Open Innovation Networks: Exploring Actor Roles and Network Orchestration in Living Labs

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**Abstract**

In our contemporary society, innovation is more and more considered as a collaborative effort
between different actors that tap into distributed sources of knowledge. This has fostered research
into open innovation, innovation networks and open innovation processes. However, research on
how these innovation processes are coordinated within these networks is largely lacking. Therefore,
within this chapter we explore a specific approach that tries to facilitate and govern distributed
innovation processes through a Public-Private-People partnership with a central role for the end-
user: Living Labs. As we consider Living Labs as clear examples of distributed innovation through a
collaborative effort of different actors, we use concepts from open innovation and from innovation
networks literature to analyze and make sense of innovation processes taking place in Living Labs. By
means of an in-depth case study analysis, we look at the knowledge transfers, constellation and
orchestration taking place in Flellap, a Flemish ICT Living Lab that generated some successful
projects, but also failed on some aspects. This allows to abstract lessons and propose avenues for
future research.

**Keywords:** Open Innovation, Innovation Networks, Living Labs, Actors
Introduction

Since the industrial revolution started near the end of the 18th century, and especially with the advent of the so-called Fordism at the beginning of the 20th century, the dominant production and innovation logic aimed at vertical integration within the boundaries of a firm or company (Chandler, 1962). Only near the end of the 20th century, in terms of innovation, this dominant view was challenged in favor of a more distributed view. This shift in the dominant mode of innovation, from vertically integrated innovation towards a more distributed mode of innovation, has forced companies to alter both their research and development processes and their approach to innovation management. Instead of focusing on hiring people with all relevant skills and knowledge, and investing heavily in internal research and development capacities, companies had to actively look outside for knowledge and technology to complement internal assets. This shift in the dominant mode of innovation not only required companies to adapt by developing or acquiring different skills and abilities, it also encouraged a growing body of research into the nature and occurrence of distributed innovation processes (Lakhani & Panetta, 2007). In academic theory, this shift has already taken place, but in practice, a lot of companies and innovation practitioners are still struggling with the concrete implementation of strategies to cope with these distributed innovation processes (Chiaroni et al., 2011). Within this chapter, we explore a specific approach that tries to facilitate and govern distributed innovation processes through a Public-Private-People partnership with a central role for the end-user: Living Labs. We consider Living Labs as clear examples of distributed innovation through a collaborative effort of different actors, therefore we study Living Labs through the lens of Open Innovation and innovation networks in order to make sense of innovation processes taking place inside Living Labs. By means of an in-depth case study analysis, we will look at the knowledge transfers, constellation and orchestration taking place from a network perspective.

A process perspective on Open Innovation
Already one year after Chesbrough’s (2003) initial book on Open Innovation, which main message was that opening the internal innovation process of a firm yields extra value, Gassmann & Enkel (2004) further explored this rapidly emerging concept and took a process perspective on Open Innovation. Based on a case study of the IBM Industry Solution Lab in Zürich, they demonstrated that the locus of the various innovation activities is decoupled into three parts. First there is the locus of knowledge creation, the locus of innovation (indicating applying the idea/knowledge/technology and transforming it into an innovation), and the locus of commercialization (product development or exploitation of the innovation). The fact that the locus of innovation shifts during the innovation development process implies the existence of knowledge transfers. Moreover, by distinguishing a locus of knowledge creation, a knowledge of innovation and a locus of commercialization, Open Innovation also acknowledges the fact that innovation is a process (van de Vrande, Lemmens & Vanhaverbeke, 2006).

Research into these transfers lead to the identification of three core Open Innovation processes: outside-in (enriching the company’s knowledge base through integrating customers and suppliers and through external knowledge sourcing), inside-out (getting pecuniary returns for transferring ideas/knowledge/technologies to the outside environment), and the coupled process, which combines both inside-out and outside-in processes by working in alliances with complementary partners (Gassmann & Enkel, 2004). West & Bogers (2013) argue that the outside-in or inbound process has received most research attention and ascribe this to the fact that this process builds further on a large body of prior research. They see three different research angles on this inbound process: how firms obtain external innovation, the role of innovation created outside the firm by individuals, and research on open source software (including open source communities).

Instead of outside-in and inside-out, exploration and exploitation are also sometimes used (van de Vrande, Lemmens & Vanhaverbeke, 2006). These are concepts introduced in the context of organizational learning and refer to the relation between the exploration of new possibilities and the exploitation of old certainties (March, 1991). Purposive outflows of knowledge or knowledge exploitation, implies innovation activities to leverage existing technological capabilities outside the boundaries of the organization, whereas purposive inflows, or knowledge exploration, relates to innovation activities to capture and benefit from external sources of knowledge to enhance current technological developments (van de Vrande et al., 2009). The coupled process can then be seen as a form of simultaneous exploration and exploitation between two companies or organizations. Interestingly, Enkel et al. (2009) equal the coupled process to co-creation with complementary partners that engage in simultaneous outside-in and inside-out processes through alliances, cooperations and/or joint ventures.
Open Innovation Systems, networks and systemic instruments

Most of the Open Innovation concepts and literature takes a single firm as the unit of analysis or the exchange process of knowledge between firms. However, these exchanges do not necessarily occur between two actors, but can also be part of a larger network or constellation of actors engaging in Open Innovation. As Living Labs consist of multiple actors engaging in innovation projects that deal with knowledge transfers and collaborative activities (such as co-creation), we need to take a more encompassing perspective that is able to analyze and describe these networked structures and activities. Therefore we turn to the literature on systemic innovation, (open) innovation networks and systemic instruments for concepts and frameworks to take into account this network view on Living Labs.

