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Services of Living Labs and Their Networks

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Abstract: In order to quantify the value creation of Living Labs and their networks, a set of value-adding services has been derived. During the course of CoreLabs' project activities in co-operation with emerging and established Living Labs, some pertinent questions regarding the service benefits of Living Labs were posed. Based on experiences and requirements of Living Labs and relevant experts, a classified set of appropriate services have been identified that can be used to steer new Living Labs or inspire established Living Labs. The classification of services is as follows: Collaborative Innovation, Validation & Demonstration, Stakeholder specific and Organisational. The methodologies used and detailed results of this service study are outlined as part of the paper.

1. Introduction

Living Labs (LL) are environments for establishing future economies where the end-user is integral in the creation of new products and services. LLs promote an alternative innovation paradigm, the end-user's role shifts from research object to a pro-active position where user communities are co-creators of product and service innovations [1]. The main objective is to provide a holistic environment for the full innovation lifecycle – ideation, through conception, development to market launch.

A co-ordinated action project, CoreLabs [2], is endeavouring to synchronise research activities in the area of co-creative LLs with the ultimate goal of positioning the LL and their networks as an effective European Innovation system. In 2006, the European Network of Living Labs (ENoLL) was launched in Helsinki, Finland in conjunction with the Finnish EU presidency. The network consists of a set of diverse LLs across Europe that are attempting to create, prototype and validate new services, businesses, markets and technologies in real-life contexts, such as cities, suburban and rural areas. The stakeholders of a typical LL include: end-users, public bodies, small and large industry and academia. Each stakeholder contributes to the creativity and sustainability of its LL and as such expects to benefit from its results. Value added benefits are subjective to individual stakeholders' requirements. The ENoLL is beginning to offer and create specialised services for each stakeholder in order to enable user-centric innovation

As part of a CoreLabs' activity in harmonisation of methodologies and best practices across LLs, it became apparent that the LL community were struggling to realise the service requirements and potential service benefits of their respective LLs[3]. This paper endeavours to capture the potential value creation of a LL and ENoLL. In pursuing this overall objective, the unique characteristics of the business model that would represent a LL and ENoLL are initially addressed. Then, in order to establish the stakeholders' perspective, a picture of existing and required value-added services is created via a series of

brainstorming sessions and workshops. The results of these activities are analysed and categorised in order to provide a set of service themes that can be used to advise and also direct the future of LLs and ENoLLs.

2. The Living Lab Business Model

The LL's concept relates strongly to current thinking about open innovation (e.g. Chesbrough, 2006). Open innovation is governed by business models that give structure to value propositions and partnerships for collaborative innovation in business settings. LLs typically operate in the domain of public-private partnerships hence business models need to make the shift from traditional enterprise settings towards public-private collaborative goals. Also, there is a lack of empirically grounded work in the field of business models for ICT-based innovation environments. An additional characteristic is the idea of a network of LLs and how to exploit the network effects in service delivery propositions. In summary, more insight is needed in the factors determining the success of service delivery models in such networked settings of public-private partnerships for collaborative innovation. As a starting point, the following statements may establish a basis for future empirically oriented work.

- *LLs as a systemic instrument for innovation*. A LL takes into account wider aspects of innovation such as the regional system, and policies at regional and national level. Systemic instruments will focus on providing an environment for learning and experimentation, and a strategic vision about longer term development. LLs should stimulate sustainable collaborative partnerships and should provide an environment for business development and exploitation of synergies.
- *LLs as instruments for networked innovation.* The concept of a network of LLs assumes that "network effects" can be identified and exploited. Service delivery models should identify the "assets' within the network that can be actively exploited to provide value added to all partners involved. Such assets include the sharing and ability to combine and package locally available knowledge, the ability to connect local business networks to shape a larger industry constituency, the connection of local user communities to create a larger and more diverse end-user market. These strategies enable the creation of a wider platform for generating and validating user experiences.
- *Living Labs as public-private partnership*. In many cases, such as in regional, national and EU-sponsored innovation programmes, a LL is an environment for innovation where public and private interests meet. Policies and strategies of public and private partners need to be adjusted to that situation. This has implications for distribution of risks, costs and benefits across the partnership.
- *Phased development of Living Labs.* LLs go through different phases of development. In the initial, strategic phase, establishment of the partnership based on some form of business plan and model is critical to enable the longer term viability. As soon as the LL becomes more operational in providing concrete innovation services, specific service provision models covering sustainability, IPR, financial aspects, delivery conditions etc. should govern service delivery. In the longer term, strategies for upscaling and commercialisation make sense.

