

URBAN LIVING LABS IN THE PUBLIC SECTOR: ORGANISATIONAL CONDITIONS AND DEVELOPMENTAL BARRIERS

Wojciech SROKA

University of Agriculture in Krakow; wojciech.sroka@urk.edu.pl, ORCID: 0000-0002-4255-3741

Purpose: This paper aims to examine the development barriers affecting Urban Living Labs (ULLs) initiated by the public sector in Poland. It focuses in particular on how institutional, financial, procedural and social constraints interact and influence the long-term sustainability and scalability of these initiatives within public administration structures.

Design/methodology/approach: The study adopts a qualitative approach combining a review of relevant literature with empirical research conducted in three Polish cities. Eight semi-structured in-depth interviews were carried out with representatives of public administration, academia, business and civil society, reflecting the quadruple helix framework. The interview material was analysed using qualitative content analysis in order to identify key categories of barriers and the relationships between them.

Findings: The findings suggest that barriers to the development of public-sector ULLs are interconnected and mutually reinforcing. The most significant constraints include project-based funding structures, limited managerial autonomy within municipal hierarchies, complex administrative procedures and difficulties in maintaining sustained citizen engagement. Together, these factors weaken institutional embedding and reduce the capacity to scale pilot initiatives beyond the experimental phase.

Research limitations/implications: The research is exploratory and based on a relatively small qualitative sample, which limits the generalisability of the results. Further studies, including comparative and quantitative research, would help validate and refine the identified barrier categories across different institutional contexts.

Practical implications: The results point to the need for simplifying administrative and procurement procedures, strengthening managerial autonomy and developing more stable funding arrangements. Improving cross-sector cooperation frameworks may enhance the effectiveness and long-term impact of Urban Living Labs operating within public structures.

Social implications: Better institutional conditions for ULLs may contribute to stronger citizen participation, increased trust in public institutions and more inclusive forms of urban innovation and governance.

Originality/value: The paper contributes to the ongoing debate on Living Labs by focusing specifically on initiatives embedded in public administration in a Central and Eastern European context. It highlights the systemic nature of development barriers and provides insights relevant to researchers and practitioners working in the fields of urban governance and public-sector innovation.

Keywords: Urban Living Labs; quadruple helix; semi-structured interviews; institutional barriers.

Category of the paper: Research paper.

1. Introduction

Contemporary urban areas are at a turning point where their role as centres of economic and technological development increasingly intersects with growing structural challenges. The accumulation of demographic, environmental and infrastructural processes within limited spatial boundaries generates tensions that call for a reassessment of established governance approaches (Nguyen, Marques, Benneworth, 2022). Traditional hierarchical planning is gradually giving way to more inclusive and democratic models based on the testing of innovations in real social contexts. A key instrument of this shift is the concept of Urban Living Labs (ULLs), defined as platforms for the active co-creation of urban solutions (Bresciani, 2025; Kosoe, Ogwu, 2025). Urban Living Labs function as environments for both co-creation and the validation of innovative solutions in real-life settings. In the literature, ULLs are described as open, user-centred innovation ecosystems whose core principle is the iterative testing of technologies and services under everyday conditions (Schuurman, Tönurist, 2017).

Urban Living Labs constitute specific physical or virtual spaces in which public authorities, private enterprises, research institutions and end users interact in a collaborative framework. The objective of this cooperation is not only the prototyping and validation of new solutions, but above all their embedding in real social and economic contexts (Sroka, Król, Kulesza, Stanuch, Lisek, 2025). This approach represents a practical operationalisation of the quadruple helix model, which integrates the perspectives of four stakeholder groups in order to generate innovations with high social relevance and utility.