The first concept we introduce has received the least attention, especially in terms of empirical research, and operates on a more ‘macro’ level compared to innovation networks: innovation systems. Although there is no consistent definition available (yet), the concept of the innovation system sees technology and information transfers between people, companies, organizations and institutions as essential to the innovation process. Wieczorek & Hekkert (2012) state that, in its broadest definition, an innovation system entails all parts and aspects of an economic structure, together with the institutional set-up affecting learning, searching and exploring, which includes the production, marketing and finance system. Actors within innovation systems include users, producers, intermediary organizations and supportive organizations (Smits & Kuhlmann, 2004).

Wieczorek & Hekkert (2012) discern between different types of innovation systems: national or regional innovation systems (when a geo space is a unit of analysis), sectorial innovation systems (dealing with a whole sector of economic activity, often going beyond national borders), and technological innovation systems (evolving around a specific technology). This means that innovation systems consist of multiple levels that interact with each other and that can be subjected to analysis. Fichter (2009) discerns the company level (the most used level of analysis in Open Innovation research), the value chain level of innovating actors, and the level of framing and interlinking organizations (a superstructure level that hosts organizations that enable other actors to innovate).

Following the broad definition of innovation systems, we can see innovation networks as part of these systems, where innovation networks can be defined as purposefully established connections between the demand side (intermediate and end-users of innovation) and the supply side (producers of knowledge and technologies) of the knowledge infrastructure, as well as with other relevant actors from within the innovation system (Klerkx & Leeuwis, 2009). Within this system and network...
perspective co-operation between several different types of actors is seen as key to successful innovation. Fischer (2006) relates this to the belief that innovation networks offer time advantages over internal development in realizing innovations in a shorter time interval. Rese & Baier (2011) discovered the following four network-related success factors that enhance the chances of successful innovation in innovation networks: trust, commitment, dependency, and compatibility of the network actors. Referring back to the Open Innovation processes of exploration and exploitation, Dittrich & Duysters (2007) hypothesize that actors pursuing an exploration strategy will look for partners with distinctly different capabilities, resulting in an innovation network consisting of partners in new technological areas, whereas companies following an exploitation strategy will search for companies with similar technological capabilities, resulting in an innovation network of partners in similar technological areas.

Rese & Baier (2011) state that innovation networks appeal in particular to SMEs as they are able to reduce existing barriers for innovation by complementing the resources they lack. This resonates with the hypothesis put forward by Leminen & Westerlund (2011) that small companies find it easier to switch to an Open Innovation strategy (cf. supra).

However, research into innovation systems and networks also revealed that several gaps might hinder effective co-operation. Based on an in-depth case study of an innovation network in the Dutch agriculture industry, Klerkx & Aarts (2013) provide an overview of the three main challenges and paradoxes that occur when dealing with open innovation networks. First, they need to find a balance between new relationships and existing relationships, i.e. balancing openness (exploiting weak ties) and closure of the network (fostering strong ties). This is also referred to as the need for ‘dynamic stability’ (Dhanaraj & Parkhe, 2006). Second, the ways of interaction between the actors in the network need to take into account the different perspectives of the actors on the nature and form of the cooperation, as (too) diverging perspectives may lead to conflicts or even network failure. Third, the formal and informal relationships between the actors in the network need to be balanced. Actors in the network need to manage the paradox that they have to develop their position in the network to reap the benefits, but that total control of the network by one firm may be counterproductive as it undermines the informal basis of network cooperation.

These challenges can be overcome through the process of network orchestration. The literature regarding this orchestration has identified three basic elements (Pittaway et al., 2004; Batterink et al., 2010; Klerkx & Aarts, 2013): demand articulation, which refers to the continuous vision development and articulation of related technology, knowledge, and other resource needs; innovation network composition, which entails scanning, filtering, and matchmaking of new
network partners for accessing certain resources; and innovation process management, or coordinating the network to foster trust, transparency and reciprocity.

This led to the creation of systemic instruments that aim to address problems, referred to as systemic weaknesses or systemic failures, that arise at the innovation system level and which negatively influence the speed and direction of innovation processes that run in the innovation networks within the innovation system (Smits & Kuhlmann, 2004). One of these ‘instruments’, advocated by scientific and policy literature, are so-called intermediary organizations to fulfill bridging and brokerage roles within innovation systems to overcome various gaps among innovation system stakeholders that can lead to innovation system failures and reduced performance (Klerkx & Leeuwis, 2009). Katzy et al. (2013) also state that there is broad agreement in literature that innovation processes in open networks are coordinated through a visible hand, often referred to as innovation intermediary, and propose the Living Lab as a process coordinating innovation intermediary for ‘(1) closing the pre-commercial gap by manifesting initial demand for products and services, as well as (2) orchestrating the actions of disparate actors in order to gain critical mass for the creation of a product or service’ (Almirall & Wareham, 2011). These innovation intermediaries are described to provide a set of operative activities that link them to the network innovation processes, but literature provides only fragmented insight about the intermediary–process relationship. Sieg, Wallin & von Krogh (2010) also note that there is a relatively limited understanding of the implementation of open innovation through innovation intermediaries, with the notable exceptions of knowledge brokers (recombination of existing solutions) (Hargadon & Sutton, 1997; Hargadon & Sutton, 2000), and virtual knowledge brokers (Verona et al., 2006). Moreover, Smits & Kuhlmann (2004) note that the most systemic instruments, such as brokers and intermediaries, take an individual organization or a bilateral relation as unit of analysis, focusing largely on the private sector and far less on the public sector and public-private alliances, with only few attention for learning processes, platforms for experimentation or tailor-made strategic intelligence.