3. Deriving the Services

So, despite a LL's obvious potential for innovation, for all intents and purposes an intangible goal, what tangible or concrete services can they provide? The process of deriving an appropriate list or taxonomy of services required input from all key stakeholders and experts. Over the course of 9 months, a variety of opportunities were taken

when different interest groups were present to build a comprehensive picture of services provided and needed.

3.1 Brainstorming

At a workshop session in Helsinki (May 2006), a brainstorm session was held in order to identify an initial set of services that would be offered by the network. The session had stakeholders from industry, SMEs, academia and public authorities, and in order to organise and capture the service ideas in an associative and creative way, we avoided a simple meeting report and its sequential structure. What we needed was to be able to categorise the discussed topics by meaningful themes so that we could collectively start to "map the problem domain". In creating a visual “mind map” overview, we forced ourselves not to establish logical or hierarchical relationships between services, just purely associative ones. The benefit of this brainstorming method was that we did not need to think in a linear way [4] and we were able to maintain an overview of the overall concept however deep in the details of a LL we found ourselves.

From this map of services, using themes of Public Community Services, Industry Services, SME Services, Academic Services, Financial Bodies Services, Public Authorities/ Regions Services, a distilled version of key services was derived, namely:

- Network Regions and their Innovation Services
- Validation of innovation in a real or simulated context
- Pervasive sharing of community expertise
- Potential access to increased expertise
- Intellectual Property Rights Tracking service
- Channel to Externalise Innovations
- Mediation
- Market place for innovations

3.2 Involving Living Labs

Building on the outputs of the brainstorming in Helsinki, a follow-up session was taken at a workshop in the Turku Archipelago, October 2006. Attendees at this workshop included representatives from EU FP6 IST Integrated Projects(IPs) - Collaboration@Rural[5], Ecospaces[6] and CoSpaces[7]- and the Co-ordination Action, CoreLabs. The common theme across the IPs is their objective of fostering the creation of appropriate LLs for the purposes of economic and societal progression. The group were not so much stakeholders of LLs but more managers and co-ordinators of LLs, thus their perspective would highlight very different questions to the previous session. The session was opened by asking the question: “What service can your Living Lab offer?”. Initial answers from the IPs naturally reflected the specific objectives of their respective LL. Collaboration@Rural identified collaborative services, innovation services and specific rural services, eg. soil, climate and biodiversity. Ecospaces indicated innovation services for eProfessionals and collaborative tools for knowledge workers. CoSpaces named services that support innovative visualisation, collaborative workspaces for design and engineering and business innovation.

Findings from the Helsinki session were presented in order to establish their relevance towards these fledgling LLs while also creating a deeper understanding of the required services. Following a discussion on each theme, the scope of the themes was narrowed to a set of services that have understanding and relevance within the group, see Figure 1.

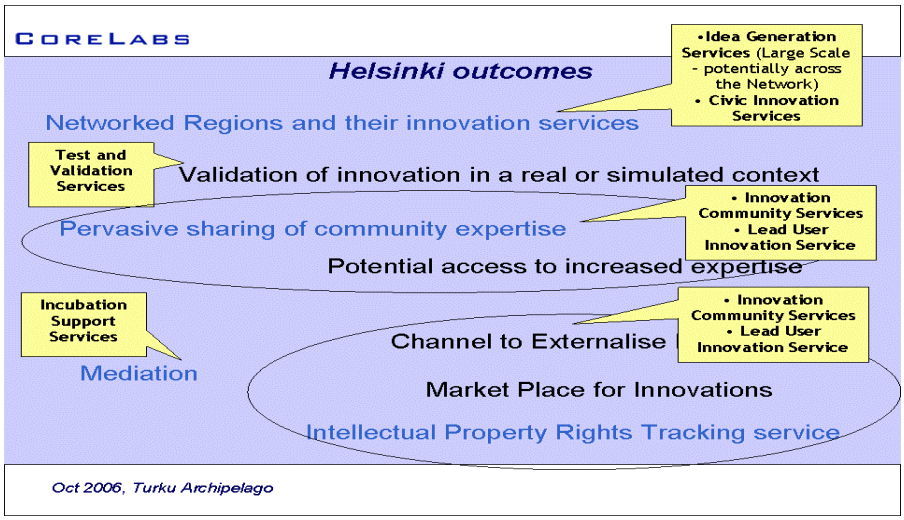

Figure 1 Relevance of Helsinki Outcomes to Turku Participants

3.3 Involving the European Network of Living Labs

The next stage in the service derivation process was to move from the level of an individual LL and consider the kind of services that a networked set of LLs (ENoLL) could offer. The first ENoLL workshop was held in Brussels in February, 2007. It consisted of 60 LLs experts including representatives from the first set of LLs within the network and also several LLs that intend to join the ENoLL, partners from the related IPs and the European Commission. One of the chief workshop goals was to address the issue of "Igniting Network Service Creation".

