Challenges of Evaluating a Living Lab in South Africa

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Abstract: The purpose of this paper is to discuss certain challenges that emerge when evaluating a Living Lab (LL). These challenges are linked to the choice of evaluation methods as well as whether to measure, when, what and how to measure. A LL in itself is a complex context that provides a successful mixture of ICT-based collaborative environments, open innovation platforms, and user centred product/service development methods and Public Private Partnerships. All of these can have effects on regional economies, industries and societal landscapes. This article shares the combined methods which were applied in evaluating a LL and also reflects on why, how and what were evaluated. A combination of three evaluation frameworks were applied, which involved: a) Outcome Mapping (OM) methodology to track user/stakeholder behavioural changes and lessons learnt, b) a framework developed by the University of Madrid, known as OO/UC3M/63 to provide the innovation strategy, process, technical development, competitive advantage and management, c) PACE which focuses on project assets, core competencies and exploitable items. The interpretavist philosophy was applied with a qualitative methodology to use a project's LL as a case study to collect feedback on a continuous basis from stakeholders through semi-structured interviews, questionnaires and observation and to interpret the results. Measurement over a specific period of time within the specific complex context of a LL with different stakeholders resulted in an improvement in LL processes, product and services.

Keywords: User participatory design, monitoring and evaluation, Outcome Mapping, measuring, mobile services platform, stakeholder matrix.

Introduction

Living Labs (LLs) can be regarded as complex environments for innovation and development in which users are exposed to new ICT solutions in (semi) realistic contexts. This can either be part of medium- or long-term studies targeting evaluation of new ICT solutions and the discovery of innovation opportunities makes evaluation and measurement challenging (Følstad 2008). One wonders where should the focus of the evaluation fall and whether to do a holistic or focused evaluation where one can measure a specific element such as a specific innovation or a specific service provided. It is well-advised that evaluation takes place throughout the lifecycle of an information systems project. These milestone assessments offer insight into the changes amongst and within stakeholders, both expected and unforeseen, and both positive and negative, and can help to shape the course for the remainder of a project's lifespan.

In this paper, we present an evaluation of a LL within Project Overture. Project Overture was established to provide very small enterprise (VSE) communities in urban areas of emerging economies (EE), such as South Africa, with a solution to conduct their day-to-day business activities on a mobile phone. The main purpose of the evaluation was to determine the effectiveness of the LL in achieving the project's objectives. The LL project described in

this paper is unique in the sense that evaluation was not conducted during the project, but primarily after the project. This was due to time constraints and requirements for deliverables to be completed within the constrained project schedule. In this case, the LL team wanted to understand what happened in retrospect and "learn from past experience" which could then be applied for future initiatives.

The remainder of the paper describes the Project Overture Living Lab, the evaluation thereof, and resulting findings from the study. In the next section we briefly discuss the Project Overture LL before discussing the evaluation thereof.

Project Overture Living Lab

Although a number of definitions exist, for purposes of this research, a LL can be defined as a "a real-time experimental environment that enables different role players with some or other common interest within a domain to collaborate in the use and development of innovative ideas to solve current and real world problems in a unique and integrated way" (Van der Walt, Buitendag et al. 2009). The theoretical foundation for this specific LL is work related to co-creation and users as innovators. Von Hippel (1988), presenting users as innovators, is referred to by three of the reviewed papers (Katzy, Loeh et al. 2005; Eriksson 2006; Kusiak 2007). Others refer to Sharmer's (2007) work on co-creation (Niitamo, Kulkki et al. 2006) and the papers by Eriksson et al. (2006) and Niitamo et al. (2006) on co-creation in LLs (e.g. Oliviera et al., 2006 & Kusiak, 2007).

Project Overture established and made use of a LL to support the design and development in the project and to evaluate the solution in a real-world scenario. The mandate of the LL was to facilitate the demonstration of the socio-economic feasibility of a mobile business solution for the very small enterprise market in urban areas of South Africa.

The case study for this research endeavour involved the use of plumbers from the construction industry. In this research, a VSE was an enterprise that employed 20 people or less and whose total annual turnover is less than approximately EUR 300 000.

