Article

Modelling Cultural Living Labs: A Process-based Review

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Abstract

The proliferation of Living Labs in the past decades has generated a great variety of definitions, practices, and research in different fields. Particularly, applications in the cultural and heritage field have increased in the past decades, which is in line with the emergence of a participatory turn in the sector. However, existing literature mainly focuses on the characteristics of Living Labs rather than their processes, fuelling existing issues related to first-time approachability, replicability, participation, and evaluation. Through a systematic interdisciplinary literature review of general Living Labs definitions and field-specific applications, this research aims to develop a process-based definition that encompasses steps, key elements, and objectives of Living Labs and addresses these challenges. By doing so, it brings four main contributions: first, it advances the theoretical modelling of Living Labs incorporating the perspective of cultural practices. Second, it proposes a practical model of Living Labs to be adopted and adapted across cultural fields – and beyond – to set-up and implement Living Labs. Third, it raises awareness of Living Labs' potential for the development of sustainable and transformative participatory practices in the cultural heritage field. Last, it identifies the potential contribution of Cultural Living Labs' experiences to addressing challenges of replicability, participation, and evaluation for the greater interdisciplinary Living Labs field. Future research can test the use of this model in guiding first-time Cultural Living Labs users' practices and subsequently inform the further refinement of the model.

Keywords: living labs, model, systematic literature review, process-based approach.

1 Introduction

1.1 Background

The term "Living Lab" presents some early mentions in medicine and biology for the fast advancement of treatments, but it became widely used in the 1990s in the United States in association to the research on collaborative smart homes design of the Massachusetts Institute of Technology (MIT) (Baran & Berkowicz, 2020, p. 5; Falanga & Nunes, 2021, p. 3). These living experimental environments – called Place Lab – resembled real-life 1-person households designed for the observation of volunteer participants' interaction with smart home technologies for a variable period of time (Intille et al., 2005, p. 1941). This research infrastructure and methodology evolved to include projects on places and products for work and living; urban modelling, prediction, and simulation; and mobility services, under the coordination of the MIT City Science research group (MIT Media Lab, n.d.).

Contextually, the concept of Living Lab has been adopted, adapted, and implemented also abroad, leading to the development of alternative strands of research. In Europe, the main divergence from the American model is the study of users and participants into their real-life environment (Schuurman et al., 2015, p. 3). This shift allowed to experiment from the start with a wider application of Living Labs, beyond the collaborative development and testing of technology in a controlled environment. Co-creation practices are embedded into real-life challenges with impact at multiple scales, enabling the participation of different stakeholders, and integrating it throughout different steps of innovation processes (Baran & Berkowicz, 2020, p. 5). While these Living Labs proliferated mainly in urban context on short term project-basis, in other world's regions, for instance in South African countries, they found longer term application in rural environments, answering different dynamics of knowledge exchange and communities' engagement (Schuurman et al., 2015, p. 5).

The Living Lab approach has been actively promoted at a European level through policy, funding schemes, and implementation toolkits, resulting in the creation of the European Network of Living Labs (ENoLL) in 2006, with headquarters in Brussels (Cerreta, Elefante, & La Rocca, 2020, p. 4). ENoLL functions as a non-profit association of benchmarked Living Labs aimed to promote the Living Labs approach and to enable their implementation worldwide (https://enoll.org/about-us/). With the support of the European Commission, the network grew to include a variety of countries in Europe and beyond in its federation, and partnerships among different stakeholders, such as civil society, governmental bodies, academia, and industries, engaging with a diverse range of fields and applications (Schuurman et al., 2015, pp. 1, 2).

1.2 A variety of Living Labs

As a result, a great variety of Living Labs has been set in place to foster knowledge generation and sharing in regulated environments, which have been translated into theories, methods, and models to be re-tested, refined, and replicated in different contexts as part of iterative learning processes (Hossain, Leminen, & Westerlund, 2019, p. 986; Schuurman et al., 2015, p. 3). They facilitated the collaboration of different stakeholders in experimental co-creation practices, ranging from prototyping, testing, and validating solutions to local problems, resulting in the development of new or improved technologies, products, and services (Baran & Berkowicz, 2020, pp. 2, 6; Fanzini, Venturini, Rotaru, Parrinello, & de Cocinis, 2020, p. 2; Florez Ayala et al., 2022, p. 1; Hossain et al., 2019, pp. 979, 986; Schuurman et al., 2015, pp. 2–3).

Much research focuses on investigating the potential of the Living Lab methodology to advance ICT development, applications, and integration into society. In this context, Living Labs are seen as spaces to explore emerging social needs and trends, enhancing research, inclusion, and innovation, and improving the usability and usefulness of technology, providing a promising methodology to address societal problems (Baran & Berkowicz, 2020, pp. 5–6; Schuurman et al., 2015, pp. 2–3). One such societal problem is the sustainability transition, where Living labs can potentially play a key role across sectors and fields by contributing to the research on environmental awareness and behaviour, the development of more responsible patterns of production and consumption, and the adoption of more equitable and deliberative decision-making processes (Baran & Berkowicz, 2020, p. 6).

In the past few years, such potential has been tested at a city scale with the increase of Urban Living Labs worldwide, and particularly across Europe, where they were adopted in line with the existing traditions of action research and appreciative enquiry (Rollin et al., 2021, p. 2; Wendt et al., 2021, p. 695). Their implementation aims at various innovative and transformative improvements of the urban landscape, ranging from efficient transportation, the creation of green

spaces, support to local food systems (Florez Ayala et al., 2022, p. 3), to regeneration schemes (Falanga & Nunes, 2021, p. 10), cultural heritage adaptive reuse (Cerreta et al., 2020, p. 4), and place-making (Fanzini et al., 2020, p. 2). Moreover, they aim to facilitate the adoption of transition management models towards multi-actor urban governance systems that can support the necessary policy changes for the sustainable transformation of urban environments and the local economy (Fanzini et al., 2020, p. 2; Florez Ayala et al., 2022, p. 3; Rollin et al., 2021, p. 2).

