A living laboratory approach in the design of the user requirements of a spatial information platform

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Abstract

The purpose of this article is to introduce the development of the Regional Spatial Profiler – a spatial information and modelling platform – for the Department of Science and Technology. Based on the steps set out in action research, this platform is aimed at strengthening spatial planning at a regional scale by providing accessible and comparable spatial information (of current and past trends) to planning practitioners in government. To ensure that the Profiler met the requirements and expectations of users, and would be used by practitioners, its user-interface and future content requirements were developed using four living laboratories (living labs): the Cape Winelands, Ugu and Amatole District Municipalities, and Mangaung Local (now Metro) Municipality. Municipal participants and project team members believed that a living-lab process was the appropriate way to develop the Profiler and experienced the living-lab Profiler as a positive initiative; however, due to time, budget and technical constraints, it was a temporally – specific and fragmented project initiative. What would be required in future project phases would be a longer time frame and continued user involvement in multiple project phases.

'N WERKLIKHEIDSLABORATORIUM-BENADERING TOT DIE ONTWERP VAN DIE GEBRUIKERSVEREISTES VIR 'N RUIMTELIKE INLIGTINGSPLATFORM

Die doel van hierdie artikel is om die ontwikkeling van die ruimtelike Profiler – 'n ruimtelike inligting- en modelleringplatform – vir die Departement van Wetenskap en Tegnologie, bekend te stel. Gebaseer op die stappe wat in aksienavorsing gebruik word, beoog hierdie platform om ruimtelike beplanning op plaaslike skaal te bevorder deur die voorsiening van toeganklike en vergelykbare ruimtelike inligting (van die huidige en vorige tendense) aan beplanningspraktisyns in die regering. Om te verseker dat die Profiler aan die vereistes en verwagtinge van die gebruikers voldoen, en wel deur praktisyns gebruik gaan word, is die gebruikerskoppelvlak en toekomstige inhoudelike vereistes ontwikkel met behulp van vier lewende laboratoriums: die Kaapse Wynland, Ugu en Amatole distriksmunisipaliteite en Mangaung Plaaslike (nou Metro) Munisipaliteit. Munisipale deelnemers en lede van die projekspan glo dat 'n lewende laboratorium-proses die geskikte manier was om die Profiler te ontwikkel en ervaar die lewende laboratorium Profiler as 'n positiewe inisiatief, maar as gevolg van tyd, begroting en tegniese beperkings was dit 'n tydelike en gefragmenteerde projekinisiatief. Wat nodig sou wees vir toekomstige projekfases is 'n langer tydsbestek en voortgesette gebruikerbetrokkenheid in verskeie projekfases.

TSHEBEDISO YA 'LIVING LABORATORY' HO BOPA DITLHOKO TSA TSHEBEDISO YA PLATFOMO YA MERERO YA DIBAKA TSE KHOLO

Bohlokoa ba serapa sena ke ho fanan ka tsebiso mabapi le tswelopele ya Regional Spatial Profiler- e leng tsebo ya dibaka tse kholo le platfomo ya Lefapha la Saensi le Thekenologi. Ho ipapisitsoe le methati e nkoeng ho ho phethahatsa dipatlisiso tse, platfomo ena e shebane le ho tlisa merero ya dibaka tse kholo ka hara karoloana ya dibaka, ka ho fana ka tsebo ya dibaka tse kholo tse fumanehang ha bobebo (tsebo ya hona tjena le kutloisiso ya diphetho tsa khale) ho batho ba sebetsang mmusong.ho phethahatsa hore Profiler e fihletse ditlhoko le tebello basebedisi ba eona, e bile e sebedisoa ke basebedisi, user- interface ya eona hammoho le ditlhoko tsa tsebo e tla hlokahala bokammosong. Di tswedisitswe pele ka ho sebedisa di living laboratory tse nne: Cape winelands, Ugu, Amatole District Municipalities, le Mangaung Local (e se e le Metro) Municipality. Batho ba sebetsang le Masepala ba dumela hore living lab ke ona mokhoa oa ho tswedisa pele Profiler, le hore living lab Profiler e se na le nako e sebetsa e tlisa ditla morao tse monate; fela joale, ka baka la nako, chelete le tse ka kenanang le mosebetsi, ho bontshitse projeke ena le ditla morao tsa eona li na le bothata. Se ka hlokahalang hore tse tlang di atlehe e tla ba hore di fue nako e ngata nyana, le basebetsi ba ntseng ba shebane le tsona mothating o mong le o mong oa projeke tseo.