The LL comprised of 7 boundary partners, which included:

- *SAP Research Internet Applications and Services - Africa*, acted as the key technology innovator for mobile services solution. SAP Research was responsible for co-innovating according the user-driven requirements.
- *Vodacom*, a telecommunication infrastructure and service provider, was responsible for hosting the prototype for testing purposes.
- *Overture Work Packages*, mini project teams investigated business requirements, process innovation, user interface and user experience design, development and testing. The LL team looked after the interest of the LL was considered a work package within the project.
- *Plumbers*, as the users and co-innovators of the mobile services solution.
- *Institute of Plumbers of South Africa (IOPSA)* representatives ensured that all plumbers' interests were maintained.
- *Suppliers*, as potential users of the mobile services platform and providers of supplies and services to the plumbers.
- *Small Enterprise Development Agency (SEDA),* a government agency that has an understanding of how VSEs operate, which provided some insight on the business operations of such enterprises.

IOPSA and Vodacom were unfortunately not able to participate in the evaluation, as IOPSA withdrew from the project 3 months before the project ended, and Vodacom was more active outside of LL context due to the nature of the business relationship. Figure 1 illustrates the various boundary partners within the LL environment, interacting between and amongst LL partners.
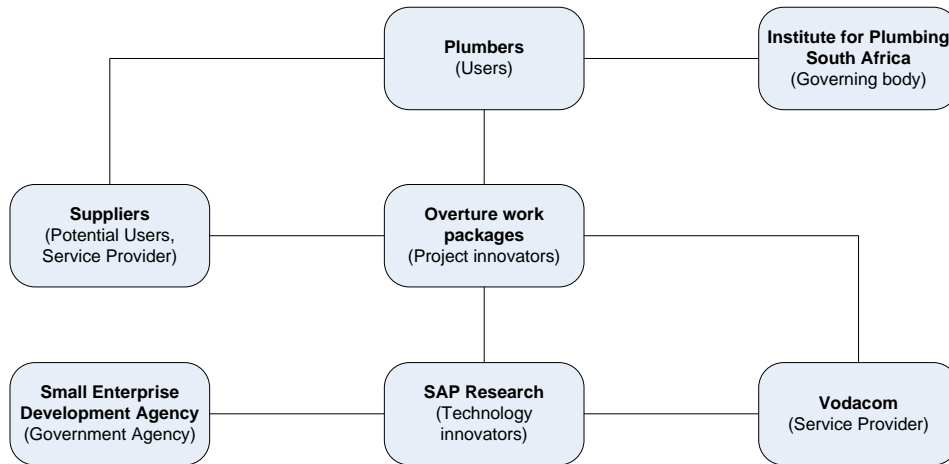
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                    ┌─────────────┐                  ┌──────────────────┐
                    │  Plumbers   │                  │Institute for Plumbing│
                    │  (Users)    │                  │  South Africa    │
                    └─────────────┘                  │(Governing body)  │
                                                      └──────────────────┘
    ┌──────────────┐        ┌──────────────┐
    │  Suppliers   │        │Overture work │
    │(Potential Users,│─────│  packages    │
    │Service Provider)│     │(Project innovators)│
    └──────────────┘        └──────────────┘
                                                      ┌──────────────┐
    ┌──────────────┐        ┌──────────────┐         │  Vodacom     │
    │Small Enterprise│      │SAP Research  │          │(Service Provider)│
    │Development Agency│────│(Technology   │          └──────────────┘
    │(Government Agency)│   │ innovators)  │
    └──────────────┘        └──────────────┘
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Figure 1: Overture LL boundary partners

These boundary partners were selected based on their experience, interest and importance to the project and the LL. Updates and notifications with regards to LL activities were communicated on a regular basis to all boundary partners, irrespective of the frequency of a LL partner's contribution. This ensured that everyone was kept informed of LL activities. This was in line with recommendations made by (CoreLabs 2008) stating that for open innovation to take place, communication and trust is imperative. The LL partners interacted with each other either on a one-to-one basis, which was requested on a need only basis, or within a group format, during LL interaction meetings. The two types of meetings, which took place every alternate month, included the "LL User Interaction Meeting" and the "LL All Partner Meeting". The purpose of the interactions was primarily the following:

- To gather, verify and validate end-user requirements for the design and development of the system.
- To communicate project progress and obtain feedback from all partners.
- To ensure all project partners are informed of the design, development, and testing of the Overture prototype.

