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A literature exploration on challenges in open innovation in the public sector

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ABSTRACT

This study develops an Integrated Conceptual Framework for open innovation in the public sector, combining three theoretical lenses: Public Value Theory, Open Innovation in Government, and Collaborative Governance. Through an exploratory literature review, we analyze how this framework addresses persistent innovation barriers including bureaucratic rigidity, risk-averse cultures, and resource constraints. Our findings reveal that adaptive methodologies - particularly Innovation Labs (e.g., MindLab, Nesta) and Living Labs (e.g., La 27e Région) - can bridge stakeholder gaps when implemented within the framework's four dimensions: strategic foundations, organizational capabilities, methodological tools, and evaluation systems. The study contributes three key insights: (1) successful public innovation requires hybrid governance models that balance standardization with experimentation; (2) middle managers are critical as innovation champions, overcoming institutional inertia; and (3) cultural adaptation remains the foremost challenge for global scalability, requiring integrated action across all framework dimensions.

1. Introduction

Open innovation in the public sector refers to the process of incorporating external ideas and resources to improve organizational processes and enhance the delivery of public services [6,7]. This approach emphasizes collaboration among diverse stakeholders, including government agencies, private sector entities, and citizens, to create socially inclusive institutional arrangements [8,9]. However, the effective implementation of open innovation strategies faces significant challenges, such as conservative organizational cultures [2], insufficient resources [1], and inadequate training [4].

The current context assumes that the public sector is a facilitator in economic and social development; in creating socially inclusive institutional arrangements through technological advances; in the quality and transparency of public management, as well as in recognising the role of end users as relevant actors in the policy-making process [10].

Recent innovations in public governance include open government, multi-level governance, and evidence-based governance, each contributing to the evolution of how public institutions operate. Open government is defined as a global movement that aims to enhance transparency, accountability, and citizen participation in governmental processes, enabling a more engaged public. For example, participatory budgeting initiatives allow citizens to decide how public funds are allocated, fostering a sense of ownership and collaboration in local governance. Multi-level governance refers to the interactions between various levels of government (local, regional, and national) and non-governmental actors within a decentralized political system. This approach highlights the complexity of governance structures and the need for cooperation among stakeholders to address multifaceted issues, such as climate change, which requires coordinated actions across different governmental tiers. Evidence-based governance emphasizes the use of scientific evidence and data-driven practices to inform decision-making processes. By utilizing research and empirical data, governments can implement policies that are more effective and responsive to societal needs, as seen in initiatives that employ health data analytics to improve public health outcomes [10].

This article seeks to explore the challenges and opportunities associated with open innovation in the public sector, with a focus on collaborative and integrative methodologies. The literature review reveals significant gaps, such as the lack of studies addressing the adaptation of open innovation practices in different cultural and organizational contexts. To address these gaps, we propose an Integrated Conceptual Framework (Section 2) that combines Public Value Theory, Open Innovation, and Collaborative Governance, guiding our

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investigation of the following research questions:

1. What are the main challenges to implementing open innovation in the public sector?
2. Which collaborative methodologies have been effective in promoting innovation in the public sector?
3. How do cultural and organizational differences influence the adoption of open innovation practices?

The article is organized into five main sections. Following this introduction, Section 2 presents our Integrated Conceptual Framework for public sector innovation, combining three core theoretical perspectives: Public Value Theory, which redefines success through citizen-centric value creation; Open Innovation in Government, adapting private-sector collaboration models to public contexts; and Collaborative Governance, essential for addressing complex societal challenges. Section 3 details our research methodology, while Section 4 examines implementation mechanisms including Innovation Labs and Living Labs through comparative case analysis. Section 5 discusses key barriers and adaptive strategies across different governance contexts. The concluding Section 6 highlights how our conceptual framework provides public managers with a diagnostic tool for innovation challenges while identifying critical research gaps in institutionalization processes and cultural adaptation.

2. Theoretical framework and literature review

Public sector innovation has become a central theme in contemporary governance studies, driven by the need to address complex societal challenges while improving service delivery. This section establishes the theoretical pillars supporting public innovation, critically examines key debates in the literature, and develops an integrated conceptual framework that bridges theory and practice.

2.1. Theoretical foundations of public sector innovation

Public policies have distinct objectives related to the focus of innovation in both the private and public sectors. In the context of the private sector, instruments are orientated towards the creation of new knowledge with added value for innovation, involving subsidies for research, training, maintenance of regulatory systems, support for intellectual property and policies that address social challenges specific to the sector [11]. On the other hand, in the public sector, public policies can address strategic management for innovation, strengthening internal organisational innovation capabilities, which may require changes in governance and actions to promote innovation [12]. The study of innovation in government contexts draws from three complementary theoretical perspectives that collectively explain how and why public organizations innovate.

Public Value Theory (PVT) [13,14] represents a paradigm shift from traditional bureaucratic models to value creation for citizens. Moore's [15] framework positions public managers as strategic actors who must identify opportunities to enhance societal well-being through innovative approaches. This perspective emphasizes that innovation should not be measured solely by efficiency gains, but by its ability to create tangible public value. Practical applications of this theory can be seen in initiatives like participatory budgeting schemes, where citizen engagement in fiscal decisions has led to more responsive public spending [13]. However, implementing PVT faces challenges in measurement, as traditional performance indicators often fail to capture qualitative improvements in governance quality and citizen satisfaction [16].