The growing interest in Urban Living Labs observed in recent years is reflected in numerous initiatives supported by European Union framework programmes and national policies promoting open innovation models (Mahmoud, Morello, Ludlow, Salvia, 2021). ULLs are increasingly perceived as important instruments fostering the transition towards more inclusive communities and smart growth trajectories. Unlike early technocratic visions of smart cities, which focused primarily on information and communication technologies, the Living Lab concept places stronger emphasis on human and democratic dimensions of urban development (Esposito, Bertello, Mora, Tucek, 2025). It assumes an active role for citizens in the design of urban services, thereby contributing to the development of social capital and trust in public institutions (Esashika, Masiero, Mauger, 2023).

Despite their recognised advantages, the implementation of Urban Living Labs faces a range of organisational and social constraints. One of the most significant barriers to their effectiveness is the lack of institutional durability and the temporary nature of many initiatives, which often operate only within the timeframe of grant-based funding (Leminen, Westerlund, Nyström, 2012). In practice, maintaining genuine user participation also proves challenging, as involvement is frequently limited to testing activities rather than meaningful co-design processes (Schuurman, Leminen, 2021). The literature also points to power asymmetries among

partners and difficulties in integrating Living Lab outcomes into formal urban policies (Willems, Kuitert, Van Buuren, 2023). As a result, embedding the Living Lab approach within smart city strategies has proven more complex than suggested by simplified interpretations of the quadruple helix model (Nguyen, Marques, Benneworth, 2022).

The aim of this article is to identify and analyse development barriers affecting the functioning of Urban Living Labs (ULLs) initiated by the public sector in Poland. The study seeks to map the relationships between individual barriers in order to demonstrate how their interaction influences the functioning of the analysed initiatives. The analysis is based on in-depth qualitative interviews conducted with representatives of academia, business, public administration and civil society, reflecting the key stakeholder groups involved in public-sector innovation initiatives.

2. Theoretical Foundations of Urban Living Labs: Models, Stakeholder Roles and Development Barriers

Urban Living Labs represent a specific form of cross-sectoral collaboration that enables the creation, testing and implementation of innovations in real-life conditions. Their operation is grounded in the assumptions of the quadruple helix model, which integrates four key sectors: academia, business, public administration and civil society. Cooperation among these actors aims not only at the development of new technologies and services, but also at their social validation and adaptation to user needs (Almeida, Deutsch, 2025). Living Labs reshape traditional perceptions of the relationship between science and its practical application by relocating research processes directly into users' everyday environments. Their core principle is co-creation, which reduces the conventional distance between solution developers and end users. In this framework, users assume the role of active co-authors of innovation, allowing new technologies to be better aligned with actual social conditions and the genuine needs of future beneficiaries.

The literature identifies four main governance models of Living Labs, which differ according to the initiating actor and the dominant operational logic (Leminen, Westerlund, Nyström, 2012):

- User-driven, initiated by citizens and local communities and focused on user needs.
- Provider-driven, dominated by technology providers who use Living Labs to test proprietary solutions.
- Utilizer-driven, organised by firms seeking to commercialise innovations and strengthen market competitiveness.
- Enabler-driven, coordinated by public institutions or development agencies that create the conditions and infrastructure for cooperation across sectors.

These models differ in terms of collaboration patterns and the primary objectives pursued within projects. Bottom-up, user-oriented approaches prioritise relationship-building and the strengthening of local communities. Business-oriented models, such as provider-driven and utilizer-driven Living Labs, focus on market efficiency and the rapid commercialisation of innovations. In contrast, laboratories managed by public authorities within the enabler-driven model provide projects with regulatory support and access to municipal structures. In practice, the leading actor largely determines decision-making processes, the actual influence of residents and the availability of financial resources.

Most academic contributions on Living Labs emphasise their well-documented advantages, including inclusiveness, grassroots participation and the capacity to develop solutions tailored to local contexts (Voytenko, McCormick, Evans, Schliwa, 2016; Schuurman, Leminen, 2021). However, implementation challenges receive considerably less attention. Empirical studies nonetheless demonstrate that translating the Living Lab concept into practice generates numerous difficulties (Leminen, Westerlund, Nyström, 2012; Nguyen, Marques, Benneworth, 2022). The literature distinguishes five main categories of barriers, ranging from structural to social.

