that ensure consistency, reliability, and usability across shared platforms (Chen and Lee, 2018; Manoharan et al., 2023; Mikhaylov et al., 2018).

Moreover, recognizing that information-rich and diverse data is foundational to accurate analytics and evidence-informed policy-making, municipal governments increasingly seek to enhance their data ecosystems by acquiring information from both internal systems and external sources (Pencheva et al., 2020; Son et al., 2023; Watson and Ryan, 2020). These efforts may include establishing formal partnerships with private-sector entities to access real-time transactional or sensor data (Mergel et al., 2016), as well as supporting community-driven data co-creation initiatives that capture local knowledge and lived experiences (Hsu et al., 2022). By broadening data access and integrating multiple perspectives, municipalities contribute to the development of AIsystems that are better aligned with public values and capable of supporting robust, context-sensitive decision-making.

3.10. Buyers

In their capacity as buyers, municipal governments leverage public procurement to acquire AI technologies and related services (Hickok, 2024). However, traditional procurement often prove inadequate for the uncertainties and experimental nature of AI initiatives. In response, some municipalities have begun to adopt more agile procurement practices that allow for greater flexibility and iterative development (Mergel et al., 2018). These include pilot programs, parallel testing with multiple vendors, and bottom-up experimentation prior to full-scale implementation. Such approaches enable municipal governments to evaluate different AI solutions in real-world conditions and compare outcomes to select the technologies that best align with operational goals and public value objectives (Nagitta et al., 2022; Soe and Drechsler, 2018).

AI governance studies also stress that municipalities can further leverage their purchasing power to shape market incentives toward socially beneficial AI. By embedding clear expectations into procurement contracts – such as specifying intended social outcomes, technical requirements, and adherence to legal and ethical standards – municipalities can ensure that acquired systems enhance service delivery and avoid reinforcing biases that can erode public trust (Nagitta et al., 2022; Soe and Drechsler, 2018). Additionally, by cultivating local *AI marketplaces* through preferred-vendor programs or cooperative purchasing agreements, municipalities can also foster mission-oriented ecosystems that align stakeholder objectives and drive sustained public value (Guenduez and Mettler, 2023; Mikhaylov et al., 2018).

Finally, as buyers, municipal governments can influence the design and functionality of the AI system by ensuring that access to relevant data is formally embedded within procurement practices. This includes addressing legal and ethical considerations related to data collection, sharing, and protection, reinforcing the integrity and accountability of AI deployments (Son et al., 2023).

3.11. Users

It is largely acknowledged that municipal governments are increasingly taking on the role of users of AI technologies (Javed et al., 2022; Son et al., 2023). However, while AI usage has the potential to enable a more adaptive and efficient management of public services and resource allocation, it also introduces critical concerns, particularly around algorithmic bias and transparency (Son et al., 2023). In response, the concept of *responsible AI* has become central to this role, emphasizing the need for transparency, accountability, and ethical deployment (Butcher and Beridze, 2019; Fatima et al., 2020; Yigitcanlar et al., 2021). As responsible users, municipalities are expected to implement governance mechanisms such as model documentation, bias auditing, and ongoing performance monitoring. These practices help ensure that AI systems align with ethical standards and promote public trust, while

contributing meaningfully to public value creation (Butcher and Beridze, 2019; Guenduez and Mettler, 2023).

As AI users, municipalities also contribute to responsible AI development (Brand, 2022; Yigitcanlar et al., 2024). They often act as co-creators, engaging with developers to provide feedback that helps ensure AI applications are responsive to local community needs and aligned with broader policy objectives (Yigitcanlar et al., 2021).

3.12. Warners

Municipal governments also act as warners by actively informing the public about both the potential benefits and risks of AI technologies. Through early-stage engagement initiatives, they facilitate dialogue with citizens on the planning and implementation of AI, promoting principles such as responsible use, safety, transparency, fairness, and accountability (Gesk and Leyer, 2022; Yigitcanlar et al., 2023). These participatory approaches help enhance public understanding of AI and foster a sense of collective ownership over technological developments (Hsu et al., 2022).

In addition to risk-focused communication, municipalities often showcase successful AI applications in public services to demonstrate tangible improvements and reduce the opacity surrounding algorithmic processes (Chen et al., 2021; Son et al., 2023). When accompanied by accessible explanations of data collection, processing, and usage practices, these narratives can enhance public appreciation of the role that AI systems migh have in delivering public value (Wolff et al., 2019).

