Living labs fostering innovations in the retail industry: A network perspective

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Abstract

This paper focuses on living labs and their underlying innovation networks. A recently emerged concept of living laboratory, or 'living lab', has quickly attracted science and practice communities. Living labs can be understood as user-centric environments for open innovation. However, prior empirical research on the living labs is scarce and literature lacks understanding on what the living lab innovation model actually is. Our study focuses this research gap by contributing to the discussions of collaborative innovation development and innovation networks in the living lab context. Thus, our aim is to describe what the living lab model is from the network perspective. Moreover, we identify the key actors and their roles in a retail industry living lab and analyze the participants' motives to join the innovation network. Finally, we discuss how living labs promote service innovation development through a case study. According to our findings, living labs are effective way of innovation development. Yet, they have many challenges and paradoxes related to the living lab network. Firms need to take these paradoxes into account if they pursue making progress in the development. First, it is crucial to be able to balance between the flexibility and stability. Second, all parties should understand the distinction between the "open world" and the "closed world". Third, actors in the living lab network need to balance between their individual needs and the common needs.

1. Introduction

The idea of involving users in innovation development has become increasingly popular. User-centric innovation development is particularly visible in the so-called open innovation model (Chesbrough, 2003; Hämäläinen, 2007). The rationale of open innovation is that in a world of widely distributed knowledge, companies cannot afford to rely entirely on their own research, but should instead acquire knowledge resources from other companies (Calanstone & Stanko, 2007). Whereas closed innovation refers to processes that limit the use of internal knowledge within a company and make little or no use of external knowledge, open innovation builds upon the collective design and production of goods and knowledge, and recognizes that firms must consider sources outside their own walls for ideas for commercialization (Gassmann, 2006). In this vein, various forms of open innovation enable organizations to leverage new potential for creating and capturing value (Chesbrough, 2006). A recently emerged form is the concept of living laboratory, or 'living lab', which has quickly attracted numerous science and practice communities (Ståhlbröst, 2006; Mulder et al., 2006; Kusiak, 2007).

Living labs can be understood as user-centric environments for open innovation (Schaffers et al., 2007). Open innovation demands greater collaboration between creators and users as it happens through collaboration across diverse communities. A living lab is an open innovation system where users, companies, governments and non-profit organisations interact around complex projects in different societal domains (Mensink & Katzy, 2007). The aim is to develop and test innovations that will best meet the customer needs and gain market success at first hand. Furthermore, living labs pursue facilitating engagement with and experimental uses of typically innovative technologies in a normal life environment. It represents a research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real-life contexts (Mulder et al., 2006). A remarkable aspect of the living lab concept is that it provides a concrete setting compared to other forms of open and collaborative innovation (Schaffers et al., 2007). Thus, the living lab approach is a powerful tool for innovation development.

The most valuable and complex technologies are increasingly innovated by networks. Companies enter networks in order to exploit and develop their resources, and create and maintain the basis for competitive advantage (Snow et al., 1992). Organized collaboration, such as joint development activity, among the companies involved is an important aspect of industrial networks (Gadde et al., 2003). Innovation networks comprise those linked actors inside and outside the firm that create, acquire, and integrate diverse knowledge and skills required to innovate complex technologies. They are intellectual assets that firms can

link up with to solve problems and find ideas, while beginning to think about those assets as an extended part of their organization. In other words, innovation networks are organized around constant learning. In the context of living labs, networking takes place both among the parties involved in the direct development work of the living lab, as well as between different living labs that may be geographically distributed. Networking among other living labs provides the members with valuable information, experiences and knowledge resources that assist them in their work.

Surprisingly, there are few frameworks and models as well as empirical research on the living lab innovation model and its rationale from the perspective of networks. Our study focuses this research gap by contributing to the discussions of collaborative innovation development and innovation networks in the living lab context. By networks here we refer to those participating actors – as well as their roles and resources – that join the innovation joint-development. Specifically, we aim to:

(1) Describe what the living lab model is from the network perspective
(2) Identify the key actors and their roles in a retail industry living lab
(3) Analyze the participants' motives to join the innovation network
(4) Discuss how living labs promote service innovation development.

Our paper is structured as follows: After this introduction, we discuss the theoretical foundations of living labs and the underlying open innovation networks. We then proceed with a conceptual framework to describe the key innovators and the overall benefits of the living lab model. After that, we illustrate the use of living labs in innovation development through a case study. The study provides us with an analysis of the key roles, outcomes and challenges related to the living lab innovation model. Finally, we conclude the study by discussing the theoretical and managerial implications derived from our analysis and recommend some avenues for future research.

