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Open Collaboration within Living Lab as an Ecosystem: an insight from SME CEO's Perspective

Jouni Huotari*

JAMK University of Applied Sciences / Nestronite Oy, Piippukatu 2, FI-40100, Jyväskylä, Finland.
E-mail: name.surname@jamk.fi

Ilkka Turunen

Nestronite Oy, Päätekuja 6, FI-40500 Jyväskylä, Finland.
E-mail: name.surname@nestronite.com

Piotr Krawczyk

JAMK University of Applied Sciences, Rajakatu 35, FI-40200, Jyväskylä, Finland.
E-mail: name.surname@jamk.fi

* Corresponding author

Abstract: There is little empirical evidence of sustainable open innovation collaboration between SMEs and educational institutions under a Living Lab as an ecosystem. Consequently, there is scarce knowledge on how to engage SMEs, universities, and end users into a value creation based on sustainable open innovation collaboration. A social process model is used to describe the relationships between key actors within the Living Lab. The resulting model depicts in a concise way how the relationships have evolved over time. In this model, major encounters between the actors are those which have at least the potential to change the relationship state between the parties. The relatively stable passages between consecutive encounters are labelled episodes. By perceiving systems development in the open innovation ecosystem as a series of encounters and episodes in IT business development, it is possible to identify the critical milestones of development work and to display the dynamics of a use-case development trajectory.

Keywords: Open Innovation, Collaboration, Living Lab, cloud computing, Social Process Model, Reflective Practitioner, SME – Small and Medium Enterprises.

1 Introduction

Our purpose in writing this article is to describe and explain the innovation processes within Lutakko Living Lab (LLL) covering the period October 2009 - April 2013. In our study we follow closely and adopt the approach by (Heiskanen, Newman & Similä, 2000). Given the type of open innovation ecosystem with the cloud computing as a use-case at stake, the basic question is how the interactions and tensions between the key

stakeholders shape the Living Lab innovation processes. Firstly, we will describe the literature on how to model the process over an extended period. Secondly, we address our research method in which we draw heavily upon the work of Donald Schön. In particular, we built on Schön's notion of the reflective practitioner (Schön, 1983). We also take some care in situating the researchers in the stories. The cloud computing use-cases is described in some depth with particular emphasis being placed on events judged to be important by the researchers ("encounters" in the language of the process model) such as interactions and decisions. We then interpret the use-case carefully to map the unfolding trajectory of the cloud computing development history using the principles of the Newman–Robey social process model (1992). The paper ends with a discussion of these findings, the limitations of the study, and draws some conclusions for researchers and particularly for practitioners who may be considering a similar approach to analysing their engagement in Living Lab innovation process.

2 Literature Review

2.1 Living Lab as an Open Innovation Ecosystem

A living lab is a user-centred, open-innovation ecosystem, (Von Hippel1986, Chesbrough 2003) often operating in a territorial context (e.g. city, district, agglomeration, region), integrating concurrent research and innovation processes (Bilgram, Brem, Voigt 2008) within a public-private-people partnership (Pallot M.2009). (Bergval-Kåreborn et al. 2009) propose the Living Lab concept to include an environment (Ballon, et al. 2005, Schaffers et al. 2007), methodology (Niitamo et al. 2006) and a system (CoreLabs 2007).

Open innovation is a term promoted by (Chesbrough, 2003) as a way for creating and profiting from technology. Sustainable open innovation collaboration as a concept is central to Living Lab approach and is often used to distinguish the type innovation ecosystem as an alternative to one-off innovation projects. Cooperrider (2008) indicates that managers should not only be situation analysts and decision makers, as they are often portrayed, but also designers. Lessons for managers as designers are further discussed by Boland et al., (2008) and concluded by six main points:

1. "A Design Attitude": to always perceive everything as an opportunity to do it in a way that has never been done before.
2. "Design Vocabulary": to always stick with fundamental principles that are proven to be good for humanity.
3. "Being Functional": a truly functional project is functional for everyone, current and in future.
4. "Models and Emotions": to listen to multiple voices from different aspect.
5. "Balancing Liquid and Crystal States": to be a better innovator, be a creator also.
6. "Love and Constraint": to not fall in love with an idea but be aware of potential improvement.

