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Designing a Formative Framework for Living Lab Establishment

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Abstract: Most established Living Lab evaluation frameworks are designed for operational or mature Living Labs. However, they provide limited guidance during the establishment phase, where early decisions critically shape future operations. This study proposes a formative evaluation framework to address this research gap by reviewing existing frameworks from an early-stage perspective and drawing on action research observations across multiple Living Lab establishment processes. The suggested framework is structured around five key dimensions (strategic, organisational, ecosystem & value creation, economic, and communication), comprising thirteen elements. Standardised maturity scale items include absent, defined internally, co-created with externals, validated, in establishment, operational, and optimised, each accompanied by item-specific qualitative descriptors. Each assessment is complemented by a timestamp indicating when a specific status level was reached, while an evidence note provides a concise justification. Together, these elements enable both cross-dimensional comparison and reconstruction of how and when Living Lab components evolved.

Keywords: Living lab; Assessment; Evaluation; Formative framework, Establishment, Set up

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1 Introduction

The European Network of Living Labs (Schuurman, De Los Rios-White, and Desole, 2025), a global federation of benchmarked Living Labs, defines Living Labs as user-centred, open innovation ecosystems that combine systematic user co-creation with research and innovation activities in real-life communities and settings (Schuurman, De Los Rios-White, and Desole, 2025). This collaborative and participatory approach has sparked increasing interest among many entities, including universities (Stuckrath, Rosales-Carreón, and Worrell, 2025), cities (Kronsell, and Mukhtar-Landgren, 2018), industries (Shvetsova and Lee, 2021), and civil society actors (Park and Fujii, 2023) in establishing and utilizing Living Labs as a means to accelerate innovation, engage stakeholders, and generate real-world value.

Living Labs vary widely in type (Alavi et al., 2020) and operate across 20 different domains (Tricarico et al., 2025). Despite their growth, prior literature highlights limited evidence on effective management, reference models, and performance, which complicates the development of suitable business models and services (Paskaleva and Cooper, 2021; Schuurman et al., 2015). Furthermore, most established evaluation approaches (e.g., Vervoort, 2022) are designed for operational or mature Living Labs. While they offer valuable insights into performance, impact, and long-term viability, they provide limited guidance for evaluating early progress during establishment, when core structures, strategy, partnerships, and processes are still being formed. The establishment phase is crucial for a Living Lab's long-term success. Early decisions lay the foundation for operations, stakeholder engagement, and sustainable impact, making the establishment phase crucial for performance, scalability, and certification readiness.

As a result, this study aims to design a formative evaluation framework to support the setup of a new Living Lab by reviewing existing frameworks and tools from an early-stage perspective and developing a framework with an integrated progress-monitoring scale.

2 Existing Living Lab evaluation frameworks

2.1 Overview of existing Living Lab evaluation frameworks

ENoLL has developed a labelling and certification process (Vervoort et al., 2022; Vervoort et al., 2024) to ensure that certified Living Labs share a common foundation of quality and credibility. The process evaluates the maturity, sustainability, and impact of Living Labs using a Harmonised Evaluation Framework, which covers six areas: Strategy, Operations, Openness, Users & Reality, Impact & Value, and Stability & Collaboration. The framework also incorporates a three-layered model (Schuurman, 2015), where the macro layer focuses on the Living Lab as an organization, the meso layer on the projects undertaken, and the micro layer on research and development activities as well as stakeholder interactions. The framework is utilized in two stages. First, before submitting a certification application, a Living Lab can assess its maturity using a self-assessment questionnaire. Second, based on the criteria, the membership application is evaluated by three independent Living Lab experts, who determine whether the applicant qualifies for certification. The older version of the ENoLL evaluation framework, comprising 20 criteria, has also been integrated with the Business Model Canvas (BMC) (Osterwalder and

Pigneur, 2010) by mapping each criterion to a relevant BMC element (Mastelic, Sahakian, and Bonazzi, 2015).

A process reference model for Living Labs (Guzmán et al., 2013), derived from a case study involving six Living Labs in the IT sector, includes five categories: Innovation Initiatives Management, Organizational Management, Technical Development, Deployment and Operation, and Monitoring and Evaluation. The degree of adoption (DoA) of each practice in the model is evaluated using a three-point verification scale, representing not applied, partially applied, and fully applied.