2.   Theoretical background

The concept of living lab innovation model draws on the open innovation approach. Because of providing a promising alternative to the traditional closed innovation development, open innovation is of particular interest to many industries today (Wu & Lin, 2001; Paulson et al., 2004; Bonaccorsi et al., 2006). The open innovation model has been supported by the emergence of social media phenomenon (e.g. "Web 2.0"), which has brought many new services on the Internet, based on content sharing and content based interaction. According to Hämäläinen (2007), successful service innovation development nowadays combines understanding of existing and emerging user needs that provide business opportunities and require adaptable technologies. In concordance to that, the use of living labs has emerged as a novel form of the open innovation model. Living labs are regions where stakeholders have formed a partnership of firms, public agencies, universities, institutes and users all collaborating for creation, prototyping, validating and testing of new technologies, services, products and systems in real-life contexts. Such contexts include cities, villages and rural areas as well as industrial plants and even virtual realities.

Living labs are co-creation environments for human-centric research and innovation. The purpose of co-creation between clients, providers, and potential third parties is to stimulate change and it requires strategic congruence between the actors (Möller et al., 2008). In a living lab, the technology is tested in a real life context and end-users are important informants in the tests (Ståhlbröst, 2006; Kusiak, 2007). Although there is no single approach to living labs, the concept should be distinguished from more common approaches such as test beds for testing of a technology or application in a laboratory environment and field trials for testing in a limited but still real-life environment (Schaffers et al., 2007). For example, Ballon et al. (2005) define the concept 'test bed' a standardized laboratory environment used for testing new technologies, products and services and protected from the hazards of testing in a live or production environment. This definition implies that in test beds, users are not necessarily involved and the laboratory setting is controlled. Ballon et al. (2005) continue by defining 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. Also Kulkki et al. (2005) provide an overview of open innovation environments for validating, testing, and developing services and products. All these definitions show that living labs are obviously different from test beds.

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Stewart (2007) makes a distinction between different types of living labs. He identifies them as narrow but 'sizable' communities of expert users, whole bounded populations, living labs for technical service development, and living labs for non-technical research using service platform, in e.g. business clusters. All these types have something in common: they employ an array of actors representing different rationale for joining the innovation development. Indeed, according to Schaffers et al. (2007), networking is an integral part of living labs. Living labs allow a focus on value generation and distribution in a network of cooperating partners, including users. In addition, many living labs join large networks of living lab, such as the Living Labs Europe, an initiative that constitutes of a number of European living labs, distributed geographically. Together these partners, consisting of a number of living labs with end-users, firms, public sector and academia, will join forces as a network to develop and offer a gradually growing set of networked services and share information, knowledge and experience on the development work at hand.

Networks are the locus of innovation. The open innovation paradigm underlying living labs stresses the networked perspective of innovation (Chesbrough & Appleyard, 2007). An innovation becomes a revolution through its relation to the larger network from which it comes. Therefore, the leading-edge companies are now learning to identify areas of interest and then develop both formal and informal mechanisms to create open innovation networks (Gassmann, 2006). Their success depends on how innovation networks function, the ways networks can be nurtured, and the impact networks will have on how firms bring products to market. Innovation networks have gained increasing importance in scholarly and practitioner writings on the management of innovation. However, managing innovation can be demanding enough; doing so in open innovation networks will bring some additional challenges (Dittrich & Dyusters, 2007). Firms involved in building and managing open networks are required to be motivated and committed both to their corporate goals and to those of the network.

It is important to understand the various actors and their roles in the living lab projects. Rönkä et al (2007) chart the nationally most important development platforms and embryos in Finland and suggest that innovative development platforms should bring together all the relevant parties; the developers, public sector, exploiters and end users of new technologies and related products and services. Described by other words, living labs open up a possibility to generate wide and extensive spectrum of product and service portfolios (De Ryuter et al., 2007) and connect different service 'providers' and 'end users' with 'utilizers'. The utilizer is a firm that seeks efficiency, supplements to resource bottlenecks, and knowledge from the living lab environment. The utilizer may also boost its innovation process through the living lab network. The utilizer may even outsource its innovation capacity and knowledge to boost the living lab network. Moreover, 'enablers' are important companies or organizations that enable, e.g., technology, space or other resources to the use of innovation development. Partners in a living lab and the underlying network of living labs are depicted in Figure 1.
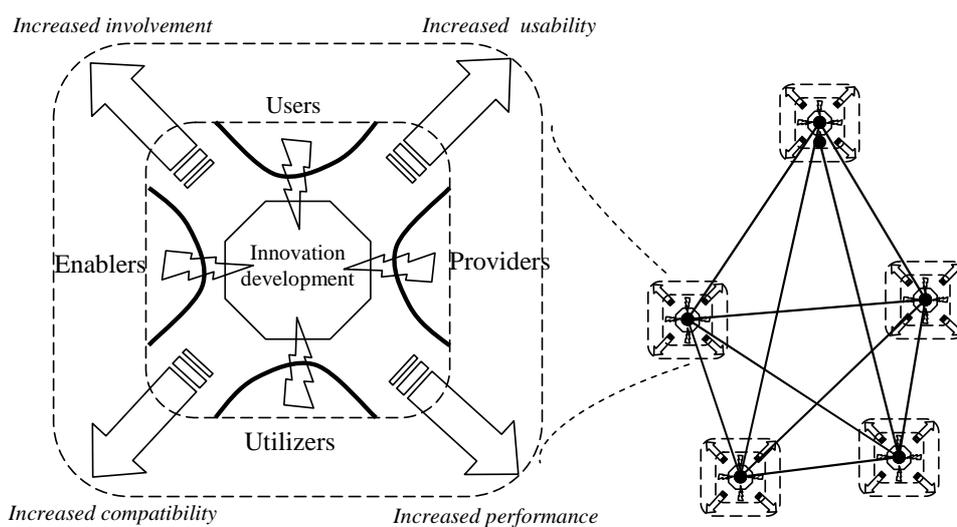

Figure 1.