Open Innovation in Government, adapted from private sector models [6], explains how public institutions can leverage external knowledge and collaboration. This approach has manifested in various methodologies:

- Innovation labs that serve as experimental spaces for prototyping new services [17].
- Crowdsourcing platforms that tap into collective intelligence for problem-solving [18].
- Regulatory sandboxes that allow safe testing of novel policy approaches [3].

The adoption of these methods faces organizational barriers, particularly in traditional bureaucratic cultures [1]. Successful implementation often depends on middle managers who can navigate institutional constraints while championing innovative practices [4].

Contemporary Perspectives on Collaborative Governance [12,19] explain how networked approaches to public problem-solving have become essential for addressing complex challenges. These studies highlight how multi-stakeholder partnerships combine diverse resources and expertise, as demonstrated in cases like the EU's Urban Innovative Actions program [12]. The OECD [9] further emphasizes that such collaborative models require careful design to overcome power asymmetries and coordination costs. These theoretical perspectives collectively reveal an evolution in public administration - from hierarchical, rule-based systems toward more open, participatory, and experimental governance models (Section 2.2) and the development of our integrated framework (Section 2.3).

2.2. Critical analysis of public innovation literature

The academic discourse on public sector innovation has evolved through several distinct phases, reflecting broader changes in governance paradigms and societal expectations.

The transition from New Public Management (NPM) to Digital-Era Governance marks a fundamental shift in innovation approaches. While NPM focused on market-inspired efficiency [20], contemporary models emphasize agility, user-centered design, and technological enablement [21]. This evolution is evident in the rise of mission-oriented innovation policies that address grand challenges like climate change and public health [22].

A central tension in the literature concerns the relationship between Open Government and Open Innovation. While both emphasize transparency and participation, they serve different purposes:

- Open Government prioritizes accountability through mechanisms like open data portals and freedom of information laws [23].
- Open Innovation focuses on solution development through methods like co-creation workshops and innovation challenges [7].

Open innovation is defined as the process of integrating external ideas, resources, and knowledge into organizational innovation practices, encouraging organizations to leverage a broader range of expertise and perspectives. For instance, a government agency may collaborate with private tech firms and community organizations to develop a mobile app that improves public service delivery, thereby incorporating user feedback and external innovations. In contrast, open government prioritizes transparency and citizen engagement in governance, aiming to create an accountable environment where citizens can actively participate in decision-making. Together, these concepts enhance public sector performance and promote innovative solutions to complex challenges, making them essential for effective governance [9,24].

This distinction becomes crucial when designing innovation initiatives. For instance, Brazil's public innovation ecosystem demonstrates how both approaches can complement each other - using transparency platforms to build trust while running innovation labs to develop better services [25].

The literature identifies persistent challenges that align with our framework's dimensions:

1. Cultural barriers - Many public organizations maintain risk-averse cultures that resist experimental approaches [2].
2. Measurement difficulties - Existing frameworks struggle to assess the impact of innovation on public value creation [26].
3. Scalability issues - Successful pilots often fail when expanded to system-wide implementation [27].

Emerging trends point toward greater integration of behavioral insights and digital technologies in public innovation processes, as seen in the proliferation of nudge units and AI applications in government services.

2.3. Conceptual framework for public sector innovation

Among the various objectives and results associated with innovation in the public sector are improvements in the efficiency and quality of the services provided to the private sector, thus promoting innovation in the latter. It also aims to guarantee essential public values, such as transparency, standardisation, impartiality, security and reliability, while addressing complex social challenges. In this context, the public sector faces more complex and diverse challenges compared to the private sector [24,28]. Thus, it becomes necessary to closely examine the many facets of innovation in the public sector, since it must be understood as a comprehensive phenomenon that involves multiple actors and evolves through different phases [3].

Building on this theoretical and empirical foundation, we propose an integrated framework that addresses the core challenges of innovating in public sector contexts. The framework identifies four interdependent dimensions that shape innovation outcomes:

1. Strategic Foundations
   The political and legal environment that enables or constrains innovation, including:
   - Legal frameworks for experimental governance [3], particularly regulatory sandboxes.
   - Cross-sector partnership models [12] that facilitate knowledge exchange.
   - Mission-oriented policy design [22,29].
2. Organizational Capabilities
   The internal capacities that public institutions need to innovate effectively:
   - Adaptive leadership that balances risk management with experimentation [4].
   - Employee competencies in hybrid methodologies [30].
   - Resource allocation for experimentation and sustained innovation [16].
3. Methodological Toolkit
   Practical approaches for implementing innovation:
   - Living labs for service co-creation [31].
   - Design sprints for rapid prototyping [30].
   - Digital enablers: AI governance tools [32].
4. Evaluation Systems
   Based on [26] and [13], we identify mechanisms to assess and improve innovation efforts:
   - Outcome-based metrics (beyond traditional efficiency measures).
   - Continuous learning processes embedded in project cycles.
   - Citizen feedback multichannels.

The framework emphasizes four key tensions that innovation managers must navigate:

- Stability versus experimentation [20].
- Standardization versus customization [21].
- Short-term results versus long-term transformation [29].
- Top-down direction versus bottom-up participation [3].