In the cultural field, the applications of the Living Lab methodology have been various in the past two decades and are increasing in line with the latest research developments on participatory practices in arts and heritage (D. Aversano P., 2017a, p. 14), the participatory turn in European policies (Rosetti, Cabral, et al., 2022, pp. 2–5), as well as the consequent push from both European and national funding agendas (Prokůpek et al., 2023; Scott, 2006). Examples of "cultural" Living Labs can be found in the ENoLL platform focusing on inclusive sustainable tourism strategies (van Geenhuizen, 2018, pp. 1284–1285), the use of arts to foster behavioural change (ENoLL webinars, n.d.-c), co-development practices in the gaming and music sector (ENoLL webinars, n.d.-b, n.d.-a), reuse of cultural heritage resources (Europeana, n.d.), and the sustainable transformation of the fashion industry (CreativeWear Project, 2019), among others. Culture can also play an important role in Living Labs across different fields and sectors, for instance, in those tackling the development of urban farming initiatives in multicultural communities or designing energy-efficient collective retrofit solutions for historic buildings (Dang et al., 2023). Living Labs appear as an opportunity and a resource to support the ongoing participatory turn in the cultural and heritage fields; however, the literature focuses mainly on case studies and little effort has been made to explore the potential of Living Labs as catalysts of participatory heritage practices from a theoretical perspective. This research aims to investigate such potential by first introducing the participatory turn in the heritage field, then analyzing existing definitions and challenges of Living Labs and how they relate to cultural and heritage practices, and eventually exploring how the modelling of Living Labs processes in the field could support overcoming existing challenges.

1.3 The participatory turns in the heritage field

Heritage is socially constructed and constantly evolving. It encompasses natural, cultural, and mixed assets, which can be intangible - like traditions - or tangible, movable - like museum collections - or immovable - like historic buildings, they can be analogue but also digital - like digitalized artworks. Various stakeholders can attribute different values to them, which can change over time; therefore, managing heritage means managing its changes and mediating the perspectives of multiple stakeholders. For these reasons, heritage practices are various, interdisciplinary, and intersectoral. They include activities that belong to technical disciplines such as scientific research, conservation, or digitalization; social disciplines such as the performance, interpretation, preservation, and exhibition of cultural expressions and knowledge; and business disciplines such as the reuse of heritage assets, cultural entrepreneurial ventures, and other forms of income generation (Clark, 2019, p. XVII). Among the vast body of literature on heritage practices, participation emerges as one of the most frequently addressed topics (Roders & van Oers, 2014, p. 5).

Since the 1960s, different engagement models have been developed and implemented for the definition and assessment of stakeholders' roles and responsibilities in heritage practices. These efforts were inspired by Arnstein's "ladder of participation" in agriculture studies (Arnstein, 1969) as well as the evolution of theories on democracy, international aid, and development (Alivizatou, 2022; Floridia, 2013; Pateman, 2012; Roberts, 2004). This exploration continues to this day, with

the development of models and their adaptation to the cultural heritage fields at local, national, and international scales (e.g. FARO, 2018; IAP2, 2020).

From a policy perspective, participatory cultural and heritage practices have been an integral part of the United Nations declarations since the 1940s (UN, 1948, Section art.27.1, 1955). Participation in one's cultural life has since then been acknowledged as a fundamental human right by cultural and heritage institutions to respect the needs and values of communities, groups, and individuals (Cultural Rights. Fribourg Declaration, 2007; UNESCO, 1976). Drawing inspiration from interdisciplinary practices (see above), participatory processes have been increasingly integrated into policies in the past 15 years alongside with sustainability principles (Rosetti, Cabral, et al., 2022).

Aligned with the field's evolution and the development of international policies over the past 20 years, there has been growing advocacy for multi-stakeholder participation to foster more effective and equitable heritage conservation, the sustainability of heritage practices, and the potential shared social, cultural, and economic benefits for the involved stakeholders and their ecosystems (Rosetti, 2022). Such participatory turns transversally permeated multiple cultural and heritage subfields, such as conservation, urban development, governance, museums, archives, and public archaeology (Council of Europe, 2018; Court & Wijesuriya, 2015; Göttler & Ripp, 2017; Moshenska, 2017; Roued-Cunliffe & Copeland, 2017; Simon, 2010; UNESCO World Heritage Centre, 2011).

1.4   Definition(s) of Living Labs

Despite the wide applications of Living Labs, and probably due to such variety, there is not a common definition that has significantly influenced the development of later literature (Baran & Berkowicz, 2020, p. 5; Schuurman et al., 2015, pp. 1–2; Tyl & Allais, 2021, p. 3). Multiple publications have addressed this issue in the attempt to draft a universal definition of Living Labs and their characteristics to facilitate the communication exchange of knowledge among them, enabling mutual learning and their improved implementation (Hossain et al., 2019; Leminen & Westerlund, 2016; Mccormick & Hartmann, 2017; Mulder, Velthausz, & Kriens, 2008).

The ENoLL definition considers Living Labs as "real-life test and experimentation environments that foster co-creation and open innovation among the main actors of the Quadruple Helix Model, namely citizens, government, industry, and academia" (ENoLL, n.d.). In academic literature, different definitions highlight or exclude a combination of core characteristics. Overall, Living Labs are considered practice-driven experimentation environments, that can be both physical and virtual spaces or controlled networks, and act as arenas, forums, and "research think-tanks" to foster innovation (Baran & Berkowicz, 2020, pp. 2, 6, 11; Cerreta et al., 2020, p. 4; Florez Ayala et al., 2022, pp. 1–3; Hossain et al., 2019, p. 980; Schuurman et al., 2015, pp. 2–3; Tyl & Allais, 2021, pp. 2–3; Wendt, Bastian, & Jones, 2021, p. 695). Living Labs serve as regulated ecosystems and networks that mediate and empower processes of collaboration between industry sectors, research organizations, institutions, and citizens through participatory methodologies to facilitate the implementation of transformative approaches of intervention in real-life contexts (Baran & Berkowicz, 2020, pp. 2, 6, 10, 11; Cerreta et al., 2020, p. 4; Falanga & Nunes, 2021, p. 3; Fanzini et al., 2020, p. 2; Florez Ayala et al., 2022, p. 3; Heinrich, Million, & Zimmermann, 2022, p. 188; Hossain et al., 2019, p. 979; Rollin et al., 2021, pp. 2–3; Schuurman et al., 2015, p. 2; Tyl & Allais, 2021, pp. 2–3; Wendt et al., 2021, p. 695).