Preliminary framework: benefits of the living lab model and its underlying network.

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Collaboration in living labs networks may lead to economical, social and environmental benefits. These benefits may be both individual and mutual among the partners in the network. Yet, although Rönkä et al. (2007) give perhaps the most extensive classification of parties in a living lab –facilitated R&D-process, research lacks description of the roles or activities of these parties and the structure of the living lab networks. Hence, also the specific benefits and motives of the living lab innovation model to participants remain ambiguous for both researchers and business practitioners (Feller & Fitzgerald, 2002). Rönkä et al. (2007) suggests that living labs speed up R&D process, result in cost efficiency, provide real user feedback, and establish real user contexts. Moreover, the development process becomes more cyclic, the open innovation approach utilizes non-linear points of R&D process, and the outcome is the development of horizontal business networks. The benefits are multiplied with the help of comparing best practices of the underlying living labs networks, such as the European living labs network. In sum, these outcomes can be categorized as: increase in actor involvement, ease of usability, better compatibility, and improved performance.

The variety of benefits in the living lab innovation model is richer than that. As noted earlier, research on the benefits is scarce, but Hongisto (2006) describes perceived benefits of living labs as speeding up innovations, scaling-up market, enabling mass-customization, and creating new extended enterprises. Furthermore, she points out that living labs increase sustainability of user centric innovation in multi-contextual environments. Concordant with these notions, Panula (2007) argues that living labs increase usability and practicality of new services, encourage citizens to join the innovation process, facilitate the collective aim to innovations, and utilize the regional and local knowledge and piloting, thus, supporting geographical area development. Von Hippel (2007) supports this by stressing the role of innovation communities and of the public domain. Thus, technology-driven innovation increases as a result of direct collaboration with partners and end users.

The living lab innovation approach is not easy. Challenges for user-centric research involve the development of innovative methodologies and tools for data collection and data analysis. Although lots of data can be collected through observational techniques, the challenge of collecting data on subjective user experiences remains harsh (De Ryuter et al., 2007). The partners must recognize that technology only has value when it is commercialized by means of the business model of a firm. A firm can use its business model to identify a more enlightened role for R&D in a world of abundant information, better manage and access intellectual property, advance its current business, and grow its future business. Organizations that both focus on current operations and allow for the exploratory operations are considered ambidextrous. The challenge of the open innovation paradigm, such as in the case of living labs, is in thinking through and handling firm business models in a way that supports both sets of objectives (Schaffers et al., 2007).

3.   Methodology

Deductive and inductive analyzes were used in the research process of this study. In order to analyze the living lab model and its network relationships, we utilized a qualitative case study approach. The research was carried out by analyzing a development platform at the Helsinki Living Lab (HLL), namely the Arabianranta area. The Arabianranta living lab locates in the metropolitan area of Helsinki, the capital of Finland, and almost twenty different projects have been carried out in the area. These projects have been both short-term regional development projects, as well as large European Union projects with long-term objectives. Our case is a project in which a major national retailer/grocery store initiated collaboration with several parties to develop a new business concept. This project targeted to increase understanding of how digital services can help customers to improve their daily consumer goods shopping. The goal included all stages in the process from decision making to actual shopping and the last mile logistics. The outcome was the development of an innovative technology-aided shopping service.

The interviews were conducted in spring 2008. Lincoln and Guba (1985) suggest a case be discussed from the perspectives of all parties. Moreover, Yin (1989) states that findings or conclusions in a case study are likely to be more convincing and accurate if they are based on several different sources of information. Thus, the interviews were conducted with all the parties that joined the project. The investigators conducted seventeen semi-structured interviews among the parties of the living lab innovation development project. The interviews were carried out during face-to-face meetings or by phone. Some issues that emerged from

the interviews were detailed later through interviews by phone. In addition, secondary material, consisting of web sites, bulletins, magazines, and reports, was collected in 2007-2008. Interviews were audio-recorded for transcription and analysis. Data collection continued until repetition of data occurred without discovery of any new themes. The conducted interviews were grouped on time span of the project and the case description was finalized.

Hirschman (1986) suggests that using multiple human observers enhances the reliability of the study. The interpretations of multiple observers were compared to determine whether the empirical data were dependable and consistent. In addition, Hirschman (1986) states that an investigator is not presumed to be emotionally neutral and personally distant from the phenomenon of interest. Therefore, the investigators communicated with representatives of the parties not only during interview sessions but also afterwards. Furthermore, Lincoln and Guba (1985) suggest an audit trail and an audit process for establishing conformability. Therefore, the investigators kept a diary of the research, which describes and opens the documentation, and contains field notes. The diary was also a methodological recording of the research process and data collection, as recommended by Yin (1989). These actions ensured that the data was carefully collected and recorded, and analyzes were reliable.