To operationalize this framework, we systematically evaluate how each dimension addresses the three persistent challenges identified in public sector innovation (cultural barriers, measurement gaps, and scalability issues). As Table 1 demonstrates, the framework's interdependent dimensions exhibit differential but complementary impacts: while organizational capabilities are pivotal for cultural transformation [4], strategic foundations prove most critical for scalability [12,22], and methodological tools coupled with evaluation systems jointly resolve measurement challenges [26,30].

This diagnostic matrix moves beyond theoretical abstraction by:

1. Quantifying dimension-specific effectiveness (High/Moderate impact),
2. Revealing necessary combinatorial strategies (e.g., Canada's KPIs [4] require methodological tools [31] to prevent gaming), and
3. Providing empirical anchors through internationally validated cases [3,4,12].

This matrix provides a diagnostic tool for public managers by correlating innovation challenges with the framework's dimensions. Three key patterns emerge:

First, cultural transformation requires synergistic interventions across:

- Organizational capabilities to develop risk-tolerant leadership (e.g., Denmark's MindLab retrained 80 % of managers through immersive programs [4]),
- Methodological tools that institutionalize experimentation (e.g., La 27e Région's co-creation workshops that reframe failure as learning [31]), and
- Evaluation systems that incentivize behavioral change (e.g., Canada's "acceptable failure rate" KPIs [4], though these require complementary training to prevent metric manipulation [4]).

Second, measurement solutions demand:

- Methodological tools for agile data capture (e.g., UK's Design Sprints embedding real-time user feedback loops [30]),
- Evaluation systems that assess multidimensional outcomes (e.g., Singapore's public value scorecards tracking both efficiency and equity [26]).

Third, scalability success depends on:

- Strategic foundations creating policy enablers (e.g., EU's Urban Innovative Actions program providing €372 M for cross-border replication [12]),
- Digital tools that standardize implementation (e.g., Brazil's LabVida platform codifying health innovations for national rollout [32]).

The framework's power lies in identifying which combinations work best for specific contexts – for example, cultural change fails if evaluation systems incentivize risk-taking without methodological tools to make experimentation safe [4,31].

Practical applications of this framework are evidenced in several internationally recognized cases documented in the literature [3,9,13]:

- The UK's Government Digital Service exemplifies the framework's strategic foundations dimension, having transformed online public services through rigorous user-centered design methodologies [23], while maintaining compliance with regulatory requirements [3].
- Denmark's MindLab demonstrates successful organizational capability building, having institutionalized cross-ministerial innovation through adaptive leadership structures [4] and continuous learning processes [19].

Table 1
Framework dimensions' capacity to address public sector innovation challenges.

Challenge	Strategic Foundations [3,12,22,29]	Organizational Capabilities [4,16,30]	Methodological Toolkit [30–32]	Evaluation Systems [13,26]
Cultural Barriers * [2]	Moderate (Risk-averse cultures can resist experimental approaches [2]	High (Leadership training [4] and team restructuring transform mindsets)	Moderate (Co-creation in Living Labs [31] builds trust incrementally)	Moderate (Canada's "acceptable failure" KPIs [4] reward risk-taking, directly countering aversion [2])
Measurement Gaps [26]	Moderate (Legal frameworks enable data-sharing [3])	Moderate (Analytics training improves measurement [30])	High (Design sprints [30] embed real-time user feedback as metrics)	High (Public value metrics replace efficiency KPIs [13])
Scalability Issues [27]	High (Mission-oriented funding [22] and sandboxes [3] enable scaling)	Moderate (Resource allocation teams [16] support expansion)	Moderate (Digital platforms [32] standardize scaled solutions)	Moderate (Learning loops [26] identify scaling bottlenecks)

Notes: **High**: (primary solution); **Moderate**: (supporting solution).
* Policy frameworks must be locally adaptable to enable cultural sensitivity [5,22]. Cultural adaptation scores "Moderate" on individual dimensions but requires their combined application for global scalability [5].

- Singapore's Smart Nation initiative illustrates effective scaling mechanisms from the evaluation systems dimension, systematically transitioning pilot projects to system-wide implementations [26] while incorporating citizen feedback channels [31].

For researchers, the framework identifies critical knowledge gaps, particularly regarding:

- The long-term institutionalization of innovation practices, particularly the sustainability of innovation labs beyond initial funding cycles [17,27].
- Cultural adaptation of innovation methods across different governance contexts, including how organizational culture mediates implementation success [2,5].
- The role of political leadership in sustaining innovation agendas across electoral cycles, especially the role of middle managers as innovation champions [4] and the impact of mission-oriented policies [22].

These research priorities align with a call for more comparative studies on innovation governance [9] and an emphasis on understanding contextual factors in public sector innovation [21]. The framework provides a structured approach for investigating these gaps while maintaining focus on public value creation [10,13].

This conceptual model provides public managers with a structured approach to diagnosing innovation challenges and selecting appropriate strategies while maintaining focus on creating public value. Its systemic perspective helps avoid common pitfalls like overemphasizing technological solutions at the expense of organizational and cultural factors.

Future research should build on this framework to develop more nuanced understanding of how different innovation approaches can be adapted to various policy domains and organizational contexts.

3. Methodology

This study adopts an exploratory literature review approach to investigate collaborative and integrative methodologies applied to open innovation in the public sector. The review aims to identify key challenges, effective strategies, and gaps in the existing literature, providing a comprehensive understanding of how open innovation can be implemented in diverse public sector contexts.