According to (Correia de Sousa, 2006) and (Khan and Al-Ansari, 2005), by learning from these six lessons, managers are more likely to develop the necessary depth and the diversity of knowledge to create and maintain a sustainable open innovation environment that stresses the importance of relationships in which actors collaborate and co-create.

Drejer (2002) suggests three common situations in innovation management:

1. Innovation management in the technology exploiting situation
2. Innovation management in the sustainable technology change situation
3. Innovation management in the disruptive technology change situation.

By responding to these three situations the living lab concept as an open innovation environment aims to, what (Schaffers & Santoro, 2010) suggest, balance the forces of technology push and market pull by contributing to the formation of sustainable collaborative innovation ecosystems where regional stakeholders, citizens and companies including SMEs are engaged and collaborating in an early stage for user-driven and open innovation.

2.2 A Social Model of Living Lab as an Open Innovation Ecosystem

To overcome the weakness of the survey approach we use an approach from the process research tradition (Gersick, 1991; Newman & Robey, 1992; Robey & Newman, 1996). We analyse the processes from the inside, as seen by the participants. We believe that our cloud computing use-case gives rich empirical insights by revealing in a concise manner how the dynamic relationships between software developers (local SME), Living Lab team, and end-users (clients) evolve over time. Inspired by (Heiskanen, Newman & Similä, 2000), we believe that the way to model the dynamics of open innovation process can be easily transferred to other circumstances. The approach is a further development and enlargement of the Newman and Robey model (1992) of user–developer interaction.

In their process model, applied also in a further case (Robey & Newman, 1996), they identified three main elements: (1) the antecedent conditions; (2) the possible interaction states between the users and developers (acceptance, equivocation, rejection); and (3) the development trajectory of the interaction process. The interaction process consisted of "equilibrium" state progress passages, called episodes, and critical events between the episodes, labelled encounters. Encounters have the potential to change the nature of the interaction. This has parallels with Gersick's punctuated equilibrium model (Gersick, 1991). According to the model, open innovation process progresses through time as a series of longer episodes, punctuated by brief encounters. An example of an encounter can be the hand-over of a beta version of the system to the power users for testing (Table 1 and Figure 1, encounters 14 and 15). The existing state of client/developer interaction may swiftly change from acceptance to equivocation or even rejection when the clients begin to discover that the proposed system does not fulfil their needs (Table 1, encounter 8, 11 and 14). The very stability of episodes may trigger critical events (encounters). Each encounter will represent a period of relative instability in the project during which the issues related to the use-case come under close scrutiny.

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3 Method

3.1 The Reflective Practitioner

Our aim is to, by closely following (Heiskanen & Newman, 1997) put our experience from practice into a form that makes sense also to the broader audience. For this purpose we use the notion of Reflection-in-Action, adopted from Schön (1983) and Raelin (1997).

Our task is related to move from what Nonaka and Takeuchi (1995) call "unarticulated practice to explicit knowledge". As stated in (Heiskanen, Newman & Similä, 2000), Schön (1983, p. 163) frames the work of design as a reflective conversation with the situation where the practitioner functions as an agent and experient. By "experient", Schön appears to mean an experimentor who is at the same time also a target or part of this experiment. Through their transactions with the situations, they shape it and make themselves a part of it.

3.2 How to model the dynamics of the Living Lab Innovation Ecosystem

For the analysis of the development of the relationships between the key actors within the Living Lab we again follow (Heiskanen, Newman & Similä, 2000) and use the Newman–Robey social process model in its basic form. For the user–developer issues, the idea is to modify the Newman–Robey model by replacing the acceptance-equivocation-rejection classification with another classification that is better suited to the analysis of the relationship between the stakeholders in an open innovation ecosystem. This latter classification is the "technology push"–"user centred"–"user-led" notions, based on user centred open innovation paradigm referred to in chapter 2.1.