First, organisational and institutional barriers relate to unclear role allocation, the absence of long-term strategies and the project-based nature of many initiatives. Numerous Living Labs operate as temporary projects dependent on grant funding, which often leads to their discontinuation once funding ends (Leminen, Westerlund, Nyström, 2012). Second, financial barriers stem from the lack of stable funding sources and limited private-sector interest in projects characterised by uncertain returns. High coordination costs and the time-intensive nature of co-creation processes further hinder financial sustainability (Nyström, Leminen, Westerlund, Kortelainen, 2014). Third, technological barriers include the immaturity of tested solutions, difficulties in integrating them with existing urban infrastructure and challenges related to data ownership and intellectual property rights. Insufficient technological support reduces user motivation and constrains the effectiveness of experimental processes (Bulkeley et al., 2016). Fourth, legal and procedural barriers arise from regulatory frameworks poorly adapted to the logic of open innovation. Rigid public procurement procedures, data protection requirements and ambiguities surrounding the co-ownership of results limit the flexibility of Living Labs. A risk-averse administrative culture further complicates the formal implementation of experimental solutions within public institutions (Lupp, Zingraff-Hamed, Huang, Oen, Pauleit, 2020). Finally, social and cultural barriers concern levels of participant engagement and relationships among partners. Users are often treated primarily as testers rather than genuine co-designers of solutions (Voytenko, McCormick, Evans, Schliwa, 2016).

An analysis of these barriers suggests that their significance and intensity vary depending on the organisational context and the dominant actor. In the case of Living Labs embedded within public administration structures, operating predominantly under the enabler-driven model, these barriers assume a particularly pronounced institutional character. This results from

the procedural and hierarchical nature of the administrative environment. Research indicates that such contexts often constrain flexibility and experimentation, generating tensions between formal requirements and the co-creation-based innovation paradigm (Cuomo, 2022; Lupp et al., 2020; Piziak, Bień, Jarczewski, Ner, 2023). As noted by Sofronievska et al. (2025), the enabler-driven model, closely associated with public initiatives, carries the risk of marginalising social partners' voices. Innovation processes are frequently absorbed by bureaucratic procedures, with declared openness yielding to control imperatives. In some cases, residents' roles are reduced to passive testing of predefined solutions or participation driven solely by grant requirements.

Consequently, Living Labs managed by public administrations face not only bureaucratic constraints but also limited capacities for dialogue and interest mediation among diverse stakeholders (Gago, Rubalcaba, 2020). Moreover, the project-based nature of enabler-driven Living Labs, combined with unstable funding, hampers the development of organisational durability and the scaling of outcomes (Leminen, Westerlund, Nyström, 2012). Additional challenges include the integration of results into urban strategies and limited intersectoral mediation capacity, which exacerbate social and communication barriers (Gago, Rubalcaba, 2020; Nesti, 2018). Public Urban Living Labs thus operate at the intersection of two competing logics: rigid bureaucracy and flexible innovation. Their day-to-day functioning involves an ongoing attempt to balance administrative formalism with the openness required for creative processes (Voytenko, McCormick, Evans, Schliwa, 2016).

3. Research Design and Methods

The study is based on a review of the relevant literature and original qualitative research. The literature review covered publications addressing the Living Lab concept, the quadruple helix model and barriers to the development of urban and social innovation. The findings of this review informed the development of the study's theoretical framework and the design of the interview guide.

The empirical research was conducted in March and April 2025 in Kraków, Toruń and Rzeszów. These cities were selected due to the presence of actively operating Urban Living Labs and their close cooperation with local academic communities. This research setting enabled direct access to practitioners and researchers engaged in innovation processes at the local level. The study employed in-depth individual interviews (IDIs) using a semi-structured format. This approach ensured methodological flexibility and allowed for the exploration of emerging themes that arose dynamically during interactions with respondents (Kvale, 2007). Each interview lasted between 60 and 90 minutes. A problem-oriented perspective was adopted,

focusing on the identification of systemic barriers affecting the functioning of Urban Living Labs.

