

Formalising Living Labs to Achieve Organisational Objectives in Emerging Economies

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Abstract: The purpose of this paper is to indicate how Living Labs (LL) are organized and applied as part of the research mandate of the SAP Research Pretoria in South Africa. This will be done by exploring existing definitions of LLs. This is followed by the identification of four dimensions of living labs which is then used to evaluate three existing LLs to indicate the relevance for choosing a LL as methodology for doing the projects as well as the dimensions of LL within each LL at this research centre. This focus attention on the selection of stakeholders and the role they play in realising a LL concept within a project. It further discusses how the organisation's objectives are addressed via the LL approach, which has never been done before in SAP Research Pretoria. Last-mentioned includes aspects like the innovation process, and user involvement which focus on these as important criteria for a successful LL.

Key words: Living Labs, Southern Africa, open-innovations, organisational objectives

1. Introduction

The term Living Lab (LL) has emerged in parallel from the Ambient Intelligence research communities' context and from the discussion on Experience and Application Research (EAR) based on the concept of user experience and Ambient Intelligence (AmI) [1]. However, the thinking and practice behind LLs has been developed by Prof. William Mitchell, Media Lab and School of Architecture and city planning, MIT Boston, who argued that a LL represents a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts [2].

Over the last few years the term has been promoted and implemented by the EU which has resulted in the creation of the European Network of LLs (ENoLL), which in 2008 expanded also beyond European borders [3]. Its mission is to help create first class innovation environments for information and communication technology (ICT)-based products, services and social innovations and facilitate innovation and collaboration between users, industry and research stakeholders. The ENoLL network and pilot projects have also received strong political support, ranging from cities or local governments to the

European Commission. This has in a way been a collective effort to include users in a systematic way in a European innovation system.

SAP Research has been following the LL methodology for the last couple of years and also participated actively in ENoLL as well as different LLs in particularly Europe, but also other parts of the World. SAP Research Pretoria has formally started pursuing the LL methodology with one of its project (Collaboration@Rural) in 2007 [4]. LLs have featured prominently in most of its research project since 2007. This is mainly due to the “practical” nature of the directed research undertaken and its specific focus on the development and adaptation of appropriate ICTs for Emerging Economies.

Following the implementation of three successful LLs in South Africa by SAP Research Pretoria, this article is an attempt to formalise and describe the problem of how the LL approach and structure were applied to better align these LLs with the research objectives of SAP Research Pretoria. The intended end results of this paper is to provide evidence that all the LLs at the SAP research unit had to adhere to four dimensions of LLs and by doing that had also to address the research objectives of the SAP research unit in Pretoria. If these LL do not address the objectives of the unit or align with the four dimensions explained below they cannot be regarded as LL in their true essence and they will fail to support the main research vision of the research unit. Each LL is unique in its nature but still add value to and is aligned to specific research objectives.

The remainder of the paper is structured as follows: Firstly a short overview of LL’s is given. Secondly a discussion is provided on how to match SAP Research Pretoria’s objectives with the LL methodology. Thirdly the concept of an integrated Living Lab model is presented.

2. Living Lab Overview

Research methodology is defined as specific ways and techniques that can be used to understand a phenomenon [5]. Various research methodologies have been invented and utilised in conducting research in different fields of study. A LL methodology, invented in the past few years, has gained popularity and is proving to be having a great impact in Information Systems (IS) research. The LL methodology introduced by Professor William Mitchell was initially used to design home-like environments to test architectural ideas. Recently the idea is spreading and being utilised in conducting research in various fields including IS. Reviewed literature [1;2;3;8] indicate that there is lack of a consensus on a LL definition. A number of definitions for a LL exist in literature [6]. For the purposes of this article and to address the objectives of the SAP research centre a LL is defined as:

“a user-centred, open innovation real environment based on a multi-stakeholder partnership (public-private-people) which enables real-life end users to take an active role in the research, development and innovation process” [7].

