Living Labs for Cross-Border Systemic Innovation

Hans Schaffers and Petra Turkama

> *"Lack of consensus among players in a complex system is one of the biggest barriers to innovation. One subgroup's innovation is another subgroup's loss of control."*
>
> Rosabeth Moss Kanter
> Professor, management consultant, and author

Innovation is increasingly taking place in cross-border collaborative networks, which are shaped by the characteristics of systemic innovation, the strategies and objectives of main actors, and the dynamics of the innovation process. Participation in such networks is of high importance for small firms, but requires long-term investments and a diverse range of collaboration and innovation capabilities. This article explores how living labs, understood as innovation projects based on open and user-centric innovation methodologies, can form collaboration networks to support small firms and other actors to engage in cross-border collaboration and to accelerate the development and acceptance of innovations. Based on the lessons learned from a major living lab project, APOLLON, we conclude that adopting the living labs networking approach requires thorough understanding of each party's objectives and drivers, the alignment of operational processes, establishment of open and collaborative culture, as well as competences, methods, and tools for supporting cooperation and community building.

Introduction

Healthcare transformation, urban renewal, enhancement of public services, and modernization of production systems are examples of today's important societal challenges; they are also examples of changes in complex systems (tinyurl.com/kdw3h). Addressing these challenges requires not just the adoption of technological innovations, but broader consideration of the wider context of open and systemic innovation (Maula et al., 2006; tinyurl.com/942oa9v). Systemic innovation comprises interrelated technological, organizational, financial, legal, and institutional adaptations as well as changes in human behaviours and practices. Change and innovation in complex systems is often very difficult to accomplish and time consuming due to the many actors and interests involved (Herzlinger, 2006: tinyurl.com/8e8s37l; Moss Kanter, 2011; tinyurl.com/6dcs3fn), their interactions and dependencies within such systems, and consequently the difficulty in identifying causes and predicting impacts of interventions (tinyurl.com/3zp58y7). Therefore, it is important to understand the characteristics of complex systems as well as the systemic nature of required interventions leading to innovation and change.

The fact that innovation activities are increasingly taking place through collaborative networks (Gloor, 2006; tinyurl.com/d4ewb78) is increasingly shaping the management of innovation cycles. This is due to the systemic character of innovations and the ongoing forces of globalization and competition, reflecting the trend towards connected and global markets and the increasingly network-based nature of the economy and society. Networks, and the interactions, exchanges, and collaborations they facilitate, constitute the backbone of innovation ecosystems (Jackson, 2011; tinyurl.com/7u4t4jh; Andersen, 2011; tinyurl.com/7u4t4jh). The resources, facilities, and competences shared among the various actors form the core of such networks and ecosystems and define their innovation potential. The complexity of the innovation ecosystems is further amplified by the fact

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that the networks are increasingly open and cross-border by nature, and they are governed by open business models (Chesbrough, 2006; tinyurl.com/c5p6s85).

Within this context, there is a need for smart innovation instruments that reflect the networked and systemic character of innovations, and can act as catalyzers of systemic change. The concept of living labs, understood as environments of open and user-centric innovation (e.g., Bergvall-Kåreborn et al., 2009; tinyurl.com/9nqmrdy), offers a promise to fulfill that role. In our recent work on living labs (e.g., Schaffers et al., 2010; tinyurl.com/9noft6f; Budweg et al., 2011; tinyurl.com/8u3yhvv), we understand living labs as constituting a setting for collaborative innovation by offering a collaborative platform for research, development, and experimentation with product and service innovations in real-life contexts, based on specific methodologies and tools, and implemented through concrete innovation projects and community-building activities. The focus is on mature technologies and operating close to market, which indicates that acceptance and integration of the developed technologies and services are major research topics. The living labs concept has been further developed, experimented, and demonstrated during the last five years within a series of Europe-wide projects in the European Commission Framework Programmes as well as in national initiatives. The concept was further institutionalized as the European Network of Living Labs (openlivinglabs.eu), which comprises more than 300 living labs in 2012. While the gradually maturing concept has generated a valuable stream of conceptual, methodological, and practical work, there is still need for more empirically tested evidence regarding the impact, effectiveness, and maturity of living labs. Based on available surveys, the sustainability perspective of current living lab models seems to remain underdeveloped because most living labs are dependent on public funding and service offerings are limited (Eschenbaecher et al., 2010; tinyurl.com/d3zolxa).