In the model, we present the use-case histories as development trajectories over time in the form of lines punctuated by encounters that may change the state of the process from one class to another. The passages between the encounters, the episodes, represent development work that does not change significantly or rapidly the way in which the parties relate (cf. Newman & Robey, 1992; Robey & Newman, 1996). The researchers looked carefully at the documentary and direct evidence from personal experience before judging what was a significant milestone from the perspective of the social process model. In the next chapter we present the cloud computing use-case background followed by "condensed" narrative in the model form.

4 Use-case: Cloud Computing

4.1 Cloud Computing Research Background

We have applied cloud computing in multiple different courses and other curricular activities. Originally a course called *Experimental enterprise in the cloud* was implemented to teach students about the findings inside the original SkyNest-project that was founded to research cloud computing phenomena. Afterwards internships were offered to students in form of so called *summer factories.* Alongside the summer factories a Living Lab cloud computing team was formed. During this time a spin-off SME was established from the research program that started utilizing the cloud computing LL for

business development and end-user testing purposes. Thirty to fifty students per semester/cycle participated in the cloud computing so far.

A cloud computing platform called FreeNest was tested and developed with the help of students and LL. The LL later also helped in benchmarking the FreeNest and it's resulting additional services against potential clients.

Stakeholders/roles

Project team: ~80 students/semester , ~30-50 student as developer/semester, ~20 students as researchers/semester, 3 lecturers, 3 permanent LLL team members, ~5 Students as Living Lab members, 2-4 students as power users (course content co-creators and course co-administration and co-design). Institutional stakeholders: JAMK University of Applied Sciences, local SME- Nestronite, spun out of JAMK.

5 The Models of Cloud Computing Development Trajectories within Living Lab as an Open Innovation Ecosystem

The long and eventful history of our cloud computing use-case can be condensed using the method described in chapter 3. We have tabulated, as the first part of our model, the cloud computing use case development encounters in Tables 1 and 2. The second part of our model presents the "shapes" or trajectories of the process by connecting the encounters with the episodes. They are in Figs. 1 and 2, including also the respective encounter numbers.

Table 1 The internal encounters of Cloud Development at Lutakko Living Lab

Encounter No	*Date*	*Encounter description*
1	10.2009	Establishment of small R&D Project inside the school of Technology with the objective to search for funding for technological platform based on cloud computing concepts. First author is appointed Project Manager, while the Second Author is hired as a student trainee to contribute to the effort.
2	9.2010	First contact between the Cloud Team and Living Lab. Talks are made about future collaboration possibilities.
3	5.2011	Planning and execution of Summer Factory '11. Meeting in May with goals set: 1. Document the R&D process and in search of all kinds of improvements; 2. recording all the feedback from users about all kinds of solutions developed by software engineers
4	8.2011	Cloud Summer Factory 2011 concludes with Living Lab having completed a networking project dubbed 'Soul Bridge Project'. Results are presented in a seminar. A report on work condition findings is written by the Living Lab members with suggestions for improvement for project participants. Preparations on-going for establishing spin-off to commercialize project findings.
5	11.2011	Spin-off company established. Spin-off company also joins an ecosystem of software companies dedicated to turn cloud based