To further support informed engagement, some municipal governments have also introduced data literacy initiatives aimed at educating citizens about how their data are generated, interpreted, and utilized in AIsystems. By strengthening the public's capacity to assess data quality and understand ethical considerations, these programs help reduce anxiety and foster more meaningful participation in AI governance processes (Wolff et al., 2019).

3.13. Mitigators

A persistent challenge in AI governance lies in the gap between high-level ethical principles and their practical implementation: a divide commonly referred to as the *principles-to-practices* gap (Palladino, 2023). To address this issue, municipal governments can assume the role of mitigators by embedding systematic oversight mechanisms into their operational routines (Engin et al., 2020; van Zoonen, 2016). This includes conducting algorithmic audits and impact assessments to detect bias, validate model performance, and assess the broader societal implications of AI deployments (Agarwal, 2018; Yigitcanlar et al., 2021). As part of these responsibilities, municipalities might apply data justice principles to ensure that training datasets are inclusive and representative, while also identifying and correcting data that is missing, outdated, or distorted to mitigate the risk of reinforcing systemic inequalities (Guenduez and Mettler, 2023; Janssen et al., 2020; Manoharan et al., 2023; Taylor, 2017).

Moreover, research indicates that accountability can be reinforced through structured documentation of developers' design decisions and the implementation of clear remediation protocols to address any harms that arise (Wieringa, 2020). In tandem, technical safeguards – such as algorithm registries, audit logs, and transparency protocols – support traceability and fairness across the AIlifecycle (Rodrigues, 2020). By institutionalizing these practices within their governance routines, municipal governments operationalize ethical principles, enhancing both the protection of citizen rights and public trust in AI technologies.

4. Discussion and conclusion

4.1. Theoretical contribution

The main theoretical contribution of this study lies in the reinterpretation of innovation management theory, specifically the concept of innovation roles, within the context of municipal AI governance. Our conceptualization shows how the foundational dimensions of the traditional innovation roles adapt as municipal governments undertake new responsibilities and functions in governing AI systems. We show that these roles retain their core logic – what we call *theoretical continuities* – while also exhibiting *contextual adaptations* that address the unique demands of AI governance in municipal jurisdictions (see Table 3). By explicitly identifying these adaptations, we extend innovation management theory to more accurately reflect the governance dynamics of AI and the evolving functions of public-sector actors to responsible, locally grounded AI implementation.

4.1.1. Initiators > AI opportunity framers and partnership catalysts

Traditionally, initiators drive innovation by identifying unmet needs and mobilizing partnerships (Borrás and Edler, 2020; Heikkinen et al., 2007; Nyström et al., 2014; Rosenzweig, 2017). This foundational role persists in AI governance, where municipal governments articulate problems and foster collaborative action. However, the scope of this role is now grounded in addressing local development challenges that AI technologies can help solve (Yigitcanlar et al., 2023). Municipalities act as catalysts for multi-stakeholder partnerships that support AI-driven problem-solving aligned with public priorities (Chen and Wen, 2021). This reinterpretation marks a shift from market-oriented innovation to public value creation through strategically framed collaborations for AI solution development.

4.1.2. Facilitators > AI collaboration enablers and ecosystem builders

Facilitators traditionally enable innovation by connecting actors and enabling knowledge and resources exchange (Borrás and Edler, 2020; Goduscheit, 2014; Hurmelinna-Laukkanen and Nätti, 2018). This coordinating role is retained and expanded in municipal AI governance, where studies emphasize early-stage engagement in AI experimentation, institutional matchmaking, and cross-sector collaboration (Deshpande and Sharp, 2022; Füller et al., 2024; Kim et al., 2024; Son et al., 2023). The adaptation prioritizes not just coordination but also ethical reflection and infrastructure-building to foster responsible innovation ecosystems.

4.1.3. Promoters > AI norms and standards advocates

Promoters are change agents who reduce resistance and advocate for innovation (Borrás and Edler, 2020; Sergeeva and Trifilova, 2018). In municipal AI governance, this role shifts toward championing normative frameworks (Manoharan et al., 2023), especially around responsible data use and interoperability. Municipal governments act as advocates of AI, but they also become champions of ethical principles, aligning technological deployment with institutional standards and public expectations.

4.1.4. Leaders > AI policy and strategy orchestrators

Leaders guide innovation through vision-setting, coordination, and resource management (Berson et al., 2016; Cusumano and Gawer, 2002; Dedehayir et al., 2018; Parker et al., 2003; Steele and Watts, 2022). In municipal AI governance, this role broadens to include responsibility for strategic alignment of AI initiatives with societal goals (Allam and Dhunny, 2019; Voda and Radu, 2019; Yigitcanlar et al., 2023), data governance leadership (Hashem et al., 2016; Janssen et al., 2020), and oversight of public–private dynamics (Borrás and Edler, 2020; Campion et al., 2022). Leadership becomes both a technical and ethical endeavor, addressing the complexity of algorithmic systems while maintaining public trust.