1. INTRODUCTION

It is widely recognised that one of the weaknesses hampering the government's strategy for growth and development since 1994 has been the poor alignment of housing, transport, land use and economic and environmental policies. Spatial planning and investment decisions are often not based on a consideration of facts describing and quantifying past trends, the current situation or the potential future economic and societal outcomes of decisions. The lack of reliable, validated and accessible spatial information that can be compared across time and scales is a significant contributor to this problem. This has seriously hampered efforts to address inherited spatial inequalities and to promote more integrated and vibrant settlements.

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In response to this challenge, the Department of Science and Technology (DST) commissioned the Council for Scientific and Industrial Research (CSIR) and the Human Sciences Research Council (HSRC) to develop an integrated information and modelling platform. This initiative was formalised as the Integrated Planning and Development Modelling (IPDM) project. One of the platform components developed as part of the IPDM project was the Regional Spatial Profiler (the Profiler[1]). The Profiler is a collection of maps and tables that users can view and download free from a web-based portal. It is aimed at strengthening spatial planning at regional scale by providing accessible and comparable spatial information (of current and past trends) to planning practitioners in government. To ensure that the Profiler met the requirements and expectations of users, and would be used by practitioners, its user-interface and future content requirements were developed using a living-laboratory (living-lab) approach.

This article sets out to assess the living-lab approach adopted for participation in the development of the Profiler and to share lessons for its future application in similar projects. It starts by outlining what is understood by a living-lab approach, and then complements this understanding with a reflection on the use of action research as a methodology for collaborative innovation and design. The living-lab approach to collaborative innovation and design is then explored by examining the application of this approach in the development of the Profiler. This is followed by a reflection on lessons learned from the living-lab Profiler.

2. LIVING LABORATORIES AS AN APPROACH

According to Van der Walt, Buitendag, Zaaiman & Van Vuuren (2009: 422), a living lab is a real-time experimental environment that enables different role players with a 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. Put differently, the term 'living lab' describes an experimental platform where the user is studied in his/her everyday habitat (Schuurman & De Marez, 2009: 5). Prof. William Mitchell, from the School of Architecture and Planning, Massachusetts Institute of Technology (MIT), Boston, is credited with conceptualising the living-lab approach (Schumacher & Feurstein, 2007: 281).

Information, Communication and Technology (ICT) is the main industry that has explored the use of the living-lab approach and has used it in their product development processes. Contexts within which living-lab approaches have been adopted for ICT applications are far-ranging, for example: 'infopreneurs' for rural development (such as in the Collaboration@ Rural project (Schaffers, Guzman & Merz, 2007: online); agri-food supply chain networks (Wolfert, Verdouw, Verloop & Beulens, 2010: 389); the development of online community services (Følstad, 2008a: 47), and complex wireless and mobile technology design and development (Ponce de Leon, Eriksson, Balasubramaniam & Donnelly, 2006: 134). This approach has yielded some significant benefits for the ICT industry as it ensures relevance of products that address real needs of the intended users. The living-lab approach is now also gaining ascendancy for applications that are not purely ICT related, but that have some systems design or ICT component.

There are a few key institutions where living-lab work is the focus. The MIT Living Labs Global Network operates on both sides of the Atlantic. The European Network of Living Labs (ENoLL), founded in November 2006 under the auspices of the Finnish European Presidency, is very active and has grown in 'waves' to currently include almost 250 member living labs. Based in South Africa, the Meraka Institute of the CSIR coordinates a Living Labs of Southern Africa Network.