Respondent selection was purposive and grounded in the quadruple helix framework (Almeida and Deutsch, 2025). A total of eight respondents were interviewed, with two representatives from each sector: public administration (managers of Living Labs operating within municipal structures), business, academia and non-governmental organisations. The recruitment process followed a two-stage procedure. Initially, contact was established with Living Lab managers and an academic community. These participants subsequently identified further respondents representing the remaining helix actors, namely the private sector and civil society, in line with the snowball sampling approach. Participation in the study was voluntary and anonymous.

All interviews were conducted face to face, and the empirical material was documented through detailed field notes prepared by the researcher. The empirical material was analysed using qualitative content analysis. Based on the identified causal relationships, an Ishikawa diagram was developed to illustrate the interconnections among barriers to Living Lab development (Pudło, 2012). The construction of the diagram followed a three-stage procedure: identification of the main problem categories (organisation, regulation, processes, finance, technology and social acceptance), allocation of respondent-identified barriers to these categories, and logical verification of their relationships with the core problem, defined as limited organisational sustainability and difficulties in scaling innovation outcomes. The validity of the interpretation was confirmed through follow-up contact with selected respondents using a member-checking approach.

4. Research Results and Discussion

Interviews conducted with managers of Urban Living Lab units, as well as representatives of the private sector, academia, non-governmental organisations and local residents, made it possible to identify the key barriers constraining the development of these initiatives. The collected empirical material points to the systemic nature of the identified obstacles and to the presence of clear cause-and-effect relationships between them. The analysis indicates that financial deficits and structural constraints within public administration constitute primary barriers that directly contribute to the emergence of further challenges in the technological, regulatory and social domains. As a consequence, the limited flexibility of urban administrative structures emerges as a central factor hindering the operationalisation of the Living Lab concept at the local level. These interdependencies are illustrated through an Ishikawa diagram (Figure 1).