4. Empirical analysis

A living lab needs a group of actors in order to execute its task. Each actor has a specified role, an array of resources, and expertise needed to carry out the project. The first phase of the project was to create the project, recruit required parties, and gain and ensure the necessary financial support. The objective of our case, the living lab project, was not clearly predefined. On the contrary, the retailer wished to increase its overall understanding of customers and customer behaviour in the retail business in order to create new innovative shopping service. Therefore, the beginning of the project was characterized by active brainstorming, where the actors suggested ideas for new service and types of products and services the retailer should offer. The result of this was redefining the objective of the case and establishment of the project plan. The project proceeded after a conclusion that the actors should first concentrate on understanding different retail customer segments and shopping behaviour in them. Naturally, this urged for the recruitment and choice of viable end users for the further join-development. This was followed by a more specific identification of the end customers' perceived hitches and challenges, as well as the positive issues in retailing processes. End users also collect data by filling out field diaries. Finally, the project concluded with the establishment and test of the pilot service concepts. Analysis of material and finalizing the report led to the presentation of the final results and publishing the project report.

4.1 Key actors and their roles in a retail industry living lab

Arabianranta living lab brings different parties together to create novel innovations. These parties include an enabler of the living lab, a utilizer, five different providers, and 15 end users. All parties are located in a geographically small area, which facilitates their intercommunication and joint activity. The living lab is constituted by various networks that represent different parties and support genuine user driven development. Thus, different intra-organizational and inter-organizational networks intermesh with each other to form a development network (see Figure 2). The names of the participants in our analysis and illustrations are withheld due to the confidentiality issues.

Enablers of living lab networks usually stand for cities and other public organisations. They enable the emergence and development of innovative environments and processes, which means flexibility, as well as object oriented and open minded approach in order to pilot and develop new workings method for a particular area. We label the enabler in the Arabianranta area as 'ADC'. The role of the enabler is to orchestrate the living lab network, to coordinate the network activities, and bunch the innovation consortium by enabling joint operations. ADC is responsible for fund raising by applying for funding from both national and international innovation development funds. Moreover, ADC is in charge of marketing operations and activities of the whole living lab network. The enabler does not necessarily render all the activity itself, but manages services gained from subcontractors if needed.

Utilizer is an organisation that exploits the innovation networks of end users and providers in their own product and service development. In the case of Arabianranta living lab, the utilizer is a retailer that is one of the largest retailer chains in Finland. This retailer and its employees have various roles in the living lab.

The utilizer first specifies the direction of the development project as well as the expected outcomes. The task of the utilizer is to join various project meetings and to co-operate with the providers during the entire time span of the development project.

Providers are the different service and research institutes that make their service and knowledge portfolio available to living labs. Providers possess diverse roles that vary depending on the project; each provider may, e.g., act as a project manager of the living lab project. The service and knowledge portfolio of providers consists of expertise of different areas of business development through prior development projects. This expertise comprises, e.g., project management experience, the clarification of service needs, the design and implementation of user-driven methods, as well as expertise on user interfaces and databases.
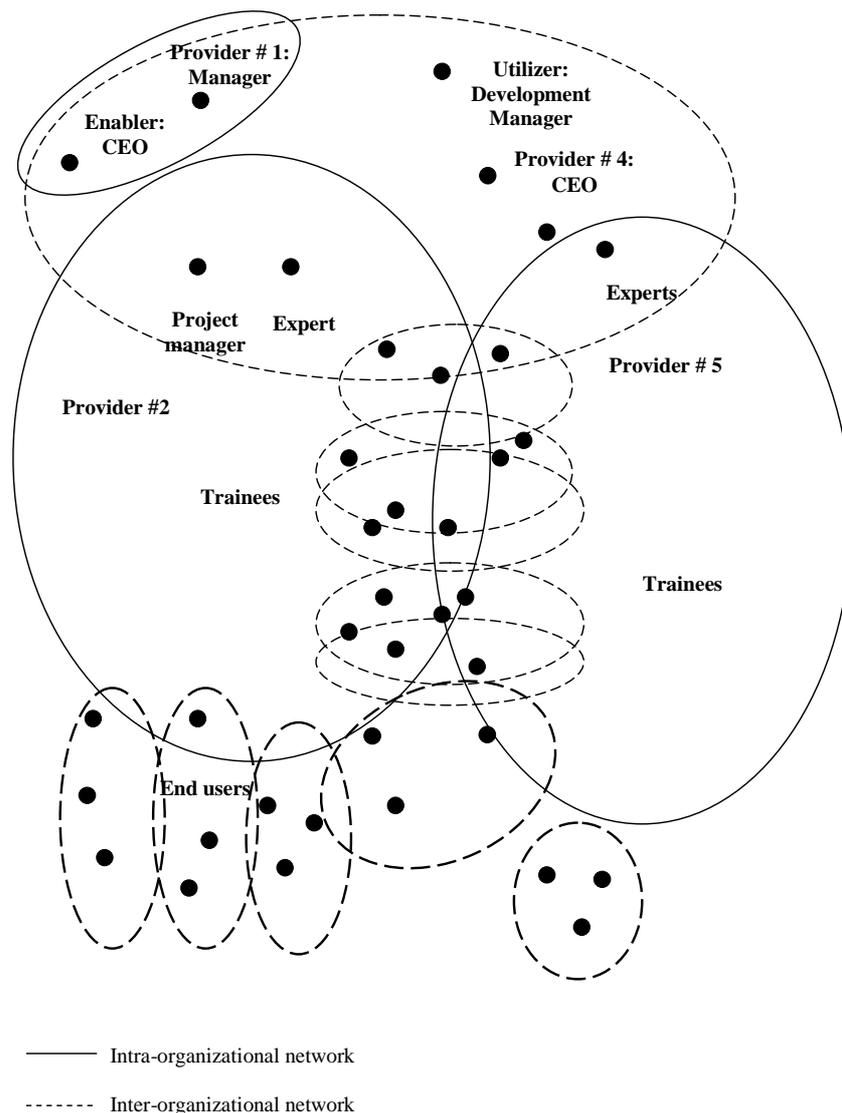