In essence, this approach marks a shift from the traditional notion of confining research to a laboratory, where the sole expertise of the researcher matters, as the researcher develops or produces what s/he thinks is needed by society. Pallot (2006, in Van der Walt, 2009: 422) argues that a living lab is neither a traditional research laboratory nor a 'test-bed'. Rather it is an 'innovation platform' that brings together and engages all stakeholders such as end-users, researchers, industrialists and policymakers in the earlier stages of the innovation process in order to experiment with breakthrough concepts and test the potential value for both the direct users of these innovations and the broader society. A critical success factor of a living lab is thus that of constant collaboration between all the various stakeholders (direct and indirect). Users play significant roles by identifying needs and formulating demands, thereby shaping emerging applications through processes of participatory design (Living Labs Europe, 2010: online).

3. PRINCIPLES OF THE LIVING-LAB APPROACH

3.1 User-centrality and user-driven

The notion of user-centrality underpins the living-lab approach, which aims to be driven by the needs and experience of the user. Von Hippel (2005: 64) defines 'users' as firms or individual consumers (customers/patrons) that anticipate gaining from using a product or a service. He goes further to delineate that 'lead users' are "users that are ahead of the majority of the general market with respect to a specific trend and are expected to gain relatively high benefits from a solution to the needs they have encountered" (Von Hippel, 2005: 69). What differentiates a living-lab approach from mere participative approaches is the targeting of lead users as a strategic step to harness innovation and add sustainable value to users. There is an emphasis on involving users early on in the process as opposed to token involvement to

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'rubber-stamp' a development once the development process is almost complete. The living-lab concept places emphasis on the centrality of users in product development and thus living labs cannot be a mere platform to present pre-packaged solutions to end-users.

Customers' needs are a crucial ingredient for product/service development (Thomke & von Hippel, 2002: 74), but it is equally important that users are empowered to assume the driving seat in the process. Schuurman & De Marez (2009: 1) explain what this means by pointing out the difference between projects that are design(ed) for users, design(ed) with users and design(ed) by users. Projects that seek to do things for users assume a traditional and top-down approach where the experts take the centre stage and users' contribution is nothing more than feedback. Designing with users would fall into a modern or innovative category as users and experts work together to bring innovative solutions preferably in the context of the user. The last approach, which is designing *by* users, signifies an advanced stage in research and development where users take the driving seat in the design of a product or service.

3.2 Open innovation – Partnerships for collaboration

Living labs offer a systematic approach designed to empower users to become active partners in the research, development and innovation process. The democratisation of the production space by instigating interaction between the developers and the public can lead to the birth of new ideas which would not have been realised by focusing internally.

It is important that the interface in the 'customers-as-innovators' or living-lab approach should happen at an early stage of development and very close to the supplier. The benefits of collaboration with end-users can reduce risks in technology development; ensure a highly reliable market evaluation (Eriksson, Niitamo & Kulkki, 2005: online), and ensure relevance and social impact of one's

product/service in addressing the real-life challenges embedded in a particular society.

Living labs allow for experimentation and learning for all partners involved in a project. It is not about using end-users as "guinea pigs" (Shumacher & Feurstein, 2007: 282) for experiments, but about empowering them to be equal partners in the innovation process. This exchange happens between various partners such as academics, businesses, end-users, researchers and government institutions. Chesbrough (2006: 1) defines open innovation as:

> the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology.

Følstad (2008b: 116) warns that the innovation cannot be accomplished through temporal and fragmented project initiatives, but through long-run innovation undertakings involving oscillations of gaining new insight and accumulating experience of implemented solutions. This means that living labs cannot be used as a quick solution to address deep-seated, real-life end-user challenges. Such projects often require bigger budgets and longer time frames than short-term projects.