Different forms of Living Labs can be set up according to their activities and actors involved. Two main overarching categories can be identified: first, Living Labs that focus on supporting structured approaches to in-context research of systemic issues, which are characterized by

participatory design methodologies, user-centred perspective, and co-creation processes; and second, those that focus on open innovation to test new technologies and services, which function as collaborative socio-technical platforms (Baran & Berkowicz, 2020, p. 6; Schuurman et al., 2015, p. 3).

The terms "Cultural Living Lab" and "Heritage Living Lab" mainly refer to the adoption, adaptation, and implementation of the Living Lab methodology in cultural and heritage programs and projects with no indicated specific characteristics to the field (Arita Hanim & Zulma'arif, 2020; Atiyat, 2021; Barata, FT; Molinari, F; Marsh, J; Cabeça, 2017; Builes et al., 2021; Celani & D'Alessandro, n.d.; Jalill & Mohd, 2020; Sukiman et al., 2023; Vokshi et al., 2021).

1.5 Challenges of Living Labs

Working with Living Labs comes with challenges related to issues of replicability, participation, and evaluation; the following sections will untangle each one of them and explore how they relate to cultural and heritage practices.

1.5.1 Replicability

Living Labs' definition has been mainly approached from a theoretical perspective, focusing on characteristics rather than processes, excluding Living Labs' characterizing elements depending on the application context (e.g. Bergvall-Kåreborn et al., 2009; Leminen, 2015).

The above-mentioned definitions (see "Definition(s) of Living Labs") have introduced the main researched characteristics and principles. For example, within the CoreLab project, an attempt has been made to cluster Living Labs' characteristics into five overarching key principles extracted from the analysis of multiple Living Labs operations: value, sustainability, influence, realism, and openness (Stahlbrost, 2012, pp. 62–66). The operationalization of these principles leaves wide space for interpretation and requires guidance (Callari et al., 2019, p. 38); therefore, a variety of tools has been created to facilitate their implementation, ranging from serious games to multi-dimensional communication and planning tools, which are tailored on specific cases and typologies of Living Labs, further contributing to the heterogeneity of approaches (e.g. (Mulder et al., 2008; Ståhlbröst & Holst, 2012, pp. 22–26; Tyl & Allais, 2021).

When looking at Living Labs from a process perspective, fewer sources offer frameworks that model steps to set up and run them. Examples are:
- The Living Labs "flow of workgroups" developed within the CulTour project. It is a linear model that combines the structure of a living lab as an organization with design-thinking processes to structure the co-creation activities of its stakeholders to develop sustainable tourism solutions. It includes three phases – *exploration, design-oriented research,* and *elaborate* – and six steps – *discovery, define, develop, verify, consolidate,* and *testing/delivery* (Fidelbo et al., 2023, p. 21).
- The FormIT process adopted and adapted within the context of different projects, e.g., SmartIES or U4IoT. It is a 3D spiral process with iterated cycles inspired by Soft System Thinking, Appreciative Inquiry, and Need-finding theoretical streams to guide the design of IT products and services innovation. It includes five cycles – *planning, concept design, prototype design, innovation design,* and *commercialization* – for each cycle, it proposes three phases – *appreciate opportunities, design,* and *evaluate* – and for each phase, it comprises three aspects – *use, business,* and *technology* (Ståhlbröst & Holst, 2012, p. 24). Simplified, it reveals a process similar to the CulTour "flow of workgroups" based on *exploration, creation,* and *implementation,* adding *evaluation*-based iteration phases of each cycle (D. Aversano P., 2017b, p. 14).

- The Collaborative Decision-Making Process Living Lab (CDMP-LL) developed within the SSMOLL project. It describes a process that stems from the FormIT approach and adapts it to bring together research and active regeneration processes for the effective reuse of built heritage. This Cultural Living Lab (CLL) is composed of four phases – CLL activation, characterized by planning, co-exploration, and tentative co-design; CH Open, which sees the re-opening of the abandoned building; CCL actions, characterized by co-exploration, co-design, co-testing, and co-evaluation; and finally, CH reuse monitoring that periodically re-assess solutions to support their sustainability.

Only the SmartIES adaptation of the FormIT invites to harmonize and reflect on key principles of Living Labs throughout the innovation products and services development process; more generally, a divide between theoretical definitions of Living Labs characteristics and implementation tools, and the modelling of their processes emerges from literature. The disconnection between theory and applications challenges the replicability of clear Living Labs processes and stresses the need to agree on their main characteristics and implementation steps from an interdisciplinary perspective (Rollin et al., 2021, p. 2).

In the cultural and heritage field, this challenge is further fuelled by the multi-dimensional and interdisciplinary nature of the sector (Clark, 2019, p. XVII), encompassing tangible and intangible attributes, which can be movable or immovable, digital or analogue, having a wide spectrum of stakeholders' attributing different values to them, and a variety of organizations, institutions, and industries – for-profit and non-for-profit – that manage them, at multiple scales, employing a diverse array of resources differently generated, resulting in a great variety of practices (Council of the European Union, 2014, Section art.2).

1.5.2 Participation

The rich variety of engagement forms emerging from participatory initiatives within Living Labs are challenged by their temporary nature, short-term agendas, and lack of sustainable human and financial resources (Falanga & Nunes, 2021, pp. 8–9). Furthermore, participatory initiatives can face additional challenges inherent in the user-centric approach of Living Labs that are related to power dynamics, know-how, and communication among the complex network of engaged stakeholders when establishing joint goals and a common language. All of this can jeopardize trust relationships and efficient management of participation processes, risking hindering their planned results, leading to unintended outcomes of participation (van Geenhuizen, 2018, pp. 1284–1285).

