Urban living labs as a new form of co-production.
Insights from the European experience

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Introduction

The economic crisis affecting the European Union (EU) has re-launched the debate on co-production, i.e. the participation of citizens in the provision of public services. Indeed, this policy tool is considered a practical solution both to constraints on public financing and to complex problems, such as environmental pollutions, ageing, and unemployment. Through user engagement, in fact, services would be less expensive and better tailored to citizens' needs. Within the debate, a relevant place is assigned to the Living Lab, a real-life test and experimentation environment where users and producers co-create innovative products (Christiansen and Bunt 2012, Bason et al. 2013, Eskelinen et al. 2015). Living Labs (LLs) are open innovative ecosystems, where end-users and producers interact through an ICT-based collaboration (Pallot et al. 2010).

Notwithstanding the fact that the literature on LL methodology has grown impressively, empirical research of its strengths and weaknesses is still scarce. Moreover, LLs have certain peculiar characteristics that are transforming the traditional idea of co-production and that need to be further investigated.

This paper aims to fill this gap by presenting the results of a qualitative survey on 47 Living Labs operating in the European Union integrated by the in depth analysis of three case studies of LLs situated in Amsterdam, Barcelona and Turin.

Through the qualitative analysis the paper will attempt to answer to the following research questions:

1. How are LLs organised and in which are their domains of interests?
2. How do LLs operate? What is their working methodology?
3. What are the strengths and weaknesses of LLs?
4. Is there a difference between traditional forms of co-production and LLs?
5. If so, what are the implications for the debate on public governance?

The paper proceeds as follows. Part 1 reviews the literature on the concept of co-production and identify its main lines of inquiry – why do people co-produce? Under what conditions? What influences effective co-production? What are the main benefits and limitations in implementing such a policy tool? It then defines what are Living Labs and illustrates their working methodology. Part 1 concludes with a description of the fortune of LLs in the European Union and illustrates how they have been implemented in several European municipalities as a part of their smart city strategy. Part 2 illustrates the empirical research, and presents the data gathered through a qualitative analysis of 47 European LLs listed on the database of the European Network of Living Labs, a Brussels-based non-profit organisation

gathering official recognised LLs from all over the world, particularly from the EU. Part 3 and 4 discuss the main findings and answer to the research questions. What emerges from our analysis is that the concept of LL covers a wide range of experiences across Europe. LLs are run by different types of organisations and operate in different policy areas. Nevertheless they share a peculiar methodology and certain distinctive characteristics that make them an innovative form of co-production. Interestingly, LLs are becoming more and more central in the Smart city approach. This trend, we conclude, calls for further research and further reflections on the transformation of public governance at the local level.

1. Co-production: Old and New

1.1. Defining co-production

After the original interest raised in the US between the 1970s and the 1980s, the concept of co-production gained renewed attention in recent years as a core element of the New Public Governance (NPG) approach. Indeed, NPG relies on the participation of multiple stakeholders in the provision of services and on core governance mechanisms such as trust, relational capital and relational contracts (Osborne, 2006: 384). In the UK, co-production has been used to describe the involvement of voluntary and community associations in policy implementation and the delivery of services or goods. In continental Europe the concept has been expanded to include the participation of citizens/users to service provision (Brandsen and Pestoff, 2006).

As Vershuere *et al.* (2012) claim, co-production is an umbrella concept. For them co-production refers to the involvement of individual citizens and groups in public service delivery (Vershuere *et al.* 2012: 1086). According to Pestoff, Osborne and Brandsen, for instance, it is "an arrangement where citizens produce their own services at least in part" (2006: 592). Bovaird (2007: 849) defines co-production as a regular relationship between users and professionalised service providers and other community groups, such as volunteers. This relation varies in more or less participation of each actor and in service planning and delivery. Full co-production entails users and professionals totally sharing the task of planning, designing and delivering the service.

Traditionally, the literature on co-production focussed on four issues (Vershuere *et al.* 2013; Bovaird 2008). First, the circumstances under which people are encouraged to co-produce. Second, the factors influencing effective co-production. Third, the benefits associated to co-production and fourth, its potential limitations.