In this context, living labs need to demonstrate professional and specialized work processes, practices, and methods to fulfill the role of innovation-network catalyzer. Living labs also need better integration within the innovation ecosystem and articulation of their value proposition. Based on our research work in a major living labs project, APOLLON (apollon-pilot.eu), this article aims to specify the role and potential added value of living labs in systemic innovation and innovation networks. We propose practical guidelines on how the living lab concept should be further developed and practically implemented in order to effectively guide and accelerate systemic innovation in collaborative networks.

Innovation Networks and Systemic Change

There is growing evidence that the autonomous activities of single organizations cannot produce the cross-disciplinary systemic innovations that would sufficiently address the increasingly sophisticated needs of the market (Maula et al., 2006; tinyurl.com/942oa9v). Consequently, innovation processes are increasingly driven by open-collaboration networks where companies enable systemic innovations through strategic pooling of resources, sharing risks, and leveraging competitive positions. These collaborative networks usually are driven by strong industry partners, but increasingly involve also small and medium entreprises and entrepreneurs.

Theoretical work on innovation networks has mostly focused on understanding network characteristics and has largely neglected designing, managing, and steering processes for collaborative networks. Recent work on collaborative networked organizations has defined specific procedures for the setting up and planning of networks including detailed processes such as partner selection, negotiation, agreement definition, and intellectual-property management (Camarinha-Matos et al., 2008, tinyurl.com/cfwnfvp). In exploring the orchestrating role of living labs within collaborative networks of innovation, this framework is useful as starting point for identifying the methods, processes, and tools that can be applied in such networks.

Innovation networks addressing systemic innovation must also consider the role of living labs in initiating and catalyzing change. Transition management (tinyurl.com/bu4xoum) is a relevant field of work for living labs methodologies. It describes how to catalyze change in complex systems and focuses on resolving complex large-scale societal problems such as sustainable energy transitions. Transition management builds on the notions of "niche", "regime", and "transition arena". Much comparable with the role of Christensen's concept of disruptive innovation (tinyurl.com/54poe6), a "niche" is an experimental environment where new innovations, including innovations in policy instruments, can incubate and where learning takes place. Such niches can grow and gradually transform the current "regime", which is the existing dominant set of business structures, rules, and policies. In addition, transition management proposes a "transition arena", which

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comprises a neutral dialogue space and focuses on identifying and realizing strategies and conditions for large-scale systems change.

In comparison to transition management, living labs methodologies are more practically oriented to setting up and conducting user-centric innovation projects in open-innovation settings. In this context, the action-research paradigm provides a valuable framework for participative ICT-based innovation and change (Baskerville, 1999; tinyurl.com/8cta6db). Creating dialogues between stakeholders, including developers and end users, can be considered as practical implementation of transition management. In this sense, living labs activities often start with creating innovation communities and partnerships, which act as "transition arenas" that establish strategic and practical dialogue between the stakeholders involved.

Such dialogue also forms the basis to arrange for institutional change to effectively catalyze systemic innovation (Turkama and Mattila, 2012; tinyurl.com/96jd8yy). Service innovation has been studied through numerous theoretical approaches and conceptual frameworks. In our view, most approaches have failed to adequately recognize the importance of the innovations' adaptation to the existing institutional environments, or alternatively, the need for institutional change in the ecosystem. Research has focused on impartialness and neutrality of the institutional environment rather than on the dynamism and change. Hence, we consider systemic innovations as changes in the local socio-technical regimes that need to be supported by adjustments in related processes, arrangements, values, and institutional logics. We contemplate the living lab approach as a means to model the characteristics and interdependencies of ecosystems, as well as potential implementation barriers and sources of resistance.

Living Labs as Innovation Catalysts

Based on the previous analysis, we conclude that, in order to act as innovation catalysts, living labs need to recognize the systemic character of innovation. Living labs will also benefit from adopting methods, processes, and tools that have been proposed for collaborative networked organizations. These conditions fulfilled, living labs can act as open-innovation and community-building-based transition arenas for overcoming institutional inertia and catalyzing for change.

Living labs offer a comprehensive service platform including testbeds, trials, competences in user-driven innovation, and access to user communities. The outputs from living lab pilots are less predictable and tangible than investing in infrastructure and services, because the focus is on mature technologies, integration to prevailing systems, and user acceptance of innovations. Recent findings from European Living Lab projects, such as APOLLON (apollon-pilot.eu) and Save Energy (ict4saveenergy.eu), support the notion that the approach is probably best suited for cases that call for user-behaviour transformation, crowdsourcing, or business model innovation. The living lab environment creates a platform for simulating business models and go-to-market strategies in low-risk, but yet real-life environments. Recent smart-city pilot projects have further indicated that the approach could also yield more value in terms of competence development and re-defining the roles and relationships between the public and private entities than for product or service development. This further validates the assumption for living labs potential as catalysts for broader societal and industrial transformations.