This apparent gap in the literature is somewhat filled by the research stream focusing on Triple and Quadruple Helix models. We already introduced the Triple Helix model when discussing the System Models of Innovation Management (cf. supra). The Triple Helix thesis states that the university can play an enhanced role in innovation in increasingly knowledge-based societies (Etzkowitz & Leydesdorff, 2000), and represents an evolutionary model of innovation that looks at the interactions between three distinct actors (‘helices’): university, industry and government (Leydesdorff & Etzkowitz, 1996). By acknowledging interactions between and influence of these actors on one another, the Triple Helix as an analytical model looks to describe institutional arrangements and policy models, conceptualizing innovation as inherently dynamic and driven by various forces
interacting with each other (Etzkowitz & Leydesdorff, 2000), which resonates with the evolutionary models of innovation in the previous chapter. A connection between these systemic and evolutionary models on innovation and Living Labs is made by introducing Quadruple Helix models that add the user as a fourth helix. Arnkil et al. (2010) see the evolution towards Quadruple Helix models as an acknowledgement of broad cooperation in innovation, and a shift towards systemic, open and user-centric innovation policy, as opposed to an era of linear, top-down, expert driven development, production and services.

Katzy et al. (2013) consider Living Labs as open innovation networks that function as systemic instruments or innovation intermediaries that try to overcome innovation barriers for the involved actors in the Living Lab network. However, research on how these innovation processes are coordinated is largely lacking, especially literature linking a more systemic view with the open innovation processes we discussed in this chapter.

Living Labs: from user research towards open innovation networks

If we consider the European innovation system, there is an apparent strength in generating knowledge, while the translation into actual successful innovations is lagging behind. This is referred to as the ‘European Paradox’ or the gap between research leadership and the commercial success of innovation (European Commission, 1995; Dosi et al., 2006). Almirall and Wareham (2011) rephrased this ‘European Paradox’ in terms of open innovation concepts and stated that Europe scores high in terms of research (= exploration), but underperforms in terms of market success (= exploitation). In order to overcome this paradox, several initiatives were started at the European policy level, such as the promotion and support of industry-university links and relationships (Perkmann and Walsh, 2007). A specific case of industry-university relationships received considerable support from Europe: Living Labs (Bergvall-Kåreborn et al., 2009). In the 1990’s the concept of Living Labs already appeared in academic discussions, but this policy support by the European Commission in 2006, stimulating projects to advance, coordinate and promote a common European innovation system based on Living Labs, provided a boost to Living Lab practice (Dutilleul, Birrer & Mensink, 2010). The most noteworthy policy support came with the establishment of the European Network of Living Labs (ENoLL), an organization aimed at connecting Living Labs for knowledge exchange, networking purposes and the development of a shared innovation concept with to date, according to their website, more than 300 Living Labs being linked to the ENoLL, mainly in Europe but also in the rest of the world (European Commission, 2013b).

One of the first appearance of Living Labs in the European academic literature pops up in the discussions regarding the impact of technology in general, and ICT in particular, on society (cf.
chapter 2). Frissen & van Lieshout (2004) define Living Labs as consciously constructed social environments in which the uncontrollable dynamics of everyday life are accepted as part of the innovation environment which enables designers and users to co-produce new products and services. This first and oldest definition from our review focuses on user involvement and on the everyday context as an important divergence from more traditional views on innovation. Living Labs are seen as research approach to study the impact of technology on society, but also the impact of society on technology, which links this to the mutual shaping-perspective from the social sciences.

Ballon et al. (2005) define Living Labs as an experimentation environment in which technology is given shape in real life contexts and in which (end-) users are considered ‘co-producers’, and situate them amongst other Test and Experimentation Platforms with the maturity of the innovation perceived as medium and with a focus between designing and testing. Eriksson et al. (2005) and Niitamo et al. (2006) see Living Labs as ecosystems fostering user-centered innovation through experimental platforms where the users are studied in their everyday habitat, and this by means of quantitative as well as qualitative research methods with the focus on accessing the ideas and knowledge of these users. The user-centric aspect is once again very dominant, as well as the everyday habitat, but the co-creative aspect is not explicitly mentioned here. A multi-methodical research approach is also put forward as inherent in Living Lab-practice. According to Kusiak (2007), the Living Lab concept calls for all stakeholders of a product or a service to participate in the development process. It supports innovation of products and services that are validated in collaborative, multi-contextual, empirical real-world environments. The main difference between the traditional consumer research programs and the Living Lab approach is in the multi-role and multi-faceted involvement of the customer. Living Labs as some kind of aggregator of various external inputs, translating them into requirements, the Living Innovation Laboratory. The Living Lab is considered as some kind of innovation intermediary.