Individuals seem to be more inclined to take part in co-production processes when they feel they will gain material rewards like monetary incentives or a benefit in return for the time and effort spent. More often, the reward can be immaterial such as, for instance, enjoyment in participating or social approval. Users can be motivated to sacrifice personal to collective interest also by normative goals such as the desire to democratize the policy process. Other factors that can influence participation are the ease of involvement and the time and effort required to participate.

Effective co-production depends on some organizational factors. The first one is the capacity to fully understand users' needs and then to meet them. The second one is the clear definition of the co-production process, of each procedural task and of the specific roles performed by users in each stage of the process.

The main benefit of co-production is user empowerment and the provision of services in a more democratic and transparent way. Another advantage is the improvement of the quality of services since user needs are more clearly defined and solutions are better tailored to them. Finally, users participation widens the range of available solutions because users can directly suggest new patterns of delivery.

Besides positive externalities there are nevertheless certain limitations. A first problem relates to the process through which users are selected. Empirical research on co-production has, in fact, revealed that participants are often not really representative of the community to which they belong because participation is voluntary and attracts some specific individuals, for instance activists. In other cases, user engagement has proven difficult, because the 'general public' is often not interested in participating. Yet another problem is professionals' resistance to open up spaces for collaboration with other actors in service planning and delivery because they fear losing discretion. Co-ordination is also a difficult task. In co-production, indeed, public officials are responsible for the management of loose networks so they have to put strong efforts in giving coherence to the process. A final crucial issue is the question of accountability. Since co-production tends to blur the boundaries between those who deliver and those who benefit from any given service, who, in the end, is accountable for its provision?

The recent economic crisis has contributed to enliven the debate on co-production, by considering new forms of collaborations between users, private and public bodies.

Organisations such as MindLab in Denmark and Nesta in the UK[1], for instance, emphasized the need to implement co-production processes as the only viable solution to the growing complexity and the wicked[2] nature of issues tackled by public authorities (Christiansen and Bunt, 2012; Bason, Mygind and Sabroe, 2013). Within this debate Living Labs are depicted as the best innovative co-production tools to face current policy challenges.

1.2. Defining Living Labs

Professor William J. Mitchell of the MIT Media Lab and School of Architecture was the first to use the expression 'Living Lab' to define a user-centric research method aimed at prototyping, validating and refining in a real life context solutions for challenges related to health, energy and creativity[3].

Living Labs (LLs) come into being as a novel research method to test products. Their original purpose was to give firms immediate feedback on users' response to innovative products, particularly in the ICT market, where innovations are costly and products often unsuccessful.

From Mitchell's original definition, others were developed over the following decades. For Ballon et al., for instance, a Living Lab is 'an experimentation environment in which technology is given shape in real life contexts and in which (end) users are considered 'co-producers' (2005: 3). For others 'a Living Lab is a system enabling people, users/buyers of services and products, to take active roles as contributors and co-creators in the research, development and innovation process' (CoreLabs. 2007: 9). What all these and other definitions share is the idea that Living Labs are both a physical space where, and a methodology through which, stakeholders, particularly users, participate in the development, testing and evaluation of a product or a service assisted by experts.

As a research methodology, LLs usually adopt a four-stage approach (Pierson and Lievens, 2005). The first stage, *contextualisation*, is the exploratory phase through which the research framework is defined and a sample of users to be involved in the experimentation is selected. In this phase the collection of information regarding user needs is also initiated. In the second stage, *concretisation*, users' everyday behaviour and their perceptions of the scope of the experimentation are identified. In the third stage, *implementation*, users are involved by experts in the co-design and prototyping processes through various approaches, i.e.