3.3 Address real-life contexts

Embedding any model development in real-world planning and policy questions is important for shaping tools that user groups will implement and thus key in a living-lab approach. Thorough background knowledge of the environment and users as part of the 'context analysis' and 'requirements identification' phases is a requirement for a successful living lab (Følstad, 2008b: 117). While a traditional lab presents one with an environment insulated from real-life issues, living labs expose research to the rich sociocultural experiences

and challenges embedded in real-life contexts. Some of these challenges have a potential to delay and thwart the project. Some of these experiences and knowledge are closely guarded by their proprietors and access to such knowledge requires substantial negotiation skills and trade-offs with the community.

3.4 Ownership and technology uptake

Users become active partners in the collaborative innovation development process and, therefore, begin to feel a sense of ownership for the innovation and are empowered to make use of it. This, in turn, makes it more likely that they will use the system that has been developed and promote its long-term sustainability. Schaffers, Budweg, Ruland & Kristensen (2009: 642) warn that operating in a real-world setting is a complex activity that demands cautious coordination of numerous stakeholders (with different and sometimes conflicting interests) and roles across the innovation life cycle. It is argued that without clear responsibilities towards, and leadership and ownership of the process, living labs can easily deviate from the original objectives, disintegrate, and undermine the reputation of living labs as a systemic approach (Schaffers *et al.*, 2009: 642). Co-ordination and conflict resolution skills become a key requirement for facilitators and researchers in order to achieve a successful living lab. Sharing some of the responsibilities with a community-elected committee or champions is a crucial step towards encouraging a sense of community ownership of the living lab (DST, 2009: online).

3.5 Value and sustainability

By operating in real-life settings, living-lab approaches seek to add value and make a difference by addressing the real-life challenges of users in their usual surroundings. For Bergvall-Kåreborn, Eriksson, Ståhlbröst & Svensson (2009: 7), what differentiates living labs from other participative approaches is an opportunity to involve users in the creation and provision of value in

terms of solutions to real-life, evolving problems.

Sustainability refers to the long-term relevance of the product/service to solving real-life problems and the trickling down of benefits that emanate from the living lab and after it has taken place. The learning and transfer of ownership to the users can be crucial steps towards ensuring sustainability of the product/service.

3.6 Boundary-crossing and multidisciplinary approach

Living labs is often a boundary-crossing approach (i.e. ICT, environment, NGOs, government, business) and can be strengthened by adopting a multidisciplinary approach. From their experience, Bergvall-Kåreborn *et al.* (2009: 3) can confirm that "living lab is a phenomenon that emerges in such diverse areas as ICT development, health services and rural development". Mobilising various entities and expertise together through a living lab can deliver better, context-relevant solutions to real-life problems. A multidisciplinary approach to problem-solving involves drawing appropriately from multiple disciplines to redefine problems outside of normal boundaries and reach solutions based on a new understanding of complex situations.

4. LIVING LABORATORIES FOR COLLABORATIVE INNOVATION AND DESIGN OF THE REGIONAL SPATIAL PROFILER

At the time of inception of the living-labs process, a 'demonstrator' or early prototype of the Profiler was developed during the first phase of the IPDM project. It was accessible via a website, and contained a selection of spatial information for a selected case study area, which was limited to Gauteng Province and Greater Sekhukhune District in Limpopo Province. The aim of the next phase of the IPDM project was to extend the content of the Profiler to provide information for the whole country; to customise its content and the way the information is disseminated

to users (i.e. government officials/ planning practitioners) to meet their requirements, and to determine requirements for possible future phases of the project.

4.1 Regional spatial profiler living labs

Living labs were established in four areas: the Cape Winelands, Ugu and Amatole District Municipalities and Mangaung Local (now Metro) Municipality. The key objectives were to determine the needs and requirements of users and to test and demonstrate the relevance and value of the Profiler for integrated planning processes by using the Profiler as an information source in the planning process of the selected municipalities. The living-lab approach adopted in this project was informed by the thinking discussed earlier, but was tailored to the objectives and constraints of the IPDM project and specifically those related to the development of the Profiler.