3.1. Search strategy

The literature search was conducted using the following combinations of keywords, connected by Boolean operators:

✓ "public administration" AND "open innovation"
✓ "governance" AND "public policies"
✓ "strategy" AND "public sector"
✓ "open innovation" AND "governance"

The search was limited to articles published between 2003 and 2024 to ensure the inclusion of recent and relevant studies. Additionally, the search was expanded to include gray literature, such as reports and case studies from institutional repositories, to capture practical insights and real-world applications. The following databases and sources were consulted:

✓ Scopus, Web of Science, and Emerald Insight for peer-reviewed articles.
✓ ENAP (National School of Public Administration), INET (Institute for New Economic Thinking), and NISPAcee (Network of Institutes and Schools of Public Administration in Central and Eastern Europe) for institutional reports.
✓ Ghent University Academic Library, STORRE (University of Stirling Institutional Repository), Theseus, SEER (Electronic Journal Publishing System), VGTU Press, ResearchGate, Internet Archive Scholar, and Academia.edu for additional academic sources.

3.2. Inclusion and exclusion criteria

Articles were included based on the following criteria:

✓ Relevance: The study must address themes of open innovation, public sector innovation, or governance.
✓ Source Quality: The study must be published in peer-reviewed journals or reputable institutional sources.
✓ Contribution: The study must provide empirical data, case studies, or theoretical frameworks that enhance the understanding of open innovation in the public sector.
✓ Focus: The study must focus on collaborative methodologies, such as Innovation Labs (I-Labs) and Living Labs.

Articles were excluded if they:

✓ Did not directly address open innovation or public sector innovation.
✓ Lacked empirical or theoretical contributions.
✓ Were published in non-peer-reviewed sources without significant academic or practical relevance.

3.3. Selection process and data analysis

The initial search yielded 156 articles, which were screened based on titles and abstracts. After applying the inclusion and exclusion criteria, 57 articles were selected for full-text review. These articles were analyzed using a content analysis approach, which involved the following steps, depicted in Tables 2 and 3:

Table 2
Thematic analysis of open innovation in the public sector.

Coding Theme	Description of Correlation	Correlated References
Challenges to Open Innovation	Articles discussing barriers such as conservative organizational cultures, insufficient resources, and inadequate training.	[2,6,7,12,15,17,18,24,32,36,37,42,44,47,49,51,53,55,56]
	Case studies and reports highlighting specific challenges in different geographic and organizational contexts.	[1,4,5,9,10,14,19,20,22,23,25–27,29,30,33–35,38–41,43,45,46,48,50,52,54,57]
Collaborative Methodologies	Articles exploring methodologies such as Innovation Labs (I-Labs), Living Labs, design thinking, and digital platforms.	[3,8,11,13,16,21,28,31,39,40–52]
	Reports and studies describing the practical application of collaborative methodologies in different contexts.	[1,2,4–7,9,10,12,14,15,17–20,22–27,29,30,32–38,53–57]
Cultural Influences	Articles analyzing the impact of cultural and organizational differences on the adoption of open innovation practices.	[2,6,7,12,15,17,18,24,32,36,37,42,44,47,49,51,53,55,56]
	Studies emphasizing the importance of adapting innovation methodologies to specific cultural contexts.	[1,4,5,9,10,14,19,20,22,23,25–27,29,30,33–35,38–41,43,45,46,48,50,52,54,57]

Table 3
Categorization of open innovation themes in public sector.

Categorization Theme	Description of Correlation	Correlated References
Barriers to Open Innovation	Articles identifying challenges such as resistance to change, lack of resources, and bureaucratic complexity.	[2,6,7,12,15,17,18,24,32,36,37,42,44,47,49,51,53,55,56]
	Case studies illustrating specific barriers in different countries and sectors.	[1,4,5,9,10,14,19,20,22,23,25–27,29,30,33–35,38–41,43,45,46,48,50,52,54,57]
Effective Methodologies	Articles evaluating the effectiveness of methodologies such as I-Labs, Living Labs, design thinking, and digital platforms.	[3,8,11,13,16,21,28,31,39–52]
	Reports describing the successful implementation of collaborative methodologies in real-world contexts.	[1,2,4–7,9,10,12,14,15,17–20,22–27,29,30,32,33–38,53–57]
Cultural and Organizational Adaptations	Articles discussing the need to adapt innovation practices to different cultures and organizational structures.	[2,6,7,12,15,17,18,24,32,36,37,42,44,47,49,51,53,55,56]
	Studies emphasizing the importance of intercultural competencies and adaptive governance for open innovation.	[1,4,5,9,10,14,19,20,22,23,25–27,29,30,33–35,38–41,43,45,46,48,50,52,54,57]

✓ Coding: Articles were coded based on key themes, such as challenges to open innovation, collaborative methodologies, and cultural influences.

✓ Synthesis: The findings were synthesized to identify common patterns, emerging trends, and gaps in the literature.

✓ Categorization: The selected articles were categorized into thematic groups, such as "Barriers to Open Innovation," "Effective Methodologies," and "Cultural and Organizational Adaptations."

3.4. Characteristics of the literature

The reviewed literature encompasses a diverse range of contexts, including local and national governments, developed and developing countries, and various organizational cultures. Key themes included the role of Innovation Labs (I-Labs) and Living Labs in fostering innovation, the impact of cultural differences on innovation adoption, and the importance of adaptive governance.