[1] MindLab is a cross-ministerial innovation unit in the Danish Government that addresses public problems through a human-centered approach. Nesta is the UK's innovation foundation (Christiansen and Bunt, 2012).
[2] The concept of wicked problems, originally elaborated by H.J.Rittel and M.M. Webber (1984) in the context of social planning, refers to problems whose solution often generates other, possibly more complex problems.
[3] See http://livinglabs.mit.edu/

questionnaires, focus groups, interviews, etc. Co-development and co-production take place in real life situations. Once they have been designed, products and/or services are tested in the everyday context in order to generate usable products and/or services. In the final *feedback* stage, users are asked to give their opinion about their experience. The aim is to assess variations in perceptions and attitudes in relation to the product or service created. To conclude, recommendations for the diffusion of the product/service are provided.

LL methodology has known a certain amount of success in the European Union, where LLs became a sort of 'fad' after the launch of the European Network of Living Labs (ENoLL) in November 2006 under the Finnish Presidency. The Prime Minister Matti Vanhanen stated, indeed, that the Network was to be seen as a concrete action to put the Lisbon strategy in practice as a large-scale experimentation platform for the creation of new services, business and technologies[4]. Also the former European Commission strongly encouraged the adoption of LLs as a means to improve EU competitiveness and growth. According to the Directorate-General for the Information Society and Media (2009) the LLs concept was linked to the second pillar "Strengthening innovation and investment in ICT research" of the i2010 policy strategy. This led to the funding of many research projects related to LLs under the Strategic Objective "Collaborative Working Environments" of the ICT theme in the Six Framework Programme and further funding was planned under the Co-operation Programme of the Seventh Framework Programme, the ICT Policy Support Programme of the Competitiveness and Innovation Programme (CIP), the Interreg IVc and other initiatives managed by the Directorate General Regional Policy.

Interestingly, the EU approach to LLs goes beyond the traditional idea of an innovative business model. LLs are conceived as a strategic opportunity to improve the creation of multi-stakeholder partnerships with citizens at the centre. According to ENoLL LLs are public, private and people partnerships (PPPP) for user-driven open innovation. But LLs are not only a tool that improves product effectiveness. In the European context they are also an opportunity to increase the economic and social attractiveness of the territory where they are experimented (Alcotra, 2011). For this reason LLs are linked with the smart-city strategy adopted by various municipalities such as Amsterdam, Barcelona, or Turin.

The concept of 'smart city' designates an innovative paradigm for city governance that aims to integrate the various visions of urban, economic, environmental, institutional, technological

[4] See *The launch of a European Network of Living Labs - Co-creation of innovation in public, private and civic partnership*, Press release 8.2.2006, retrieved at: http://www.tietoyhteiskuntaohjelma.fi/ajankohtaista/news/en_GB/100116_en_1_0/

and social change into a holistic view of sustainable development. Smart cities are committed to adopting innovative solutions to reduce CO2 emissions and this is achieved through action in the field of mobility, energy, environment, economy and housing. But sustainability is also pursued through policies aimed at improving the quality of life such as health, care, eGovernment, etc. The Smart city approach strongly relies on citizen participation in the policy cycle pursued through an extensive use of information and communication technologies. Indeed, the Web 2.0 paradigm puts users at the centre of innovation since they can contribute to the development of technological solutions. Within smart cities, citizens' creativity is an integral part of the governance approach and the 'laboratory dimension' perfectly fits with this new urban development model.

2. Data and Findings

The aims of the paper are to investigate how LLs are organized and managed at the European level, how do they work and their strengths and weaknesses as co-production tools. In Part 2 and 3 we will present and discuss the empirical data.

The LLs landscape is quite polyhedric. LLs have experienced a stunning popularity in the last ten years with spontaneous experimentation conducted throughout the world. Consequently, two problems emerge. The first concerns the selection of the 'best practices' to be analysed. The second is how to classify LLs since their organizations and domains of intervention often differ, even if they share certain core characteristics. To overcome these problems, we have relied on data available on the ENoLL website, a reference point for the LL community operating at the international and particularly at the EU level.