Figure 2. Intra-organizational and inter-organizational networks constituting a living lab.

Provider #1 is a subcontractor of the enabler. Previously, it has been a project manager in earlier living lab projects. Furthermore, provider #1 is a project manager and the coordinator of the HLL project, an umbrella project which includes three different living lab projects such as our case project. Provider #1 works at the background as a supervisor and a contact person towards to the utilizer. It also transfers knowledge and experiences, such as the coordination of important phases and activities from the previous living lab projects.

Our case project is coordinated and managed by provider #2. It has several roles in the living lab project, e.g., the role of project manager, an expert, and provider of trainees and even end users. That is, four of the end users are also employees of the provider #2, and two additional trainees have the role of end user. A project manager and an expert supervise the work of trainees jointly. Provider #2 utilizes the technical platform of the living lab to invite numerous end users to join the project. Furthermore, personnel and trainees are also invited to join the project. Provider #2 has intense co-operation with the provider #5.

Provider #5 explicates the specific methods for the involvement of users in the case. Experience, needs and desires of the end users were catalyzed, gathered and analyzed for the development process of the utilizer. Providers #2 and #5 share the role of supervisor and supporter of the trainees. In our case project, there are five trainee groups, which altogether consisted of 15 participants either from the provider #2's and provider #5's organizations. Moreover, each trainee group includes trainees from all providers. There are also fifteen end users, resulting in five end user groups. These groups are coordinated by the trainee groups. Each trainee group is responsible and coordinated by a single user group, which provided the members with valuable practical experience. The groups contributed to the documentation of end users' actual shopping behaviour, working with end users as a group, when mining information from them. The trainees also prepared presentations about the progress.

Documentation of the shopping behaviour reports different activities. These activities range from the meetings with the project group and end users to the elaboration of practical data collection tools, such as a diary for shopping, and retailing processes. Trainees executed the fieldwork: they collected the data and material from end users, as well as categorized and analyzed data. In addition, they further interviewed the end users. We identified different types of challenges, critical incidents and gaps – both positive and negative ones (see Leminen, 1999) in the retail process. A process mind map was used to link different end user groups and their behaviour with the challenges. This was the foundation for the construction of a framework to be used in actual shopping behaviour processes of end users in the analysis and documentation phases.

Provider #3 conceptualises the results of data analysis and the prototype of new user interface for the retailer e-commerce application. The conceptualization is based on the description of the actual behaviour of the end users, and takes place in mutual understanding with the utilizer. The retailer's e-commerce application contributes to the understanding of end users' daily and weekly shopping behaviour by monitoring a portfolio of receipts that vary between the consumers. Provider #3 participates also the idea generation stage and provider #4 offers its expertise to further analyze and report the data. A key contribution of the provider #4 was the brainstorming activity and advance development of methods in the living lab network.

Finally, our case project involved altogether 15 end users. These end users, or lead users as we call them, are individuals who volunteer to give feedback in order to contribute to the development of the concept. They are typically considerable open-minded and innovative. The lead users were segmented into five categories that represent, on one hand, different buying habits, and, on the other, purchasing power based on the age and marital status of the users. These end users were trawled from around Arabianranta in order to make them represent people who live, work and study at the area. The segmented end users are: singles, couples without children, families with children, single mothers or fathers, and senior citizens.