As part of protocol for the LL to function in an open, transparent and ethical manner, boundary partners that wanted to interact with other partners in the LL were only allowed to do so after providing a motivation for the one-to-one interaction. The one-to-one interaction was communicated to the other partners to ensure that there was an awareness of such an interaction.

Evaluating the Overture LL

Evaluating the LL is seen as one of the fundamental aspects to be able to show how a LL has made an impact on society and to show why replication of a LL project is essential. After considering literature on the evaluation of projects and LLs, it was decided to apply a combination of three evaluation frameworks also sometimes referred to as methodologies from different articles:

Outcome Mapping (OM) methodology, which is used to track user/stakeholder behavioural changes and lessons learnt from different stakeholders. Outcome Mapping (OM) was designed to build learning and reflection into development programs specifically relating to developing contexts like South Africa (Earl, Carden et al. 2001) and it allows researchers to track behavioral changes. OM focuses on influencing changes in the behaviour, relationships,

activities, or actions of the people, groups, and organisations with which a program or developing context project works directly (boundary partners or stakeholders). OM provides the route map and data gathering tools to produce evidence based results (Earl, Carden & Smutlyo, 2001). Observations were used as data collection instruments over the duration of the project, whereas open-ended questionnaires were used and semi-structured interviews were conducted with all partners at the end of the project.

The **OO/UC3M/63** framework (García-Plaza 2010), which contributes to the determination of issues such as practices for creating and implementing LLs, progress and impacts of LLs, how LLs influence their rural and regional environments, the different development patterns of LLs and the performance of the LLs as an innovation methodology. It proposes a common way to determine the innovation strategy of a LL, define the services to be provided in the scope of a LL, deploy the base technological platforms required to develop the applications, perform the user roll out and provide the corresponding training, and compile relevant information to evaluate and assess the LL performance.

PACE (Vontas and Protogeros 2009), which is a qualitative instrument to assess the added value of a LL. It was adapted from the Scandia Navigator model (Koumpis and Mavridis 2006) by setting a sharp focus on financial, market, process, renewal and development, and human capital assets. It offers the basis for identifying the key attributes and features of a LL as analysed by means of a case study where interviews were conducted and questionnaires completed.

These three evaluation frameworks were used to measure and evaluate the success and outcome of the LL used in Project Overture. The three frameworks were combined through mapping specific aspects in each and to ensure that the same aspects like process, assets and tools were not repeated. Through a combination of these frameworks replication of aspects were eliminated but also it was ensured that important aspects were not left out. The explanation in the next paragraph highlights how these were combined. Many aspects in all three overlap, especially PACE and OO/UC3M/63. All three frameworks have the same focus; however, using only one of the frameworks could have lead to missing important outcomes and indicators for success or failure. Each framework is unique and adds another measurable dimension to the evaluation.

Two of the frameworks were combined as follows. The PACE framework was combined with the OO/UC3M/63 framework because both focus on process, product/service/tool. The PACE framework refers to human capital assets which is the same as the OO/UC3M/63 management issue. Furthermore, both also involve an evaluation or assessment but PACE does not focus on technical development.

OM is different from PACE and OO/UC3M/63 as OM only focuses on lessons learnt and behavioural changes occurred in the boundary partners, which the other two do not indicate or refer to at all.

The research approach applied in this LL was mainly qualitative in nature (experiences, feedback of all stakeholders and lessons learnt) although some quantitative measures were also applied (network matrix, Lickert scales in questionnaires, key elements of innovation, assets, competencies). The case study method (Yin 2009) was used as Overture was seen as one case study with different units of analysis (stakeholders, evaluation frameworks, assets) and data collection instruments involved open-ended questionnaires with Lickert type questions, semi-structured interviews and observation. Table 1 below provides the summary of the data collection method, participation level and number of participants. All the partners indicated in the Table participated on a continuous basis, except for suppliers, who participated on an ad hoc basis, because of limited participation in the project.