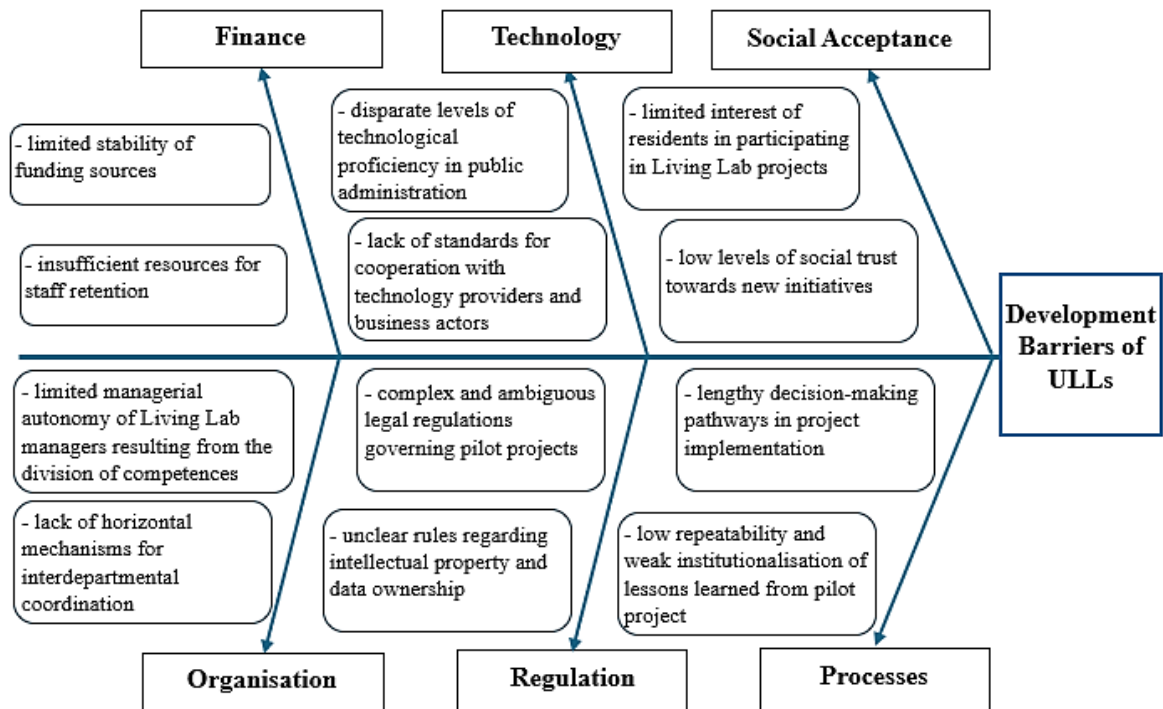


Figure 1. Ishikawa diagram illustrating cause-and-effect relationships among barriers to the development of Living Labs.

Source: own elaboration.

The issue most frequently raised during the interviews concerned the stability of funding for Living Labs. Respondents, particularly Living Lab managers, emphasised that funding is primarily provided through ministerial programmes and secured over a multi-year period, which enables the ongoing operation of laboratories and planning activities within a medium-term horizon (R1; R2). At the same time, it was noted that these resources largely cover basic operational costs and do not provide sufficient conditions for implementing infrastructure-related or investment-oriented initiatives. From the perspective of Living Lab managers, available funding allows for the financing of staff remuneration and the maintenance of existing infrastructure; however, moderate salary levels combined with high organisational and competency requirements significantly limit the ability to build stable and specialised teams (R1).

As a consequence, this funding structure encourages ULL to focus on so-called soft activities, such as educational, participatory or communication-oriented projects (R1, R2). Respondents indicated that initiatives of this type are relatively easier to implement within existing organisational frameworks, as they do not require interference with the competences of other administrative units and allow for the continuity of activities as well as the maintenance of institutional legitimacy within the urban environment (R1). At the same time, this orientation limits the willingness to undertake more complex infrastructural or technological experiments, which would require stronger interdepartmental coordination, additional financial resources and a higher degree of decision-making autonomy.

In effect, the funding structure combined with the institutional embedding of Living Labs within municipal administrations (in the cases of Rzeszów and Toruń, ULLs operate directly within city hall structures) jointly creates a mechanism that constrains managerial autonomy. The necessity to respect formal divisions of competences translates into frequent interdepartmental negotiations and reinforces a focus on activities that are feasible under existing organisational conditions, namely soft projects. The literature emphasises that the dominance of project-based funding in the public sector, combined with the absence of dedicated development-oriented resources, may limit the capacity of Living Labs to gradually build sustainable innovation ecosystems, even where baseline funding remains relatively stable (Leminen, Westerlund, Nyström, 2012).

Organisational barriers were particularly frequently highlighted by representatives of the business sector (R3, R4) and non-governmental organisations (R5, R6). These respondents stressed that although Living Labs have formally designated leaders, their actual capacity to act is constrained by the rigid organisational frameworks of public administration (R3, R5). In their view, ULL managers operate within narrowly defined competences, which restricts flexibility, hampers rapid responses and limits the initiation of more complex undertakings. From the perspective of external partners, the requirement to repeatedly coordinate activities with other administrative units significantly complicates the implementation of projects with an implementation-oriented character, such as pilot urban infrastructure or demonstrator installations (R3, R4). Respondents noted that under such conditions, initiatives extending beyond educational or participatory activities involve lengthy procedures and high coordination costs (R3, R4). At the same time, one ULL manager (R1) pointed out that small-scale solutions had been tested in the analysed laboratory within public space, including covered ecological bicycle shelters. According to this respondent, such initiatives may gradually broaden the scope of interdepartmental cooperation, although they do not eliminate the structural constraints associated with the position of Living Labs within municipal administration.