Based on a synthesis of the literature, Sofronievska et al. (2025) propose a comprehensive qualitative framework for assessing Living Labs across nine dimensions: governance, user engagement, methods, infrastructure, outputs, scalability, sustainability, equity, and learning. Each dimension is assessed on an emerging–moderate–high scale. The framework also claims to integrate a temporal perspective to capture short-, medium-, and long-term impacts; however, this perspective appears to be operationalised only within the outputs dimension.

Osorio et al. (2019) identified and compared eight existing frameworks from the literature for evaluating innovation laboratories, including Living Labs. They proposed a maturity grid–based assessment tool comprising 30 individual criteria, classified into the dimensions of strategic intention, process of creation, physical embodiment, process of use, and innovation outcomes. For each criterion, a four-level maturity scale was specified.

Santonen et al. (2020) proposed a multifactor maturity model for transnational Living Lab collaboration. Instead of assessing individual Living Lab, the model assesses collaboration maturity among Living Labs from different countries across six dimensions: environment, membership, structure–process, communication, purpose (goals and vision), and resources. For each factor and subfactor, maturity levels are defined as network, coordinated network, co-operation, and collaboration.

Living Lab Harmonization Cube (Mulder, Velthausz, and Kriens, 2008) encompassed six analytical elements—user involvement, service creation, infrastructure, governance, innovation outcomes, and methods and tools—and three development phases, namely set-up, sustainability, and scalability. Building on the main elements of the Cube and the quantitative methodology developed within the ALCOTRA project, Kovács (2016) proposed an enhanced evaluation approach. In this approach, each Living Lab element is assigned a score of 1 when the initial steps (set-up) are in progress, a score of 2 when the set-up phase has been completed (sustainability), and a score of 3 when the element is fully developed (scalability). As the scoring is calculated for all six elements from organizational, contextual, and technological viewpoints, the maximum score in the cube is 108.

Tellioğlu (2024) proposed a framework for the creation, establishment, and maintenance of living labs across strategic, project, and operational levels, and introduced a balanced scorecard to support their management and ongoing evaluation. The structure closely resembles the three-layered model proposed by Schuurman (2015), without explicitly referencing it. The framework highlights several key elements to consider when establishing a living lab: the context, including physical, socio-cultural, economic and political environments; stakeholders, as defined by the Quadruple Helix (Carayannis and Campbell, 2009), including academia/research organisations, government, industry and civil society; topics and focus areas, derived from stakeholders' interests and needs; anticipated challenges in the establishment and operation of the lab; activities and services,

such as workshops, prototyping and testing; and methods and tools, encompassing research methods, software and physical equipment, along with evaluation of their application.

Santonen et al. (2025) proposed a conceptual model to align Living Lab processes and activities with Technology Readiness Levels (TRLs) by including details on objectives for each level. Although the model was not originally designed to support the establishment of a living lab, it nevertheless provides a practical framework for managing innovation processes, including the development of a Living Lab, encompassing technological, service, process, and human-centred dimensions.

Drawing on a literature review, Forbat et al. (2025) proposed a framework for assessing Living Labs (LLs) as a social change method that integrates stakeholders' perspectives and values, supports systematic evaluation, fosters meaningful co-creation, and clearly distinguishes between short-, medium-, and long-term objectives. However, the framework focuses on evaluating the effectiveness, results, and sustainability of LLs instead of the establishment. Similarly, a study by Bronson, Devkota, and Nguyen (2021) focused on evaluating the performance of the Living Lab process and its wider impacts while summarising the relevant evaluation frameworks and utilized methods in the literature.

3 Research design

To achieve the study's goal of developing a formative evaluation framework for new Living Labs, assessment frameworks from the emerging Living Lab literature were analysed in conjunction with action research observations and co-creation workshop outcomes from the Horizon Europe–funded FARCLIMATE project (No. 101112860) as follows.