The main points of deviation from ideal living-lab processes were:

*   The Profiler was partly conceptualised and a demonstrator version of the platform that was developed before the living labs were initiated.
*   The content (i.e. the spatial information) to populate the next phase of the Profiler was to an extent predetermined/limited in terms of the project terms of reference, and subject to budget and time constraints. This meant that all user requirements, inputs and innovations could not necessarily be addressed in the current phase of the project, but were captured for future reference.
*   The living-lab process was set up only for the development of the current phase of the Profiler. Ideally, this process should be taken forward in future phases.

4.2 Methodology for the development of the regional spatial profiler

In the view of Schaffers *et al.* (2007: online), who facilitated a number of living labs in the Collaboration@

Rural project[2] (one of which is based in Sekhukune, Limpopo Province, South Africa), the action research paradigm provides guidance to implementing living labs. Action research, according to Baskerville (1999: 6-7), is a collaborative activity among individuals working with others in teams, or communities of practice, searching for solutions to real everyday problems. It has emerged as an established, although not undisputed, research method in use in the social sciences. In action research, "the researcher is actively involved, with expected benefit for research and organization; the knowledge obtained can be immediately applied, based on a clear conceptual framework; the research is a (typically cyclical) process linking theory and practice" (Schaffers *et al.*, 2007: online). Baskerville (1999: 13-16) goes further to outline the components of an action-research cycle:

1. Diagnosing: capturing the issues and challenges, interpretation, data collection;
2. Action planning: specifying improvements and interventions, action plans;
3. Action taking: implementing the changes, continuous monitoring, providing feedback to participants;
4. Evaluation: joint evaluation of outcomes, problem redefinition, and
5. Specifying learning: an ongoing process directed to the participating organisations, actors and researchers.

This kind of research "seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities" (Reason & Bradbury, 2001: 2).

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2   "The C@R project aims to foster innovation in rural environments through the introduction of software collaboration tools, improving rural business processes and collaboration environments, enhancing productivity of the innovation process, and thus improving rural development and quality of life" (Schaffer *et al.*, 2007: online).

The living-lab process should be regarded as an adaptation of the action-research methodology as set out in Table 1.

The steps in the adapted living-lab methodology for the Profiler involved the following key actions and outcomes:

Step 1: Individual engagements and gap assessments

The project team set up engagements with each of the living-lab municipalities to formalise the process and identify the appropriate officials to form part of the living labs. Officials involved in spatial planning, geographic information systems and integrated development plans were targeted. During this step, the project team assessed the planning processes and documents of the municipalities to develop an understanding of the context and to identify gaps in the processes/ documents that could potentially be addressed through the application of the Profiler. Reports highlighting the gaps were generated for each municipality, which served as a key input in the initial stages of the development and customisation of the Profiler. They also served as the basis for agreement with the municipalities on the targeting of specific phases of planning processes. These reports were important in orientating the project team to the real-world contexts of the respective end-users (municipalities).

Step 2: Joint living-lab session for use-case development

A joint session was set up involving identified participants from the four selected municipalities where the demonstration version of the Profiler and the living-lab process were introduced. This session was used to develop a detailed use case for the Profiler. In this context, the use case refers to how the participants envisaged the use of the Profiler in their planning processes; the specific steps in their planning processes where the Profiler would be used, and the contribution they expected the Profiler to make to their processes.

This was achieved in two ways. First, the participants were given a conceptual framework of a broad use case developed by the project team to stimulate discussion and input. The process then commenced to a more collaborative activity where researchers, municipal officials and members of the technical development team engaged each other and shared ideas as they worked towards finding solutions to planning problems in their respective municipalities. This two-way knowledge-sharing experience became a learning platform for both the future end-users from municipalities and the project team. The realities in different municipalities were compared and shared, with specific reference to where and how the Profiler could potentially make a contribution. At the same time,

the municipal participants gained insight into the process of information collation, analysis and dissemination that form the basis of the Profiler.