It should therefore be noted that the limited, and largely non-volitional, organisational agency of Living Lab coordinators, as clearly perceived by external partners, acts as a factor reinforcing other barriers to their functioning. This results in prolonged decision-making processes, hinders cooperation with the business sector and reduces the attractiveness of participation in Living Lab projects. Similar observations are made by Schuurman and Tönurist (2017), who argue that the lack of genuine autonomy and managerial agency weakens interdepartmental collaboration and complicates the transition from experimentation to durable implementation.

Another problematic area concerns technological and procedural conditions. Respondents emphasised that the key barrier is not access to infrastructure as such, but rather unclear and time-consuming procedures for obtaining approval to test solutions in public space. From the perspective of a business representative (R4), procedural unpredictability and long waiting times for decisions reduce firms' willingness to engage in Living Lab pilot projects.

Additionally, respondents pointed to imprecise rules governing intellectual property and the allocation of rights to jointly developed outcomes. According to a private sector respondent (R6), the absence of clear regulations in this area increases perceived risk and diminishes the willingness to invest resources in cooperation with Living Labs. As a result, procedural and legal ambiguity leads to delays in pilot implementation, reduced private-sector engagement and a low level of innovation commercialisation, a pattern also observed in the literature (Van Geenhuizen, 2018).

Regulation and bureaucracy were also identified by respondents as significant barriers. A business sector representative (R5) highlighted complex administrative procedures and lengthy public procurement processes, which prolong project implementation and undermine the momentum of collaboration. From an entrepreneurial perspective, such procedural barriers are difficult to reconcile with the operational logic of firms. These observations were echoed by respondents from the academic sector (R7, R8), who additionally noted that Living Labs could benefit from stronger and more systematic engagement by universities. At the same time, they pointed out that institutional support from academic organisations remains limited and that involvement in Living Lab projects is not adequately recognised within systems of academic evaluation, promotion or workload allocation (R7). Consequently, researchers' participation in Living Lab initiatives is typically additional in nature and largely driven by individual motivation and personal commitment. One academic respondent (R8) observed that, from a regulatory standpoint, Living Labs often closely resemble academic institutions. Rather than introducing genuinely novel rules of operation, they are frequently required to apply procedural frameworks typical of bureaucratised public organisations. As a result, despite declared openness to experimentation, these initiatives tend to reproduce constraints familiar from university-based projects, which in practice hampers the translation of pilots into lasting solutions. The literature highlights that the absence of flexible legal frameworks, including regulatory sandbox-type arrangements, constitutes a significant barrier to the development of urban innovation. At the same time, extensive administrative procedures and high levels of formalisation prolong implementation processes and discourage potential partners from long-term engagement in Living Lab projects (Puerari et al., 2018).

In the area of social barriers, respondents consistently pointed to difficulties in engaging residents in Living Lab activities. It was emphasised that the Living Lab concept remains insufficiently clear to local communities, which complicates the development of sustained engagement. This issue was raised by academic respondents (R7, R8), business representatives (R5, R6) and representatives of civil society themselves (R4), who noted that residents rarely perceive themselves as meaningful partners in innovation processes and more often view themselves as recipients of initiatives launched by public institutions. From the residents' perspective, the lack of a genuine sense of agency and the absence of quickly visible outcomes significantly weaken motivation to participate in ULL initiatives (R5). Respondents also indicated that project objectives and expected outcomes are not communicated clearly enough

and that non-governmental organisations are not always fully included in decision-making processes (R4). As a result, limited perceived influence, low visibility of outcomes and weak communication contribute to low levels of citizen participation and reduced social support for ULL activities, thereby undermining their legitimacy and limiting access to further funding. This mechanism is consistent with previous research on participation in Urban Living Labs (Voytenko, McCormick, Evans, Schliwa, 2016).