End users should write a diary of their purchases and the purchasing process. For example, they should keep track on what are the irritating and convenient issues, while shopping in a grocery shop. In fact, end users should provide their original shopping lists and receipts for further analysis and discussion during a one-week period. This is due to that the viewpoint was not a single purchasing process, but a longer time period. Different end users also reported background and the actual reasons for their shopping. This information was then further brainstormed to create possible e-solutions that would support consumers' daily shopping in the various phases of the retail process. New interesting viewpoints of actual shopping behaviour were captured, which was fundamental in order to develop a prototype of retailer's e-commerce application. In sum, the role of end users was to describe their everyday needs and experiences in order to facilitate the product and service development process. Table 1 summarizes the resources, which different parties provided to the living lab project.

Actor	Resources
Enabler	o Virtual living lab platform o Knowledge and experience of living lab activity
Utilizer	o Financial input o Knowledge of the retail branch, such as end user process descriptions o Human resources, participating project meetings
Provider #1	o Project management o Human resources, the umbrella project manager
Provider #2	o eBusiness laboratory o Focus group interviews and web surveys o Human resources for both expert and hands on work, such as project management and coordination
Provider #3	o Knowledge of data mining –analysis and reporting o Human resources
Provider #4	o Usability study o Prototype of user interface o Human resources
Provider #5	o User centric and user driven methods development o Focus group interviews and web surveys o Human resources
End users	o Knowledge and experience of shopping behaviour

Table 1. Actors and their resources in the Arabianranta living lab project.

4.2 Participants' motives to join the innovation network

The actors in the living lab have different objectives and motives to join the innovation network. They are based on individual interests and goals, which can be reconciled when parties work together and understand more of each others' activities and needs. In this vein, merging knowledge and activities leads to a shared goal: the development and boosting of living labs network and processes.

The enabler has several motives to engender living lab projects. The main motive for the enabler to join a living lab network was to extend and establish the organization and brands of living lab activities for the entire metropolitan area. The Arabianranta living lab project is a concrete tool for that. Therefore, it is essential to execute a set of activities and projects in order to gather experiences and document reference cases. The gathered experience targets to the formulation and creation of standardized multiple living labs model. That is, it targets to conceptualise and productize the living lab model. This means the construction of a business model and service portfolio for the living lab, as well as producing various documents and final reports.

The utilizer expressed that it does not have any substantial expectations for the outcomes. According to it, this particular development project targets to increase the understanding on how digital services can improve and help customers to make their daily consumer goods shopping. The project covers all stages from the decision making phase to actual shopping and the last mile logistics. The retailer needs findings and outcomes of the project to establish and support the future projects in the area of e-business and m-business by creating and testing a pilot retail process and prototype concepts.

Providers have contradictory motives to join the innovation network. These motives can be summed up as the way of work development, competence development and business as usual. Provider #3 constructed an user interface prototype, which the utilizer may exploit in its e-business process development. The user interface prototype is based on needs and desires of end users analyzed by trainees. Provider #4, in turn, targets to develop and productize a new product for analyzing and reporting data in the living lab project. Especially provider #2 and provider #3 stressed that their motives to joining the network is to commercialize the product and make it become 'business as usual', as well as be more efficient in that business.

Providers #2 and #5 point out that there are several motives to join the innovation network. The living lab innovation approach bolsters up their research and training activities, which enables the development and increase of knowledge and expertise. This means that the providers are in transition from a single project into a chain or process of activities. Furthermore, the trainees appreciated experience from the project work as well as the living lab activities themselves. This means that the trainees can coordinate, manage, execute, communicate and present the entire case unprompted.

Voluntary, motivated and pledged end user is a foundation stone of the living lab. The majority of end users emphasize that financial compensation was not the primary reason to participate the project. Conversely, several other reasons emerged. First, end users perceive that the participation of the living lab project is an expedient to mediate to the development of the area. Examples include, e.g., the increase of service offerings and competition in the area. Further, other personal interests for joining the living lab network were stressed. It increases the honest information sharing of the retailing process, the educational process, and the learning process itself. End users even enquired results of this study. Last but not least, it is essential for the living lab to communicate in a decorous way. However, end users also appreciate formal appreciations, such as the speech of thanks and compensation fee, which was a food basket.

4.3 Living labs promote service innovation development

The living lab project aimed to search novel approaches to innovation development. All participants of the Arabianranta living lab felt that the project was a success with excellent outcomes. In prior projects, which were somewhat similar to our case project, each party had generated its output, but the outcomes were not synthesized. Moreover, learning took place in both inter-organizational and intra-organizational networks. The project strengthened co-operative and concurrent procedures and processes because of the knowledge and processes intermeshed. A learning process that cumulated into common experiences occurred not only between a specific party and the utilizer, but among all parties of the living lab network. According to the representative of enabler, as a result of learning there were remarkable improvements between the first and last development phase. Ultimately, the conducted case project turned out a new method to generate products and services.

There are several differences between the traditional innovation development project and the open innovation –based living lab project. The emphasis in traditional projects is on solving specific questions instead of exploring the end users' behaviour and their everyday life problems. The living lab project is more flexible model than the traditional one; development in a living lab is user-driven. The emphasis is not on the development of a specific product or service, and being user-driven means much more than supplier discussing with the customers. Conversely, innovating in living labs involves the whole living lab network and the end users have central role in the development work. The network may consist of numerous participants. In our case project, all the parties shared the view that participation in the work of the network and the network itself were fundamental outcomes of project.