Similar challenges affect the cultural fields. In the last decades, participation in culture and heritage practices has been advocated both for more effective and equitable conservation approaches and for the best alignment of the field to broader sustainability goals; however, not all forms of participation are considered to lead to the same outcomes. Distinctions are made between one-off participatory activities, looking at their inclusivity, form, timing, and related capacity to drive positive externalities, and longer engagement programs, with their potential to build capacity for participation, promote aware and empowered practices, and foster longer-term planning, dedicated resources, and regulation for a more transformative impact (Rosetti, Cabral, et al., 2022, pp. 2–5).

Perceived challenges range across dynamics, methodologies, and ethics of participation, focusing on the need for professional skills to facilitate the participation of multiple and diverse stakeholders and manage its politics, the effectiveness of different tools and approaches, and the value that participatory practices create or how it is contested (Rausch et al., 2022). Overall, a persisting challenge that relates to all of the above is the allocation of adequate resources – people, funding, and time – to the optimal implementation of participatory practices (Rosetti, Roders, et al., 2022),

which is matched with the international trend of increasing cuts of national subsidies to the sector that have urged cultural organizations to rethink their collaborations and partnerships (Prokůpek et al., 2023).

1.5.3 Evaluation

The complexity of Living Lab scenarios raise questions on their effectiveness as spaces of change and open innovation, and bring attention to the importance of monitoring and evaluation processes (Beaudoin et al., 2022; Bronson et al., 2021; Paskaleva & Cooper, 2021; Scholl et al., 2022; Ståhlbröst, 2012; van Geenhuizen, 2018). Recent studies have investigated reporting practices on Living Labs implementations, observing inadequate performance evaluations, difficulties in developing general assessment frameworks that enable comparisons, and limited published evidence (Bronson et al., 2021, pp. 13–14; Paskaleva & Cooper, 2021, pp. 8–9). Efforts have been made to develop frameworks and tools to monitor and evaluate a Living Labs as an organization or a methodology, and to measure its projects' impact on a certain environment. However, two main limitations have been identified: first, tools that assess the key lab's process steps are missing from the list; second, a managerial approach is prominent in this field, lacking easily accessible and approachable solutions for practitioners and calling for more playful designs (Overdiek & Genova, 2021, p. 18). Among the existing resources, ENoLL uses an assessment framework of 20 indicators based on six *common attribute areas – active user involvement*, *multi-method approach*, *multi-stakeholder participation*, *orchestration*, *real-life setting*, and *co-creation* (ENoLL, 2019), which mainly focuses on characteristics rather than processes. Other critics of this approach underline how the sustainability and durability of Living Labs are not commonly addressed by existing frameworks, and how elements of Business Modelling could support such crucial assessment (Mastelic et al., 2015).

Monitoring and evaluation practices pose many challenges in the cultural and heritage fields too, particularly when assessing participation and measuring its impact.

The social nature of participatory practices, their complex time- and place-specific dynamics, together with the lack of dedicated resources, especially at the end of projects, are considered among the main challenges to evaluation processes in the cultural and heritage field (Landorf, 2009). Moreover, while the progressive shift in policy – hence in subsidies – towards an instrumental understanding of the role of cultural heritage institutions and participation in their operations and activities stresses the need for periodical evaluations and reporting, existing frameworks tend to represent the perspective of limited groups of stakeholders and favour quantitative metrics, struggling with measuring hard-to-quantify externalities (Scott, 2006).

2 Methodological approach

To better understand the potential of Living Labs as a resource to support the participatory turn in the cultural and heritage fields and foster sustainable participatory practices, in light of the identified challenges of this methodology and how they relate to current field's dynamics, this paper aims to develop a process-based definition informing a practical implementation model of Cultural Living Labs, inspired by literature on their general characteristics and specific applications by means of an interdisciplinary systematic literature review (Boland et al., 2017).

The keywords "living lab" and "cultur*"[1] were used to select an initial pool of peer reviewed articles and book chapters on Scopus (63) to understand the possible peculiarities brought by field-

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1. In the context of this research, the cultural field includes all interdisciplinary fields that directly pertain, or are affected by cultural practices.

specific types of stakeholders, value systems, and business model architectures. The documents were screened to assess *relevance* – whether a definition of Living Labs and/or their characteristics was provided and whether the paper addressed culture in any form and context – *quality* – including only peer-reviewed documents with clear methodology and discussion – and *availability* – whether the document is open access or retrievable through the university library. On this ground, 37 records were excluded. A second round of sources harvesting in Scopus was carried out to refine the search by using "living lab" and "cultural heritage" as keywords (37), and extra 18 records were excluded from the final selection. Lastly, 10 extra records were added via snowballing forward search to integrate frequently referenced research on the definition of Living Labs and their processes that did not figure in the original selection (Boland, Cherry, & Dickson, 2017, Chapter 4).
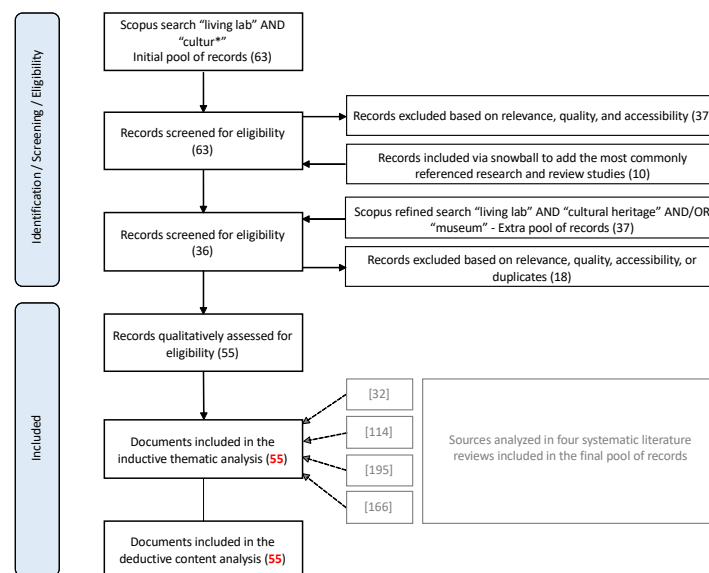
Figure 1. PRISMA Flow diagram of records' selection (adapted from Boland et al., 2017).