Schaffers et al. (2007) define Living Labs as user-centric environments for open innovation characterized by early and continuous involvement of users and by user-driven rapid prototyping cycles. Here, the focus shifts towards the front-end of innovation (the early involvement) and iteration of the innovation in development. Ståhlbröst & Bergvall-Kåreborn (2008) give a quite similar definition, but again mention co-creation explicitly as they state that Living Labs are a means to gain access to the ideas, experiences, and knowledge that users possess, built upon co-operation with users to support creativity, so an efficient interaction with a larger population of people should be facilitated. They place Living Labs within a strong user-centric approach but do not stress the everyday habitat. Levén & Holmström (2008) also put forward co-creation as the central process permeating all Living Lab operations, with a focus on the consumer, but also in the context of a
public-private partnership. Feurstein et al. (2008) see Living Labs as a systemic innovation approach in which all stakeholders in a product, service or application participate directly in the development. Living Labs are thus seen as collaborations of public-private-civic partnerships in which stakeholders co-create new products, services, businesses and technologies in real life environments and virtual networks in multi-contextual spheres. This definition stresses the multi-stakeholder aspect of Living Labs with less exclusive attention for the end-user, who is only one of the stakeholders involved. This also relates to the Living Labs aimed at collaboration and knowledge exchange from the previous chapter. Turkama (2010) distinguishes the underlying principles of Living Labs as opposed to those from the closed innovation model and user driven Open Innovation. Here, Living Labs are seen as an extension of the principles of Open Innovation. According to Turkama, the main principles of Living Labs are:

- Crowdsourcing the people’s wisdom leads to smarter products/services
- R&D and innovation must be done with the users in open, real-life testing environments
- Time-to-market & market potential are enhanced by working with users
- Social and institutional factors are as important as technology and economics in driving innovation
- New and better ideas come from users integration since the very early stages of product/service development
- A transparent public private partnership is the way to deploy innovation and to achieve more sustainable results in the medium-to-long run

Besides the principles we also abstracted from most of the previous definitions (a public private partnership, real-life contexts, early-stage user involvement), there are also some links to the methodological level, as ‘crowdsourcing’ is explicitly mentioned, and to the eventual outcomes of Living Labs, a shorter time-to-market and a higher market potential. Summarizing, these principles are rather diffuse and deal with methodological aspect, organizational aspects and outcomes of Living Labs without making a clear distinction between them.

The final definition in this time-based overview comes from Almirall & Wareham (2011) who state that “Living Labs are semi-partitioned spaces in the form of innovation arenas integrated in real-life environments but separated by means of an innovation project structure that cultivate user-led insights” and “Living Labs are fundamentally infrastructures that surface tacit, experiential and domain-based knowledge such that it can be further codified and communicated”. Bearing in mind the ‘European Paradox’, it is surprising that ‘exploitation’ is not mentioned explicitly in the
definitions, whereas exploration is. We also wish to stress the ‘innovation project structure’ mentioned by Almirall & Wareham, as we see this as an important distinguishing element in Living Labs. A Living Lab innovation project is carried out within a given Living Lab infrastructure, but in most literature this distinction is not explicitly made, as both are mostly referred to as ‘Living Labs’. Based on the findings from the previous chapter and from the evolution of Living Lab definitions, we propose the following sublevels to be distinguished in Living Labs.

Within these overview of definitions and conceptualizations we can see an evolution from Living Labs as user centered and user driven approaches towards a more fully eco-system driven approach, with attention for all (possible) stakeholders in the innovation process. Whereas in the earlier definitions the ‘innovation arena’ is situated in society as a whole, we see more realism in later definitions, as is the case with Almirall who distinguishes the Living Lab by a project-based space. Later definitions also acknowledge the diversity of approaches and evolve into less ‘strict’ definitions and more in terms of elements, ‘philosophies’ or principles that can or should be present in Living Labs. The natural context, albeit artificial or real-world, is also a constant in these definitions, as well as the conceptualization of innovation as a process consisting of various steps.

Leminen et al. (2012) base most of their published research on this matter on an analysis of 26 Living Labs from Finland, South-Africa, Spain and Sweden. They obtained data form these Living Labs by conducting 103 semi-structured interviews with informants from 39 different organisations participating in these Living Labs. The interviewees included senior managers, project managers, researchers, project coordinators and users. Within the various publications that are based on these data, they take different perspectives which enable to draw a clearer picture of the complexity of Living Labs, their actors and their roles.

Based on an empirical investigation of multiple Living Labs, Leminen et al. (2012) propose four different Living Lab actors based on their role: utilizers, enablers, providers and users.

- **Utilizers** aim to develop their businesses within the Living lab ecosystem, mostly through short-term Living Lab cases. Their focus is on developing and testing their new products and services. These utilizers use Living Labs as a strategic tool to collect data on test-users of their products or services and collaborate with all stakeholders in the Living Lab ecosystem, including the end-users. These actors drive short-term Living Lab projects and can be regarded as short-term, ad hoc ‘consumers or partners of the Living Lab’.
- **Enablers** can be various public sector actors, non-governmental organizations, or financiers, such as towns, municipalities, or development organizations. This actor provides (financial) resources or policy support in order to start-up and maintain the Living Lab operations.

- **Providers** provide the other actors in the Living Lab with their product or service portfolio. They take care of the (material) infrastructure used for the Living Lab operations. Providers are mainly private companies that enter into Living Labs to co-develop new products, services, and solutions to their own business or industry needs, and focus more on long-term results. They attain these goals through their involvement in general Living Lab operations and (possibly) in the Living Lab cases, driven by utilizers.

- **Users** are the ‘end-users’ that are being involved in the Living Lab-operations and in the (short-term) Living Lab cases. In some Living Labs, existing user groups or user communities are involved, while in others the Living Lab operations themselves facilitate the formation of a Living Lab user community.

In the typology of Leminen et al. (2012) academic researchers are considered providers because they provide the necessary expertise on user research. Other research such as the triple and quadruple helix concepts, however, stresses the importance of universities as a distinct actor in the innovation ecosystem (Perkmann and Walsh, 2007; Etzkowitz, 2008; Arnkil et al., 2010; Cosgrave et al., 2013). Moreover, the contribution of academia is not limited to user research, as it can also include research on technical topics related to the focus of the Living Lab or policy and business researchers. Therefore, we distinguish **researchers** as a separate type of actor within the Living Lab anatomy.