3.1 Literature review

A novel AI-powered search approach was adopted to conduct the literature review using Google Scholar Labs (Google, 2025). Google Scholar Labs is an experimental, AI-powered search tool designed to handle complex, multi-faceted research queries. It analyses questions to identify relevant papers, explains the connections between them, and provides concise summaries. Scholar Labs uses the same database as Google Scholar, which is recognized as the most comprehensive source (Martín-Martín et al., 2021), but not without criticism if used as a primary search system for systematic literature review (Gusenbauer and Haddaway, 2020). When evaluating emerging and evolving research fields—such as the assessment of Living Labs—it is essential to consider the most up-to-date studies, including those from low-impact journals, conference proceedings, popular scientific literature, and other grey literature sources, all of which are indexed by Google Scholar (Aguillo, 2011; Meho and Yang, 2007; Haddaway et al., 2015). Therefore, Google Scholar was considered suitable for the study purposes.

Instead of using keywords, the following prompt questions were used for the search: (1) *What kinds of evaluation frameworks have been used to evaluate Living Labs?* and (2) *Which Living Lab evaluation frameworks focus on evaluating and supporting the establishment of a Living Lab?* Results were awaited until all relevant results were found for both questions. The two search results were combined, resulting in a total of 51 publications. Scholar Labs was used solely for literature searching, while all analyses were conducted manually to identify publications relevant to the study's objectives.

Google Scholar Labs results were also cross-checked with Google Scholar keyword searches to evaluate that key articles were included. The exact phrase search for "living lab assessment" resulted in 27 hits (5 in the title of the article), and for "living lab evaluation" 170 hits (9 in the title). Based on the search results comparison, Google Scholar Labs exclusion criteria were logical, including e.g. paper describing technological aspects such as sensor-based assessment, non-English papers, or papers referring to evaluation or assessment frameworks instead of developing them.

3.2 Action research process

A significant number of different action research approaches have been presented (Cassel and Johnson, 2006). For this study, a constructive action research framework originally proposed by Kasanen et al. (1993) and subtly refined by Oyegoke (2011) was adopted. *First*, the practical relevance of the proposed problem was addressed in Section 2 through a literature review, which highlighted a lack of evaluation models to support formative decision-making during the setup phase.

Second, the Horizon Europe–funded FARCLIMATE project (No. 101112860) was identified as a suitable platform for collecting practical experience to develop the proposed model. The project seeks to promote climate resilience in agriculture, forestry, and fisheries by establishing at least 20 new Living Labs across Europe. Since August 2024, the authors of this study have been supporting and mentoring 23 Living Labs. The support offered includes training sessions, guideline documents, workshops, and document analysis to assess the current status of each Living Lab and identify the type of support required. The process has been iterative and cyclical, following the standard stages of planning, action, observation, and reflection.

Third, the Living Lab Mapping Canvas (ENoLL, 2025) was utilised as an initial data collection tool to develop a consolidated understanding of the current status of each Living Lab initiative. Each Living Lab was first guided to complete the canvas internally within its core team and subsequently refine it in collaboration with relevant stakeholders. During this process, it became evident that a more detailed framework for evaluating progress was needed. The authors conducted a series of workshops to iteratively co-create the framework by comparing variables from the Mapping Canvas, ENoLL's evaluation framework (Vervoort et al., 2022; Vervoort et al., 2024), and the Business Model Canvas (Osterwalder and Pigneur, 2010), while aligning these with findings from the literature. The model was also reviewed by several members of ENoLL staff who were not involved in the framework's development. This process resulted in an initial framework that combines theoretical rigour with actionable support for early-stage Living Lab development.

Fourth, to demonstrate the usability of the framework, ten Living Labs completed a survey questionnaire and evaluated its ease of use. Based on the pilot testing, it was concluded that the proposed scale and item-specific descriptors required modification. The resulting final formative evaluation framework is presented in the results section.

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4 Results

4.1 Framework assessment dimensions and elements

The formative evaluation framework is designed to provide a structured and comparable way to evaluate the development of a Living Lab during its setup phase. The Living Lab Mapping Canvas (LLMC) tool was selected as a starting point, as it is widely utilized and recognized as a best practice by the European Commission. The LLMC has undergone various iterations, and it was also adapted further to meet the requirements of the suggested framework as described in Appendix Table 1.