Our case living lab network was in a state of constant change. An ultimate reason for this was the shifting assignment. There were no strictly preset specifications or outcomes. One of the fundamental ideas of the living lab project was to involve users and other parties into the development process, foster their involvement, monitor their views on ongoing basis, and adapt to changes. Therefore, the assignment was loose and it was only specified later during the project. In this vein, the living lab approach differs from the traditional way of innovation development, where the development project is more standardized, linear, and both the target and the development path are often preset. The parties of the living lab told that changes have been more a rule than an exception. This means that the parties in the living lab network have together more tacit knowledge and experience than the utilizer alone. The living lab network employs new knowledge and may lose existing one whenever there are changes in the participants.

The inter-organizational network in a living lab is more stable than the intra-organizational networks. The whole living lab network adapted to changes more effectively than an individual actor. The prerequisite for that are good relationships among the participants. Our interviewees stressed that "chemistry" and co-operation between the parties enable such relationships. Thus, the network has an ability to change; it transfers when there are personal changes of any kind. The reason for the fluctuation may seem unimportant. At the beginning of our case project a target was to construct a new business model. However,

this goal was later dropped out as it turned out to be too challenging at this time. Hence, the roles are seen to change by the change of assignment. Furthermore, the interviewees emphasised that during the project they have piloted diverse procedures, compared the roles of parties among different living lab cases, and elected best outcomes of the learning process. In this way, the roles of parties have become clear and crystallized.

4.4   Challenges in the Living Lab Network

There are several paradoxes related to innovation development in a living lab network. To begin with, the network should be flexible and adapt to changes, but at the same time be able to guarantee its stability to the living lab parties. Flexibility here means that members will be able to join the network or leave it at any time. Stability here means that the accumulated knowledge will stay in the network; the living lab network needs to adapt its resources and tasks when the objectives change. Moreover, the network offers both long-term and short-term benefits. That is, there is the question of balancing exploration and exploitation in the living lab network. The project aimed to increase understanding of the retailing process as a phenomenon where learning and method development were intermeshed. However, some providers stressed that they have more short-term focus and the goal of the living lab network was not part of their core business. In fact, their goal was to concentrate on efficient production and their long-term objectives should target to productization and quantification of knowledge.

The participants in the living lab need to change their mindset when the objectives shift from an actor's to that of the networks. The parties are not only responsible to the utilizer of their actions, but to the whole network. This will also change the structure of assignments. Moreover, the living lab project should be interlinked with the strategic processes of the utilizer and it should be long-term by its nature in order to be able to better understand the utilizer's needs, motives, and processes. That is, the project needs to tie parties with long-term objectives. In fact, the whole living lab network should depict better the benefits and potential of the living lab innovation development potential to current and future utilizers and possible financing bodies. In addition, building trust and transparency to each party is a necessity in a living lab project. These are a challenge, because the parties should at the same time be open about their knowledge and apply "secrecy" related to the internal company issues. The paradox is similar to that presented in the open innovation literature.

A major challenge for the innovation development in living labs is that the concept needs some construction and conceptualisation of the process, management, methods, tools, and services. During our case study no similar projects existed for benchmarking purposes. The project was managed and coordinated by using ad-hoc principles, which was partly due to the loose objectives in the beginning. However, it seems reasoned that living lab projects require more formal procedures and goals, such as briefing about the ultimate objective of the utilizer, an in-depth background of the case, better role description of the participants, and use of advanced methodologies. It was stressed that the engagement of the living lab network should align with the long-term strategic goals of the utilizer. In order to ensure the participation of utilizer in the process the project necessitates a distinction between openly shared and internally withheld company issues.

There are no standard living lab project or process development instructions available. Thus, further formulation and creation of standardized living lab model is needed. This means a well documented model and conceptual tools useful for all participants. The living lab innovation development process requires flexibility in order to adapt the network's resources and tasks at the time of changes in the assignment. Productization and quantification of knowledge is a necessity to produce efficiently the product and service portfolio in the network. In the best case, this will result in a chain of development projects by a specific utilizer. This requires that the utilizer takes an active role in the interaction among the members of the living lab network. Moreover, as the living lab project is based on a user-driven approach, it is essential to ensure that end-user participate actively, express their interests and share their knowledge during the process. This calls for an active and open-minded approach by all members to interact with the end-user groups. The living lab may both require and result in new intangible and tangible ways of rewarding end users. Table 2 summarizes the motives, outcomes and challenges of parties in the living lab project. The identified motives support the suggested outcomes (increased involvement, usability, compatibility, and performance) that were presented in Figure 1.