4.1.5. Regulators > AI governance enablers

While regulators traditionally set and enforce innovation rules (Dedehayir et al., 2018; Finch et al., 2017), municipalities adapt this role to develop flexible, anticipatory frameworks for AI. Rather than

Table 3
Reinterpreting innovation roles in municipal AI governance: Core continuities and contextual adaptations.

INNOVATION MANAGEMENT		MUNICIPAL AI GOVERNANCE			
Innovation role	Role logics	Innovation role	Role logics	Theoretical continuities	Contextual adaptations
Initiators	Identify innovation opportunities and initiate networks	**AI opportunity framers and partnership catalysts**	Identify local challenges where AI is applicable and catalyze partnerships for AI-driven problem-solving in its administrative boundaries.	Strategic problem identification and initiation of innovation processes.	Reoriented from market-driven innovation to addressing public sector challenges through AI; municipalities frame local issues and initiate AI-specific multi-stakeholder partnerships
Facilitators	Enable collaboration and resource access, often in commercialization stages.	**AI collaboration enablers and ecosystem builders**	Coordinate early-stage AI activities by bridging municipal departments and external actors to foster experimentation and co-development.	Enabling collaboration and reducing barriers to innovation.	Shift from supporting commercialization to facilitating early-stage AI experimentation and co-creation.
Promoters	Overcome resistance to innovation by championing change through influence or relationships.	**AI norms and standards advocates**	Mobilize support and shape AI development by advocating responsible practices and interoperability across sectors.	Driving change by overcoming resistance and aligning stakeholder interests.	Emphasis on ethical standards and data governance in promoting AI technologies.
Leaders	Guide innovation by setting goals, aligning efforts, managing resources, and motivating actors.	**AI policy and strategy orchestrators**	Set and align AI goals with broader local development strategies while leading collaborations, data governance, and ethical oversight.	Strategic vision setting and resource allocation.	Added responsibility for ethical oversight and managing the balance between innovation and public interest.
Regulators	Create innovation-conducive or constraining rules and frameworks.	**AI governance enablers**	Enable innovation by creating anticipatory and adaptive regulatory frameworks that mitigate risks while supporting experimentation.	Establishing rules and frameworks to guide innovation.	Shift from static regulation to dynamic and flexible governance models – such as regulatory sandboxes.
Entrepreneurs	Pursue and commercialize innovation through risk-taking and network-building.	**AI innovation enablers**	Mobilize public resources and build local capacities to drive socially impactful AI innovation.	Mobilizing resources and taking calculated risks to drive innovation.	Focus on public value creation and capacity building rather than profit-driven ventures.
Gatekeepers	Control access to innovation-critical resources and information; ensure quality and alignment.	**AI-enabling resource access managers**	Regulate access to municipal assets (e.g., data, infrastructure, funding) while ensuring ethical and secure use.	Managing access to critical resources and information.	Emphasis on ethical considerations and equitable access in the allocation of resources.
Knowledge providers	Supply scientific and technical expertise; often external to innovation developers.	**Data and contextual insight contributors**	Provide contextualized data and interpretive knowledge to guide responsible AI development.	Supplying expertise and information to support innovation.	Shift from being passive knowledge sources to active curators and interpreters of data for supporting AI developments.
Solution architects	Convert innovative ideas into practical, scalable technical solutions through design and engineering.	**AI system co-designers**	Co-develop AI systems with external partners and ensure ethical alignment and technical interoperability.	Translating ideas into solutions that are functional and scalable	Emphasis on participatory design and context-specific applications in AI system development.
Buyers	Set procurement criteria, evaluate suppliers, and influence innovation through purchasing decisions.	**AI solution experimenters**	Adopt agile and iterative procurement practices, pilot and evaluate AI solutions and ensure that ethical and social value criteria are integrated in assessments.	Influencing innovation through purchasing decisions.	Adoption of flexible procurement models prioritizing public value creation and experimentation over cost-efficiency and traditional market criteria.
Users	Provide feedback, co-create innovation, and influence development trajectories through their experiences.	**Responsible AI implementers**	Adopt responsible innovation principles while using AI to improve service delivery and decision-making. Provide feedback to AI developers to ensure systems align with regulatory standards.	Utilizing innovations and contributing to their refinement through feedback.	Role expands to include stewardship and accountability in responsible AI implementation.
Warners	Identify and communicate potential risks of innovation early in the process.	**AI educators**	Enhance civic understanding of AI by communicating risks and benefits, promoting transparency, and fostering public data literacy.	Identifying and communicating potential risks associated with innovation.	Broader emphasis on public education and civic engagement as tools to raise awareness of benefits and risks and build trust in AI technologies.
Mitigators	Manage and reduce innovation risks; align efforts and ensure compliance and long-term success.	**AI impact auditors**	Operationalize ethical principles by monitoring, auditing, and correcting AI systems to protect civic rights and ensure responsible AI governance.	Managing and reducing risks associated with innovation.	Institutionalization of accountability measures and emphasis on justice and accountability in AI governance.