Based on the various roles of the Living Lab actors and the central role of the infrastructure, we propose the following theoretical model of a Living Lab.
Methodology & hypotheses

As an empirical data gathering and analyzing technique, we used the case study technique, a common method in social sciences to describe and explore poorly understood processes and events. Case studies are especially suited because of their emphasis on detailed contextual analysis of a limited number of events or conditions and their relationships (Eisenhardt, 1989). Yin (1984) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used. Given the complexity of the studied phenomenon, the multiple levels of analysis (innovation network, Living Lab project, knowledge flows, etc.), this research design seems most appropriate. Finally, our study also shows some elements of an action research design (Susman & Evered, 1978) as members of the author team participated themselves in the cases studied as researchers, embedded in real projects and interacting in real-life settings with the different actors participating in the Living Labs and in the Living Lab projects in order to help solving problems and learn from this experience (Ottosson, 2003). This position provided the authors with in-depth, rich insights and access to all sorts of data sources. This unique position allowed to constantly shift between reflection and theorizing on the one hand, and actively doing and putting into practice on the other hand.
For our analysis we were able to use the following data sources as first-hand involved actor in the Living Lab operations and Living Lab cases:

- official meeting minutes of all steering committees and of all official work package meetings
- the initial project proposals and all project reports
- all deliverables from the Living Lab operations and of the Living Lab cases
- all data from user research regarding Living Lab operations (intake surveys, domestication interviews,...) and regarding the Living Lab cases
- field notes of all Living Lab cases meetings
- data from a short survey that was held amongst all consortium partners from LeYLab at the end of the Living Lab, which took the form of a SWOT-exercise
- In depth interviews with the three Living Lab managers from FLELLAP, LeYLab and Mediatuin
- Semi-structured interviews with the instigators from all the Living Lab projects from the analysis

The interview guides were pretested with colleague Living Lab researchers from iLab.o. The results were also discussed with them. For the analysis of all interviews, we used the technique of affinity diagramming, which originates from the User Centered Design tradition (Beyer & Holtzblatt, 1999) and allows to discover emerging themes and topics in the research data. We did this by extracting quotes from the transcribed interview and grouping quotes that dealt with similar topics.

From the literature on open innovation and from our Living Lab actor model, we abstract the following hypotheses:

For **utilizers**, we expect exploration as main motive in order to stimulate their innovation processes. The Living Lab provides the opportunity to get need information and solution information from the users involved in the Living Lab. For them, it is an ecosystem in which they can develop, test and learn.

The **researchers** are expected to function as intermediaries between utilizers and users, as through their research they are able to abstract need and/or solution information from the users, which the utilizers are looking to explore. However, the Living Lab operations and activities also allow researchers to explore their own knowledge base (testing hypotheses, generating new theories/methodologies, etc.). They expect to generate research data that can be academically valorized. By doing so, researchers contribute to the knowledge retention of the Living Lab.
For **providers**, we expect exploitation of the technology and/or knowledge they bring into the Living Lab network as main motive. They expect the Living Lab operations to provide them with input for their market strategy and roadmap. On top of that, the Living Lab enables them to showcase their innovative infrastructure. For **users**, we expect intrinsic motivations (such as task enjoyment and curiosity) to participate in the Living Lab to be dominant, as knowledge transfers between users and producers have found to be non-pecuniary. However, extrinsic motivations might also play a role (incentives and social value).

As **enablers** contribute to the Living Lab with money or others assets that enable the Living Lab operations, these public organizations expect the Living Lab to fulfill some predefined policy goals. Mostly, this concerns the generation of social and/or economic value, such as increased neighborhood cohesion or stimulating innovation and entrepreneurship.

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In the proposed conceptual model of a Living Lab, the infrastructure has a central role since it facilitates collaboration among all actors and enables knowledge and technology spill-overs within the innovation ecosystem.

**Results**

**Flemish Living Lab Platform – Vlaams Proeftuin Platform (FLELLAP)**

FLELLAP officially started in October 2010, to support the development of innovative information, communication and entertainment (ICE) products and services. Its mission was to boost the valorization of ICE research and development in Flanders and to support joint value creation for all involved stakeholders. FLELLAP is a consortium of several industrial partners (Telenet, Fifthplay, Androme & Alcatel-Lucent) and the iMinds department iLab.o.

**Telenet** ([www.telenet.be](http://www.telenet.be)), one of the major telecom operators of Flanders, was coordinating the initiative. It is a traditional telecom operator that delivers cable television, high-speed Internet access and fixed and mobile telephony services, mainly via their cable network. **Androme** ([www.androme.be/](http://www.androme.be/)) and **Fifthplay** ([http://www.fifthplay.com/](http://www.fifthplay.com/)) are two innovative SMEs. The former offers high-quality software solutions to large multinationals and SMEs, the latter develops and produces innovative technologies for energy management, health monitoring and builds upon the integration of technologies in buildings and cities and is 100% owned by Niko, a hardware company. The last named industrial partner, **Alcatel-Lucent** ([www.alcatel-lucent.com](http://www.alcatel-lucent.com)), is a worldwide solution and service provider, with the prominent research and development center Bell Labs.

Initially, as was stated in the project proposal, the Living Lab focused on three domains: Smart Cities (FifthPlay), Smart Grids (Alcatel-Lucent) and Smart Media (Telenet), with each partner dedicated to one field and Androme providing technical support where necessary. This way FLELLAP would consist of three Living Lab constellations with each its dedicated infrastructure and a separate panel of test users. However, due to multiple reasons, that will be dealt with later on, this ambition was never realized. No active Smart Grids or Smart Media panel was recruited, while the Smart Cities panel was much smaller than predetermined (75 households and 250 end-users). This was mainly because of the lack of clearly defined internal Living Lab projects and also because of shifting goals and priorities among the consortium partners.