Table 1 indicates the data collection methods applicable to each LL partner in the Overture LL as well as the participants involved under each.

Table 1: Data collection methods per LL partner

LL partner	Data collection method	No of participants
SAP Research	Semi-structured interviews	3
Overture LL team	Semi-structured interviews	3
Overture work packages	Semi-structured interviews	4
Plumbers	Evaluation questionnaire	6
Suppliers	Evaluation questionnaire	2
SEDA	Evaluation questionnaire	2

The results of the Overture LL evaluation can be reflected by providing results on the combined PACE and OO/UC3M/63 framework as well as the depth of the OM results from interviews and questionnaire results.

PACE and OO/UC3M/63 Results

Table 2 presents the results of the evaluation making use of the combined PACE and OO/UC3M/63 frameworks. The aspects of both PACE and OOU3M/63 were combined to ensure that there is no replication and these aspects or criteria are listed below on the left hand side with the assets under each criteria. These were then mapped onto Overture to provide the results. Data collection involved gathering feedback from semi-structured interviews of SAP Research and Overture LL team as partners.

Table 2: PACE and OOU3M/63 Results

Criteria	Assets	Overture results (Yes or No)
Financial capital	New services Improved services New methods/tools/application	Yes Yes Yes
Market capital	Marketing for new research or business collaborations Create, sustain and improve a collaboration network Increased reputation	Yes Network matrix – Yes Yes from all stakeholders
Process capital	Quality improvements through cycles of project More productivity and better communication New and improved infrastructures	Yes Yes Yes
Human capital	Increased skills and potential Employ new staff User involvement	Yes No Yes – all levels
Renewal and development capital	New ideas or approaches Acquire knowledge	Yes Yes

Technology	Improved interfaces Improved content Robust and stable technology	Yes Yes Yes – stable platform
Operational	Project management Methods and tools User training and education Services/tool change and configurations	Yes - did provide detailed processes for each life cycle of the LL and provided user training and evaluation Yes Yes
Competitive advantage	LL reference model to be used where specific experiences were found in a specific context Specific business models	Automisation of a basket of business processes and the unique business model is something to share amongst LL Yes

Outcome Mapping Results

Outcome Mapping (OM) was initially seen as more important as a methodology because it focuses on change in behaviour of partners involved in the project, which was the most important outcome of the LL project. It was envisaged that the outcome from the LL evaluation would provide findings that achieved the mandate of the LL. In order to achieve the evaluation of the LL, each partner was asked for their responses to two main areas:

- *LL Communication*, in terms of establishing whether there were any communication concerns and areas for further improvements in future iterations.
- *LL Participation*, in terms of understanding how the partner felt that they have contributed to the LL and how they felt their experience of participation was acknowledged and rewarded.

These results were mainly collected through semi-structured interviews and evaluation questionnaires of all partners involved in Table 1 above.

LL Communication

Due to the inherent diversity in the Overture LL environment, it was inevitable that it created communication complexity. It was important to note that different LL partners' interests needed to be identified and articulated within the LL. Although some planning was executed at the initiation of the LL, it did appear to be challenging to manage for the duration of the project. The LL team felt that more could have been done had they perceived such risks and challenges of working with a large group of partners.

However, most partners rated the overall level of communication and interaction between partners and the LL as excellent. All partners felt that they were kept informed of all LL activities within a reasonable time and did not feel burdened or overwhelmed by this communication. Despite being kept informed, some partners, in particular the plumbers, felt that, at times, there was miscommunication and contradictory information regarding LL meetings. The plumbers, who highlighted this concern, said it was not a serious concern, but could be improved. However, consistency should be maintained to avoid non-attendance and other problems that may arise at LL meetings.

When asked to rank the most preferred method of communication (face-to-face, telephonic voice, SMS, or email), face-to-face and telephonic voice would be the most preferred method of communication, followed by SMS and then email communication. The plumbers preferred personal one-to-one communication. Email access could be limited to certain periods and

therefore not regarded as an optimal method for relaying urgent LL information and notifications.