This definition addresses four dimensions forming the basis of a LL approach. These will form the basis of this paper and will be used to evaluate the SAP Research LLs against.

User-centred: This term refers to the envisaged end users of a particular innovation should that innovation be implemented in a real-live scenario, i.e. not only in the experimental LL phase, but also in the maturity of the innovation. A selected group of “typical users” gets involved not only in the evaluation of a specific product, but right from the conceptualisation of the idea, requirements definition, design and implementation. In this way, it is believed to result in the development of a much better and suitable product for the end users. The role of a user during product development becomes more important if the intended target market is relatively large and increasingly diverse.

Users typically fall into one of three categories, depending on their maturity and the role they play relating to the innovation: “Drivers” where they take on a user-lead role, “Pro-

active” which typically results in an idea-generation role and finally “Reactive” which normally relates to a concept validation role.

Open-innovation: This research paradigm proposes the involvement of many stakeholders, outside the normal limits of a traditional organisation (e.g. a company, a non-governmental organisation, a university) in the innovation process. In contrast to closed-innovation where firms only use internal sources, open-innovation suggests the companies use both external and internal sources. This shift in innovation paradigm becomes more important in the current innovation environment where external sources possess ever increasing knowledge and information which are key to innovation.

Real environment: Innovating in a real environment as opposed to a test or laboratory environment has definite benefits. Different factors, sometime unforeseen, are present and influences the innovation. This leads to a more realistic, applicable and ultimately a more suitable product or solution. Performing research in a real environment is one of the key aspects of the LL philosophy.

Multi-stakeholder: One of the key philosophies of the LLs as well as Open Innovation approaches is multi-stakeholder involvement. Different categories of stakeholders have been defined [8]. “*Users*” refer to end-users for whom the innovation are designed and who will be using the final product. They participate from the beginning of the innovation life cycle, throughout all stages until they eventually use the innovation. “*Innovators*” drive the actual innovation and are very interested in its quality and success. “*Policy-makers*” play an important role especially in the creation and support of LLs as innovation environments or networks. “*Researchers*” conduct their “academic” research in the LL either because it feeds into the innovation or because it benefits from its synergies. “*Service providers*” have a key role to play in the management and operation of the LL. Typical tasks include brokering the projects, engaging and motivating users, facilitation and project management, and supporting methodologies.

3. Living Labs Supporting Directed Research Objectives

The primary function of the LL is based on a multi-stakeholder partnership which enables end-users and researchers to take an active collaborative part in the research, development and innovation process. Because of the heterogeneous nature of user groups in directed research projects, a mixed-method research approach has to be followed [9]. During a software development project, the software development lifecycle can be adopted as an additional methodology. The chosen methodology should support and align with the organisational objectives of the institution to foster innovation and competitiveness.

The high-level directed organisational objectives of SAP Research Pretoria include:

- Research and Develop new ICT solutions for Emerging Economies (EE)
- Measure and Validate the Social and Economic impact on EE
- Investigate methodologies, technologies and techniques for EE

The rationale for using the LL methodology is clear. These objectives require direct user involvement to achieve the objective, i.e. it must be “user-centred”. “Measure and validate” refers to end user value and acceptance. All three objectives refer to “Emerging Economies”, which indicates the importance of this specific context in the organisation, in other words “the real environment” in which the solutions should be developed and tested.

Following a “multi-stakeholder” approach will enhance the applicability and acceptance of the final research results and provide further opportunities or “open-innovation” – a key requirement when pursuing high-quality, relevant ICT research. Thus a LL approach is best suited to address the organisational objectives of SAP research Pretoria.

Three separate LLs established by SAP Research in Pretoria will be used to evaluate against the four dimensions discussed earlier. Here follows a short description of each LL.