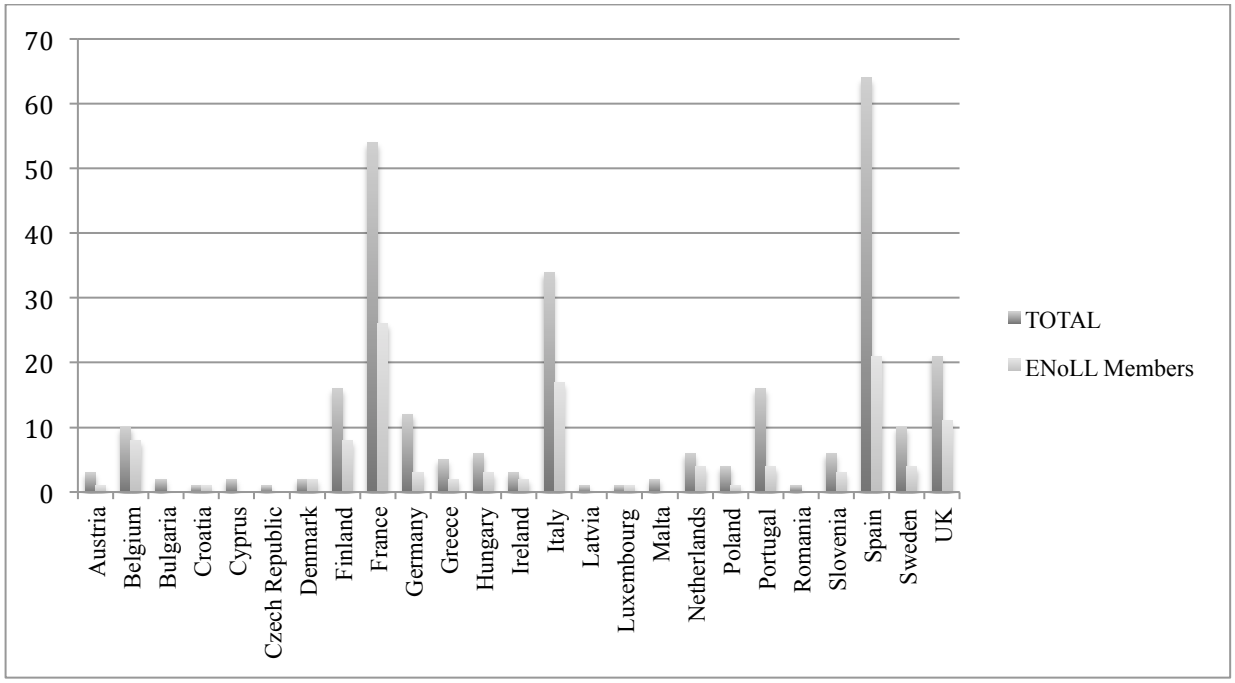
ENoLL was created in 2006 and legally established as an international, non-profit, independent association of Living Labs in 2010. It is based in Brussels and it is composed by a General Assembly, a Chair, and a Council of 18 members. Membership to ENoLL is granted following an application based on twenty criteria[5] and an evaluation made by seven

[5] The selection criteria are: 1) evidence of co-created values from research, development and innovation, 2) values/services offered/provided to LL actors, 3) measures to involve users, 4) reality usage contexts, where the LL runs its operations, 5) user-centricity within the entire service process, 6) full product lifecycle support – capability and maturity, 7) LL covers several entities within value- chain(s), 8) quality of user-driven innovation methods and tools, 9) availability of required technology and/ or test-beds, 10) evidence of expertise gained for LL operations, 11) commitment to open processes, 12) IPR principles supporting capability and openness, 13) openness towards new partners and investors, 14) business-citizens-government partnership: strength and maturity, 15) organisation of LL governance, management and operations, 16) business model for LL sustainability, 17) interest and capacity to be active in EU innovation systems, 18) international networking experience, 19) channels (e.g. web) supporting public visibility and interaction, 20) people/positions dedicated to LL management and operations (see http://www.scribd.com/doc/254557130/ENoLL-9th-Wave-of-Membership-Brochure-2015-pdf).

teams.