Step 3: Context-specific application

After the joint session, the focus shifted to working directly with each municipality. The integrated development-planning and spatial planning processes within the municipalities were targeted. The living-lab process involved a series of work sessions including members of the project team and designated municipal planning officials. The information contained in the Profiler was used as input into the analysis phase of planning processes, using the web-based portal that was developed in the first phase of the IPDM project as the initial dissemination tool. As a result of the work sessions, specific planning deliverables were developed that formed an input into various municipal plans. The deliverables were a regional spatial context chapter for the Integrated Development Plan (IDP) of the Cape Winelands, spatial input into the project prioritisation and capital investment framework of Ugu, and regional spatial analysis for Amatole and Mangaung for input into the IDP and Spatial Development Framework (SDF).

During this step, the detailed user-requirement specification for the

Table1:   Steps in the living-lab process based on action research

Steps	Action research	Profiler living-lab process	Living lab	Officials and practitioners
1	Diagnosing: capturing the issues and challenges, interpretation, data collection	Participation agreements and gap assessments	Cape Winelands, Ugu Amatole Mangaung	Spatial planning, geographic information systems and integrated development plans
2	Action planning: specifying improvements and interventions, action plans	Joint use case development	Cape Winelands, Ugu Amatole Mangaung	Researchers, municipal officials and members of the technical development team
3	Action taking: implementing the changes, continuous monitoring, providing feedback to participants	Context-specific application of Profiler in municipal planning processes	Cape Winelands, Ugu Amatole Mangaung	Designated municipal planning officials
4	Evaluation: joint evaluation of outcomes, problem redefinition	Content and web-based portal development and customisation		
5	Specifying learning: an ongoing process directed to the participating organisations, actors and researchers.	Testing and verification	Cape Winelands, Ugu Amatole Mangaung	Municipal officials
6		Capturing and sharing of learning		

Profiler was developed. This user specification included:

- Information themes and level of analysis, ranging from base data to interpretation, analysis and production of indices;
- Scale of information, e.g. regional information or point/ward-based information;
- Temporal nature of information (past trends, present situation, and future projections);
- The organisation and packaging of information;
- The presentation of information on the web-based portal, e.g. how to navigate between information sets and spatial areas, the format of the information (e.g. maps and tables), the functionality of the portal (e.g. ability to combine information layers, print maps, download data, etc.), and
- Restrictions on dissemination, e.g. outdated user software, bandwidth restrictions, unease of users with electronic vs. paper-based maps, etc.

Step 4: Development and customisation

Observations and input from the joint sessions were consolidated by the project team into a detailed user specification for the further development of the Profiler and the web-based portal. After a technical assessment of this specification, certain key requirements were prioritised that could be addressed within the scope of the project. Both the content of the Profiler and the web-based portal used to disseminate the Profiler to users were enhanced. Major improvements were made to the web-based portal, which was completely redeveloped based on the learning gained from the interaction with the municipalities. The content of the Profiler was also extended beyond its original scope, with the addition of information themes, metadata documents, a degree of data analysis, and other supportive documents.

Step 5: Testing and verification

After the selected improvements to the Profiler were completed, municipal participants were asked

to access the redeveloped product as part of the testing process. As an extension of this step, the Profiler was used as input into spatial analysis activities at a series of training events[3] that formed part of the IPDM project; participants were also requested to complete questionnaires about their experience working with the Profiler, gaps and suggested future improvements.

Step 6: Capturing and sharing of learning

The capturing and sharing of learning were achieved in a number of ways. First, the detailed user specification was expanded based on the input from living-lab participants, but also subsequent feedback during the training events. This, together with an understanding of the technical limitation of information dissemination via a web-based portal, will form an input into future phases of the IPDM project and specifically the future development of the Profiler.

Secondly, various papers and conference papers were developed to share learning with a broader community.