		research into viable business cases.
6	12.2011	The third author invited to spin-off company advisory board.
7	1.2012	Key stakeholders are diagnosed with burnout and also experience other unrelated stress factors, limiting capability to partake in company business
5	….(dotted line) 1.2012	Initial line of communication for further collaboration between cloud team and LL is established.
6	….(dotted line) 8.2012	Summer Factory '12 wraps up. Results of research data returned in form of Report. Cloud computing becomes the use-cases of Living lab. Deepening of relationship, further conversations about collaboration between Cloud Team Inc. Spin-off company.
8	9.2012	After continuous attempts to engage customers, spin-off company key stakeholders come to realization that the proposed business model needs a revision in order for the company to gain traction.
9	10.2012	Idea of a new business model and technological platform arises for spin-off.
10	11.2012	Conversations about third author being involved in spin-off company. Also initial partnership conversations with an external stakeholder pertaining to a new approach in business model and technological platform development.
11	12.2012	Proposed partnership happens, but is greatly reduced in commitment from stakeholder point of view.
12	12.2012	Pilot 1 of proposed new business direction idea for spin-off company. Results encouraging but not complete. Second author named CEO of Spin-off company. Third author named COO into the company. It is decided to pivot the direction of the spin-off to the new business mode and technological platform approach. Joint FP7 ICT STREP call application with multiple other stakeholders. LL Organization takes lead, Spin-off company joins in.
7	….(dotted line) 12.2012	New pilot for original technology stack found under research program in Project.
13	2.2013	LL Engaged in business development activities with Spin-off company. LL agreed to become integral part of Spin-Off company's business development activities and resources. Company hires new developers to start development activities of pivot targets
14	3.2013	First pilot for proposed product is a failure due to end-user adoption difficulties and problems in production. Seen as a part of a learning curve of a new team.
15	4.2013	LL planned to beta test improved version of product. Also agreed that LL will help mount full-scale pilot (Pilot 3). Positive reception from stakeholders as a new customer is found for pivot platform.
8	….(dotted line) 4.2013	New pilot agreed with external stakeholder project for original project technological platform.