- **Overture LL** which was established to support the design process for the “mobile business services for very small enterprises (VSEs) in Emerging Economies” concept and to evaluate it in a real-world scenario. A number of small organisations in the construction sector were selected and invited to participate in the LL from the conceptual phase right through to the implementation phase. Constant feedback from users on the design and implementation of a mobile product. This enables all stakeholders ranging from the VSEs, suppliers, associations, government agencies, and other services providers to effectively develop new ideas together, evaluate the concepts and obtain direct input during the whole process.
- **Rustica LL** where the main goal is to provide a collaborative environment with various stakeholders for the implementation and deployment of sustainable ICT innovations for socio-economic development in the rural community. It supports introduction of ICT solutions to the small scale traders in rural areas and studies the impact of this intervention. The involvement of various stakeholders in the design and implementation of a technology which can support their day-to-day business activities had to adhere to the four dimensions of LL as described above.
- **PatHS LL** was a health LL in South Africa where new and novel patient health management systems were developed and tested in several rural healthcare clinics. Participating organisation ranged from private organisations, universities, NGOs and government and their inputs into the concept, its design and implementation as various type of users in an open innovation scenario were crucial for successful delivery of a product they can apply to improve their overall health.

In all three LLs the idea was to address the needs of emerging economies in different contexts through use of different data collection instruments to get constant feedback from users in an open innovation environment to improve operations through application of specific technology platform. This allows for each LL to support the research objectives of SAP Research, Pretoria and support the LL dimensions each in their own unique way.

Table 1: Evaluation of 3 LL's

| Dimension | Overture | Rustica | PatHS |
|----------------------------|---|---|---|
| Main purpose of LL | Mobile business services for VSEs in Emerging Economies | Sustainable ICT innovations for socio-economic development in the rural community | Understanding of health clinic business processes and development of patient management system |
| User-centred | End-users are drivers of innovation, idea generators and concept validators. Involved from initiation to final prototype and evaluation | Users are involved as idea generators (pro-active) and innovations are centred around their feedback | Users are part of field trails, centred in the development of applications and provide feedback to improve the product |
| Open innovation | Ample opportunities are created to stimulate open innovation: regular workshops, walk-throughs, meetings, feedback, field user testing | Researchers often visits remote rural areas for discussions, workshops and trials in order to stimulate open innovation | Regular discussions, workshops and on-site software development directly involving end-users and other stakeholders provide opportunity for open innovation |
| Real environment | Small plumbing organisations in urban area | Small scale retailers (spaza shops) in remote rural | Rural health care clinics |
| Multi-stakeholder | Multiple stakeholder involvement (use both internal and external sources). Vodacom, plumbers, SEDA, developers, SAP team, academia | Small scale retailers, SAP team, funders, CSIR, Suppliers, Academia (M and D Associates, Joint University Appointees), Vodacom, ATM Solutions | SAP team, developers, home-based care nurses, clinic nurses, Dept of Health |
| Innovation outcomes | Mobile phone software prototype in a hosted cloud environment | A mobile e-procurement and logistics solution for rural small scale traders | Clinic based patient management software system |

Table 1 explains how the LLs at SAP Research Pretoria adhere to the four dimensions of LLs (user centred, open innovation, real environment and multi-stakeholder). The purpose and innovation outcome of each LL is also provided.

In the above table it is evident that each LL address the four dimensions of the LL methodology and involves an array of different stakeholders who are key role players to provide feedback in improving a specific innovation which is geared towards specific needs in each cycle or phase of the product life cycle. Each LL has its own specific context and technological focus but all of these involve open-innovation based on both internal and external role stakeholders, involve users as drivers, centred innovators or as active participants from the initiation of the LL through to the evaluation.

4. An Integrated Living Lab Model

The following integrated model was developed by SAP researchers to depict how different LLs within SAP Research Pretoria are integrated to function based on the strategic mission (highlighted in orange) and objectives (above each LL).