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For the Smart Media theme, Telenet had initially foreseen to roll out 100 3D TVs for user testing with content and various applications, but after Flellap had started, it was decided internally that 3D was no longer a priority for Telenet, something which was announced during the first steering committee meeting by a Telenet representative. Eventually, Telenet did an in-house user test with 3DTV, but the size of this project was much smaller than planned and this took place only during the later stages of Flellap. As became clear later on in the project (cf. infra), their focus had turned towards other television services, such as the development of a second screen streaming application, YeloTV, together with Androme\(^3\). This project was carried out outside the scope of Flellap, but resulted in a small scale user test with Flellap panel members, but this also took place in 2013, near the end of the Living Lab.

Alcatel-Lucent intended to integrate its testing laboratory for energy monitoring applications, but around the time Flellap started, an internal company re-orientation caused less commitment towards exploiting this technical lab. As for the Smart City theme, FifthPlay took care of 50 tablets and gateways that were preconfigured to run the InCitys platform that was developed by FifthPlay, but in the meantime FifthPlay had also enabled a connection of the platform with a smart plug from its product portfolio which enabled to monitor the energy consumption. This way, FifthPlay also partly covered the Smart Grids topic, which potentially interfered with the leading role of Alcatel-Lucent within this thematic domain (although their focus was exclusively on B2B-applications). In terms of the infrastructure roll-out, only the FifthPlay project needed users, for which 250 people were recruited in the city of Sint-Niklaas, of which 50 were eventually equipped, as it was the intention to roll out extra services from (local) external utilizers on the platform. Telenet also acted as a provider by offering a specific modem (DOCSIS 3.0 modem) and free internet to the participants of the field trial. It is worth mentioning that the tablets were preconfigured to run the InCitys platform and could not be used for other applications, something which was not the case in LeYLab (cf. infra).

As in terms of panel recruitment and user research not much activity was planned, the researchers and the panel managers decided to build a larger panel that could be used when external utilizers would come to the Living Lab to initiate a Living Lab project. This was realized by conducting surveys during fixed time intervals that covered different aspects for the three thematic domains. This way, one larger panel of 2,015 users was built up, allowing for data gathering and profiling of this user panel for external Living Lab projects. This way, Flellap re-positioned itself towards a panel-based Living Lab in which the end-user became the major asset. Besides the smaller Telenet projects with

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3D TV and YeloTV, this panel was used in three external cases in the Smart Media domain: Fietsnet, MuFoLive and OKEEZ.

The internal Telenet cases are not covered in our case analysis as the results and tests were for the most part an internal Telenet matter. The Okeez case is also not covered because we had no first-hand experience in this case and because it turned out to be not possible to schedule an interview because the company had moved to the United States. The other three cases, InCityS, Fietsnet and MuFoLive, will be covered in the project analysis.

As we could observe in the fifth chapter in the ENoLL analysis, FLELLAP applied for membership during the fifth wave and is still listed as one of the 21 effective members to this date, despite the fact that the Living Lab constellation ceased to exist in the course of 2013.

**Analysis of actor roles**

When analyzing the Living Lab constellation according to the actor roles from Leminen & Westerlund (2012), Telenet clearly is in the role of provider of the infrastructure, where the initial goal was to explore future applications and features for its cable network and look for additional services that could be offered to its customers, with a focus on Smart Media. Based on the project proposal, Alcatel-Lucent was also to be a provider within the Living Lab constellation, but due to a changed course from the management of the company, the Smart Grid laboratory for testing applications and services was reoriented towards B2B applications, so the laboratory infrastructure was never used for external utilizers. The goal of Alcatel-Lucent was initially to exploit the laboratory to utilizers and to explore the possibilities, but these goals were not realized. Androme can also be labeled as a provider as it offers its technical knowhow to the Living Lab constellation and was looking to exploit this knowledge in other projects. However, in practice, Androme only delivered services to Telenet, especially for the user interface of YeloTV, the second screen application that Telenet announced and launched during the running time of the Living Lab. These exchanges took place in a pecuniary modus, where Androme exploited its knowledge to Telenet. Androme also became a utilizer during the project as it did a user test with a user interface for video conferencing that they were developing at that time, which was not successful at all as they experienced a lot of technical problems. The panel management from iLab.o is the fourth provider in the Living Lab constellation, providing the communication with and handling of the user panel and of the devices that were given to the users, and also providing the Living Lab constellation with the LLADA-tool (Living Lab Data Aggregator for storing all user information). Through the Living Lab operations, iLab.o’s panel managers could further develop their skills and expertise, and additional users were recruited that increased the number of total available end-users for other projects.
FifthPlay is situated somewhere between the provider role and the utilizer role within the Living Lab constellation. FifthPlay wanted to explore the possibilities of its platform and used the Telenet infrastructure and the user panel recruited by the iMinds researchers and panel managers to roll-out their platform, but they also provided the gateway and the platform itself on dedicated tablets on which other services could also run. Attracting other service providers on the platform is a form of exploitation, although they were not very successful in this matter as local retailers and organizations were not very keen to get on the platform. After Flellap FifthPlay launched a commercial version of the platform on the market called Nuvonet, but according to FifthPlay themselves this has not been a huge success. One of the services that did run on the platform during the Living Lab, and which appeared to be one of the most valued applications by the test-users, was the energy monitoring application with smart electricity plugs from Niko. In the course of Flellap, FifthPlay was able to exploit this technology to Electrabel (www.electrabel.be) in the form of a joint ‘smart boxes’ offering that was launched as a commercial service to end-users.