4. Results: Challenges and barriers to open innovation in the public sector

As mentioned above, the literature review has identified several persistent challenges in the implementation of open innovation practices in the public sector:

1. Cultural barriers - Many public organizations maintain risk-averse cultures that resist experimental approaches [2].
2. Measurement difficulties - Existing frameworks struggle to assess the impact of innovation on public value creation [26].
3. Scalability issues - Successful pilots often fail when expanded to system-wide implementation [27].

It seems that a proactive stance is in need in order to effectively implement and promote the adoption of such practices. In this section, the main ideas advanced by the literature concerning the barriers to its adoption are synthesized. Overall, the literature suggests that open innovation is important and that the main bottlenecks, which impede a more effective implementation, revolve around the themes of culture, collaboration and regulatory efforts, and that a comprehensive approach to these themes will ultimately address the main identified challenges. The literature also suggests that there is an ongoing work and action on these themes and that much is yet to be done, particularly concerning scalability issues.

The literature reveals three systemic implementation challenges: (1) Cultural barriers, exemplified by MindLab's 18-month leadership training to overcome risk-aversion in Danish bureaucracies [13] and Canada's 67 % employee resistance to unsanctioned experimentation [4]; (2) Measurement gaps, evidenced by the UK Government Digital Service's need for custom civic trust metrics [32] and OECD findings that 72 % of agencies lack tools to quantify innovation ROI [9]; and (3) Scalability failures, demonstrated by Brazil's LabVida health project stalling nationally despite local success [25] and France's La 27e Région achieving only 22 % institutionalization of co-created solutions [33]. These data points underscore how quantitative deficits (67–72 % indicators) and qualitative mismatches (18-month adaptations, 22 % scaling rates) collectively hinder open innovation institutionalization.

Open innovation has the potential to generate substantial value for companies, public organizations, and society at large by leveraging a broad spectrum of external resources and knowledge. However, both global companies and public organizations encounter challenges in harnessing open innovation due to cultural and institutional differences across regions. In this context, public organizations must cultivate intercultural competencies and implement effective communication strategies to execute open innovation practices successfully [34]. For example, the Impact Canada Initiative has successfully utilized a challenge-based approach to overcome institutional barriers by fostering cross-sector collaborations in various domains, including health and clean energy [3].

Three primary barriers to the adoption of open innovation have been identified: conservative organizational culture, lack of resources, and inadequate employee training. Addressing these barriers necessitates a proactive role from the government in fostering open innovation. Specifically, governments must establish a conducive regulatory environment and invest in training programs that equip employees with the essential skills needed to implement open innovation effectively. This

underscores the importance of government support in overcoming internal resistance and facilitating the adoption of innovation [4].

To tackle these challenges, leaders must adopt targeted strategies that recognize the unique contexts of their institutions. For local governments, fostering a culture of innovation through training programs and workshops can significantly enhance employee engagement and reduce resistance to change. For instance, initiatives like La 27e Région in France highlight the importance of embedding teams within local administrations to co-create solutions, thereby improving public health outcomes and community engagement [33].

To effectively promote open innovation in the public sector, it is essential to adopt comprehensive and diverse innovation policies that encompass not only the creation of new technologies but also their diffusion and adoption by society as a whole. The organizational diversity within bureaucratic institutions significantly influences the success or failure of innovation policies, aligning with established theories that highlight the importance of adaptive governance in complex environments [35]. Furthermore, the dynamics of collaboration between the public and private sectors, along with the structure of these partnerships, are critical determinants of how various types of bureaucratic innovations emerge and function, as supported by recent literature on multi-level governance [9].

Conversely, national governments should prioritize creating flexible regulatory frameworks that facilitate collaboration between public and private sectors, tailoring their strategies to regional contexts. In developed countries, leveraging technological advancements can expedite the innovation process, while in developing nations, emphasizing co-creation with local communities ensures that solutions are tailored to specific social challenges. This tailored approach avoids a "one-size-fits-all" strategy, allowing for more effective solutions in diverse contexts [36].

The next section explores the main findings concerning the implemented mechanisms of open innovation that are a response to the difficulties encountered in the adoption and implementation of open innovation in the public sector.

5. Results: Main mechanisms of open innovation in the public sector

In open innovation, public innovation and e-governance need to be understood together and comprehensively in order to understand how government organisations can respond to society's challenges. It should be noted here that in terms of the public service, this process is still restricted by normative and regulatory issues. Furthermore, enabling an open innovation approach requires a paradigm shift from top management and flexibility in adjusting to organisational rules.

However, despite these restrictions, various approaches have been adopted and various forms of open innovation have been implemented. The following sections identify and briefly describe these new forms.

5.1. I-Labs

With the focus on endogenous government innovation, the emergence of innovation labs (I-Labs) stands out, mainly covering innovative functions in political institutions, procurement and organisational services. Innovation labs present themselves as open innovation and user tools designed in a public context [37,38].

The aim is to break the historical tendencies of an insular and predominantly regulatory structure of the state (with an excessive focus on control mechanisms) and make it a facilitator in building complex solutions in a networked approach [21,35,39,40].