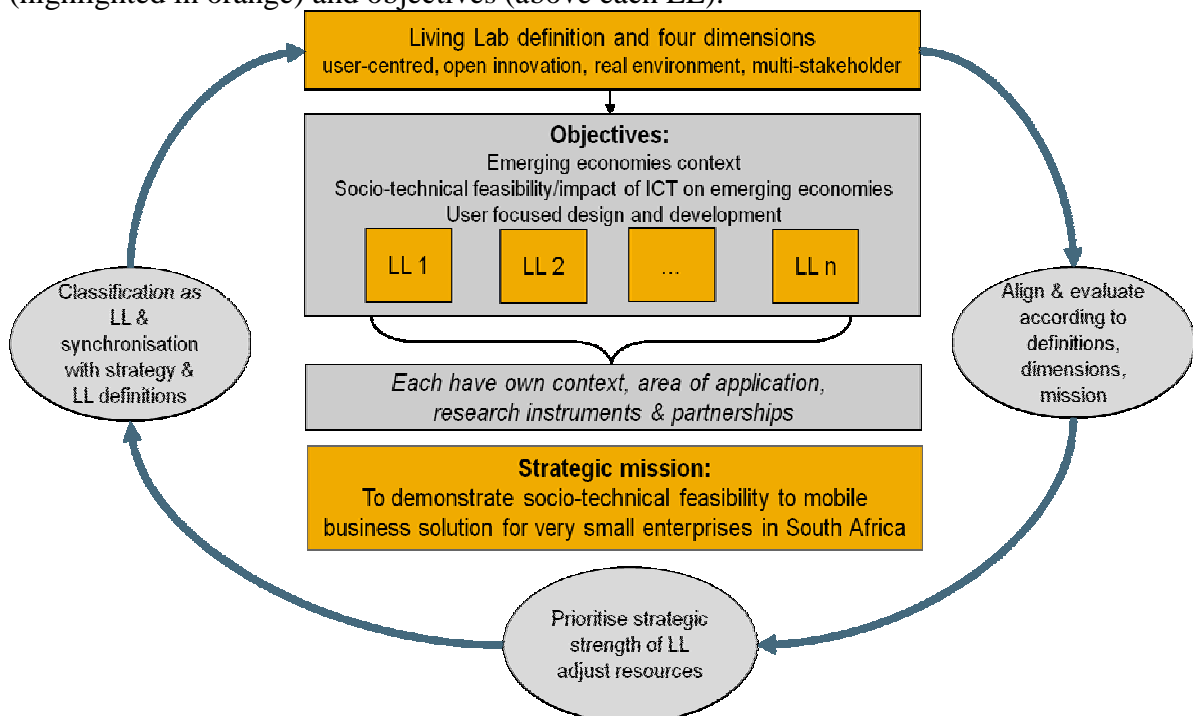


Figure 1: An integrated LL model for SAP Research Pretoria

As shown in figure 1, the primary mission of the LL strategy for this research unit can therefore be defined as: to demonstrate socio-technical feasibility of mobile business solutions for very small enterprises in South Africa. This model is primarily aligned to and driven by the strategic research focus/mission of the SAP research centre (bottom of figure). Based on the research mission each LL has to focus on specific objectives (emerging economies context, socio-technical feasibility/impact of ICT on emerging economies and user-focused design and development). Each LL also have to constantly realign and evaluate itself to ensure that it is still aligned with the main LL definition with its four dimensions (user-centred, open innovation, real environment and multi-stakeholder components). Within each LL there can also be a specific context (urban, rural or semi-urban), area of application or also referred to in the table above as innovation outcomes, research instruments (for collecting data and improving the area of application) and partnerships (unique and specific for each LL environment) that can differ from other LL within the SAP research centre. Based on the defined research context and appropriate application area, the different stakeholders that interact in this particular environment

should be identified and their roles need to be defined within the research context. The associated research instruments should be designed to achieve and assess the goals of this particular LL. This generic structure is used to facilitate the classification and synchronisation of the various LLs, and it further allows individual LLs to create its uniqueness given the context of project/research needs.