These characteristics have been further clustered and thematically divided into belonging to *process steps*, *key elements*, and *objective*s of Living Labs. The following sections present these characteristics and model the relation between them with the aim to provide a process-oriented visual representation of the system of (cultural) Living Labs.

3   Results

The resulting pool of documents is interdisciplinary, covering Living Labs applications ranging from urban regeneration, green mobility, and culture of sustainability (Barbi et al., 2020; Boeri et al., 2017; Calcagno et al., 2023; Fanzini et al., 2020; Ferretti et al., 2022; Fu & Bu, 2016; Galderisi & Limongi, 2024; Gianfrate et al., 2020; Sopjani et al., 2019; Turilazzi et al., 2021; Turillazzi et al., 2020), accessibility, reuse, and retrofitting of built heritage (Barbi et al., 2020; Cerreta et al., 2020; Claude et al., 2017; Egusquiza et al., 2021; Fava, 2022b, 2022a; van Knippenberg & Boonstra, 2022), to open innovation of ICT solutions for participatory decision making, interactive visitors

experiences, heritage conservation, and the promotion of sustainable cultural tourism in historic cities (Cerreta & Poli, 2020; Gatta et al., 2017; Suma et al., 2014; Ten et al., 2020; Turilazzi et al., 2021). Also, most of the research represented in this sample is based in Europe, with a few exceptions, as well as the analysed case studies. Therefore, the results presented below are to be considered as representative of specific geographical regions and culture-related fields.

3.1 Characteristics

The 21 most addressed characteristics of Living Labs have been identified and prioritized according to the mentions' frequency (see Table 1a, 1b). They can be analysed distinguishing them into process "steps", "key elements", and "objectives".

Table 1. Analysis of the frequency of characteristics' mentions.

CHARACTERISTICS	Stakeholders' participation & co-creation	(Open) innovation process & outcomes	Real context	Sustainability of practices & transformative change	Experimentation	Research & exploration	Co-ideation & co-design	Needs-based actions	Collaborative methods, tools, & approaches	Networks, ecosystems, & business models development	User-centered approach	Evaluation	Facilitated PPP partnerships & collaborations	Iterative learning & knowledge development	Collab. governance, management, leadership, ownership	Stakeholders & partners' mapping	Structured set-up	Mutal benefits for business, society & users	Identification of challenges & opportunities	Monitoring	Diverisfied participation
Baran and Berkowicz, 2020	X	X	X		X	X	X	X			X		X	X		X	X	X			
Barbi et al., 2020	X	X	X	X	X	X	X	X	X		X	X	X						X		X
Barbutl et al., 2020	X					X	X	X						X	X	X			X		
Bergval-Kåreborn et al., 2009					X				X	X						X	X	X			
Boeri et al., 2017	X	X		X			X				X										
Calcalgno et al., 2023	X	X	X		X						X										
Callarl et al, 2019	X	X	X	X		X		X			X							X			X
Cerreta and Poli, 2020	X	X		X		X	X			X		X	X			X					
Cerreta et al., 2020	X		X		X	X		X	X		X	X	X		X					X	
Claude et al., 2017	X	X	X	X		X				X	X										
de Los Rios et al., 2015	X		X		X	X					X	X									
Edvinsson, 2018	X	X									X			X							
Egusquiza et al., 2021	X		X	X		X	X					X	X								
Fabregã, 2018	X			X							X										
Falanga and Nunes, 2021	X	X	X	X			X	X						X		X					
Fanzini et al., 2020	X	X	X		X		X		X						X						
Fava, 2022	X						X		X		X				X	X		X			
Ferretti et al., 2022	X				X	X			X												
Florez Ayala et al., 2022	X		X	X	X	X					X		X			X					
Følstad, 2008	X		X		X	X		X			X								X		
Følstad, 2008b	X	X	X				X												X		

CHARACTERISTICS	Stakeholders' participation & co-creation	(Open) innovation process & outcomes	Real context	Sustainability of practices & transformative change	Experimentation	Research & exploration	Co-ideation & co-design	Needs-based actions	Collaborative methods, tools, & approaches	Networks, ecosystems, & business models development	User-centered approach	Evaluation	Facilitated PPP partnerships & collaborations	Iterative learning & knowledge development	Collab. governance, management leadership, ownership	Stakeholders & partners' mapping	Structured set-up	Mutal benefits for business, society & users	Identification of challenges & opportunities	Monitoring	Diversifed participation
Fu and Bu, 2016	X	X		X		X	X	X	X	X		X								X	
Galderisi and Limongi, 2024	X	X		X		X	X	X	X	X		X					X				
Galle et al., 2022	X	X			X	X			X												
Gatta et al., 2017	X			X			X			X		X		X	X	X					
Gianfrate et al., 2020	X				X		X	X		X		X				X				X	
Heinrich et al., 2022	X	X															X				
Hossain et al., 2019	X	X	X	X			X	X	X	X			X			X	X	X	X		X
Lafontaine, 2013	X	X			X				X							X		X	X		
Leminen and Westerlund, 2016	X		X						X	X											
Maksymiuk et al., 2021	X		X		X		X			X						X					
Mccormick and Hartmann, 2017	X		X		X							X		X	X						
Morantes et al., 2016		X			X		X	X			X							X			
Mulder et al., 2008	X	X							X	X						X		X	X		
Pinto and Viola, 2016	X	X		X		X		X		X						X					
Quarto et al., 2014	X																				
Rasanen, 2012	X	X																			
Ritalahti, 2009									X		X										
Rollin et al., 2021	X			X	X		X						X	X	X	X				X	
Scaillerez and Tremblay, 2017					X			X							X	X					
Schuurman et al., 2013	X		X	X	X	X		X					X	X							
Sopjani et al., 2019	X	X	X	X	X	X	X				X										
Ståhlbröst, 2012	X	X	X	X							X							X			
Suma et al., 2016	X	X		X							X				X						
Svensson, 2015	X	X	X	X		X	X				X										
Ten et al., 2020	X	X					X	X	X		X					X			X		
Thinyane and Terzoli, 2011	X										X		X								
Tortora, 2018	X									X						X					
Turilazzi et al., 2021	X			X	X				X				X	X							
Turilazzi et al., 2020	X						X	X													
Tyl and Allais, 2021	X		X	X	X	X	X				X		X								