However, more evidence and success cases are needed for the analysis of living labs best positioning and "value add". The living labs organized within the mentioned European Network of Living Labs may find a special mission in supporting small firms' innovation and international market development ambitions. So far, living labs have mostly acted as single entities in urban, regional, or rural innovation contexts. Our previous work in the Collaboration@Rural project related to collaboration among living labs across rural areas was limited to providing a common technology platform facilitating the sharing and reusing of collaboration services and tools across the living labs (Schaffers et al., 2010; tinyurl.com/9noft6f). In other European living labs projects, networking among living labs remains mostly at the level of exchanging experiences, practices, and methods. We conclude that a new challenge for living labs networking is to elaborate and adopt mechanisms, processes, and tools to support small firms to engage in cross-border collaboration and innovation networks, focusing on systemic innovation.

Cross-Border Networks of Living Labs

The cross-border challenge has been addressed by the APOLLON project, which ran from 2009-2012. The project focused on experimenting with the setting up and running of cross-border networks of living labs in real-life pilots in four thematic domains of systemic innovation: homecare and independent living, energy efficiency, manufacturing networks, and citizen

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participation. During the project, and in close interaction with the real-life pilot activities, we developed, introduced, and validated a methodology for cross-border networking and collaboration of living labs that is based on key principles of collaborative networked organizations (Lievens et al., 2011; tinyurl.com/brcppxl).

The project provided evidence that the role of living labs in setting up cross-border collaboration for innovation and market creation involves a wide range of issues. Supporting small firms to exploit a new technology in homecare and assisted living internationally is highly different from collaboration between small and medium entreprises and large manufacturers in a business-innovation network. Aspects to be addressed include the particular product or service innovation, but also contextual factors such as language and culture, organizational and regulatory settings and more. For this reason, our approach in APOLLON started with defining high-level scenario storylines in order to structure the process of setting up, planning, and running a cross-border living labs network and identifying collaboration needs within the evolving cross-border networks.

The living labs network-development process starts when international business opportunities emerge for the small firm; thereafter, the small firm contacts a local living lab, which establishes collaboration with other living labs across borders and with foreign partners. A next step is to define the innovation or market-development project and arrange for collaboration agreements. The cross-border collaborative-networking project is then implemented, managed, and finally concluded. In summary, the following major phases can be identified:

1. Connecting: identifying opportunities for joint innovation and market development, and identifying potential partners for collaboration

2. Planning: defining partner roles and responsibilities, building and planning the network, and finalizing agreements and contracts

3. Support: conducting collaborative testing, innovation, and market-development activities

4. A fourth and final phase, which is not considered in this article, is to assess the achieved benefits and impacts that the network has created.

The APOLLON approach was to first understand the collaboration needs of partners involved (e.g., small firms, living labs, larger companies, local governments, agencies) and to develop a process of introducing, adopting, and evaluating methods, tools, and guidelines to enhance collaboration in cross-border living labs networks (Schaffers et al., 2012; tinyurl.com/cdchh99). Table 1 presents the main collaboration issues as a framework defined by the dimensions of phases (connecting, planning, and supporting) and scope levels (strategic and operational).

Table 1. Strategic and operational collaboration issues in cross-border living labs networking

Scope	Phase 1: Connecting	Phase 2: Planning	Phase 3: Support
Strategic level of collaboration	• finding potential partners • agreeing on common goals and approaches • dialogue building and negotiation support • business models • intellectual-property principles	• organizing the cross-border living lab planning and development process • partnership structuring, contracting frameworks • elaborating a common plan and approach, defining responsibilities and roles	• governance models structuring living labs operation and collaboration in the network • defining the processes and tools for project management and coordination
Operational level of collaboration	• collaboration procedures and processes for the connect phase • Internet-based tools for communication and collaboration	• detailed planning processes and procedures • tools for collaborating in the planning phase (e.g., using shared workspaces)	• processes and tools for living labs collaboration during support phase (e.g. web-conferencing tools and shared workspaces)

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Table 1 demonstrates that collaboration encompasses a wide range of different operational and strategic aspects, covering the processes related to collaboration as well as collaboration arrangements (e.g., business models, partnership agreements) and tools to support collaboration and communication in networks. It highlights the crucial role of the connect and planning phases as success factors of cross-border living labs networks, and it also brings to the foreground the importance of a shared vision and strategy regarding the objectives and implementation of such networks.

