
Exploring the Impact of Methodological Set-up on Innovation Contribution in Living Labs

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Abstract: Open Innovation scholars as well as practitioners are still struggling with the practical implementation of Open Innovation principles in different contexts. Within this paper, we explore the value of a Living Lab approach for open innovation in SMEs. Therefore, we conducted a comparative case study analysis of 27 SME projects conducted by iMinds Living Labs in the period 2011-2015. The results suggest that a real-life intervention and a multi-method approach, methodological characteristics of Living Labs, increase the chance of generating actionable user contributions for the innovation in development. Moreover, the results also suggest that a Living Lab project yields maximal value when evolving from concept towards prototype. Besides these exploratory findings, this paper also demonstrates that Living Lab projects are a perfect ‘playground’ to test and validate assumptions from the Open Innovation literature.

Keywords: Living Labs; Open Innovation; SME; User Innovation; Innovation Management; User involvement; Distributed Innovation.

1 Introduction

In academic theory, Open Innovation is regarded as the norm for studying innovation management since Chesbrough’s seminal and widely cited ‘Open Innovation: The New Imperative for Creating and Profiting from Technology’ originally published in 2003. However, in practice, a balance should be found between open and closed innovation, which calls for innovation management approaches that deal with finding this balance (Lakhani & Panetta, 2007). Although a lot of principles and phenomena from the Open

Innovation literature, such as economic spill-overs (Arrow, 1962) and dynamic capabilities (Teece & Pisano, 1994), were already described a long time ago, and Open Innovation as a domain has already fostered a large body of research (West & Bogers, 2013), 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).

Three issues and gaps can be mentioned here: First, there still is a lack of adequate innovation management models for implementing Open Innovation (Lichtenthaler, 2011). Second, Enkel et al. (2009) state that there are only few studies that try to put forward *measurement systems* and key performance indicators to evaluate open versus closed approaches. Thirdly, as Huizingh (2011) states it, Open Innovation became an umbrella that connected a range of already existing activities. However, most of the principles and research of Open Innovation is tailored at large, resourceful companies (van de Vrande et al., 2006), despite the fact that SMEs are usually more flexible, less formalized and quicker to make decisions, which holds a lot of opportunities for the implementation of Open Innovation (Lee et al., 2010).

Therefore, within this paper, we will assist in filling these gaps by investigating Living Lab projects, an organized Open Innovation approach (as opposed to an ad hoc approach) consisting of real-life experimentation and active user involvement by means of different methods involving multiple stakeholders (Leminen et al., 2014; Schuurman, 2015). More specifically, we will explore the value of a Living Lab approach for open innovation in SMEs. Therefore, we conducted a comparative case study analysis of 27 SME projects conducted by iMinds Living Labs in the period 2011-2015, looking at the impact of the methodological set-up of Living Lab innovation projects on the innovation contribution of end-users and on the eventual outcome of the NPD process. This way, we assist in filling the need for impact assessment and measurement systems of Open Innovation approaches, and we demonstrate the viability of Living Lab projects as ‘playground’ to test and validate assumptions from the Open Innovation literature.

2 Gaps in Open Innovation theory

The first premise of Open Innovation is that from the perspective of a single firm, the usual level of analysis in Open Innovation research, opening the internal innovation process of a firm yields extra value (Chesbrough et al., 2006). According to Chesbrough and Bogers (2014), the critical conceptual distinction between the previous literature on spillovers in innovation is that Open Innovation transforms these spillovers into inflows and outflows of knowledge that can and should be purposively managed. A lot of Open Innovation research deals with the economic (pecuniary) implications and opportunities provided by external sources of innovation and commercialization, and mainly focuses on the revenue-generating practices from a firm perspective (Vanhaverbeke et al., 2008; van de Vrande et al., 2009). Enkel et al. (2009) conclude that the future of innovation processes lies in an appropriate balance between open and closed innovation approaches, as too much openness can lead to a negative impact on companies’ long-term innovation success, loss of control and loss of core competences, while a too closed innovation approach does not serve the demands of increasingly shorter innovation cycles and reduced time-to-market. However, there seems to be a gap between theory and practice as multiple studies have indicated that a lot of companies struggle with implementing Open

Innovation practices (Lichtenthaler, 2008; van de Vrande et al., 2009), and that there are major differences between different firms and organizations (Laursen & Salter, 2006).