CHARACTERISTICS	Stakeholders' participation & co-creation	(Open) innovation process & outcomes	Real context	Sustainability of practices & transformative change	Experimentation	Research & exploration	Co-ideation & co-design	Needs-based actions	Collaborative methods, tools, & approaches	Networks, ecosystems, & business models development	User-centered approach	Evaluation	Facilitated PPP partnerships & collaborations	Iterative learning & knowledge development	Collab. governance, management leadership, ownership	Stakeholders & partners' mapping	Structured set-up	Mutal benefits for business, society & users	Identification of challenges & opportunities	Monitoring	Diversifed participation
Valtolina et al., 2013	X											X				X					
van Knippenberg and Boonstra, 2024	X	X			X	X		X	X					X							
Voytenko et al., 2016	X		X		X					X		X			X	X					
Wendt et al.,2021	X	X	X	X		X		X	X			X		X							
Incidence Count	51	28	24	23	22	22	22	20	18	18	17	15	14	14	13	13	11	7	5	4	3

3.2   Process

Research and exploration are considered by many sources (22 out of 55) a key component of Living Labs. As part of these processes, the need to identify relevant stakeholders (13 out of 55), understand their needs (20 out of 55), challenges, and opportunities, and build a network (18 out of 55) are often mentioned as necessary starting point for collaborating towards common goals (see references in table 1).

Co-creation is the most mentioned characteristic across the examined studies (51 out of 55) (see references in table 1). Its processes are commonly distinguished into co-ideation and co-design (22 out of 55), and co-experimentation activities (22 out of 55) for the temporary testing of a common vision of transformation (Florez Ayala et al., 2022; Følstad, 2008a; Hossain et al., 2019; Morantes et al., 2016; Scaillerez & Tremblay, 2017; Tyl & Allais, 2021; Voytenko et al., 2016).

During the stages of research and exploration, and co-creation, a Living Lab ecosystem is created as made of its networks (18 out of 55), governance and management structures, dynamics, and fields of action (13 out of 55). Naturally, this also becomes the avenue where the value creation for the multiple stakeholders involved is addressed and business models are developed (Bergvall-Kåreborn et al., 2009; Egusquiza et al., 2021; Hossain et al., 2019; Leminen & Westerlund, 2016; Mulder et al., 2008; Voytenko et al., 2016).

Monitoring (4 out of 55) and evaluation (15 out of 55) are considered fundamental to the functioning of Living Labs as spaces of iterative learning and knowledge development (14 out of 55) that can facilitate change (23 out of 55) and innovation (28 out of 55). The collaborative definition of indicators among the stakeholders and the periodical discussion of their relevance and performance is important to assess and validate the impact of the Living Labs (Baran & Berkowicz, 2020; Cerreta et al., 2020; Florez Ayala et al., 2022; Følstad, 2008b; Mccormick & Hartmann, 2017; Rollin et al., 2021; Schuurman et al., 2015; Voytenko et al., 2016). Therefore, monitoring and evaluation actions need to be integrated into Living Labs processes to ensure the allocation of the necessary time, financial, and human resources for their undertaking (Cerreta et al., 2020, pp. 7–8).

3.3   Key elements

Among the identified characteristics, there are a few elements that are considered essential to the creation of Living Labs, defining them as such together with their processes:

- The diversified participation (3 out of 55) of mapped (13 out of 55) multiple– stakeholders (51 out of 55) is the most mentioned element. It is common to all Living Labs across fields and typologies, indicating that the mapping and representation of multiple perspectives and the collaboration of a variety of stakeholders are considered a must for their implementation (Baran & Berkowicz, 2020; Bergvall-Kåreborn et al., 2009; Cerreta & Poli, 2020; Falanga & Nunes, 2021; Hossain et al., 2019; Rollin et al., 2021; Scaillerez & Tremblay, 2017).
- People-Public-Private partnerships (14 out of 55), as a form of participation, are invited by many and align with the Quadruple Helix Model promoted by ENoLL (ENoLL, n.d.).
- Collaborative governance, management, leadership, and co-ownership (13 out of 55) are increasingly considered fundamental to empower participating stakeholders in co-owning the Living Labs' processes and outputs to foster leadership and enhance their resilience (Mccormick & Hartmann, 2017; Rollin et al., 2021; Scaillerez & Tremblay, 2017; Voytenko et al., 2016).
- Structured set-ups (11 out of 55) are mentioned in different contexts as an important condition to ensure the participation of all stakeholders throughout all the steps of the Living Labs process, offering the necessary infrastructure and facilitating monitoring and evaluation practices (Baran & Berkowicz, 2020; Bergvall-Kåreborn et al., 2009; Lafontaine, 2013; Mulder et al., 2008).
- A real context setting (24 out of 55) is generally considered another fundamental aspect of Living Labs, which address and deals with complex multi-stakeholder challenges, offering a controlled environment where to bring together all relevant actors and experiment with shared solutions (Leminen & Westerlund, 2016; Mccormick & Hartmann, 2017; Ståhlbröst & Holst, 2012).
- User-centred practices (17 out of 55) are mostly indicated as part of open innovation processes within Living Labs that aim to design services, products, or solutions that directly respond to the needs of new stakeholders or end users (Baran & Berkowicz, 2020; Ståhlbröst & Holst, 2012; Tyl & Allais, 2021).

As embedded throughout the different stages of research and exploration, co-creation, monitoring, and evaluation, the above mentioned elements contribute to addressing the objectives of Living Labs.

3.1.3 Objectives

Living Labs are generally advocated for fostering open innovation, mutual benefits for society and organisations, sustainability of practices, and transformative change.