The strategic dimension, including *Purpose*, *Scope,* and *Vision & Strategy* elements, defines the overall direction of the Living Lab, clarifying its purpose, focus, and long-term orientation. It guides decision-making and ensures alignment across activities and stakeholders. Contrary to the original LLMC model, vision and scope were separated to improve clarity, as the scope defines what the Living Lab does and its focus areas, while vision describes its long-term goals. To keep the model simple, the strategy component from LLMC was combined with vision, as these two are inherently interlinked. The vision sets the desired future state, while the strategy defines the concrete pathways, priorities, and actions required to achieve that state.

The organisational dimension comprises the *Host organisation*, *LL people & internal roles*, and *Governance* elements, covering the internal structure and institutional embedding of the Living Lab, ensuring its operational stability and legitimacy. The host organisation provides structural support and institutional anchoring, while internal roles define the human resources and responsibilities required for operation and development. Governance underpins the system by shaping decision-making, role distribution, and accountability.

The ecosystem & value creation dimension covers *Stakeholders, customers, and external roles*, as well as the *Value generated for them*. It focuses on identifying and characterising the external actors involved in or affected by the Living Lab, including their roles, relationships, and levels of engagement. It also defines the benefits, outcomes, and value propositions created for different stakeholder groups, as well as the mechanisms through which value is generated, delivered, and captured.

The economic dimension covers the *Cost structure* and *Financial resources & sustainability*, focusing on the financial foundations of the Living Lab. The cost structure outlines the key cost components and financial drivers associated with establishing and operating the Living Lab, while the latter addresses the availability, management, and long-term viability of its funding base and financial operations.

The communication dimension focuses on the *Communication strategy and channels*, defining how the Living Lab engages with internal and external audiences. It includes the strategic objectives, key messages, communication channels, and mechanisms for monitoring and evaluating communication performance.

4.2 Evidence-based maturity tracking scale for Living Lab establishment

The framework is built on the assumption that Living Lab development is not a purely sequential process. Different components, such as governance or cost structure, may evolve at different speeds. Therefore, each dimension is assessed independently using a set of common analytical criteria, enabling both horizontal comparison (across dimensions) and

longitudinal tracking (over time). Each measure is assessed using a common standardised maturity scale, but the qualitative descriptors are item-specific, meaning that each dimension has its own context-sensitive descriptions for each level. Standardised scale items, including *absent*, *defined internally*, *co-created with externals*, *validated*, *establishing*, *operational*, and *optimised,* are defined in Table 2. The example of the Living Lab service portfolio element presented in Table 3 is provided to illustrate the use of context-sensitive descriptions.

In addition to the maturity assessment, the scale integrates temporal and evidential elements to strengthen traceability and analytical robustness. Each assessment is complemented by a timestamp indicating when a specific status level was reached, allowing for longitudinal analysis of development trajectories. Furthermore, an evidence note is recorded for each rating, providing a concise justification based on observable data sources such as documents or project records. Together, these elements enable not only the comparison of development levels across dimensions but also the reconstruction of how and when each component of the Living Lab evolves over time.

Table 2 Evidence-based maturity tracking scale for Living Lab establishment

Scale	*Description*
Level 0: Absent	Not present, defined, or recognised within the Living Lab. There is no formal or informal activity related to it.
Level 1: Defined internally	The element has been conceptualised by the core team but remains internally developed, without external input or validation.
Level 2: Co-created with externals	The element has been developed collaboratively with relevant external stakeholders, reflecting shared input and initial alignment across stakeholders.
Level 3: Validated	The co-created element has been reviewed and agreed upon by stakeholders, confirming its relevance and acceptability, while the practical application is still missing or the implementation is very limited.
Level 4: Establishing	The element is being translated into practice, with structures, processes, or activities actively being established, but not yet fully operational or routinised.
Level 5: Operational	The element is fully embedded in day-to-day Living Lab activities and functions reliably as part of regular operations.
Level 6: Optimised	The element is not only operational but also continuously monitored and refined based on feedback and practical evidence, demonstrating adaptive improvement and high maturity.