LL Participation

Findings from SAP Research

Representatives from SAP Research, in general, felt the LL was a good medium to use. The real world perspective assisted in the design and development of a prototype that otherwise could not have been developed without such insight. It only through the contextual comprehension of user needs that designers and developers understood what was required. The representatives also felt that, by engaging with the end-users, getting buy-in is much easier and can streamline acceptance and adoption of the final solution.

Findings from Overture LL team

Each member of the core LL team had very different views on the use of the LL. However, in general the team supported the use of the LL as a driver in the "co-innovation" prototyping exercise. Some team members commented that more could have been planned and implemented prior to the actual implementation of the LL. This included the concept of understanding the complete profile of the partners and establishing the group first, before any LL work could start. By recruiting the plumbers first, this would prevent delays and not hamper other LL activities.

In terms of perception of partner commitment and relationship management, various issues related to sustaining the relationship with the LL partners were encountered by the LL team. The main problem was that, although partners agreed to take part in the research, some did not appear committed. Although partners agreed to attend scheduled interactive forums, certain partners had a tendency of either cancelling on a short notice, or neglecting the meeting request without providing a cancellation notification. The resulting challenge was inconsistent meeting attendance, which made the logistical arrangements of meetings more difficult for the LL team. The interactive discussions anticipated were therefore constrained by the lack of attendance. A common reason for cancellation of meetings or non-response was that the partners were too busy to attend scheduled meetings.

A clear communication strategy was recommended to prevent possible inconsistency and duplication of effort by other team members. Another point of concern was defining roles and responsibilities within the LL team. At the beginning, it was not easy working with a new team, most of the team was not familiar with the concept of LL and had to, through trial and error, learn and adapt. The team members felt that the LL team lead was supportive throughout the process and provided an open forum to discuss and share ideas. The LL team manager believes that getting everyone on board, with the proviso of committed effort, goes a long way and helps to drive all LL activities.

The LL team noted that as the project progressed, some changes were made to the profile of which a plumber should comply with in order to be considered a user for the Overture LL. For example, the size of the plumbing VSE influenced the already existing group of plumbers. One question that arose was that, if one of the existing plumbers does not fit the profile, should they be excluded from the LL or should they be kept on board? Another issue was that new plumbers fitting the reused profile had to be recruited, which led to scope creep. This severely placed stress on the LL team when they had to restructure the LL. It is thus very clear that the LL partner profile need to be finalised before recruiting partners. This is necessary in order to satisfy the requirement made by (Schaffers, Merz et al. 2009), who emphasize that users partaking in a LL should be recruited at the start of a research project, and that their roles and responsibilities should be defined within the given LL context.

Findings from Plumbers

All plumbers, except one, felt that their participation was regular. The plumber, who cited limited participation, attributed limited participation due to personal schedule constraints. When asked if they felt that their participation was *not* required, five plumbers disagreed with the statement and one plumber strongly disagreed. All plumbers felt that it was worth their while participating, in terms of experience gained in learning how different plumbers operate and meeting various partners that the plumbers would not generally interact with, if it was not for the LL forum. It can therefore be deduced from the responses received, that all plumbers perceive their contribution in the LL as valuable and required. All felt that they were given a platform (both during the one-to-one sessions and the group sessions) to contribute and share their views and opinions about the Overture prototype.

Furthermore, five plumbers felt that the time was not limited, and was sufficient for participation within the LL. However, one plumber felt the time was limiting, and more time could have been beneficial in terms of actively participating, to achieve project and LL objectives.

All plumbers agreed that they would participate in a future LL initiative upon request. In fact, all plumbers strongly agreed and are willing to continue in future projects relating to the development of such novel business solutions.

Table 3 highlights specific findings collected from the plumbers through the evaluation questionnaires.