A cyclic approach is followed where the LLs align and evaluate themselves constantly, but also need to (bottom of figure 1) prioritise strategic strengths of each LL and allocate resources from a strategic point of view to support the development and co-creation activities within the eco-system of the LL definition. This then feeds back (left hand side of model) to the LL definition and why a LL is classified as a LL, synchronisation of LL with strategy and definition in a constant cyclic way to ensure that all LLs do address these important issues within the centre. The industrial significance and eventual benefits of having a specific integrated LL model ensures that each LL within the research unit constantly evaluate itself to adhere to its main strategy and objectives as well as whether it adheres to the four dimensions of being a LL. It was important for SAP research Pretoria to have its own unique LL model which depicts its coherence and individuality compared to European LLs and other existing LLs within South Africa. The LL concept is currently flourishing in South Africa as a concept to apply to projects to provide evidence of complexity and user involvement as well as innovation that should result from it. This model is the first step for SAP research Pretoria to ensure all current and future LL will apply the same standards and adhere to the strategic objectives and four dimensions of LL.

5. Conclusions

In conclusion, the LL should offer an environment aimed at determining and evaluating proof of concepts for products, services and solutions. It should be designed to boost open innovation by ensuring that all relevant stakeholders, including end users, are closely involved throughout the research and development process of future products and services, based on the principles of user-centric design. A suitable LL methodology (or a mix of methodologies) should be applied within a physical or virtual innovation environment – ensuring that research and industry are closely engaged to develop, test and showcase proof of concepts of their research visions.

This paper illustrates a possible way to align organisational (research) objectives with LL objectives in order to ensure consistency and efficiency. Using four dimensions (user centred, open innovation, real environment and multi-stakeholder) from the definition of a LL, three existing LLs have been evaluated against these dimensions.

The LL definition, dimensions and the integrated model is under constant scrutiny and will be further refined in future. The end results will be that any future LL within SAP research Pretoria will also have to adhere to this integrated model but has to have its own uniqueness of application, context, users, stakeholders, innovation and positively influence and support the emerging economies it deals with in a specific society.

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References

- [1] de Ruyter, B., van Loenen E. & Teeven, V. (2007). *User Centered Research in ExperienceLab*, European Conference, AmI 2007, Darmstadt, Germany, November 7–10, 2007. LNCS Volume 4794/2007, Springer.
- [2] Core Labs (2006), <http://www.ami-communities.net/wiki/CORELABS>.

- [3] European Network of Living Labs. 2008. Online available at: <http://www.openlivinglabs.eu/>.
- [4] Van Rensburg, R. Smit, D. & Veldsman, A. 2007. Marrying the 'System of Innovation' and Micro Enterprises in Real World Rural SADC: An Overview of Collaborative SMME Incubation in the Rural Living Lab of Sekhukhune, IST Africa 2007, Maputo, Mozambique, 2007.
- [5] Limpanitgul, T. (2009): Methodological consideration in quantitative study examining the relationship between job attitudes and citizenship behaviours. 18th EDAMBA summer academy, Soreze, France. July 2009. Available online: <http://www.edamba.eu/userfiles/file/Limpanitgul%20Thanawut.pdf>
- [6] Schaffers, H. Guzman, JG Navarro, M. & Merz, C. 2010. Living Labs for Rural Development Results from the C@R Integrated Project. Published by Tragsa, Spain, 2010.
- [7] Ec.europa.eu (2010): Living labs for user-driven open innovation, an overview of living labs methodology, activities and achievements: Online available at: http://ec.europa.eu/information_society/activities/livinglabs/docs/brochure_jan09_en.pdf. Accessed June 2010.
- [8] Living Lab Handbook. 2010. Online available at: <http://ve-forum.org/apps/pub.asp?Q=3386&T=Living%20Lab%20Handbook>
- [9] Schaffers H, Budweg S, Kristensen K, Ruland R. A Living Lab Approach for Enhancing Collaboration in Professional Communities. ICE 2009 conference proceedings, Leiden, Netherlands, 22-24 June 2009.