Participant	Motives	Outcomes	Challenges
Living lab (The whole network)	• Establishing and improving the living lab network and its processes in order to develop new products and services • Merging knowledge and activities of different parties	• Common learning process • Strengthens co-operative and concurrent procedures and processes • New practices to develop services and products • Dynamic adaptation of the network • Efficiency of the network • Transition and evolution of knowledge from and to the network	• Ensuring flexibility and continuation of the project • Ensuring exploration and exploitation of resources • Settling contradictory motives and expectations • Shifting and combining objectives of a single party and the network • Tying parties to long-term objectives • Depicting benefits and potential of the living lab • Engaging trust and transparency
Enabler	• Establishing living lab organization and brand for entire metropolitan area	• Gained experience • Successful reference case	• Further formulation and creation of standardized multiple living lab model
Utilizer	• Increasing understanding of the retail purchasing process • Creation and testing of pilot concepts	• A tested pilot service concept for retailing • Prototype of the user interface of e-commerce application for retailers • Revealing and supporting the future projects and activities in retail purchasing process development	• Engaging the living lab network for the long-term strategic goal development • Distinction between the openly shared and internally held company issues
Provider	• Improving the working practices • Competence development	• The accumulation and development of knowledge and competence for every provider in their expertise areas, e.g. mind maps, methodologies, tools, procedures, processes, data mining, and reports • Training and learning as a part of the living lab development project	• Transition from a single project to a chain of projects • Productization and quantification of knowledge
End Users	• Development of individual interests, e.g. promoting competition • Educational and learning process	• Accumulation of knowledge • Learning experience	• Ensuring end users' participation, capturing their interests and knowledge

Table 2. Motives, outcomes and challenges of parties in the living lab project.

5.   Discussion and conclusion

In this study, we focused on describing the living lab innovation development model. The examination was conducted especially from the perspective of networks. That is, we aimed first to describe both theoretically and empirically what the living lab model is, and pursued identifying the key actors and their roles in a case living lab project. Moreover, we analyzed the participants' motives to join the innovation network and discussed how living labs promote service innovation development.

Our key premise is that collaboration in the living lab innovation model requires different inputs from different actors. For example, enablers are those who provide the living lab with infrastructure such as facilities and premises. Conversely, end-users contribute their time and effort by expressing their needs and by assisting in testing the innovation. Other participants include enablers and utilizers. All partners will benefit of the shared living lab approach. Collaboration maximizes production gains and shortens the innovation development cycles. In all, the society, the retail industry, and the participants of living labs benefit of open innovation: they achieve increased involvement, usability, performance, and compatibility

of innovations. Moreover, networking with other living labs provides knowledge resources, experience and best practices that further foster the success of the development.

The findings of our empirical study suggest that the lack of strict objectives in the beginning of the living lab project may turn out to be more effective than the traditional, narrowly focused methods. The objectives of the Arabianranta living lab project were not clearly defined at the beginning of the project. This led to the fact that the outcome of the living lab innovation development project was adjusted and readjusted based on the ongoing work and findings all the way during the project. We suggest that this is a corner stone that actually enables the development of a successful living lab network and its processes. Different roles of actors could be revealed, such as the changing role of the coordinator and project manager, because the intended outcome or the process how to achieve ultimate goal was not clear. The most viable actor at the time will lead the development work at least until a new shift in the assignment takes place.

Overall, the Arabianranta living lab project attracted different parties and increases our understanding on various methodologies for problem solving and innovation development. All parties in the project stressed that the initial concept progressed quite well, but it is still subject to the learning process. Another fundamental cornerstone is the user-driven approach, i.e. the development work is conveyed in close collaboration with end users. This method is rather different to the traditional innovation development, where the structured and firmly managed development work aims at well-defined goals. In the open innovation model, such as the living lab innovation development with no strictly predetermined objectives, the effectiveness of the outcome comes from the fact that it is a sum of numerous unplanned changes, events, and ideas. This type of approach requires openness and the capability to stand the risks and challenges related to the learning process. However, the best result may come if the open innovation model complements the traditional innovation development method.

Using the living lab innovation development model has many challenges and paradoxes. Firms need to take these paradoxes into account if they pursue making progress in the development work. Many of the paradoxes are related to the network and the relationships between the members of the living lab network. First, it is crucial to be able to balance between the flexibility and stability. This means that the network and its actors should adapt to shifting needs and assignments in a fraction of time. The living lab network may, for example, require more developers and end users. Second, all parties should understand the distinction between the "open world" and the "closed world". The living lab approach is a learning process to each party. They need to be able to share their information, which may be considered the core competence of a firm, with other parties in the network. Only then it is possible to achieve the benefits of multiple innovators. This leads to the third aspect: actors in the living lab network need to balance between their individual needs and the common needs. The network has to settle sometimes contradictory motives and expectations of different parties. Common goals should dominate the individual aims in order to ensure genuine participation and willingness to achieve radically new innovations.

There are some limitations in our study. Our analysis is based on only one living lab case project, which may turn out to be not a typical case. This requires analyzing more living lab innovation development projects. Moreover, the number of end users in our case study was rather small. As the living lab model emphasizes strongly the role of users in the process, we suggest that the future studies and living lab innovation projects involve more end users in order to gain more heterogeneous ideas, resources, and experience.

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