applying rigid regulations, they create adaptive mechanisms that allow for safe experimentation and responsive oversight (Alaassar et al., 2021). This marks a critical shift from static rule-making to agile regulatory frameworks.

4.1.6. *Entrepreneurs > AI innovation enablers*

Entrepreneurs mobilize resources and networks to bring innovations to market. Municipal governments reinterpret this by funding digital infrastructure, supporting public sector experimentation (Gupta et al., 2020; Timeus and Gascó, 2018) and risk taking (Mergel et al., 2018; Pencheva et al., 2020), and investing in workforce development for AI (Agarwal, 2018; Guenduez and Mettler, 2023; Neumann et al., 2022). The entrepreneurial logic remains, but the emphasis is now on public value creation and local capacity building.

4.1.7. Gatekeepers > AI-enabling resource access managers

Gatekeepers control access to critical innovation resources (Borrás and Edler, 2020; Heikkinen et al., 2007; Markham et al., 2010; Nyström et al., 2014). Municipal governments retain this role, regulating access to data, infrastructure, and funding for AI initiatives (David et al., 2024; Dowling and McGuirk, 2022; Goodspeed, 2011; Kalampokis et al., 2011; Mikalef et al., 2022). The adaptation introduces ethical conditions and accountability standards into access governance, ensuring equitable and responsible innovation.

4.1.8. Knowledge providers > data and contextual insight contributors

In the innovation management literature, knowledge providers are actors that deliver scientific and technical insights to support innovation processes (Díez-Vial and Montoro-Sánchez, 2016; Tödtling et al., 2009). Municipal governments expand this role by supplying local, context-sensitive data and knowledge (Ardito et al., 2019; Engin et al., 2020; Guenduez and Mettler, 2023). Their contributions move beyond information dissemination to the distribution of embedded intelligence, enabling the development of AI solutions tailored to local socio-political contexts and their specific challenges.

4.1.9. Solution architects > AI system co-designers

Solution architects traditionally are responsible for operationalizing innovation by transforming conceptual ideas into practical, scalable solutions. In the context of urban AI governance, this implementation focus remains central. However, the role is reinterpreted to prioritize participatory processes and the co-design of AI systems with external stakeholders (Mikhaylov et al., 2018). Municipal governments increasingly act as co-developers. This adaptation underscores a shift from technical execution alone to inclusive and governance-informed system design, whose objective is to ensure that AI applications are both technically effective and aligned with public values.

4.1.10. Buyers > AI solution experimenters

In innovation management, buyers influence the direction of innovation by shaping demand through procurement decisions (Dalpé et al., 1992; Howells, 2024; Lanzolla et al., 2020). Municipal governments retain this function in the context of AI governance but reinterpret it by adopting agile and iterative public procurement models (Mergel et al., 2018). Their approach emphasizes piloting and the pursuit of social value, allowing them to shape market offerings that align with civic priorities (Nagitta et al., 2022; Soe and Drechsler, 2018). Rather than merely acquiring AI technologies, municipalities use procurement as a tool to experiment, evaluate, and scale responsible AI solutions tailored to public needs.

4.1.11. Users > responsible AI implementers

Users influence innovation by articulating needs and offering feedback that informs iterative development (Bugshan, 2015; Guo et al., 2017; Kim et al., 2008; Ranjan and Read, 2016; Wang et al., 2024; Zhang et al., 2024). In the context of AI governance, existing literature increasingly emphasizes the notion of the responsible user, particularly in public sector settings (Butcher and Beridze, 2019; Fatima et al., 2020; Yigitcanlar et al., 2021). Municipal governments embody this expanded role by not only using AI tools but also actively contributing to the co-shaping of system design and application. Through their engagement, they provide feedback that helps developers align AI systems with public needs (Yigitcanlar et al., 2021). This reinterpretation positions municipalities as informed and responsible users who ensure that AI solutions are contextually relevant and ethically grounded in societal priorities.