Therefore, as **a first gap in Open Innovation literature**, there is no clear way either to adequately manage Open Innovation. Huizingh (2011) states that a decent cookbook and integrated framework that helps managers to decide when and how to deploy which Open Innovation practices remains absent. The main criticism that can be abstracted here is that Open Innovation remains too descriptive and is less able to provide concrete innovation management guidelines given certain circumstances. Given these inconsistencies between theory and practice, Lichtenthaler (2011) argues that in order to advance the field of Open Innovation, practitioners and academics need a better understanding of Open Innovation processes in order to reap the benefits and avoid potential negative consequences. Summarizing, this holds the criticism that there are at this moment **too many ‘blind spots’** to implement the insights from the Open Innovation framework into **an easy-to-use and one-size-fits-all Open Innovation management approach**.

Enkel et al. (2009) state that there are only few studies that try to put forward measurement systems and key performance indicators to evaluate open versus closed approaches. In an attempt to solve this, West and Bogers (2013) identified the following metrics to measure value creation based on Open Innovation: rate of new product releases, product performance, revenue growth, fraction of revenues attributable to radical innovations, fraction of revenues attributable to new products, revenues per employee due to new products, and patenting. However, large-scale or more holistic studies on these matters are still missing (Huizingh, 2011). Therefore, as a **second research gap**, we can mention the absence of more quantitative, **systematic studies** addressing **measurement and impact assessment** of Open Innovation.

A third research gap in the Open Innovation literature is the focus on large companies with an abundance of assets and resources, and **a lack of research into Open Innovation within SMEs** (van de Vrande et al., 2006), although recently more attention has been paid to this topic (Brunswick & Vanhaverbeke, 2013; Lee et al., 2010; van de Vrande et al., 2009; Zeng et al., 2010). This is quite surprising, as van de Vrande et al. (2009) argue that the Open Innovation model recognizes that smaller firms take an increasingly important role in the contemporary innovation landscape and that because of their lack of resources and smallness, they are more relying on their networks to find missing resources. Gans and Stern (2003) state that small start-up firms and entrepreneurs have to deal with specific management challenges. The fact that SMEs cannot cover all innovation activities required to successfully realize an innovation is ascribed to their smallness and resource constraints (Brunswick & Vanhaverbeke, 2013). However, this also holds opportunities, as SMEs are usually more flexible, less formalized and quicker to make decisions (Lee et al., 2010).

In the following paragraph, we introduce Living Labs as a structured approach to Open Innovation that foster Open Innovation in SMEs by opening up the company boundaries to user contribution. Therefore, we see Living Labs as ideal ‘playing grounds’ to test and validate theoretical assumptions in practice which holds the opportunity to assist in filling the gaps in Open Innovation theory.

3 Living Labs as structured approach to Open Innovation

From the previous paragraph, we gathered that there is a lack of structural approaches and guidelines for implementing Open Innovation, a lack of measurement systems that allow impact assessment, and a lack into research of Open Innovation in SMEs. One specific approach that offers a structured approach to Open Innovation and that has been used specifically by start-ups and SMEs are so-called ‘Living Labs’ (Schuurman, 2015). Living Labs are put forward as an institution to overcome the so-called ‘European Paradox’ or the gap between research leadership and (commercial success of) innovation (Almirall & Wareham, 2011). Living labs are physical regions or virtual realities, interaction spaces, in which stakeholders form public-private-people partnerships (4Ps) of companies, public agencies, universities, institutes, users and others that follow the philosophies of open and user innovation to collaborate for improving, developing, creating, prototyping, validating, and testing of current or new technologies, services, products, and systems in real-life contexts (Leminen et al., 2012), and are driven by two main factors: involving users in early stages of the innovation process and experimentation in real world settings that aims to provide structure to user participation (Almirall & Wareham, 2008). Therefore, Living Lab projects are a specific case of Open Innovation where companies open up their innovation processes to users or customers (Schuurman et al., 2013), which can be linked to the User Innovation paradigm (von Hippel, 1976; 2009).

In terms of methodological deconstruction of the Living Labs-approach, the work of Pierson and Lievens (2005) remains unique at describing the different phases of which a Living Lab project should consist: 1) contextualization, 2) selection, 3) concretization, 4) implementation, 5) feedback. However, the methodological basis of these five phases is left unexplored, as are the actual outcomes and added value when engaging in Living Lab projects. Schuurman (2015) suggested that this methodology is very similar to a quasi-experimental design, with a pre-test, a real-life intervention and a post-test.