The final category of barriers identified relates to processes, particularly slow decision-making and the absence of systemic mechanisms for scaling developed solutions. Both academic respondents (R7) and business representatives (R3, R4) pointed to difficulties arising from the mismatch between the pace of actual implementation work and the procedures and timelines prevailing within public sector organisations. From a business perspective, prolonged procedures and delayed decisions restrict the ability to obtain timely results, thereby reducing the economic attractiveness of engagement in ULL projects (R3). As a consequence, many initiatives remain at the pilot stage, and accumulated experience is not consistently translated into lasting organisational change. The absence of formalised mechanisms for implementation and institutional learning contributes to the fragmentation of knowledge and reinforces the operation of ULLs within grant-based cycles, a pattern also identified in the literature (Bulkeley, Castán Broto, 2013). At the same time, one ULL manager (R1) noted that, in practice, experiences are gradually being transferred and solutions incrementally scaled, both through national and international cooperation among Living Labs. In this respondent's view, such processes are already underway, although their effects are not yet fully visible at the institutional level and require time to translate into durable outcomes.

The analysis demonstrates that barriers to the development of Living Labs are interconnected and systemic in nature, and that their impact extends beyond individual areas of operation. The findings are consistent with earlier studies highlighting the particular sensitivity of Urban Living Labs to resource constraints, process formalisation and organisational conditions characteristic of the public sector (Leminen, Westerlund, Nyström, 2012; Schuurman, Tönurist, 2017). Against this background, a critical question emerges as to whether the challenges faced by public-sector Living Labs stem solely from imperfect implementation, or whether they reflect a deeper structural incompatibility between the ULL model and the operational logic of public institutions. The flexible and experimental nature of Urban Living Labs may come into conflict with the hierarchical and procedural character of public administration, particularly in projects implemented under the enabler-driven model. This raises broader questions regarding the actual capacity of the public sector to act as an effective facilitator of social and technological innovation. Addressing these issues, however, requires further in-depth comparative research.

5. Conclusions

The conducted research demonstrates that the functioning of public-sector Urban Living Labs (ULLs) is shaped by a complex configuration of institutional, financial and social interdependencies. Although the Living Lab concept is widely recognised in the literature as a cornerstone of contemporary innovation processes, its practical implementation within public administration encounters multiple barriers that constrain both the scale and the durability of such initiatives. A key conclusion of the study is that the effectiveness of Living Labs is not determined by isolated obstacles, but rather by the cumulative and mutually reinforcing nature of these barriers.

The central challenge lies in the project-based logic of financing, which imposes a medium-term planning perspective and significantly limits managerial autonomy. Dependence on grant funding hampers the retention of stable and specialised teams and subjects Living Labs to rigid administrative hierarchies. As a result, decision-making processes are slowed, and more ambitious initiatives often remain confined to the pilot stage, failing to achieve lasting integration within municipal structures.

Organisational fragility directly affects relations with the business sector. Complex legal procedures and insufficient coordination mechanisms render the testing of solutions in urban space unpredictable from a corporate perspective. Elevated temporal and procedural risk discourages private-sector engagement in the Living Lab framework, thereby substantially reducing the potential for commercialisation of developed technologies.

An equally significant set of interrelated barriers concerns the social dimension. Limited understanding of the nature and objectives of Urban Living Labs, combined with a weak sense of agency among residents, results in low levels of participation. This situation is further exacerbated by the marginalisation of non-governmental organisations in decision-making processes. The absence of broad social legitimacy reduces political support, creating a self-reinforcing cycle that hampers access to additional funding and constrains long-term development.

The low visibility of outcomes, stemming from the dominance of so-called soft projects and the lack of guarantees for their scaling, discourages further stakeholder involvement. Although respondents pointed to a gradual exchange of experiences among Living Labs, this process remains too slow to generate durable systemic value. Enhancing the effectiveness of public Living Labs therefore requires simultaneous action in several areas, including strengthening managerial decision-making capacity, simplifying experimental and testing procedures, and establishing stable frameworks for cooperation with both the business sector and civil society.

While the conducted interviews enabled an in-depth analysis of practices in selected cities, the limited size of the sample precludes the formulation of generalised conclusions. The study is exploratory in nature, and the identified mechanisms require further validation through quantitative and comparative research.

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