4.1.12. Warners > AI educators

Warners traditionally identify and communicate risks (Borrás and Edler, 2020). In AI governance, municipal governments extend this role to include public education and civic engagement (Hsu et al., 2022). By fostering transparency, explaining responsible data use, and promoting digital literacy, they build trust and encourage informed participation in AI development and oversight (Gesk and Leyer, 2022).

4.1.13. Mitigators > AI impact auditors

In innovation management theory, mitigators manage the risks embedded in innovation processes (Borrás and Edler, 2020). Within AI governance, municipal governments extend this role by instituting mechanisms for auditing, bias detection, and algorithmic accountability (Agarwal, 2018; Yigitcanlar et al., 2021). Their responsibilities include translating abstract ethical principles into concrete operational practices, such as continuous monitoring, transparency protocols, and safeguards that uphold citizen rights (Rodrigues, 2020; van Zoonen, 2016). This adaptation reflects a shift toward embedding fairness and justice into the governance of AI technologies.

4.2. Practical contribution

This study offers practical insights for municipal governments. By reinterpreting well-established innovation management roles, we propose a structured framework comprising 13 functions that can guide municipalities as they expand their responsibilities in the domain of AI governance. Moreover, our conceptualization is also relevant for AI developers and technology providers, who can benefit from understanding the multiple responsibilities municipal governments assume. Improved clarity around these roles can foster more effective collaborations and more realistic expectations between municipalities and their partners.

The literature reviewed in this study emphasizes the importance of collaboration throughout the AI lifecycle (Bertello et al., 2022; Deshpande and Sharp, 2022; Füller et al., 2024; Kim et al., 2024; Pantanowitz et al., 2022). Scholars point to the need for municipalities to engage stakeholders early in the innovation process, particularly during phases of testing and experimentation (Soe and Drechsler, 2018). This early coordination enables more inclusive and socially aligned outcomes (Bertello et al., 2022). Several studies also recommend that municipalities adopt more agile and adaptive governance approaches, rather than relying on traditional regulatory or procurement mechanisms (Alaassar et al., 2021; Mergel et al., 2018; Nagitta et al., 2022; Soe and Drechsler, 2018). This includes piloting technologies in controlled environments and adjusting governance approaches based on emerging insights. This creates space for continuous learning.

Evidence also consistently stresses that municipalities should invest in internal capabilities (Agarwal, 2018; Guenduez and Mettler, 2023; Neumann et al., 2022). These include building teams that can manage AI-specific challenges, allocating dedicated resources, and supporting staff training to improve data literacy and governance skills (Janssen et al., 2020). Another recurring recommendation is the need for transparency in AI governance. Municipalities are encouraged to educate the public on how AI systems function, and to explain the implications of their use in public decision-making (Gesk and Leyer, 2022; Yigitcanlar et al., 2023). This type of public communication can help address trust deficits and enhance civic participation (Wolff et al., 2019).

Finally, AI governance literature shows that municipal governments should maintain oversight of the ethical and social implications of AI (Palladino, 2023; Son et al., 2023; van Zoonen, 2016). This includes conducting regular audits of algorithmic performance, identifying risks and bias, and embedding accountability mechanisms that ensure ongoing responsiveness to public concerns (Agarwal, 2018; Tan, 2023; Yigitcanlar et al., 2021). In doing so, municipalities can help ensure that AI solutions align with societal values, are fit for local needs, and are implemented in a way that reflects democratic governance principles.

4.3. Future research directions

This study proposes a conceptual framework of reinterpreted innovation roles that reflect the requirements of municipal AI governance.

However, while theoretically grounded, these roles require empirical validation to better capture how they are enacted in practice and how they connect. Future research should explore how municipal governments assume these roles, how responsibilities are distributed across departments, and how roles evolve over time.

These roles incorporate new theoretical insight not previously emphasized in the innovation literature. Our work demonstrates how these shifts may reshape role responsibilities, revealing key avenues for empirical inquiry at the intersection of public administration research and emerging strands of innovation theory. These can include, but are not limited to, responsible innovation, agile and collaborative innovation, data-driven approaches to innovation, and social innovation. Building on these insights, future research can further develop the conceptual and empirical understanding of how public sector actors govern AI systems.