Currently there are 354 LLs listed on the website: 283 of these are from the EU (82%) and 71 are from other countries (18%). The prevalence of LLs from the EU is due to the fact that the creation of LLs was strongly encouraged by European institutions. Most of the EU labs, in fact, were created after 2006. 148 LLs are current ENoLL members, i.e. they have the status of adherent or effective members[6], 122 of these are from the EU and 26 are from other Countries[7]. Fig. 1 shows the number of LLs from the EU listed on the ENoLL website, divided between members and non-members.

Fig. 1 - Living Labs in the European Union



Source: our elaboration from ENoLL website

Detailed descriptions of each LL are available for members only. A pdf document is provided for each member and, in certain cases, also the initial application form. For each LLs are also indicated contacts and website.

From the 148 members, the analysis was restricted to the 122 members from the European Union. We went through their descriptions listed in the ENoLL database and we integrated them with information and documents available on each individual LL's website. This

[6] Adherent members are organisations that represent a Living Lab, which was duly selected according to ENoLL criteria but that do not pay any membership fee, except an annual administrative fee and have no voting rights in the General Assembly. Executive members are those who pay the annual fee and therefore have the right to vote in the Assembly.

[7] See the Appendix for a full list of LLs and the ENoLL website (http://www.openlivinglabs.eu/livinglabs)

double-step procedure has proved necessary as the ENoLL database is not up to date and some LLs are no longer in operation, even if they are still recognized as members. Moreover, other organizations have been excluded from the analysis because they do not have the basic characteristic of a LL - namely the involvement of users in the process of co-design and/or co-production. The final list of LLs has, thus, been reduced to 47 units (see Table 1).

Tab. 1 – List of analysed LLs

Country	No. of LLs	Name of the LL
Austria	1	Evolaris next level GmbH
Belgium	8	iMinds iLab.o Ghent Living Lab Kameleon Flander Care Living Labs: AIPA - Ageing in place Aalst, Licalab, Careville, InnovAGE JFOcean
Croatia	1	Rijeka iLiving Lab
Denmark	2	Copenhagen Living Lab (CLL) Insero
Finland	3	Laurea Living Labs Network Helsinki Living Lab OULLabs
France	15	ImaginLab Discovery Innovation Lab (DIL) Autonom'lab eCare Erasme Normandy Living Lab Espace Public Numérique (EPN) Centre de Recherche de l'Institut Paul Bocuse SmartCity Pôle Numérique PROPEDIA La Fabrique de l'hospitalité Nova CHILD's Living Lab ActivAgeing (LL2A) Streetlab
Ireland	1	The Green Way
Italy	4	Trentino as a Lab (TasLab) CSP Piemonte City of the Future Living Lab (CoF) KLIO Lab
Netherlands	3	Care Innovation Center West-Brabant CIC Brainport Regio Eindhoven Innovate Dementia
Spain	5	Barcelona Laboratori (BCN) Citilab Cornellà EVOMOBILE Iberian Institute in Psycho-Sciences Lab (IBIP LaB) Living Lab Comercios Innovadores de Gran Canaria (COMINGC)
Sweden	2	Botnia Living Lab Halmstad Living Lab
UK	2	Digital Birmingham Lab4Living

Descriptions have been supplemented by the literature and by key informant interviews with experts, public officials and LLs' coordinators from the cities of Amsterdam, Barcelona, and Turin.

On the basis of the in-depth analysis of the 47 case studies five typologies of organizational structures that are currently managing and funding LLs have been identified – enterprises, governments, universities and/or research centres, consultancies and clusters. In the first category there are six LLs coordinated by private firms such as the Austrian Evolaris owned by a private foundation whose members are Raiffeisen-Landesbank Steiermark AG and AVL List GmbH, Kemeleon, which is part of the Belgian Egg Corporation, the Danish Insero consisting of five companies (Insero energy, e-mobility, software, business services, and science academy) owned by the Insero Horsens Foundation, the Italian City of the Future, managed by the private hospital San Raffaele, the Iberian Institute in Psycho-Sciences Lab managed by the enterprise IDES, the French private institute Paul Bocuse. The second category is the most numerous with 17 LLs funded by local and/or national governments. One each in Finland, Belgium, Italy and the UK, three in the Netherlands, four in Spain and six in France. 19 LLs are hosted by universities or public research institutions. There are six in Belgium, two in Finland, three in France, two in Sweden, one each in Croatia, Italy, Spain and the UK. Only three LLs are managed by private consultancies, one each in Belgium, Denmark and France. Finally three French LLs and the Irish GreenWay are managed and funded by a cluster of enterprises, universities, consultancies and local authorities.