As a form of open innovation, Living Labs enable the confluence of multiple perspectives (Baran & Berkowicz, 2020; Falanga & Nunes, 2021; Følstad, 2008b; Hossain et al., 2019; Lafontaine, 2013; Mulder et al., 2008; Ståhlbröst, 2012). On the one hand, this can bring innovative power to development processes and fast progress, while on the other hand, it can trigger costly and slower actions (Ståhlbröst, 2012, p. 66). In any case, Living Labs create a space for mutual knowledge exchange among intersectoral stakeholders and its effectiveness is closely bound to the adoption and implementation of its elements (inclusiveness and variety of participatory practices, partnerships, and governance structures) and processes (co-creation) that contribute to the openness of their innovation outcomes.

Living Labs are intended to bring mutual benefits for society, users, and organization – for and non-for profit (Baran & Berkowicz, 2020; Følstad, 2008b; Lafontaine, 2013; Mulder et al., 2008; Ståhlbröst, 2012). By bringing together different stakeholders they are meant to generate value for each one of them to ensure the continuity of collaboration and maintain the openness of the

innovation process (Ståhlbröst, 2012, p. 68). To this end, adopting a people-centred approach in dealing with real context issues is instrumental and requires a thorough identification of relevant stakeholders to understand their needs, challenges, and opportunities (Baran & Berkowicz, 2020, p. 6). However, there's a lack of empirical studies that measure the generated value for different stakeholders and no comparative analysis of the most effective management approaches in Living Labs (Hossain et al., 2019, p. 986).

Lastly, Living Labs are adopted as spaces where transformation processes can be mediated to improve the sustainability of practices, guide their change, and enhance their impact (Hossain et al., 2019; Mccormick & Hartmann, 2017; Schuurman et al., 2015; Ståhlbröst, 2012). They have been used to implement projects aimed at fostering the culture of sustainability at multiple scales through initiatives on inclusive governance, green mobility, sustainable urban development and regeneration, and circularity; however, these projects often belong to short-term funded programs, preventing the reiterative cycles of sustainable Living Labs processes and the evaluation of their longer-term impact (Falanga & Nunes, 2021, p. 8). Attempts have been made to track the transformative changes of Living Labs' activities by looking at their direct impact through indicators-based co-assessment processes, their indirect impact monitoring changes in the field dynamics and policies, and their diffused impact observing shifts in societal perception and value system; however, measuring changes poses multiple challenges and no common approaches have been adopted (Rollin et al., 2021, pp. 2–4).

4   Discussion

Despite the lack of a seminal definition (Baran & Berkowicz, 2020, p. 5; Schuurman et al., 2015, p. 1; Tyl & Allais, 2021, p. 3), it emerges that Living Labs are open innovation ecosystems that mediate the collaboration among (cultural) organizations, researchers, industries, communities, and governments to co-identify needs and priorities, co-design, and co-experiment with concrete solutions in real-life environments. They offer approaches and space to generate knowledge through exchange and co-evaluation and bring change through action-based projects in iterative learning cycles.

The identified Living Labs characteristics are found across sectors, with apparent no cultural fields-specific variations, from a definition perspective. However, from the analysis of studies, different practices emerge in relation to the co-creation of products, services, or strategies, and for-profit or not-for-profit goals that have been tailored to specific projects, reflecting the specificity of each Living Lab. To address issues of definition and replicability, this study offers a different approach compared to existing literature reviews on Living Labs (Følstad, 2008a; Hossain et al., 2019; Leminen & Westerlund, 2016; Scaillerez & Tremblay, 2017). It focuses on existing general definitions and specific practices to the cultural and heritage fields and related interdisciplinary ones, and proposes a definition that distinguishes Living Labs' characteristics that shape their process steps, key elements, and objectives in the sector and beyond, bridging the existing divide between the definition of characteristics and processes of Living Labs (see Figure 1).

- The characteristics that describe Living Labs' processes can be organized into four different steps: (1) research and exploration, (1a) including stakeholders' identification, (1b) needs assessment, and (1c) identification of challenges and opportunities; (2) co-creation, including (2a) co-ideation, (2b) co-design, and co-experimentation; (3) monitoring, and (4) evaluation.

- The characteristics that constitute Living Labs' key elements throughout these stages are (1) stakeholders' (diversified) participation, (2) PPP partnerships, (3) collaborative governance, management, leadership, and ownership, (4) structured set-up, (5) real context, and (6) user-centred practices.

- Finally, the characteristics that define Living Labs' objectives are (1) open innovation, (2) mutual benefits for society and organizations, (3) sustainability of practices and transformative change – measuring their direct, indirect, and diffused impact.
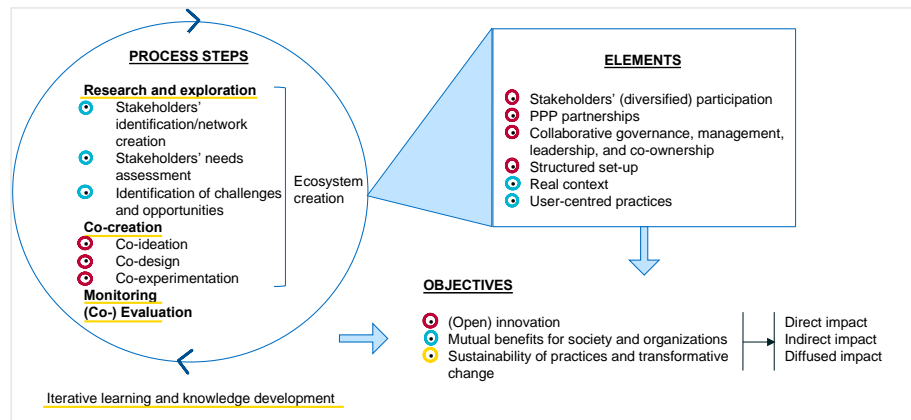
Figure 2. Living Lab process steps-elements-objectives model

This model addresses the existing divide identified in literature between the definition of Living Labs' characteristics and their processes, offering a visual representation of how general Living Lab's definitions can be operationalized. Specifically, compared to previous models, it proposes a circular iterative process (differently from the CulTour "flow of workgroups", and more similarly to the FormIT and CDMP-LL), which retains core steps that relate to the *co-exploration/-discovery*, *co-design/-define/-creation*, *co-implementation/-develop/-delivery*, and *co-evaluation* phases and steps that are present in others, but abandons projects' goals-specific elements such as *opening*, *prototyping*, and *commercialization* (Cerreta et al., 2020, pp. 5–7; D. Aversano P., 2017b, p. 14; Fidelbo et al., 2023, p. 21). As a result, it can represent a resource for those organisations, institutions, and firms that want to approach the Living Lab methodology as a starting point to develop project-specific processes tailored to their set goals.