From a methodological perspective, future research on municipal AI governance can consider a wide range of approaches to empirically explore and refine the theoretical roles proposed in this study. Qualitative methods, particularly in-depth interviews and surveys are recommended to capture how these roles are enacted and interact in real-world settings (see David et al., 2024; Mikalef et al., 2022). Studies could use case study designs to examine municipal procurement processes and the functioning of collaborative innovation initiatives, while also linking to the implementation of responsible AI frameworks. Research might also investigate how municipal actors interpret and apply ethical standards in practice, or how data governance strategies unfold across different organizational contexts (see Hashem et al., 2016). Empirical inquiry should aim to understand both role-specific dynamics and the interconnections between roles, thus adding nuance and structure to the theoretical framework. Furthermore, scholars are encouraged to explore role evolution over time, especially in relation to shifts in policy, regulatory environments, or technological advancements. This approach would allow for a more dynamic and context-sensitive understanding of municipal involvement in AI governance.

4.3.1. Social innovation lens

While AI governance literature emphasizes the importance of public value and social good (Li et al., 2023; Moon, 2023), there is limited research on how municipal governments can effectively balance public value with commercial interests in the context of AI governance (Criado and Gil-Garcia, 2019). This gap creates an opportunity for more research linking social innovation theory with AI governance in the public sector, specifically investigating frameworks and strategies that municipalities can employ to align AI commercialization efforts with social innovation goals. We explore these concepts through the lens of both the initiator and buyer roles.

First, as initiators, municipal governments are tasked with enhancing public value by identifying key areas for AI innovation that address local challenges. This approach focuses on creating societal benefits rather than the traditional idea of pursuing profit and competitive advantage, reflecting the principles of social innovation. Social innovation, which emphasizes the development and implementation of solutions that address social needs and improve the welfare of communities, aligns closely with the public sector's mandate to serve citizens. In this context, municipal governments can use AI as a means to drive social progress rather than profit. However, integrating social innovation thinking into AI governance presents challenges and opportunities that require further exploration. For instance, research is needed to understand how municipal governments can structure AI initiatives to foster collaboration with private sector entities while safeguarding public interests (Zuiderwijk et al., 2021).

Second, we build on the traditional buyer role – this role typically emphasizes the commercial aspects of innovation – by exploring how municipal governments can drive public value through AI procurement. Despite growing political support for using public demand to foster AIinnovation (Edler and Georghiou, 2007), there remains a significant gap in understanding how municipal governments can effectively assess AIsolutions for their societal impact and establish procurement standards that prioritize public value while ensuring the safe and ethical deployment of AItechnologies (Wirtz et al., 2019). Current procurement practices for AI initiatives often clash with the complex needs of municipal governments. Innovative procurement approaches, such as flexible contracts, should be explored as ways to avoid strict bureaucratic regulations that might hinder AI innovation (Alhola and Nissinen, 2018). However, the challenge lies in implementing these approaches without compromising transparency and the efficient use of public funds. More research is required to develop strategies for balancing these competing demands and implementing effective stewardship in AI procurement (Wilson and van der Velden, 2022).

Social innovation theory can offer valuable research stimuli to explore new ways of aligning AI solutions with public welfare while avoiding bureaucratic constraints. Literature on social innovation has introduced "new ways of governing" (Galego et al., 2022) innovation processes, including more flexible, participatory, and collaborative approaches (Kim, 2022). This is particularly relevant for public procurement of advanced technological solutions, which is often hindered by rigid, bureaucratic processes (Sandulli et al., 2017). By adopting principles from social innovation, future research might explore how to develop procurement strategies that relax strict regulatory constraints while ensuring transparency, fairness, and public accountability (Wirtz et al., 2019).

Furthermore, AI procurement introduces the necessity for effective two-way knowledge transfer between municipal governments and suppliers (Beckers and Mora, 2025). Municipalities need to communicate their technical, social, and environmental requirements to potential suppliers, who in turn must share their expertise on technological solutions. The process of managing this knowledge exchange in the context of AI innovation is still poorly understood, especially considering the increased need for interaction between procurers and suppliers when dealing with non-standardized products like AI systems (Torvinen and Ulkuniemi, 2016). Additionally, although transparency practices such as public disclosures of impact assessments, data quality, and embedded algorithmic decisions in AI systems are recognized as important, there is a lack of empirical evidence on how municipal governments can effectively implement these measures (Hickok, 2024).

4.3.2. Agile innovation lens

Traditional literature on innovation roles largely overlooks the concept of agility in AI governance. This gap is increasingly recognized in recent discussions about AI system procurement within the public sector. Here, agile innovation theory offers a crucial lens through which future research can examine these challenges, as it emphasizes flexibility, rapid iteration, and active stakeholder engagement (Bellis et al., 2024) – principles that directly address the rigid, linear processes that often characterize public sector procurement (Mergel et al., 2018; Soe and Drechsler, 2018). Therefore, we argue that, by applying this theoretical lens, we can better address the need for municipal governments to adopt more adaptive approaches in their AI procurement practices.