Ten thematic domains have also been identified for these 47 LLs. The areas cover:

1. Information and communications technologies (app, telecommunications and mobile services, new media and internet services) of which there are16 LLs;
2. e-Health and eCare (innovative services for the elderly and the disadvantaged, Internet-of-Things for the elderly) of which there are 24 LLs;
3. Intelligent Energy, Smart Grid and Sustainable Buildings (solar panel, smart grids) of which there are 4 LLs;
4. Transport, Logistics and Automotive (e-mobility) with 5 LLs;
5. eGovernment (web-portal for public communications) with 4 LLs;
6. Creative industries and culture (online platforms) with 7 LLs;
7. Tourism (touristic guides for mobile phones, online platforms) with 4 LLs;
8. Food and agriculture (an experimental restaurant, a service laboratory) with 1 LLs;
9. Planning, housing and urban regeneration with 4 LLs;
10. Services for business and commerce (assistance systems for production, iBeacons,

online catalogues, etc.) with 4 LLs.

The resulting number of LLs is higher than 47 because some of them operate across multiple domains, such as the Danish INSERO, the Helsinki Living Lab, the Italian CSP Piemonte, the Dutch Brainport Regio Eindhoven.

In Table 2 the 47 LLs are allocated according to their typology and domain of interest.

What emerges from the case studies is that the Living Lab approach is characterized by certain distinctive features.

First, as Fig 2 and Table 2 clearly show, most European LLs (34 out of 47) are of a public nature, since they are funded and managed by governments or universities/research institutions. Within this group, 16 LLs deal with eHealth and eCare, 14 LLs deal with ICTs, 5 with culture and creative industries, 3 with tourism and 4 with business services. These LLs also cover other thematic domains, except for food and agriculture. Private enterprises and consultancies are concentrated in the health and care sector (5 LLs) while clusters operate mainly in the health and care (3 LLs) and in the energy sector (2 LLs).