To this end, a subgroup was formed to perform a "brainstorming" task on the subject of "ENOLL service creation". The group participating represented a cross-section of the workshop attendees including members of the ENoLL, members of other LLs and collaborative innovation experts. Common services that should be supported across all LL and the ENoLL include Idea Generation, Demonstration/Validation/Prototyping, Customisation/Product Deployment across multiple countries, New service integration, Business support services, Management, Governance and Organisation. The ENoLL should be supported by a standard collaborative architecture that incorporates horizontal layers of: network technologies, communication technologies, collaborative tools and community applications. In conclusion, ENoLL services could be divided into 3 types: (1) Technical services such as communication and collaboration; (2) Customer services such as innovation output, community services; (3) Intra-network services (within ENoLL) – idea generation, governance, management. The results of the task were presented to the overall group where they received workshop consensus.

4. The Services

The LL arises from a need to stimulate sustainable innovation across a region for the purposes of creating a meaningful and profitable local economy and improving quality of life. In addition, it acts as a large scale prototype validation and demonstration environment for the evaluation of new products. All stakeholders contribute to its' success and as such expect to receive relevant value from it. Thus, when considering the value-added services of LLs, it became necessary to consider four dimensions of service. Figure 2 illustrates the process by which the inputs of Chapter 3 were collated to realise these four dimensions.

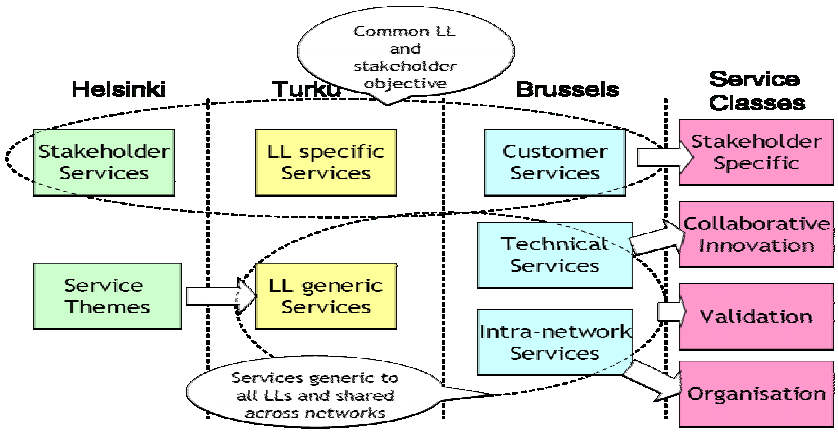

Figure 2 Collated Service Inputs

The services are further classified into status categories: *Grounded* (service already exists in LLs and can be re-used), *Emerging* (service has already been identified and is being implemented) and *Future* (service is an aspiration and could be developed in the future.

4.1 Services Supporting Collaborative Innovation

There is much discussion surrounding the environment that enables collaborative innovation but once the environment is created and the collaboration is initiated, can we just snap our fingers and say "Innovate". This is unrealistic, given that many of the innovators have never worked together before. To this end, services that support the generation of new ideas across a heterogeneous collaborative workspace are being created. The LL objective of addressing the innovation cycle supported by all innovation stakeholders is highly ambitious. Services need to be in place that seamlessly enable the cycle across a large-scale multi-contextual environment.