Table 3: Specific findings from plumbers

Perspective on interaction	All plumbers felt that there was a need to have group interaction sessions on a regular monthly basis in order to "touch base", to share ideas, to address concerns and to get feedback on the status of the project and prototype development. All plumbers felt that these interactions did not "waste time and effort".
Perspective on administration	Initially, the core LL team felt that administrative burdens on the plumbers might be tasking and time consuming. However, the plumbers did not feel burdened by the administrative demands of the LL. It was seen as part of the functioning of the LL. The plumbers felt that they complied when requested. Three plumbers, however, felt that due to work commitment, it was not easy for them to fulfil administrative requests within the required timeframe.
Perspective on enjoyment	One plumber strongly agreed that his participation and interaction was an enjoyable experience that lead to the development of the Overture prototype. The plumber felt that the interaction with the other LL partners allowed him to network with other plumbers and also have the opportunity to meet with Suppliers to discuss the needs of a very small plumbing enterprise. All plumbers agreed that it was a good experience interacting with other LL partners.
Perspective on incentive	In order to compensate for the time spent in participating in the LL, plumbers were provided an incentive, which they were grateful for. However, some plumbers felt that the process was administered too late in the project. The plumbers highlighted that such issues should be attended to before project inception, to ensure that all procedures are in place for the incentive scheme to work. All plumbers, although appreciative of the incentive, reiterated that even without an incentive, it is the participation that is of more value as they believe they are helping to design and develop a solution that they will be able to use one day. In essence, one can regard the plumbers' participation as the reward and incentive in itself. All plumbers felt acknowledged for their participation in the LL.

Perspective on LL achieving set mandate	All plumbers felt that the LL did in fact achieve its mandate of demonstrating socio-economic feasibility of a mobile business solution for the very small enterprises in urban areas of South Africa. The plumbers felt a part of the process and design, development and testing cycle of the prototype.

Findings from Suppliers

Two major suppliers participated in the LL, CashBuild and Plumblink. The suppliers were asked to share their perspectives on the LL as a facilitator in achieving the objective of the LL and that of Overture. Although the interaction was ultimately focused on the purchasing of supplies component of the Overture prototype, the suppliers offered insight into how their customers operate and how this can be incorporated in the design and development of the prototype. Both suppliers felt that, although their participation was at times limited and more active towards the latter part of the project, it was a good experience and certainly supported the "co-innovation" philosophy of the LL. The LL provided a means for suppliers to interact with their customers and also to understand their customers' purchasing preferences and how their customers conduct their business. The suppliers appreciated the approach of the interaction meetings as a collaborative feedback forum with more detailed discussions following on a one-to-one basis. Furthermore, the suppliers indicated a strong willingness to continue their contribution in future projects. The suppliers see potential in the objectives of the project and that of the LL.

Findings from SEDA

Representatives of SEDA acknowledged the activities of the Overture LL and that of Overture and support the initiatives, to some extent. Interestingly, the representatives of SEDA were concerned about the uptake of such mobile applications, and were sceptical on whether many VSEs would buy into the Overture solution on offer. SEDA believes more work needs to be done on a grass-roots level, outside the scope of the project's LL in order to obtain insight into the business ethic of VSEs. SEDA advises caution should the solution be used by more VSEs. This partner, unlike other partners, offers caution on co-innovation within the LL context and made the researchers realise that although most of the partners found the LL to be conducive to prototype design and development, one must not forget that not all partners are the same.

Conclusion

Albeit the monitoring and evaluation played a more profound role at the end of the project, the evaluation resulted in findings that support and promote the use of a LL methodology as a driver for user-inspired, co-innovative design and sustainable development of solutions such as the Overture mobile application platform. End-users play a pivotal role in defining solutions that application and service providers would like to sell and that the users want to use. Furthermore, end-users perceive their inputs as valuable and useful to the project as a whole, even though at times this input may be limited due to other commitments out of the LL environment. The importance of conducting consistent evaluation, eliciting regular feedback at marked intervals cannot be emphasized enough. This supports studies that encourage planning, initiation and follow-through of a holistic evaluation exercise. Had such a monitoring and evaluation intervention be planned and adopted, the course of the project and rich feedback of using the solution could have altered the final outcome of the evaluation and provided further findings that may not have been expected. Future LL initiatives can learn from the evaluation experience gained from the project Overture LL initiative and be better

prepared to manage the intricate relationships and interests of various LL partners. Managing a LL is a delicate balance of ensuring objectives is met by acknowledging the needs of all partners, at each fundamental stage of the project.

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