Fig. 2 – Types of LLs

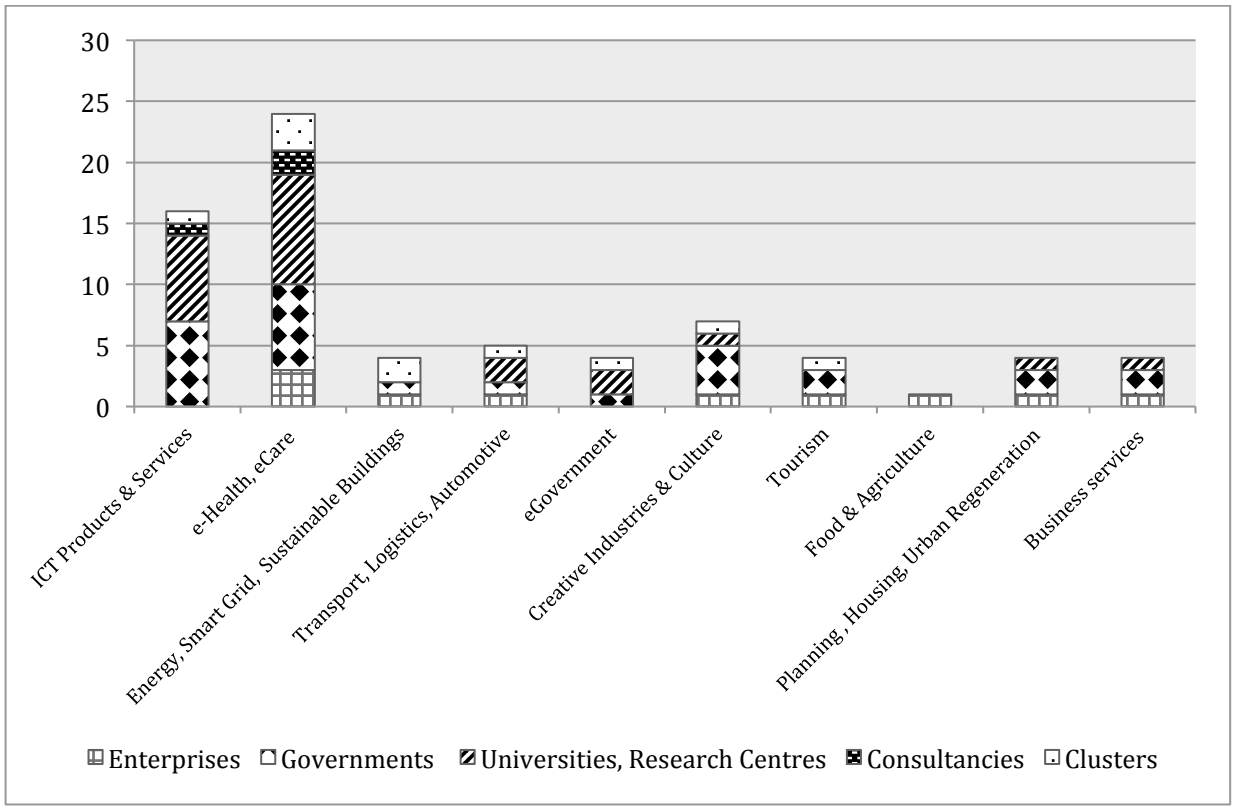


Table 2 –Typologies and Thematic Domains of LLs

	Enterprises	Governments	Universities, Research Centres	Consultancies	Clusters
ICT products & services		Finland 1 (Helsinky LL) France 3 (ImaginLab, EPN, Pole Numerique) Netherland 1 (Brainport) Spain 1 (CitiLab) UK 1 (Digital Birmingham)	Croatia 1 (Rijeka) Finland 2 (Laurea, Oullabs) France 1 (DIL) Italy 1 (Klio Lab) Sweden 1 (Botnia) Belgium 1 (iMind)	Belgium 1 (JFOcean)	France 1 (Normandy LL)
e-Health, eCare	Italy 1 (CoF) Spain 1 (IBIP) Belgium 1 (Kameleon)	Finland 1 (Helsinky LL) France 2 (Autonom'lab, La Fabrique de l'hospitalité) Netherland 2 (CIC, Brainport, Innovate dementia) Italy 2 (TasLab, CSP)	Belgium 4 (AIPA, LiCaLab, CareVille, InnovAge) Finland 2 (Laurea, Oullabs) France 1 (LL2A) Sweden 1 (Halmstad) UK 1 (Lab4Living)	Denmark 1 (CLL) France 1 (Streetlab)	France 3 (eCare, Normandy LL, Nova Child)
Intelligent Energy, Smart Grid and Sustainable Building	Denmark 1 (Insero)	Italy 1 (CSP)			France 1 (Normandy LL) Ireland 1 (GreenWay)
Transport, Logistics and Automotive	Denmark 1 (Insero)	Netherland 1 (Brainport)	Croatia 1 (Rijeka) Spain 1 (Evomobile)		Ireland 1 (GreenWay)
eGovernment		Belgium 1 (Ghent LL)	Croatia 1 (Rijeka) Finland 1 (Oullabs)		France 1 (Normandy LL)
Creative Industries & Culture	Belgium 1 (Kameleon)	Finland 1 (Helsinky LL) France 1 (Erasme) Italy 1 (CSP) Spain 1 (BCN)	Belgium 1 (iMind)		France 1 (Normandy LL)
Tourism	Belgium 1 (Kameleon)	Finland 1 (Helsinky LL) Italy 1 (CSP)			France 1 (Normandy LL)
Food & Agriculture	France 1 (Centre de Recherche de l'Institut Paul Bocuse)				
Planning , Housing, Urban	Belgium 1 (Kameleon)	Finland 1 (Helsinky LL)	France 1 (Propedia)		