Table 1: Methodological design Living Lab project

<i>Pre-test</i>	<i>Intervention</i>	<i>Post-test</i>
- Contextualization		
- Selection	- Implementation	- Feedback
- Concretization		

By adopting this methodological approach, Living Lab projects would be able to overcome the barriers to user contribution, as this implies triangulation of different methods and a real-life contextualization (Frissen, 2000). However, only very few studies try to assess the impact of the methodological design of Living Lab projects (Veeckman et al., 2013). For Living Labs, there generally is a gap in measurement systems, as Katzy and Turgut (2010) state that for the innovation performance of individual Living Labs a valid research methodology still needs to be developed. According to them, the measurement of the efficiency of Living Lab processes and structures would serve two purposes: legitimating the (EU) research budget that has been used to stimulate the establishment of Living Labs, but also for potential modification of the concept or certain aspects of it. Therefore, by studying Living Lab projects that are an emanation of Open Innovation, this enables a more systematic study of Open Innovation processes and

principles, which is one of the problems of Open Innovation because of conceptual ambiguity (Dahlander & Gann, 2010). By regarding the methodological aspects and characteristics of Living Labs as structural elements of Open Innovation in SMEs, this allows to explore the impact this type of Open Innovation projects generate, this also serves as a test of Living Labs as structural approach for Open Innovation implementation, and this fills the gap of Open Innovation research into SMEs.

4 Methodology

Based on a comparative case study analysis, this paper wants to assess the impact of the methodological set-up on innovation contribution of end-users and on the outcome of the innovation project. 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).

Within a case study design, careful consideration should be dedicated to the selection of the cases to be included in the analysis (Dion, 2003). We tackled this by analyzing all SME Living Lab projects that have been carried out by iMinds Living Labs in the period from 2011 to 2015. This makes a slightly larger sample of cases than usual, but this enables also a more quantitative, yet still exploratory, analysis coupled with more in-depth qualitative investigation. Therefore, the case studies are prospective (in which criteria are established and cases fitting the criteria are included as they become available) nor retrospective (in which criteria are established for selecting cases from historical records for inclusion in the study), but can be labeled as comprehensive for the analyzed time frame (2011-2014), which is in line with the “sustained period of time” criterion for data collection of Shepard (2001).

For our analysis we were able to use the following data sources as first-hand involved actor in the Living Lab projects:

- Transcripts of semi-structured interviews with representatives of the SMEs
- All project deliverables

Within the Living Labs community iMinds Living Labs has plays an important role and is regarded internationally as a ‘best practice’ example (Almirall et al., 2012; Dell’Era & Landoni, 2014), something which is reinforced by the fact that iMinds Living Labs also acts as secretary of the ENoLL. Therefore, the availability of rich data, first-hand experiences and the leading role of iMinds Living Labs in the Living Labs landscape warrant the choice for these 27 projects (Yin, 1984).

For a description of the cases studied, we can refer to Schuurman (2015) and to the websites of iMinds Living Labs¹. For this paper, we gathered the following data for the 27 projects: the presence of the Living Lab methodology, evolution in terms of NPD

¹ <http://www.ugent.be/ps/communicatiewetenschappen/en/research/mict/research-domains/living-labs>

stages, user contribution generated by the Living Lab project, and outcome of the innovation.

- *Presence of the Living Lab methodology*

If the project included a quasi-experimental design (pre assessment – real-life intervention – post assessment) and a multi-method user involvement approach, this criterion was coded as ‘yes’. If only one or none of these characteristics was presents, this was coded as ‘no’.

- *Evolution in terms of NPD stages*

For all projects, the evolution of the innovation in terms of NPD stages was logged during the interviews with the project instigators. We discerned between the following stages, based on Jespersen (2008): idea – concept – prototype – pre-launch – launch – post-launch. We recoded the project into three categories, which are also used to describe the type of Living Lab projects¹: exploration (indicating a project where the innovation starts at the idea or concept stage and end in the idea or concept stage) – experimental (a project that includes the prototype stage) – evaluation (projects that start at the pre-launch stage or later). The following table summarizes the three project types.