Table 1 Collaborative Innovation Services

Service Offered	**Description**	**Status**	**Stakeholder**	**How?**
Network for Innovation Lifecycle Support	Network of actors and infra-structure that supports the innovation life-cycle.	Grounded	SMEs, Large Industry, Academia	Environment for total innovation lifecycle
			End-users	Role of Co-creator
User-centric innovation	Users as innovators and procurers [8]	Emerging	End-users	Collaborative workspaces that encourage users to articulate their requirements [9,10].
Idea Generation Services	Ideation tools that encourage diverse creativity, idea potentiality and an increase of cognitive capacity [11].	Emerging	SMEs & Large Industry	Services that encourage collaborative idea generation eg IBM's "Innovation Jam" (www.globalinnovationjam.com)
			End-users	Collaborative workspaces that encourage/enable users to articulate their requirements and/or desires
Market for Ideas & IPR	Open exchange of ideas amongst stakeholders.	Grounded	SMEs & Large Industry	Advisory services, IPR tracking
			Academia	External evaluation of ideas
Pervasive sharing of community expertise	Consultation with relevant experts	Future	All stakeholders	Access to multi-disciplinary expertise. Evaluation of ideas.

4.2 Services Supporting Validation and Demonstration

The importance of test and experimentation platforms (TEPs) in realising a new breed of innovation is discussed in [12]. Six identified TEPs are: (1) prototyping platforms (2)open test beds (3) open field trials (4) living labs (5) open market pilots and (6) societal pilots . While the LL is defined as a distinct entity from the other TEPs, in many cases it acts as a combination of other TEPs. LLs generally incorporate an area that enables prototyping collaborations (eg. *Philips HomeLab, ArcLabs, Botnia, Mobile City Bremen),* they have originated from open test beds (eg. *ArcLabs, Botnia, Mobile City Bremen, Freeband)* and their very definition makes them a natural environment for showcasing and piloting (eg. *Bremen, Freeband).* However, the open nature of the LL creates whole new challenges for current validation technologies.

The inclusion of the end-users requires a high-level of focus on usability studies in order to gain meaningful results from user evaluations. LLs not only support evaluation of the usability but also end-users level of acceptance for the innovation. Lately, user experiences have become a more central concept in the field of interaction design. Evaluation of user experiences means to focus on how the innovation behaves and is used by end-users in its natural environment. More specifically, it is about gaining knowledge about how end-users feel about a new product or service and their pleasure, or satisfaction, when using it, looking at it, holding it, and using it [13].

Table 2Validation & Demonstration Services

Service Offered	**Description**	**Status**	**Stakeholder**	**How?**
Test & Validation	(1)Technical Validation (Functional, Scalability, Robustness) (2) Usability (3)Agile processes [14]	Grounded	SME	Availability to large “real” open infrastructure
			End-Users	Early adopters of new services
			Large Industry	Validation of new services without necessity of opening proprietary closed test beds.
Demonstration	Showcasing & piloting of innovations	Grounded	SME/Large Industry	LLs as a platform for showcasing
			End-Users	Access to emerging products.

4.3 Services Specific to Stakeholders

As discussed earlier, each stakeholder will only invest time or money in a LL if they feel they have something to gain from it. Services to **end-users** will typically be in the form of community building or specific to the needs of a particular demographic. Services towards the **public sector** would relate to governing, civil and regional development issues. Research and development costs in **small industry** are prohibitive in contrast to the scale of the organization. In addition, smaller enterprises may lack the expertise required in terms of human capital or capital infrastructure to innovate in isolation. **Large industry** serves to gain from LLs by forging closer relationships with its potential customers, public bodies and smaller industry. **Academia** while normally removed from the commercialisation of its research can focus their efforts toward viable future innovations via collaboration with relevant stakeholders. LLs and their services may be specific to a particular discipline or demographic, for example: rural development, health sector, automobile industry..etc; The following listed services will focus only on services that are common across all disciplines of LLs.