In general, I-Labs have been set up to enable interdisciplinary and citizen-orientated approaches [41], producing much of their work jointly or targeting ministerial departments and other government agencies. This is because the public sector largely funds their activities [42]. I-Labs work by bringing together various institutionalised resources, including academic, political, industrial and commercial, juxtaposing these resources in unique policy packages. The policy innovation I-lab can be defined as an experimental laboratory for solving the social problems and public issues that plague governments, located at the interstitial boundaries between sectors, fields and disciplinary methodologies [27].

The focal concerns of I-Labs include health, urban governance, education, citizen engagement in public services and government innovation. The labification of public and social policy and governance is significant in bringing particular scientific forms of methodological and technical knowledge to the policy process, while ostensibly avoiding the politics, values and ideology of conventional policymaking [27].

Mindlab in Denmark and Nesta in the UK are examples of I-Labs that consciously operate under different rules to typical public service organisations: they are small organisations with low levels of funding and diverse funding sources, and are usually involved in short-term projects, relatively far from political leadership [39].

Innovation labs (I-Labs) such as MindLab in Denmark and Nesta in the UK exemplify successful applications of open innovation within public administration. MindLab has facilitated collaboration between government agencies, academia, and citizens, leading to improved public policies in areas such as urban governance and health [39]. Similarly, Nesta has contributed to significant advancements in public sector innovation by implementing design thinking methodologies, resulting in enhanced citizen engagement and the development of new service models [41]. These I-Labs not only foster interdisciplinary approaches but also demonstrate the effective integration of user feedback in policy-making processes, thereby addressing complex social challenges more efficiently [42].

Innovation labs (I-Labs) such as MindLab in Denmark and Nesta in the UK have made significant contributions to public administration by implementing innovative practices that enhance citizen engagement and service delivery. MindLab, for instance, has collaborated with various governmental departments to develop solutions that resulted in a 25 % increase in public satisfaction regarding urban development projects [39]. Similarly, Nesta's initiatives have led to the successful launch of over 100 new public services, achieving a 30 % improvement in efficiency by utilizing design thinking methodologies [41]. These I-Labs exemplify how targeted innovation can address complex social issues while fostering a more participatory governance model.

5.2. Living labs

Living Labs are practice-oriented organisations that promote open and collaborative innovation, as well as real-life environments and arenas where both open innovation and user innovation processes can be studied and experimented with, and where new solutions are being developed. This unique resource allows the Living Lab to generate concrete and tangible innovations based on the contributions of users and communities, while at the same time advancing the (academic) understanding of the principles and processes of open and user innovation [42].

Living Labs are defined as an environment and approach characterised by five main principles: value (delivered to all participating stakeholders), sustainability (of the Living Lab organisation), influence (of the participating stakeholders on the outcome of the innovation), realism (integration of the real-life context into the innovation process) and openness (to input from different stakeholders) [43].

Living Labs are also defined as: 'physical regions or virtual realities, or spaces for interaction, in which stakeholders form public-private partnerships (4Ps) of companies, public bodies, universities, users and other stakeholders, all collaborating to create, prototype, validate and test new technologies, services, products and systems in "real life" contexts' [44].

La 27e Région (France) works with regional governments in France, applying design thinking and user-centered methodologies to address

policy challenges. La 27e Région has a distinct approach of embedding teams within local administrations for extended periods to better understand problems and co-design solutions with stakeholders. Its projects span sectors such as education, urban planning, and social welfare [33].

Living Labs, such as La 27e Région in France, have significantly influenced public administration by applying user-centered design methodologies to address policy challenges. For instance, La 27e Région embedded teams within local administrations, resulting in a 30 % increase in citizen engagement in urban planning initiatives [33]. Another example is the Helsinki Living Lab in Finland, which has successfully tested over 50 urban innovations, including smart traffic solutions, leading to a reported 15 % reduction in traffic congestion [44]. These labs demonstrate how collaborative environments can yield tangible benefits, enhancing public services while fostering innovation through active stakeholder involvement.

5.3. I-Labs vs living labs

While I-Labs focus on the problem and the definition of ideas, Living Labs concentrate on methodology and the generation of knowledge. I-Labs are more agile and volatile due to their considerably smaller size and relative independence, while Living Labs have a more formal and stratified organisation due to the multidisciplinary of the participants. Another difference to be highlighted is that I-Labs are centred on the expertise of the initiators, with the aim of attracting ideas and solutions for public service, while Living Labs develop the expertise inherent in end users into real-life everyday experiences [42].

I-Labs and Living Labs have made significant contributions to successful public sector innovations, employing distinct strategies across local and national governments in both developed and developing countries. For instance, local I-Labs in developed nations, such as the UK, typically rely on expert insights to generate solutions, utilizing agile methodologies to implement rapid improvements in public services. This approach often leads to enhanced efficiency and technological innovation, resulting in substantial citizen engagement [45]. In contrast, Living Labs in developing countries prioritize co-creation with end users, focusing on developing solutions that directly address complex social challenges and community needs [33]. This adaptive structure enables Living Labs to experiment with solutions in real-world contexts, allowing for greater flexibility and responsiveness. Together, these dual approaches foster a rich exchange of knowledge and practices, ultimately enhancing public administration's ability to adapt to diverse challenges.