While recent AI governance literature acknowledges the importance of agile procurement (Donia and Shaw, 2021; Modgil et al., 2022), a significant lack of research remains on how municipal governments can effectively integrate agile innovation into their practices. This calls for a deeper exploration of how the traditional buyer role can evolve by incorporating agile innovation principles in public sector procurement, moving beyond conventional fixed procurement criteria and market evaluations. Through the lens of agile innovation theory, adaptive methodologies such as experimenting, piloting, and iterative development become central to improving procurement processes. Recent research emphasizes the need for municipal governments, in their role as buyers, to actively adopt these practices to manage risks more effectively and secure solutions that align with public needs (Nagitta

et al., 2022; Soe and Drechsler, 2018).

By using agile innovation theory as a guiding framework, we see several key areas for future research and theory-building opportunities that can benefit both innovation management literature and public administration studies. We invite AIgovernance researchers to leverage this framework to explore how agile principles can be operationalized in public procurement (Schmitz and Wimmer, 2023), how to balance flexibility with public accountability (Li et al., 2023), and what internal capabilities municipalities need to develop to support this agile approach (Grimbert and Zabala-Iturriagagoitia, 2024; Vandercruysse et al., 2024). Employing this theoretical perspective provides a valuable foundation to outline practical and theoretical contributions.

Our findings also show a growing need for flexible and dynamic regulatory frameworks to adapt to advancements in AI technology (Johnson, 2022). However, the innovation literature introducing the regulator role has traditionally focused on long-term regulatory frameworks rather than agile regulations that provide temporary spaces for experimentation. Therefore, we expand on the traditional regulator role by elaborating on agile regulatory approaches that municipal governments can adopt to keep pace with AI technological advancements while ensuring compliance. For example, they can reduce legal barriers by providing regulatory support through flexible and enabling laws (Guenduez and Mettler, 2023) and regulatory models such as sandboxes for testing, piloting, and validating AIsolutions without legal consequences or administrative burdens (Alaassar et al., 2021; Fenwick et al., 2018). This is another research area where agile innovation theory can help develop a finer understating.

4.3.3. Responsible innovation lens

The concept of responsible AI is gaining prominence in the AI governance literature, particularly concerning the roles of innovation users and solution architects. Responsible AI emphasizes the ethical design, development, and use of AI systems in ways that ensure fairness, transparency, accountability, and respect for privacy. This means that municipal governments must not only utilize AI solutions that address community needs but also actively contribute to developing AI systems that protect citizen rights, minimize risks, and promote societal welfare (Marzouk et al., 2023). This notion aligns closely with responsible innovation theory, which advocates for the inclusion of ethical considerations, public engagement, and responsiveness to societal needs throughout the innovation process (Voegtlin and Scherer, 2017). However, there is a significant lack of empirical research on how municipal governments can operationalize responsible AI practices. This gap calls for further research at the intersection of AI governance, responsible innovation theory, and public administration research.

Responsible innovation theory provides a framework for exploring how municipal governments, as users and developers of AI solutions, can align their practices with ethical expectations and public values. This theory emphasizes the importance of anticipating social impacts, inclusivity, and reflexivity in the innovation process (Stilgoe et al., 2013). As responsible users of AI, municipal governments are expected to demand solutions that are specifically tailored to address local issues while upholding principles such as fairness, transparency, and privacy (Guenduez and Mettler, 2023). This involves managing and interpreting data in ways that protect citizen rights, ensuring that data practices meet the highest standards of security and openness (Gupta et al., 2020; Kuziemski and Misuraca, 2020b; Meijer, 2018).

Additionally, AI governance literature emphasizes the need for municipal governments to actively participate in the development processes of AI solutions that will be adopted by the city. As responsible users, they are expected to provide ongoing feedback to AI developers, ensuring that solutions remain flexible and responsive to the evolving needs of the local communities they serve and their values (Yigitcanlar et al., 2021). By engaging in this iterative and collaborative process, municipalities can work towards AI solutions that align with the ethical and societal considerations central to responsible innovation theory. Therefore, applying this theory might offer an opportunity to gain deeper insights into how municipal governments can guide AI systems toward outcomes that are socially beneficial, equitable, and aligned with local priorities.