Table 2: Stages in NPD process

<i>Idea</i>	<i>Concept</i>	<i>Prototype</i>	<i>Pre-launch</i>	<i>Launch</i>	<i>Post-launch</i>
Exploration					
		Experimental			
				Evaluation	

- *User contribution generated by the Living Lab*

This indicates what the instigator mentioned to have done with the user contributions generated during the Living Lab project. We discern three conditions: the results were used to modify the innovation **during** the project, the results were used to modify the innovation **after** the project, and the results were not used to modify the innovation, which we label as **none**.

- *Outcome*

The final variable that was logged deals with the current status (at the time of writing, May 2015) of the innovation: **on the market** indicates that the innovation is launched and available for end-users, **pipeline** indicates that the innovation is still planned to be launched, but is not available yet, whereas **reoriented** is used when the instigator has decided not to launch the innovation.

¹ <https://www.iminds.be/en/succeed-with-digital-research/living-lab>

5 Results and discussion

The table below gives an overview of the variables for all the 27 projects. In terms of the methodological approach, we notice that a the majority of the projects (14 – 52%) did not include all the methodological elements of an ‘ideal’ Living Lab project. Only 19 out of 27 projects contain a real-life intervention (70%), whereas 13 out of 27 (48%) also include a post assessment. These 13 projects are labeled as ‘yes’ in the table.

These methodological elements can be regarded as forms of user contextualization, which is proposed as a means to overcome barriers related to user involvement, or the so-called ‘real-life experience’ of Living Labs (Frissen, 2000). Another method to overcome these barriers was to include triangulation of different methods, which equals the ‘multi-method’ characteristic of Living Labs. The majority of the projects adhere to this criterion, with 23 out of 27 projects containing triangulation of user involvement.

The absence of some of these characteristics can be ascribed to various reasons. First, start-ups and SMEs are constrained by time and budget, which did not allow to have all elements in a project. Second, the NPD stage also impacted the possibility of a real-life intervention. Projects that remained in the exploration stage have more difficulty in organizing a field trial as there is no working prototype yet. As a solution, a proxy technology assessment (Pierson et al., 2006), which means a simulation of the innovation by means of existing technologies, can be used (e.g. the Partago-project), but this requires extra effort and expertise.

In terms of NPD stage, 7 projects (26%) can be labeled as exploration, which means that at the end of the project there was no working prototype yet, 15 (56%) are experimental in nature, including the prototype stage, and 5 (18%) were coded as evaluation as these projects consisted of innovations that were already in a pre-launch stage at the start of the project.

Table 3: Overview of the 27 Living Lab projects

<i>Project name</i>	<i>LL method</i>	<i>NPD stage</i>	<i>User contr</i>	<i>Outcome</i>
InCitys	Yes	Experimental	During	On the market
Planidoo	Yes	Evaluation	During	On the market
Streemr	Yes	experimental	During	Pipeline
La Mosca	Yes	experimental	During	Pipeline
Veltion	Yes	experimental	During	Pipeline
Wadify	Yes	experimental	During	Reoriented
Mufolive	Yes	experimental	During	Reoriented
Partago	Yes	exploration	After	On the market
Planza	Yes	experimental	After	On the market
For Good	Yes	experimental	After	Pipeline
Postbuzz	Yes	experimental	After	Pipeline
Poppidups	Yes	experimental	None	Pipeline
WeePeeTV	Yes	evaluation	None	Reoriented

Twickey	No	experimental	During	On the market
neoScores	No	experimental	During	On the market
SeenSpire	No	evaluation	During	On the market
Unicorn	No	experimental	During	Pipeline
Flowrooms	No	experimental	During	Reoriented
Jukebox21	No	exploration	During	Reoriented
Coxo	No	exploration	After	On the market
SonicAngel	No	exploration	After	Reoriented
CEONav	No	evaluation	After	Reoriented
SmartSeats	No	experimental	None	On the market
CityTripPlanner	No	evaluation	None	On the market
Hoaxland	No	exploration	None	Pipeline
Qwison	No	exploration	None	Reoriented
Kianos	No	exploration	None	Reoriented

The first variable that refers to an outcome of the Living Lab project is user contribution, as this indicates what happened with the user contributions generated during the project. For 13 cases (48%), modifications were made during the project, for 7 cases (26%) after the project, and the remaining 7 case instigators stated that they did not use the Living Lab results to modify the innovation.