In the 3DTV and YeloTV projects, Telenet also acted as a utilizer within the Living Lab, but these cases did not seem to have had a high priority. For 3DTV this became apparent during the first steering committee and also due to the fact that the only 3D only channel, High 3D TV, was recently removed from the offering. For YeloTV, most of the development was done outside of the Living Lab in alliance with Androme, and the user test only took place in the period between the sneak preview in October 2012 and the official launch in March 2013, which did not allow to include a lot of modifications. YeloTV is considered as a success by Telenet.

It is striking that the consortium did not include any actor that could be labeled as purely a utilizer, which indicates that Flellap was conceived as a Living Lab that would be able to quickly attract external utilizers, but this turned out differently. This also forced the researchers in FleLLap, who came from iMinds and were connected to iLab.o, to be creative and initiate research with the panel members in order to activate them. These users consisted of a separate ‘Smart City’-panel of testers of InCityS, all living in the Flemish city Sint-Niklaas, and a user panel with 2.015 users that were...

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4 http://www.nuvonet.be/en
6 http://www.hightv3d.com/
7 http://nl.wikipedia.org/wiki/Telenet_Digital_TV
recruited by iLab.o panel management and that were sent a survey once every two months regarding the three thematic domains. However, this also allowed to conduct some experiments regarding user motivations to participate and regarding panel retention (exploration of new knowledge), that resulted in research valorization through some publications (cf. Lievens et al., 2014; Logghe, Baccarne & Schuurman, 2014; Logghe et al., 2014; Baccarne et al., 2013).

As enabler of the Living Lab constellation, we can discern IWT (Institute for the Promotion of Innovation by Science and Technology in Flanders), a Flemish government agency, together with iMinds. IWT supports innovation in Flanders in various ways: financial support, services, coordination and policy preparation. First, IWT distributes more than 260 million euro in subsidies yearly. This money mainly goes to the individual and collective projects of small and large companies, universities, colleges and other Flemish innovation actors. As was already explained in the historical overview of Flemish Living Labs, iMinds and IWT were in charge of redistributing the subsidy that was awarded to the defunct I-City Living Lab. In terms of involvement, the Living Lab manager and the consortium partners had to report to IWT regarding the progress they made once a year. In between, there were also informal contacts between responsible of IWT and with the Living Lab managers. However, the role of IWT in Flellap remained rather passive. In order to stimulate external projects, a one-time call for Living Lab projects was announced within one of the existing funding mechanisms for SMEs of IWT\(^\text{12}\), but this resulted in no extra projects for Flellap. Interestingly, no other enabler was present in the external cases, as at the time these were conceived, the ‘KMO Portefeuille‘-option (cf. infra) was not known, or rather it was not seen as a funding option for Living Lab projects. However, in order to generate research activity and to activate the user panel, the external research cases were largely funded by the researchers themselves who ‘invested’ their research capacity, thus also acting as a temporary enabler for these cases, and by the utilizers themselves who paid for using the Living Lab infrastructure.

<table>
<thead>
<tr>
<th>Actor</th>
<th>Role</th>
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</thead>
<tbody>
<tr>
<td>Utilizers</td>
<td>Develop &amp; test city platform</td>
</tr>
<tr>
<td></td>
<td>Test &amp; develop smart media</td>
</tr>
</tbody>
</table>

Table 1. Core Living Lab actors for FLELLAP

<table>
<thead>
<tr>
<th>Enablers</th>
<th>Providers</th>
<th>Users</th>
<th>Researchers</th>
</tr>
</thead>
<tbody>
<tr>
<td>IWT</td>
<td>Telenet</td>
<td>Smart City user panel</td>
<td>iMinds</td>
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<tr>
<td></td>
<td>Alcatel-Lucent</td>
<td>General user panel</td>
<td></td>
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<td></td>
<td>Androme</td>
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<td>FifthPlay</td>
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<td>iLab.o</td>
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<tr>
<td>Financial resources</td>
<td>Network infrastructure</td>
<td>Test city platform</td>
<td>User research</td>
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<tr>
<td></td>
<td>Smart Grid test laboratory</td>
<td>Profiled panel members</td>
<td></td>
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<tr>
<td></td>
<td>Integrate solutions in the network</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Smart city platform</td>
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<td></td>
<td>Panel management</td>
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Analysis of the three innovation network paradoxes

- ‘dynamic stability’ or balancing new relationships and existing relationships

As the name suggests, this Living Lab network was initially conceived as a platform connecting the separate Living Labs with each their own set of partners, panel and scope. It was intended to attract external projects within these three ‘sub-Living Labs’ as there were no clearly described internal projects in the project proposal. To this end, the relationships between the actors in the thematic projects needed to be strong. Telenet and Androme did build a strong tie within the development of YeloTV, but this remained almost exclusively an exchange of knowledge and (monetary) assets between the two actors. The researchers and panel managers were involved only very late in the innovation process, and the demand came more from their side, so Telenet did not act very committed towards the network. For the Smart Cities Living Lab, clearly more actors were involved (FifthPlay, Telenet, the researchers and the panel managers) and the roll-out of the infrastructure and of the platform among a dedicated set of end-users was successful, but attracting external utilizers on the FifthPlay platform (new relationships) appeared to be much more difficult. The most
interesting and valued use-case on the platform was a smart energy application, which sparked some distrust from FifthPlay towards Alcatel-Lucent, as they were potential competitors in this domain, which was not foreseen in the proposal. However, as Alcatel-Lucent had made a strategic change in priorities, the exploitation of their laboratory infrastructure with the other Living Lab actors remained absent.