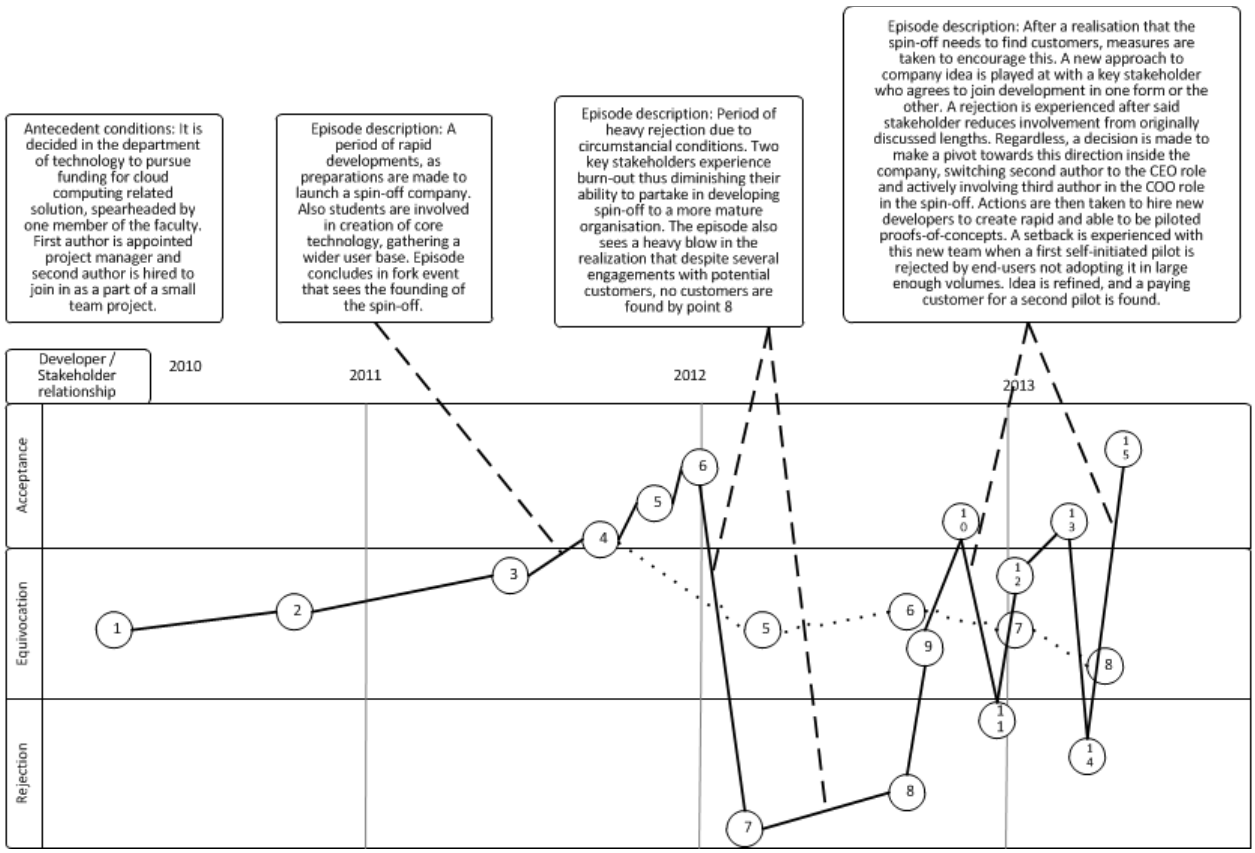

Figure 1 The development trajectory of the cloud computing System within Lutakko Living Lab as an open innovation ecosystem.

Table 2 The external encounters of the Cloud Computing development at Lutakko Living Lab

Encounter No | *Date*	*Encounter description*
1 4. 2011	Idea of summer course based on technological learning of project. Idea of course is evolved to include summer factory. Decision is made by first author and third author to involve living lab as a part of the proceedings.
2 5. 2011	Maturing the idea of the spin-off, running experimental course based on research program findings and learning, also running 3 teams of 5 as "Summer factory 2011" because there were too many interested students.
3 8.2011	Summer Factory ends, cloud team Inc. first and second authors start maturing the idea of spin-off because of proposed collaboration with other companies. Thesis research is made into generating communities around technological platform.
4 11.2011	Spin-off Nestronite is officially established. Cloud team members divide time between spin-off and cloud project. Third author asked

	to join spin-off in advisory board.
5….(dotted line) 5.2012	University awarded Entrepreneurship act of the year award for spin-off company and cloud project. Cloud team achievements. Second summer factory is planned. Suggestions from previous year are taken into consideration and student involvement is increased in planning features. Students also use the same platform they develop in daily working life.
6….(dotted line) 8.2012	Summer factory concludes. Seen as a significant success, students having been involved in feature generation and planning increasingly.
7….(dotted line) 10.2012	New pilot is planned for technology developed by students. This pilot however is for non-technical users, reducing potential for user involvement.
5 12.2012	Market research into pivot idea done and verified idea. Decision on company level made to refocus effort into pivot. Second author named CEO and Third author COO.
6 4.2013	Customer is found for a new pilot for Pivoted product and technological platform. Customer is significantly more involved in planning of technological platform and pilot, with weekly encounters.
8….(dotted line) 4.2013	New pilot found for original technology stack. Pilot is technically oriented, resulting in more relevant and richer user data.