Table 3 Stakeholder Specific Services

Service Offered	Description	Status	How?
End User services			
End User service – Personalisation, Customisation	Better understanding of user needs, user participation in product creation.	Grounded	Better understanding of technology, products customised to user needs
Lead User Community Services – Database services, Lead User Advisory services, Lead User Reward services	Lead users have a good understanding of the latest market developments and would have higher expectations on new innovation than the average user [8])	Emerging	Access to expertise, Exploiting and benefiting from own ideas, Acknowledgement for contribution
Innovation Community Services - Hosting and facilitation services, service set-up services, Professional Services	Collaboration of end-users, eg. interest groups, clubs, for information sharing, community driven service development.	Emerging	Hosting and facilitation, eg. websites, Community service development eg. library; Professional services, eg. business support
Public Sector services			
Public innovation services, Consensus Building services, Strategic Development services, Regional marketing services	Co-created public services, forum for agreement on issues of public concern, regional strategic development and investment, Marketing of Region	Grounded/ Future	Co-creation of public innovation services; Inclusive platform for stakeholders; Efficiency in critical infrastructures by best-practice sharing; Stimulation of citizens to take an interest in future enterprise; A LL or ENoLL gives national and European visibility to the region.
Small to Medium Size Enterprises (SMEs)			
Business Incubation Support services, Collaborative/Mediation services, Channel to externalise innovations	Business development advice, access to grant funding, technical guidance, large scale validation infrastructure, Mediation between stakeholders, Real market for evaluation	Grounded/ Emerging	The LL acts as an enterprise support centre providing access to relevant financial bodies eg. banks, venture capitalists, customer groups, and presence of a real market for evaluation.
Large Industry			
Channel to externalise innovations, Understanding of end-users, Mass customisation services[15], Linkage to smaller industry, Creation of Lead Markets	Real market for evaluation, Better understanding of end-users, Creation of relationships to smaller industry for outsourcing requirements, Use of lead-user availability within a region to stimulate the creation of globally competitive products and solutions	Emerging/ Future	Early endorsement for innovations; Interaction with the real end-user during innovation; Environment for mass customisation thus providing a scalable, cost-effective solution; Mediator towards small industry; Lead markets provide early competitive edge.
Academia			
Exploitation Channel services, Experimentation, Education, Business Incubation	Evaluation of the commercial viability of innovations, Environment for prototyping and validating innovations; Educational demonstrations	Emerging/ Grounded	Providing real links towards industry and the market; Open validation infrastructure for experimentation; LL activities serve as case studies and learning tools for the future professionals

4.4 Services Supporting Organisation

Given the heterogeneous and collaborative nature of the LL and indeed Networks of LLs, a suitable organisational and governance structure needs to be agreed and in place to support the effective administration of this co-operative effort. Managerial and organizational practices need to resolve issues of private-public-citizen interrelationships which constitute LLs both at the level of the local network of stakeholders as well as regarding the efficiency of the network of LLs. Services will relate to the fours aspects of value creation presented earlier and will address three key aspects.

Table 4 Organisational Services

Service Offered	**Description**	**Status**	**Stakeholder**	**How?**
Governance	Guidance and leadership in the making and administration of policies.	Emerging	All	1)Govern public-private inter-organisational relationships 2)Manage innovation results 3)Comprehension of regional, national and European issues
Management of phased development and packaging synergies of LLs	Implementation of economic development strategies as well as innovation strategies	Emerging	All	1)Design of innovation systems that support partnership creation and synergy generation. 2)Integration of available knowledge and practices
Organisation of LLs as instruments of systemic innovation.	Effect of collaborative innovation on organisational structures	Emerging	All	1)Examination of inter-organisational structures forms and patterns of interaction 2)Support for evolution of virtual organisations, flexible work paradigms and diversity management

5. Conclusions

During the course of CoreLabs co-ordination activities, it became apparent that "would-be" LLs were having difficulty in determining the full value creation potential of their LL. This paper attempted to capture the service delivery model that would provide LLs and the ENoLL with a value creation strategy. As input to this work, the characteristics that distinguish the LL business model from a traditional "open innovation" business model were outlined – systemic instruments for innovation, instruments for networked innovation, public-private partnership and phased development. A series of brainstorming and workshops amongst assorted stakeholders and experts in the area of LLs, revealed a set of value-added services that have been realised or could in the future be realised within the LL and ENoLL system. Based on the business model input and the derived service catalogues from the brainstorming sessions, four service categories have been identified that represent key characteristics of the LL, they are:

- Services that support Collaborative Innovation for eg. idea generation, sharing expertise
- Services that support Validation and Demonstration for eg. Prototyping, showcasing
- Services specific to stakeholder requirements, for eg. SMEs, academia..etc
- Services supporting the organisation, for eg. Governance, managment

These categories and their associated services act not only as a selling point but also a starting point to emerging LLs. Drawn from the experience of existing LLs, they equate to basic characteristics of LLs that should be in place to ensure a value creating environment.

Services within the paper classed as grounded or emerging can be identified as "best-practice" of value creation in existing Living Labs. These services have already proved their positive effects and continued sustainability and thus can be re-used. "Future" services form the basis of requirements of existing LLs and thus serve to place structure on the future evolution and sustainability of the LL and ENoLL.

The gathered services are common to all LLs and intended for the use of all. The list is by no means exhaustive and will, no doubt, be expanded as the ENoLL matures. Future work would include future service implementation, long term validation of service value creation against LL sustainability and specific service identification as per LL objective, i.e. rural, industrial.

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