

Living Labs as an Instrument for Activating Transformative Demand: The Potential of Slovak Cities in the Context of Innovation Ecosystems

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Extended Abstract

1. Introduction

Urban territories are increasingly exposed to complex, interdependent environmental, social, economic, and technological challenges that require systemic and integrative governance responses. Climate transition, digital transformation, demographic change, energy transition, and social inclusion generate pressures that transcend sectoral policy models and demand experimental and adaptive approaches to innovation governance. Innovation policy has consequently evolved from linear, supply-driven models toward systemic, mission-oriented, and demand-side approaches that emphasize societal engagement and co-creation (Edler & Georghiou, 2007; European Commission, 2018).

Within this context, Living Labs (LL) have emerged as participatory and experimental governance instruments enabling collaborative innovation in real-life environments (Bergvall-Kåreborn et al., 2009; Schuurman et al., 2016). By integrating public authorities, universities, firms, civil society, and end-users, Living Labs operationalize the quadruple helix model of innovation (Carayannis & Campbell, 2009; Arnkil et al., 2010). They function as intermediary platforms combining socio-technical experimentation, stakeholder engagement, and policy learning.

This paper conceptualizes Living Labs as instruments for activating transformative demand within regional innovation ecosystems. Transformative demand is understood as articulated societal demand capable of influencing socio-technical trajectories and contributing to structural transformation toward sustainability. The study investigates whether and how Slovak urban environments - shaped by a post-socialist institutional legacy - possess the structural preconditions necessary to embed Living Labs as stable components of territorial innovation systems rather than isolated project-based initiatives.

Three research questions guide the analysis:

1. To what extent do Slovak cities exhibit structural preconditions for Living Lab institutionalization?
2. How can Living Labs activate transformative demand within urban innovation ecosystems?
3. What systemic barriers constrain their long-term sustainability and integration into strategic governance frameworks?

The objective of this paper is to assess whether and how Living Labs can function as institutional mechanisms for activating transformative demand within Slovak urban innovation ecosystems. Beyond empirical mapping, the paper aims to contribute theoretically by linking demand-side innovation policy, regional innovation ecosystems, and adaptive governance within the specific institutional context of post-socialist urban systems. Empirically, it provides a structured comparative assessment of selected Slovak cities, identifying both systemic barriers and latent transformation capacities.

2. Theoretical Framework

The conceptual foundation integrates three complementary strands: regional innovation ecosystems, transformative demand, and socio-technical transitions with adaptive governance.

2.1 Regional Innovation Ecosystems

Innovation processes are territorially embedded within systems of actors and institutions (Lundvall, 1992). Contemporary regional innovation ecosystem approaches emphasize interactive learning, institutional thickness, and place-based specialization (Asheim et al., 2019; Trippel et al., 2019).

The evolution from triple to quadruple helix models highlights the growing role of civil society and users as co-creators of innovation (Carayannis & Campbell, 2009; Arnkil et al., 2010). Within such ecosystems, Living Labs can be conceptualized as operational nodes facilitating cross-sectoral coordination, experimentation, and knowledge exchange (Bergvall-Kåreborn et al., 2009; Schuurman et al., 2016; Almeida & Deutsch, 2025).

Rather than isolated projects, Living Labs represent intermediary governance mechanisms capable of mobilizing latent territorial capacities and strengthening ecosystem connectivity.

2.2 Transformative Demand and Mission-Oriented Innovation

Demand-side innovation policy emphasizes the strategic role of public and societal demand in shaping innovation pathways (Edler & Georghiou, 2007; Lember et al., 2014). Mission-oriented frameworks conceptualize innovation as a systemic response to grand societal challenges (European Commission, 2018).

Transformative demand extends this perspective by focusing on sustainability-oriented societal needs that can reconfigure socio-technical systems. Living Labs create structured environments where such demand can be articulated, tested, and iteratively refined through co-creation (Schuurman et al., 2016; Schuurman et al., 2026; Park, 2025).

They thus bridge bottom-up societal needs with institutional and technological innovation trajectories.

2.3 Socio-Technical Transitions and Adaptive Governance

Urban transformation involves evolutionary reconfiguration of socio-technical regimes (Geels, 2002). Systemic innovation instruments increasingly support these transitions (Smits & Kuhlmann, 2004).

Living Labs contribute to adaptive governance by enabling experimentation, reflexivity, and iterative feedback between stakeholders and institutions (Herth, 2025; Cheshmedjievska et al., 2026). However, their transformative capacity depends on institutional embedding, stable funding, and robust data governance infrastructures.

3. Methodology

The study applies a comparative qualitative case study design focusing on selected Slovak cities. Case selection reflects variation in population size, regional positioning, and innovation capacity.

Data sources include strategic urban development documents, smart city strategies, publicly available project documentation, municipal innovation reports, university - city cooperation initiatives, and secondary analytical materials. Where available, insights from interviews and policy documents were incorporated.