The second outcome variable refers to the market introduction of the innovation after the Living Lab project. In total 10 innovations (37%) were launched on the market, for 8 cases (30%) the innovation is still in development, and 9 instigators (33%) reoriented themselves and abandoned the innovation development.

These results indicate that in the majority of the projects, the user contribution had an impact on the innovation development (nearly 3 out of 4 projects), but that iteration of the innovation development during the Living Lab project, or the so-called ‘pivots’ out of the lean start-up literature, is less common (nearly half of the projects). However, when comparing the projects where the ‘full’ Living Lab methodology was used, there are some pronounced differences. The results can be found in the table below.

Table 4: Comparison of methodological differences

<i>Project</i>	<i>Yes</i>	<i>No</i>
During	7 - 54%	6 - 43%
After	4 - 31%	3 - 21%
None	2 - 15%	5 - 36%
On the market	4 - 31%	6 - 43%
Pipeline	6 - 46%	2 - 14%
Reoriented	3 - 23%	6 - 43%
Evaluation	2 - 15%	3 - 21%
Experimental	10 - 77%	5 - 36%
Exploration	1 - 8%	6 - 43%

For the cases that did contain all methodological Living Lab elements, only 2 did not generate user contributions that led to modifications in the innovation. Stated differently, 85% of these projects generated actionable user contributions, and more than half of the cases included iterations during the project. For projects that did not contain all methodological elements less than 2 out of 3 generate actionable user contributions not following the Living Lab methodology. In terms of outcome, the 'real' Living Lab projects resulted in 4 market introductions and 6 innovations still in development. Only 3 cases resulted in the innovation being abandoned. For the other 14 projects, the number of reoriented cases is twice as high (6 or 43%), but the number of successful market introductions is also slightly higher (6). A potential explanation could be that the Living Lab projects generated more input for the innovation, which requires more time to implement these changes and induces a longer time to market.

Finally, when looking at the stages in the NPD process, the majority of the full Living Lab projects can be labelled as 'experimental', whereas the majority of the other projects were exploratory in nature. As the experimental projects lend themselves more to incorporate all methodological Living Lab elements, our results seem to suggest that the best time for a Living Lab project is when advancing from concept to prototype, or at least to include this stage in the project. Because of the time and budget constraints of start-ups and SMEs, this was not always realistic within the cases we studied. One of the strategies that was used was to overcome this issue, was to carry out multiple Living Lab projects in sequence. As an example, the Coxo-case was an exploratory project that did not include all methodological elements, but that was aimed at studying all stakeholders in the complex ecosystem of the innovation. The Planido-project was the follow-up Living Lab project of Coxo, with the innovation carrying a changed name (something which followed out of the results of this first project). This project did carry all Living Lab characteristics, as it started in the pre-launch stage and evolved towards market introduction during the project.

This illustrates that a lean and agile approach and attitude are necessary when carrying out these type of projects with SMEs, both from the researchers and from the project instigators.

4 Conclusion and future research

Within this paper we have looked at 27 innovation projects from Flemish start-ups and SMEs carried out within the iMinds Living Labs constellation. These Living Lab projects are aimed at opening up the company boundaries towards user contributions, thus facilitating outside-in Open Innovation. This was successful for almost 2 out of 3 projects, as this led to modifications of the innovation during or after the project based on user contributions, and for 2 out of 3 projects, this resulted in a market introduction or in further development. This shows that Living Lab projects are a means to successfully facilitate Open Innovation in start-ups and SMEs. When taking into account the methodological set-up of these projects, it seems that a real-life intervention, a quasi-experimental design and a multi-method approach increase the possibility of user contribution that lead to modifications in the innovation, as this was the case for 85% of the projects against 64% for the projects that lacked one or more of these elements. Moreover, the projects with the most positive outcomes could be characterised as 'experimental', which indicates a transition from concept to prototype during the Living

Lab project. This seems to support the these that triangulation and real-life experience lower the barriers for user contribution, as was suggested by Frissen (2000). Future research should investigate these findings more in detail for a larger sample, in order to validate these assumptions. Other variables that might play a role such as the attitude of the instigator, the characteristics of participating end-users or the nature of the innovation in development should also be taken into account. This would enable a more concise impact assessment. In any case, the characteristics of a Living Lab, where a given constellation carries out multiple innovation projects following a given methodology, allows to test hypotheses on a supra-case level.

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