Table 3 An example of an evidence-based maturity tracking scale for a service portfolio element

Scale	*Living Lab service portfolio*
Level 0: Absent	The Living Lab R&D and back-office service portfolio is not defined. There is no clear understanding of potential services.
Level 1: Defined internally	Possible R&D and back-office services have been identified by the core team, but remain preliminary and internally developed without external input.
Level 2: Co-created with externals	R&D and back-office services have been collaboratively designed with stakeholders, reflecting shared input and alignment with their needs.
Level 3: Validated	The demand for R&D services and the internal need for back-office services have been confirmed by key stakeholders, ensuring relevance and needs.
Level 4: Establishing	The development and implementation of R&D and back-office services are ongoing, with the necessary structures, processes, and tools being established but not yet operational.
Level 5: Operational	R&D services are operational and marketed, and back-office services support internal activities. The service portfolio is embedded in day-to-day operations and used by stakeholders.
Level 6: Optimised	The service portfolio is continuously evaluated and refined based on feedback, performance, and demand to improve effectiveness and impact.

5 Conclusions

The literature review revealed that most established Living Lab evaluation frameworks are designed for operational or mature Living Labs rather than for guiding their initial formation. Although some models incorporated developmental stages, these were typically applied retrospectively to assess progress, sustainability, or impact, rather than prospectively to support formative decision-making during establishment. Even approaches that acknowledged early-stage development tended to treat set-up as an evaluative category, overlooking its nature as a dynamic, process-oriented phase requiring context-sensitive guidance. This gap highlighted the need for tools that support the configuration of foundational elements, sequencing of activities, and management of uncertainty in early-stage Living Lab development.

Addressing this gap, the proposed framework integrated insights from the literature with action research observations to provide a structured yet flexible approach to Living Lab establishment. Organised around five dimensions and thirteen elements, and supported by a standardised maturity scale with item-specific qualitative descriptors, the framework enables systematic yet context-sensitive assessment. The inclusion of timestamps and evidence notes enhances traceability and analytical robustness, allowing both cross-dimensional comparison and longitudinal analysis of development trajectories. In doing so, the framework shifts the focus from retrospective evaluation to formative support, offering practical value for practitioners and contributing to the theoretical advancement of Living Lab research.

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Appendix. Table 1 Formative evaluation framework dimensions and elements

Dimension	*Elements*	*Description*
Strategic	Purpose	Defines the fundamental rationale of the Living Lab, clarifying its core objectives and the problems or needs it aims to address.
	Scope	Specifies the thematic focus, domains, and types of activities the Living Lab engages in, including targeted sectors and challenges.
	Vision & Strategy	Articulates the long-term direction of the Living Lab and the strategic pathways through which its objectives are pursued and achieved.
Organisational	Host organization	Refers to the institutional entity that provides structural anchoring, support, and legitimacy for the Living Lab's establishment and operation.
	LL people and internal roles	Defines the internal human resources, including roles, responsibilities, and competencies required to operate and develop the Living Lab.
	Governance	Describes the structures, roles, and processes through which decisions are made, responsibilities are allocated, and accountability is maintained.
Ecosystem & value creation	Stakeholders, customers & external roles	Identifies and characterises the external actors involved in or affected by the Living Lab, including their roles, relationships, and levels of engagement.
	Values for stakeholders	Defines the benefits, outcomes, and value propositions generated for different stakeholder groups, including mechanisms for value creation and capture.
Operational	Living Lab context	Refers to the physical, digital, and organisational environments in which Living Lab activities take place, including infrastructure and pilot settings.
	Living Lab service portfolio	Describes the set of services offered by the Living Lab, including innovation activities, facilitation processes, and support functions delivered to stakeholders, as well as the underlying methods and tools through which these services are designed and implemented.
Economic	Cost structure	Outlines the key cost components and financial drivers associated with establishing and operating the Living Lab.
	Financial resources and sustainability	Addresses the availability and management of financial, as well as the long-term viability of the Living Lab.
Communication	Communication strategy & channels	Defines how the Living Lab communicates with internal and external audiences, including strategic objectives, messaging, channels, and performance monitoring.