Thirdly, many of the insights gained through the living-lab process were used to structure the series of training courses mentioned earlier, where the Profiler was also used as a tool in training exercises, forming part of a future user application and feedback cycle, as described earlier.

5. ASSESSING THE LIVING-LAB APPROACH: PARTICIPANT AND PROJECT TEAM FEEDBACK

The general impression of the living-lab process for the development of the Regional Spatial Profiler was that it was a positive and enlightening process. Still, it was deemed important to systematically assess the living-lab process. This was achieved by administering questionnaires to both the municipal

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3 The 'Regional Spatial Analysis as a Basis for Effective Regional Planning' three-day course conducted with national, provincial and municipal planners from all nine provinces between December 2010 and March 2011 as part of the IPDM project.

participants and the project team members (both facilitators and technical experts), aimed at assessing the usefulness and impact of adopting a living-lab approach in the development of the Profiler. The results of this survey showed that the majority of the officials (73%) were of the opinion that they had a real opportunity to make a contribution to the content and design of the Profiler and web-based portal, with comments such as "this will bring a sense of ownership to the users". Over half of the officials (55%) believed that their inputs were taken seriously and that these will be used to influence the further development of the Profiler. The majority of the officials (82%) expressed confidence in how the process had changed their perceptions of the value and usefulness of the envisaged Profiler.

In addition to general feedback, the application of the specific principles underlying the living-lab approach was assessed.

Co-creation and user-involvement are two of the main living-labs principles that seek to involve users not as objects of research, but as sources of innovation in the creation process. Analysis of questionnaires from participants from the participating municipalities revealed that the officials who were part of the living-lab processes understood what was required of them. They also confirmed that their participation was not limited to merely attending workshops, but that they fully participated in all the various sessions of the living-lab process. Through these sessions, participants made contributions by providing crucial information in terms of their SDF and IDP documents. They also contributed their ideas on the presentation of information and the type of information to be included in the portal. During the sessions, which included attempts to draw information from the web-based portal, participants provided input about the technical features of the web-based portal. Important insight was also gained by the project team in terms of technical specification, e.g. the hardware and software in use by the municipalities, bandwidth limitations,

and ease of use and acceptability of web-based maps vs. printed maps.

The majority of the participants agreed that they had developed a sense of ownership through their involvement in the living-lab processes where their contribution formed crucial input into the finalisation of the Profiler. An official from Ugu District Municipality mentioned that, even though "the concept [Profiler] was urban-biased and not befitting the predominantly rural municipality after a few discussions, the scope was reconsidered". Some officials mentioned specific examples of issues that were accommodated in the final Profiler product. These included the identification of poverty pockets and migration patterns.

Assessing whether officials were of the opinion that there were sufficient benefits from the living-lab process in comparison to the amount of time they invested, some noted that being part of the living-lab process "was time well spent", with others highlighting the fact that the process had helped them realise the "existence and usefulness of all the planning tools in their possession [in] improve[ing] their IDPs". For other officials, the information in the Profiler "enabled them [municipalities] to understand current trends, cross-border issues and infrastructure planning, and assisted in strategic decision-making". Municipal officials stated that, although the living-lab concept was new for most of them, they had learned a great deal, were satisfied with the outcomes, and believed that a living-lab process was the appropriate way to develop the Profiler.

From the perspective of the project team, the development of a detailed user specification upon which to base future expansion of, and improvements to the Profiler proved very valuable.

6.   LESSONS AND RECOMMENDATIONS

This section draws on the feedback from facilitators and technical experts involved in the living-lab processes

as well as on feedback provided by the end-users and municipal officials involved in the living-lab processes. It attempts to draw out the lessons that were learned from adopting a living-lab approach for the development of the Profiler.

6.1   A strong value proposition is required

Users would like to use only tools that they believe work, and with a strong perceived value statement. Depending on the tool's real usability compared to the users' expectations, they either increase use, maintain limited adoption, or stop using it. End-users are not impressed with research for the sake of research itself. Their primary concern is to address their daily work challenges and they are (potentially, although there is still some adoption resistance) interested in things that have a strong perceived value statement in terms of, for example, time savings or quality improvements to their work outputs. In this respect, in addition to demonstrating value addition during the implementation of the product or solution during the living-lab process, it is also important to manage user expectations from the outset of the process.