Based on the three-year real-life pilots conducted in APOLLON in the four selected domains of homecare and independent living, energy efficiency, manufacturing, and citizen participation, a range of collaboration bottlenecks related to systemic innovation were identified. For example, the homecare and independent living pilot encompasses a cross-border network of living labs, small and medium entreprises, and other actors facilitating the transfer of a homecare solution from one country to another. The pilot made clear that, for such solutions to be successfully transferred and adopted, they must be embedded in local ecosystems comprising organizational, regulatory, and institutional arrangements.

We conclude this section by highlighting some lessons as regards the role of living labs in developing and operating cross-border collaborative-innovation networks for systemic innovation:

1. Developing such networks requires a phased approach where both strategic and operational issues are addressed and a shared vision is built. Living labs engaging in collaborative cross-border networks must be aware of the importance of carefully building an ecosystem that implements this approach.

2. It is important to define collaboration agreements as part of the connect phase. Important agreements to be made during the connect phase relate to the business model, intellectual property rights, the business proposition, and contractual agreements. Sometimes, it is necessary to be prepared for changes in the composition of the collaborative network (i.e., entry or exit of partners).

3. Defining clear roles and responsibilities of living labs, small firms, and other network partners is important. Role definition, in particular regarding the role of living labs in the network, may avoid project delays and conflicts in later stages of the project. One example is to define a clear leading role for one of the living labs.

4. The definitions of roles and responsibilities imply that living labs should possess the necessary competencies, expertise, and skills.

5. Before a networked project starts, partners should agree on a common understanding of the business case. This will avoid difficulties in engaging the partners and ensures commitment. Objectives, results to be achieved, time frames, and needs and expectations of partners must be clearly defined and aligned to the project goals before the pilot starts. A win-win for all parties involved should be negotiated before the actual start. The pilot should be part of the roadmap and it should target clear business opportunities after the project ends.

6. Adequate project planning and project management should be ensured. Setting up and running a cross-border living labs network must be considered as a complex project. Sound project definition, project management, and the use of project management tools are preconditions for success. Collaborative workspaces and communication tools will support the project community and facilitate communication, interaction, and commitment.

7. Utilizing technologies in cross-border settings requires that technologies to be tested or used in other contexts are compatible. Technologies that have been developed in one context often are not compatible in another environment. Additionally, legal, cultural, social, and organizational issues may hinder the adoption of a technology solution in a different context than originally envisaged.

Conclusion

The living labs concept comprises one particular approach for accelerating systemic innovation in collaborative innovation networks. We will need to further explore with different systemic innovation instruments and learn from experience in the years to come. While living labs may potentially act as initiators and catalyzers of systemic innovation, many living labs are not yet sufficiently well positioned to fulfill this potential. Many living labs are not sufficiently integrated in regional innovation ecosystems. To achieve the full potential, concepts related to living labs, such as open innovation and user engagement, must become better

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embedded into existing innovation networks and ecosystems and their instruments. This article contributed to that objective by presenting a practice-based typology of the collaboration issues that need to be considered in establishing cross-border networks of living labs.

The living lab approach itself faces several risks such as the lack of standardization and inadequate criteria for living labs methodologies and performance. Moreover, there is the risk that the value proposition becomes impossible to communicate, because the term "living ab" can mean different things in different contexts and for different target groups. Additionally, most living labs lack sustainable business models, since they operate on project-based funding or as a part of universities or regional development agencies. The European Network of Living Labs is tackling this concern through tight criteria for living labs that can carry the European Network of Living Labs “brand”, as well as through establishing thematically focused sub-networks, where the added value and focus are clearly defined.

An overall conclusion is that systemic innovation in cross-border collaborative networks requires adequate open-innovation partnership models. Findings from the APOLLON project support the notion that living labs can assume a coordinating role in such networks. The living labs approach is probably best suited for cases that call for user-behaviour transformation or business-model innovation. Living lab environments create platforms for simulating and experimenting business models and go-to-market strategies in a managed, low-risk, but yet real-life environment. In that capacity, living labs and their ecosystems act as learning environments for catalyzing systemic innovations that may gradually transform existing instruments and networks of innovation.

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