An increasing number of governments worldwide are using innovation labs (iLabs) and Living Labs to develop and test new interventions in the public sector. In Australia, the Digital Transformation Agency (DTA) serves as a center of excellence for digital solutions, while Canada, through the Impact Canada Initiative, adopts a challenge-based approach to promote innovation in areas such as health and clean energy [3]. The case of Recife, Brazil, exemplifies the success of Living Labs with the Living Health Laboratory (LabVida), which co-created solutions for public health in collaboration with professionals and users [36]. In Portugal, Living Labs, such as those in Aveiro and Coimbra, are recognized as important tools for public innovation, despite challenges related to resources and coordination [31].

5.4. Other mechanisms

In addition to iLabs, there are other possible mechanisms that are widely used in private companies, but which could also be used in a public context to promote innovation.

Meet ups are face-to-face or virtual gatherings where people with common interests come together to share knowledge, learn from each other and build relationships. These meetings are a powerful way of creating connections and fostering innovation in specific communities. They present themselves as a tool for strengthening the network of relationships within ecosystems and promoting collaborative innovation [46].

The brainstorming technique is a creative tool that aims to generate ideas and solutions from the collective contribution of participants. It is an approach that is widely used in various areas, from solving problems in teams to generating new products and services [47]. Brainstorming is one of the best-known and most widely used techniques for generating innovative ideas in organisations.

A systematic review and synthesis of literature on human-centred design (HCD) as an approach to social innovation identified four main areas of focus for HCD in social innovation [48]: (1) user involvement; (2) interdisciplinary collaboration; (3) experimentation and prototyping; and (4) adopting an iterative approach. The study emphasises the importance of stakeholder participation and diversity in the approach to meeting the complex and global challenges faced by today's society. Thus, human-centred design seeks to develop solutions to complex problems from a user-centred perspective, taking into account their needs and experiences.

Design thinking is an approach that aims to deeply understand user needs and generate innovative solutions based on this understanding. On the other hand, design sprint is an innovation methodology that uses design thinking in an intensive five-day process in which a multidisciplinary group works together to develop solutions to a specific challenge. These approaches have proven effective in fostering innovation in various sectors, including business and government, but they must be adapted to the reality of each case and require commitment from the leadership and others involved in the process [30].

In addition to design thinking, open innovation, agile immersion, lean startups, hackathons and regulatory sandboxes have emerged as powerful tools that can be useful for innovation in the public sector. They are rooted in the realisation that innovation is not just about technology, but also about creativity, collaboration and a willingness to learn from failure. These tools and approaches allow public sector organisations to test and iterate new ideas quickly, involve stakeholders in co-creation and build a culture of experimentation and learning [3].

The Agile methodology is based on values such as individuals and interactions, functional software, collaboration with the customer and response to change. These values are implemented through practices such as scrum, kanban and lean, which seek to increase the efficiency and effectiveness of the product and service development process. Adopting this methodology can bring benefits such as faster delivery, greater user involvement, reduced costs and greater flexibility to deal with changes in the project's scope. However, there can also be implementation challenges, such as the need for a more collaborative organisational culture and greater communication between the teams involved. Applying it can be especially useful in managing government projects, which often face problems related to tight schedules, limited budgets and frequent changes in the priorities and needs of the stakeholders involved. By adopting agile practices, it is possible to deal with these challenges more effectively, delivering solutions more quickly and with higher quality. In addition, the methodology can also help improve communication and collaboration between the various bodies and entities involved in public administration, promoting a culture of innovation and transparency [49].

The Lean Startup methodology is an innovative approach that can help government organisations develop more efficient and effective solutions to meet citizens' needs. Implementing this concept can reduce the development time of new projects and products, allowing public managers to test hypotheses in a more agile way and thus reduce the risk of failure. The methodology emphasises constant interaction with clients or users and the continuous adaptation of proposed solutions, allowing government organisations to be more responsive to changes in the environment. However, the implementation of this methodology in governments can face challenges such as resistance to change, lack of resources and the complexity of bureaucratic processes, which require

specific adaptations for the public context [50].

The regulatory sandbox methodology is an open innovation approach that allows governments to test new regulatory solutions in a controlled and limited environment, reducing the risks associated with adopting new public policies. This approach promotes collaboration between government, businesses and citizens, and can lead to more efficient and innovative solutions to the challenges faced by public administration. However, for it to be successful, it is important that there is a clear establishment of objectives, a transparent process for selecting and monitoring projects, as well as guarantees of legal certainty and protection of citizens' interests. In addition, it is crucial to determine a limited period for the duration of the tests and define clear criteria for entering and leaving the programme [51].

In the fintech sector, for example, the United Kingdom was one of the first countries to implement a regulatory sandbox in 2016, aimed at encouraging innovation in financial services. Since then, other countries, such as Australia, Canada, Singapore, and Malaysia, have also adopted this approach [52].

The Mexican regulatory sandbox program, launched in 2019, aims to foster financial innovation, allowing companies to test solutions in a controlled environment under National Banking and Securities Commission (CNBV) supervision. Brazil followed in 2020, with a similar program led by the Central Bank, though with a narrower regulatory scope and more complex application process. In Colombia, the 2020 sandbox, supervised by the Financial Superintendency, focuses exclusively on fintech companies, offering even more limited scope compared to Brazil [53].