In the case of the Profiler, it had to be made clear, for example, during various stages of the process that there were budget, time and technical constraints on the information that could be provided in the current phase of the product.

6.2   Time and budget demands of living-lab processes

The external and internal demands on municipal staff are enormous, and this often affected their availability and capacity required to participate meaningfully and consistently in the living-lab processes. The unavailability of officials to participate in living-lab processes due to numerous other commitments caused delays in the process.

The living-lab sessions had to be arranged to fit in with the set schedules of ongoing municipal processes, some of which are legislated (e.g. budgeting and

IDP preparation) and cannot be changed or delayed to accommodate an external research or product-development process. For future initiatives, it will be important to ensure that living-lab processes are more directly matched to the business schedule of end-users (municipalities) to ensure uptake. For example, they could be scheduled to run concurrently with IDP sessions and events.

The fact that living-lab processes are, by definition, iterative in nature also tends to make them demanding in terms of time and budget. The process involved numerous trips by members of the project team to facilitate sessions at participating municipalities. It also required a high level of commitment from the designated municipal officials, because of the requirement to have consistency in representation in the sessions. Because of the iterative development of the user interface of the Profiler, it was necessary for the same participants to take part in living-lab sessions, so as to compare changes in the interface.

It would have been worthwhile to invest more time and resources in on-site demonstrations and on-site use of the product. It would have been ideal to have facilitators who could have spent a substantial amount of time (e.g. an uninterrupted week or two) with municipalities and participated in more planning events in the municipality to observe in more detail the use of the product.

A solution to budget constraints may be to focus on deeper rather than wider participation, i.e. a smaller number of participating municipalities would have afforded more time to participate more fully in planning processes.

6.3   The need for a dedicated champion and working group

It is critical to find the right official to act as champion for the process inside the participating municipality, and the right team of people to work with. The internal project champion must enjoy the support of senior management, and the facilitators of the living-lab process should be

aware of not aligning with isolated technical groups or cliques within the municipality. One of the facilitators suggested that more time should be spent with the internal project champion during the initiation of the process in order to gain a better understanding of the internal dynamics of the organisation that is entered.

6.4 Two-way learning process

The participatory and communicative approach within the IPDM led to a two-way learning process, which shaped project interventions to local needs, opportunities and constraints. The challenge at the conclusion of the process is for researchers and facilitators to be able to draw lessons from the process and feed that information into future project phases, not only to ensure an improved product, but also to make better living labs in future.

Technical/system development of the product/service has to run parallel to, and interactively with the living labs. To achieve this, technical (in this case, software and website) developers must be part of the living-lab sessions for instant incorporation of feedback into the portal/product and to determine (and communicate) the feasibility of user requirements. In the living-lab Profiler process, the technical developers relied on feedback from the session facilitators who, in turn, had to give secondary feedback if certain user requirements were not technically feasible. This was partly due to financial constraints that prohibited a larger project team from attending each living-lab session.

7. CONCLUSION

The living-lab Profiler process that formed part of the IPDM project was a very useful, albeit time-consuming, process to ensure an end product that was developed *with* users and not *for* users. The process had its limitations in terms of time, budget and technical constraints, but was experienced as a positive initiative by both municipal participants and members of the project team.

The biggest potential criticism against the living-lab Profiler process, or area for improvement, is that, due to funding realities, it was what is called a temporal and fragmented project initiative, and as such is a risk to real user-driven innovation. What would be required in future project phases would be a longer time frame and continued user involvement in multiple project phases. As emphasised by Følstad (2008a: 116): "…innovation is not achieved through short and fragmented project initiatives but through long-term innovation efforts involving cycles of gaining new insight and gathering experience of implemented solutions."

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