The process steps-elements-objectives model can help address current limitations both of Living Labs and of participatory practices in the cultural and heritage fields. First, it can address issues of replicability and offer a common knowledge base for mutual learning if multiple actors within and beyond the cultural sector adopt it, thanks to its wide applicability, enabling the comparison of very specific Living Labs implementations (Rollin et al., 2021, p. 2). Second, it can facilitate the integration of participatory practices throughout organizations' processes by structuring them into clear steps, inviting to embed key elements within each step, and linking them to set objectives. In this way, attention can be paid to setting up timely and inclusive participation, designing forms of participation that are suitable for desired outcomes, and having an overview of necessary resources throughout the process, which can support long(er)-term planning (Rosetti, Cabral, et al., 2022; van Geenhuizen, 2018, pp. 1284–1285). A Living Lab does not necessarily produce new financial resources – unless it aims to develop commercial goods and services – but can facilitate the participation's value capturing throughout its processes for more efficient use of existing resources.

Lastly, bringing together Living Labs' characteristics, objectives, and process steps in a single model can support the development of monitoring and evaluation frameworks that include the latter, which are currently missing (Overdiek & Genova, 2021, p. 18). Moreover, adopting a process-oriented evaluation approach can facilitate the embedding of monitoring practices at each step and the development of additional indicators that are key to the measuring of Living Labs' participatory practices against their set objectives (Landorf, 2009; Rosetti, Cabral, et al., 2022; Scott, 2006).

5   Conclusion

This research explores the potential of Living Labs as a resource to support the participatory turn in the cultural and heritage fields and foster sustainable participatory practices. First, it introduces the participatory turn in the heritage fields. Then it frames the main challenges in the definition and implementation of Living Labs and how they relate to current participatory cultural and heritage practices. Eventually, through a systematic review of interdisciplinary culture- and heritage-related literature, it analyses current definitions and applications of Living Labs developing a model that brings together their process steps, elements, and objectives.

This approach aims to bridge the identified divide between the definition of Living Labs' characteristics and processes, and differs from previous systematic literature reviews on Living Labs by focusing on their general definitions and specific applications in the cultural and heritage sector. The resulting model emerges from interdisciplinary culture-related field experiences, which required a simplification of Living Labs' core process steps and doesn't present any sector-specific characteristics. The resulting wide applicability of this model can offer an interesting kick-starter tool for institutions and organizations in different fields – for and non-for-profit – that want to experiment with the Living Lab methodology. Moreover, it can be adapted and further developed to meet each project's needs, guiding the planning of Living Labs' co-creation and learning processes.

Living Labs can represent a resourceful methodology to support the implementation of participatory heritage practices, showing potential to address issues of replicability, participation, and evaluation. It can be adopted by an array of actors across diverse culture-related fields thanks to the inclusivity of its steps, which facilitate the adaptation of processes to the specific needs, resources, and objectives in different contexts, addressing issues of replicability. The Living Labs methodology can facilitate the implementation of long-term forms of participation of multiple stakeholders by enabling the planning of timely engagement activities and commensurate resources that are in line with the set objectives. Moreover, it provides a framework for the integration of monitoring and evaluation activities within each step of the process, which is fundamental to enabling learning and the improvement of practices through iteration. Therefore, Living Labs represent an important resource to the participatory turn in the heritage field, becoming catalysts of participatory heritage governance.

The heritage field's experiences in setting up and running Living Labs can inform the research of Living Labs scholars, whose studies so far have focused predominantly on other fields. Particularly, the adaptation of the Living Labs processes to facilitate transformative participatory heritage practices can offer different perspectives on how issues of replicability, participation, and evaluation can be tackled.

To conclude, this research brings four main contributions: first it advances the theoretical modelling of Living Labs incorporating the perspective of cultural practices. It draws from existing definitions and moves one step forward towards a more operational approach that stresses the core characteristics of Living Labs and their implications for addressing their objectives. In doing

so, it bridges theory and practice to facilitate a mutually informative dialogue among them. Second, it proposes a practical model of Living Labs to be adopted and adapted across cultural fields – and beyond – to set-up and implement Living Labs. By creating a model of the *process steps*, *key elements*, and *objectives* of Living Labs, this investigation offers guidance for first-time users of the Living Lab methodology. Third, it raises awareness of Living Labs' potential for the development of sustainable and transformative participatory practices in the cultural heritage field by highlighting how Living Labs' characteristics could enable a more efficient use of available resources and facilitate the effective planning of participatory processes. As such, this research opens opportunities to inform cultural policies at different scales that aim to foster a more resilient post-pandemic cultural sector and bring mutual benefits to heritage and society by regulating participatory practices. For instance, it can inform the current ratification of the Faro Convention on the Value of Cultural Heritage for Society in multiple European countries[2]. Last, this study identifies the potential contribution of Cultural Living Labs' experiences to addressing challenges of replicability, participation, and evaluation for the greater interdisciplinary Living Labs field. Therefore, it offers an additional perspective to the Living Labs research field by including the practices of cultural actors, which play a crucial role in system change processes for the sustainable implementation of more participatory governance forms.

Limitations of this research relate to the partial perspectives offered by the selected pool of articles, which focuses on peer-reviewed publications, excluding grey literature and reports. Future reviews can expand the scope of investigation by including different document typologies and evidence from under-represented culture-related fields. Future research can apply the model in diverse interdisciplinary case studies to guide first-time cultural Living Labs users' practices, inform its further refinement, and measure its impact on issues of replicability, participation, and evaluation. Furthermore, the performance of Living Labs in facilitating the implementation of participatory heritage practices and their outcomes can be compared with the other participatory approaches adopted in the cultural fields. Besides these limitations, this research informs the work of cultural heritage institutions that want to experiment with Living Labs to support the development of sustainable participatory practices to foster long-term transformative processes.

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