5.5. Digital platforms

Digital platforms are systems that connect different stakeholders to create value, both in the public and private sectors. These systems act as intermediaries between producers and end users, enabling, in the case of businesses, the creation of new markets and business models. Business ecosystems, in turn, are made up of a set of interconnected agents that collaborate to create and distribute value for their members and for the ecosystem as a whole, including government entities, civil society organisations and the private sector. Digital platforms are often the technological basis of these ecosystems, enabling efficient coordination and collaboration between their members, which is key for the public sector in providing services and interacting with citizens. They enable the connection of different stakeholders, such as governments, citizens and companies, and can thus lead to innovation through the co-creation of value. Digital platforms and business ecosystems are powerful tools for driving innovation and organisational growth in the public sector. Public organisations can be proactive in looking for opportunities to connect and collaborate with other stakeholders in order to maximise the potential of these emerging technologies. Innovation through platforms and ecosystems seems to be an imperative for public organisations seeking to meet the demands of society in an increasingly connected and digital world [46].

Digital government platforms are virtual environments that allow innovative companies and startups to present solutions to government agencies directly and efficiently. The platform methodology has the potential to foster organisational innovation within the public context, allowing for greater collaboration between the public and private sectors. However, there are still challenges to be faced, such as the need for greater transparency and standardisation in evaluating the solutions presented [45].

Consistent with prior classifications [32], three main types of digital government platforms can be identified: 1) interaction platforms, which aim to improve communication and interaction between citizens and government; 2) service platforms, which provide online services for citizens; and 3) collaboration platforms, which enable collaboration between different government agencies and stakeholders. The aim of digital government platforms is to improve efficiency, transparency and citizen participation in public management, as well as promoting innovation and collaboration between government agencies and other stakeholders. The design and usability of digital government platforms are essential to ensure their effectiveness and acceptance by users [32].

Government digital platforms have become key drivers of innovation in public service delivery. For example, Gov.uk in the UK centralizes services like tax payments and license applications, improving accessibility and efficiency [45]. Similarly, Service Canada offers access to benefits and pensions through a unified online portal, while SingPass in Singapore provides secure access to services across various sectors, from taxes to healthcare [32]. Australia's MyGov integrates healthcare, welfare, and tax services, streamlining public administration through digital innovation. These platforms exemplify how governments are transforming service delivery through technology [32,45].

Digital government platforms, such as Pitch.gov in the U.S. and Business.gov.au in Australia, facilitate collaboration between public and private sectors by lowering barriers for startups and promoting organizational innovation. These platforms enable companies to present solutions directly to government agencies, although challenges like the need for inclusivity and active participation from relevant agencies persist. Programs like the Small Business Innovation Research (SBIR) and Challenge.gov further illustrate how digital platforms can address specific problems while enhancing efficiency and citizen engagement [32,45].

6. Conclusion

The rigid, bureaucratic, and hierarchical nature of public institutions often acts as a limiting factor to the development of dynamic co-creation environments that promote experimentation, risk-taking, and innovation [1,54]. Normative and regulatory constraints further complicate these processes, requiring a paradigm shift in leadership mindsets and greater organizational flexibility to adopt open innovation effectively [4,2].

This study highlights three key contributions to the literature on open innovation in the public sector:

Comprehensive Analysis of Barriers: Our review identifies persistent challenges—such as conservative cultures, resource scarcity, and bureaucratic inertia—while offering actionable insights into overcoming them. For instance, adaptive governance models and cross-sector collaboration (e.g., through Innovation Labs) can mitigate these barriers [17,27,55].

Methodological Insights: We assess the effectiveness of collaborative approaches like I-Labs (e.g., MindLab, Nesta) and Living Labs (e.g., La 27e Région), demonstrating their role in fostering innovation across diverse contexts [13,31,56]. These methodologies bridge gaps between stakeholders, enabling prototyping and user-centric solutions in real-world settings [43].

Future Research Directions: Critical gaps remain, particularly in addressing cultural disparities in risk tolerance [30] and the related issue of adapting open innovation to different national contexts. Future studies should explore:

- Strategies to institutionalize experimentation in bureaucratic settings [19].
- The long-term scalability of I-Labs and Living Labs [27].
- The role of intercultural competencies in public-sector innovation [2,5].

The evolution of networked governance [12,57]—particularly the tension between bricolage (incremental adaptation of existing systems) and breakthroughs (transformative innovation)—highlights the diverse pathways for public sector innovation. As [57] demonstrate, this duality reflects both the pragmatic constraints of bureaucratic settings and the potential for systemic change when experimental approaches are strategically combined with institutional support.

End-user participation [18] and evidence-based policymaking [9] further underscore the need for flexible, inclusive frameworks that balance these approaches. However, success hinges not only on structural adaptability but also on transparent criteria for policy experimentation [3] and legal safeguards to mitigate risks for stakeholders [22].

Open innovation in the public sector demands policies that balance technological advancement with societal adoption [29], leveraging organizational diversity and cross-sector partnerships [7]. By addressing these dimensions, future research can help build more agile and responsive public institutions [21].

The literature presents various potential methodologies and practices for leveraging innovation as a tool for creating value in the public sector [26]. However, it is essential to take cultural differences into account and adapt methodologies to ensure their effectiveness in different organisational innovation contexts [2]. In the public sphere, resistance to change, scarcity of resources, and bureaucratic complexity are significant barriers to the adoption of innovative approaches [1,19].

CRediT authorship contribution statement

Letícia Brilhante: Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Fernando Romero:** Writing – review & editing, Validation, Supervision, Methodology, Funding acquisition.

Declaration of competing interest

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

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Data availability

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

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