The analytical framework is structured around five dimensions: (1) institutional anchoring, (2) stakeholder engagement intensity, (3) strategic alignment, (4) data and digital infrastructure, and (5) long-term sustainability potential. The goal is not quantitative performance measurement but identification of structural patterns, governance mechanisms, and transformation potential within the Slovak post-socialist context.

4. Findings

The preliminary findings indicate a predominantly project-based and externally funded character of Living Lab-type initiatives. While experimentation activities are visible across analysed cities, institutional stabilization remains limited. The results reveal both systemic fragmentation and significant latent transformative capacity rooted in university ecosystems, civic engagement, and increasing digital maturity.

4.1 Institutional Fragmentation

Living Lab-type initiatives in Slovak cities are predominantly project-based and externally funded, often supported by EU programs. While Bratislava and Košice demonstrate higher institutional capacity due to strong university ecosystems and international exposure, formalized Living Lab institutions remain rare.

Participatory experimentation typically occurs through hackathons, innovation challenges, pilot digital services, participatory budgeting, and temporary urban interventions. Such fragmentation limits continuity, policy learning accumulation, and strategic scaling.

4.2 Stakeholder Engagement and Community Capacity

Despite institutional weaknesses, significant community-driven innovation potential exists. University ecosystems - particularly in Bratislava, Košice, and Žilina - serve as knowledge anchors. Civic tech communities and digital entrepreneurs support bottom-up experimentation.

However, engagement is frequently consultative rather than co-decisional. Feedback loops into formal governance structures remain weak, limiting the translation of transformative demand into structural policy innovation.

4.3 Strategic Alignment and Governance Integration

Strategic urban documents often reference smart city principles and digital transformation agendas. Nevertheless, Living Labs are rarely embedded as systemic governance instruments. Cross-sectoral coordination remains limited, reflecting broader fragmentation within evolving regional innovation systems (Asheim et al., 2019; Trippel et al., 2019).

4.4 Data Infrastructure and Digitalization

Digital capacity is improving, particularly in larger cities. However, open data ecosystems and interoperable digital infrastructures remain underdeveloped. Without robust data governance frameworks, Living Labs cannot fully leverage real-time experimentation, monitoring, and evidence-based evaluation.

Strengthening data architecture would significantly enhance adaptive governance and policy learning capacities.

4.5 Transformative Potential

Despite structural barriers, substantial latent capacities exist:

- strong academic institutions
- increasing digital maturity
- active civic communities
- exposure to EU innovation frameworks
- growing awareness of sustainability transitions

If institutionalized systematically, Living Labs could function as bridging platforms connecting societal demand articulation with technological experimentation and policy learning.

5. Discussion

The Slovak case reflects characteristics typical for post-communist institutional contexts:

- high dependence on external funding
- limited horizontal governance culture
- fragmented policy coordination
- evolving but incomplete digital governance frameworks

Living Labs currently operate primarily as experimental governance instruments rather than institutionalized ecosystem components. Their transformative potential depends on moving from isolated pilots toward systemic integration within urban innovation governance (Almeida & Deutsch, 2025; Schuurman et al., 2026).

Activating transformative demand requires structured co-creation processes and stable demand-side policy mechanisms (Edler & Georghiou, 2007; European Commission, 2018). Three systemic shifts are necessary:

1. Institutional stabilization – permanent urban innovation units embedding Living Lab methodologies.
2. Data governance reform – interoperable and open digital ecosystems supporting experimentation.
3. Strategic embedding – alignment with long-term sustainability missions.

Living Labs may serve as transitional governance mechanisms that gradually reshape institutional routines and strengthen collaborative governance.

6. Implications for Post-Communist Contexts

Although grounded in Slovakia, the findings are relevant for other Central and Eastern European countries facing similar structural challenges. Such contexts often combine strong technical expertise and growing digital sectors with weaker participatory governance traditions. Living Labs can function as institutional learning laboratories that gradually strengthen trust, cross-sectoral coordination, and adaptive governance. Their integration into urban policy may enhance resilience and accelerate alignment with EU sustainability objectives.

7. Conclusion

This paper positions Living Labs as instruments capable of activating transformative demand within regional innovation ecosystems. The analysis reveals a fragmented, yet promising landscape characterized by institutional limitations but significant latent capacities. Living Labs in Slovakia remain predominantly project-based. However, their transformative potential is substantial if embedded within stable institutional frameworks, supported by robust data governance architectures, and strategically aligned with sustainability missions.

By conceptualizing Living Labs as structural components of urban innovation governance rather than isolated projects, the study contributes to broader debates on resilience, adaptive governance, and sustainability transitions in smart cities operating within structurally evolving institutional environments.

The paper contributes to the literature in three ways. First, it conceptualizes Living Labs as instruments for activating transformative demand within regional innovation ecosystems. Second, it provides empirical evidence from a post-socialist urban context that remains underrepresented in Living Lab research. Third, it identifies institutional and governance conditions necessary for moving from experimental pilot initiatives toward systemic integration. These insights are relevant not only for Slovakia but also for other Central and Eastern European cities facing similar structural constraints.

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