Because of these issues, attracting external projects that would lead to new relationships was difficult. This task was mainly executed by the Living Lab manager and by the iMinds researchers who looked for ways to develop and showcase the research capacity and opportunities, and to activate the panel members. In order to foster a stronger tie with these end-users, the researchers and panel managers conducted multiple survey waves with fixed time intervals and covering different subjects. This was also carried out in order to gather relevant data to attract external utilizers, but the most important side effect was that the response rates of the panel members remained fairly high, which suggests a sense of community among the end-users. Eventually, three external utilizers engaged in an innovation project (OKEEZ, Fietsnet and MuFoLive), but these projects were executed without any assistance or involvement of the other actors.

• Interaction for goal alignment

Because of its intended structure, with three separate Living Lab networks, interaction between the different actors needed to be facilitated in order to reap potential benefits of the ‘platform’ structure. This was intended by having regular steering committees to report the progress of the different internal projects, with one Living Lab manager as the central spokesperson. However, in practice this did not work out very well. Because of distrust between some of the partners (FifthPlay and Alcatel-Lucent), partly caused because of the asymmetrical power relationships between the participating actors (SME versus multi-national) and potential conflicts of interest (Smart Grids & energy), and also because of the rather closed attitude of Telenet and Androme. This resulted in most of the internal as well as external projects being carried out with only a limited set of actors. Only the researchers, panel managers and Living Lab manager had the shared goal to attract external utilizers, carry out innovation projects and activate the user panel, while the companies rather pursued their own goals and agendas.

• Balancing informal and formal relationships

From the different data, we gather that the balance between formal and informal relationships between the different actors within the Flellap seemed to be a hurdle. Especially the dual role of Telenet, as utilizer in the smart media thematic domain as well as (potential) provider of its
infrastructure in the other cases as well as overall project lead with the Living Lab manager being a consultant who was at that time employed by Telenet. However, because of his position as external consultant working for Telenet, he lacked the negotiation power to mobilize other people and divisions within Telenet for the Living Lab. This was confirmed by the observation that Telenet was not very supportive towards testing its own technologies in Flellap, as became apparent when discussing the actor roles in the Living Lab (cf. supra). Therefore, none of the other companies involved took the initiative to attract external utilizers, but instead they focused on their own projects. As stated earlier, the Living Lab manager, the researchers and the panel managers became an informal alliance in search for external projects, which resulted in three external projects.

In terms of panel members, the Flellap panel was rather successful as the response rates of the surveys remained rather high, but the lack of external cases and offline testing activities did not foster a strong sense of community among the panel members.

We will summarize all the previous discussions and analyses by means of the network-related success factors, identified by Rese & Baier (2011): trust, commitment, dependency, and compatibility.

**Trust** was clearly one of the main issues within Flellap, as most of the companies were not eager to share a lot of information regarding their innovations in development. This was also related to the low commitment of some of the actors. Especially the role of Telenet, consortium lead, is notable, as they decided to develop in partnership with another actor from the consortium with the researchers, panel managers and end-users only involved when the innovation was nearly ready to be launched. For Alcatel-Lucent, the **commitment** went down once the internal company strategy changed. It seems that this problem is mostly related to large companies, as the SMEs were more committed towards their projects, although they also showed less commitment towards the Living Lab itself. This low commitment was also triggered by the fact that none of the actors was heavily **dependent** on one of the other actors for the projects running in the Living Lab. For the development of the application, Telenet was dependent on Androme, but Telenet decided to take most of the development process outside of the Living Lab. The largest dependency was on the funding by the enabler, but this actor refrained from a lot of participation or control. The (too) broad thematic differentiation also lowered the **compatibility** of the actors, as they operated in different domains.

**Conclusion**
Within our contemporary society, distributed innovation is regarded as the norm rather than as an exception. However, companies still struggle to adequately manage their innovation processes in order to create successful and innovative products and services within this distributed innovation environment. Within this chapter, we have explored Living Labs as open innovation networks that engage in knowledge exchange.

We can conclude that the Flellap Living Lab is a clear example of an open innovation network, but that it did not function optimally. As the Flellap project proposal did not contain detailed internal innovation projects, and no consortium partners could be categorized as pure utilizers, one of the main goals was to establish a Living Lab infrastructure that would attract external projects and utilizers, and this goal was clearly not reached with only three external projects. Moreover, these projects were even not clearly related to the subthemes of the Living Lab. One of the major hurdles was the complexity of the constellation because of the different use cases with each their own dedicated panels. This made it difficult to attract external utilizers, and it also caused that the commitment and dependency amongst the actors was lower, as they had fewer shared goals. It seems advisable to have a more compatible consortium with clearly defined internal projects and a dedicated actor or group of individuals that is concerned with attracting external utilizers to maintain the balance between existing relationships and new relationships. We propose that the enabler(s) of the Living Lab might have more impact on the composition of the network in order to avoid this type of imbalances.

The main limitation of this paper is that it draws upon the experiences of one Living Lab. Therefore, it is difficult to generalize the insights. However, the complex nature of Living Labs and innovation processes running in these Living Labs lend themselves towards a case study research approach, and this paper is the first to analyze these processes, set-up, roles and outcomes taking an open innovation network perspective. Future research could also take into account the role of the individuals engaging in this kind of open innovation. This way, the interactions between the different actors within an open innovation network could be studies with the individual as a level of analysis, looking at the impact of individual characteristics on the innovation processes and on the outcomes of the network.

References