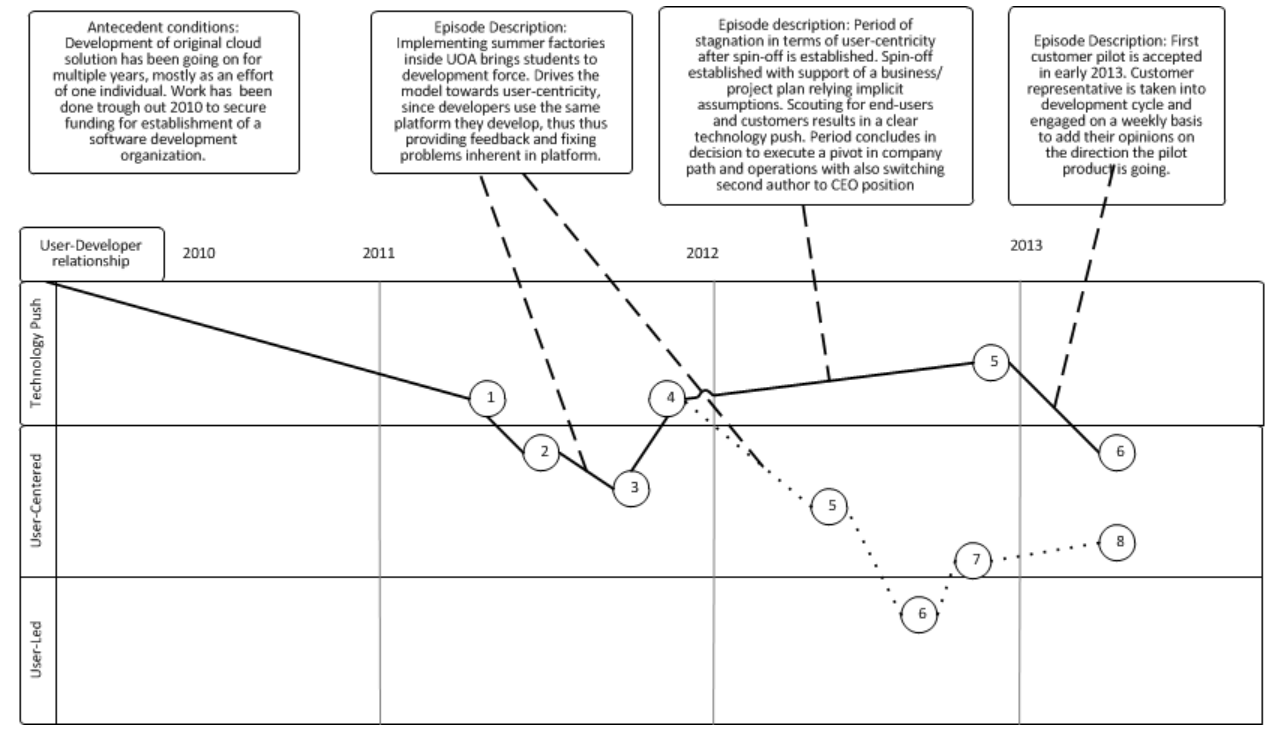

Figure 2 The development trajectory of the user-SME relationship of the cloud computing System within Lutakko Living Lab

With these two sources, we believe that the reader is able to easily understand the dynamics of the processes. The figures also contain brief descriptions of the antecedent conditions of the development trajectories as well as explanation boxes for especially interesting encounters and episodes.

In order to save space, episodes were not included in this tabulation. Each of the encounters was consecutively numbered, dated (month/year), and described. The encounters as well as the episodes between the encounters were identified and classified by the second author. This work was based on his analysis of the archived data. The data were familiar to him, because he had participated in all the Living Lab's decisions concerning the relationships with the local SME, as well as negotiations with the internal and external actors.

The encounter/episode classification rules were quite simple, but required careful considerations. If the cloud computing development activities were dominated by end-users/power users, it was classified as a "User-Led". The category "Technology Push" was chosen at the early stage when the SME relied on classic test-bed like market approach. A user-centred form of open innovation was between the technology push and the user-led where the input of the client or user organisation, or the expertise of the SME, was essential to but not dominating the cloud computing development.

6 Discussion and Conclusions

The modelling principles presented here were used to which kind of patterns can be identified from the cloud computing use-case development trajectories within the Living Lab as an Open Innovation ecosystem.

For the practitioner, the results should provide some encouragement in the quest for a solution to the open innovation issue. Whether the model based on this use-case would fit other use-cases and other living labs is best left to the decision makers concerned, but the evidence could at least be considered when decisions are being made. We have also shown how open innovation processes can entail improvisation in a complicated situation, where different stakeholders interacted. The outcome of this "battle" between forces inside and outside of the Living Lab over the cloud computing solution was the emergence of a coherent (but interpretive) development and open innovation strategy.

The limitations involved in this kind of research are clear. In addition to the ones discussed by Heiskanen and Newman (1997) concerning the reflective practitioner, we present only one use-case as a basis for our findings. Other factors which limit the general usefulness of the findings include the specific Living Lab Cloud Computing use-case settings in which the study took place.

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