As solution architects, municipal governments can promote responsible AI design by establishing a clear vision for AI development that prioritizes ethical considerations and societal impact. This includes creating secure data infrastructures for processing and storage, ensuring the protection of citizen data while facilitating the effective deployment of AI solutions (Butcher and Beridze, 2019). By integrating responsible innovation theory into public sector AI governance literature, research can further develop frameworks that guide municipalities in building AI systems tailored to their specific priorities and the broader needs of their communities (Hsu et al., 2022). Such an approach embodies the core principles of responsible innovation, emphasizing ethical alignment, societal benefit, and responsiveness to local concerns.

4.3.4. Collaborative innovation lens

Previous studies have highlighted the challenges in understanding the conditions necessary for collaborative innovation ecosystems to function effectively (Mora et al., 2023; Thabit and Mora, 2023), especially in the concepts of digital innovation that relies on the interplay between multiple actors and sectors (Linde et al., 2021). In this paper, we introduce collaborative innovation as a possible lens to examine the role of municipal governments in AI governance, specifically to examine how they can act as solution architects who engage diverse stakeholders in co-developing AI solutions (Hsu et al., 2022).

Collaborative innovation theory emphasizes the importance of cooperation between public, private, and academic actors to create shared value and drive technological advancement (Sørensen and Torfing, 2011). By applying this theory to public-sector AI governance, we can expand our understating of how municipal governments can foster data and AI collaborations within cross-sector ecosystems by coordinating efforts among public agencies, private sector entities, academic institutions, and citizens (Borrás and Edler, 2020; Chen and Wen, 2021; Mergel et al., 2016; Voda and Radu, 2019). This involves encouraging partnership and knowledge sharing while ensuring that these collaborative activities align with the municipality's AIobjectives and adhere to interoperability standards, which are crucial for building comprehensive databases that support robust AIsolutions (Guenduez and Mettler, 2023).

However, there is a lack of empirical research on how municipal governments can effectively create and manage collaborative innovation ecosystems in the context of AI governance (Mora et al., 2023; Viale Pereira et al., 2017). By examining this process through the lens of collaborative innovation theory, we can gain a deeper understanding of how municipalities can facilitate stakeholder engagement, promote interoperability, and navigate the complexities involved in co-developing AI solutions focused on public value creation (Torfing, 2019). This theoretical approach offers valuable insights into how municipal governments can adopt the solution architect role to structure and guide effective collaboration within the AI ecosystem.

4.3.5. Data-driven innovation lens

Emerging literature on AI governance underscores the critical role of data as a fundamental input for developing AI systems, driving knowledge production, and addressing societal challenges (Bessen et al., 2022; de Pedraza and Vollbracht, 2023). Despite its significance, the role of data in AI remains underexplored within the innovation roles literature. To address this gap, we introduce data-driven innovation as a theoretical lens to examine how municipal governments can enhance their roles in AI governance by effectively utilizing data. Data-driven innovation theory emphasizes the strategic use of data to drive technological advancement, inform decision-making, and address complex problems. Applying this framework to the context of AI governance, we can expand traditional innovation roles by integrating data practices into roles such

as users, gatekeepers, and knowledge providers.

First, as users, municipal governments can ensure responsible data practices by implementing proper methods for collecting, analyzing, storing, and sharing municipal data (Gupta et al., 2020; Meijer, 2018). This also involves addressing local data challenges such as privacy, security, and transparency to build trust and public value (Yigitcanlar et al., 2021). Second, as gatekeepers, municipal governments can manage data as a form of critical infrastructure for AI, strategically overseeing external data relationships. This includes facilitating access to open data sources, controlling which datasets can be shared, and with whom, to foster an ecosystem of transparency and collaboration (Goodspeed, 2011). Third, in their role as knowledge providers, municipal governments can transform their data into valuable local insights, contributing directly to AI development tailored to the specific needs of their communities (Ardito et al., 2019). By acting as data sources, they can leverage their unique datasets to drive AI solutions that address urban challenges, thereby fueling innovation.

By adopting data-driven innovation as a guiding framework, future research can expand theories in AI governance by examining how municipal governments can develop strategies to harness data effectively in their various roles. This includes investigating how to establish robust data governance practices, facilitate data sharing and interoperability, and use data to guide AI solutions that serve public interests.

CRediT authorship contribution statement

Farah Elbehairy: Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Conceptualization. **Luca Mora:** Writing – review & editing, Writing – original draft, Supervision, Investigation, Conceptualization. **Ralf-Martin Soe:** Writing – review & editing, Writing – original draft, Supervision, Investigation, Conceptualization.

Disclosure statement

The authors report there are no competing interests to declare.

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Data availability

No data was used for the research described in the article.

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