Regeneration, Economic Development		France 1 (SmartCity)			
Business services	Austria 1 (Evolaris)	Finland 1 (Helsinky LL) Spain 1 (COMINGC)	Finland 1 (Laurea)		

Second, organisations supporting a LL always portray it on their websites as a highly innovative way to develop, test and prototype a product or a service and they emphasize their user-centred approach as the added value of their project. Yet, the approach adopted by each LL is seldom explicit. Most of the LLs state that they foster open innovation but they do not clarify how this takes place. Other LLs simply report that users are engaged with the aid of an online platform and/or brainstorming sessions or face-to-face workshops where they are encouraged to share they experience (Evolaris, Kameleon, ImaginLab). A few cases (iMind; Copenhagen LL, OULLabs, LL2A, CSP Piemonte, City of the Future, Klio Lab) describe their methodology. From this empirical evidence the process can be divided into three stages:

1. *context analysis*: evaluation by experts of the current state-of-the-art in the thematic domain and assessment of users' needs in relation to the problem under consideration;
2. *prototyping and testing*: users assist experts in designing and creating the prototype of the product or service to be developed; users are then involved in testing the prototype in real-life settings, thus enabling experts to iteratively improve the prototype and product design; testing may cover mock-ups, single features or more complete live testing;
3. *evaluation and feedback*: validation of the product or service and assessment of the added value of the innovation.

Users are usually selected on a voluntary base upon registration on a website platform. LL experts involve them in each stage of the process through ethnographic techniques such as interviews, surveys, focus groups, case studies, context mapping, story-telling, scenario building, etc.[8] and/or through online platforms and social networks.

The final feature is that, regardless of the thematic domain, LLs mainly concern the application of the Internet-of-Things (IoT) to service delivery. This is particularly true in the case of eHealth and eCare, where experimentation almost exclusively entails the creation and implementation of digital devices to assist the elderly. But the IoT is also central in domains such as energy, mobility, tourism, business and commerce.

[8] An example of the LL approach and related techniques is avaliable in the Appendix.

Key informant interviews have revealed yet another interesting aspect. A current evolution of LLs is what we call 'the city as a Living Lab'. The transformation of the city into an urban LL (ULL) is often part of its broader 'Smart City' strategy. The ULL is, in fact, aimed at supporting the process of policy innovation at the municipal level through local community empowerment and through the promotion of partnership with enterprises.

Amsterdam and Barcelona, for instance, are seen as laboratories where companies can test their products in a living environment before commercialization. This process entails small scale testing – usually in a limited city area – and then, the implementation in the whole city and in other cities. In this case the municipality enables companies that are developing innovative solutions in various fields (energy, mobility, lightening, urban planning, etc.) to test them in a specific district (for instance Passeig the Gracia or the 22@Barcelona[9] or the IJburg, Zuidoost and Nieuw-West districts in Amsterdam[10]) through pilot trials.

Urban laboratories involve citizens at different levels: as partners in the testing – encouraging them to give feedback to the Municipality about product effectiveness – or as co-producers. In the latter, citizens are invited to develop products or services for the city. A typical example is that of hackathons, which create apps for specific uses[11]. But citizens may also take part in urban LLs through the design of specific services[12], by posting their ideas in a virtual space for example for urban development[13], or through the participation in theme groups. In all these cases the local authority once again plays a crucial lead role, enterprises are partners and citizens participate in the process more or less actively, depending on their role as co-designers and/or co-producers.

3. Discussion

The empirical analysis reveals certain interesting findings of the LL phenomenon.

The first striking feature is that LLs have a high mortality rate. There are 354 LLs in the ENOLL database, but de facto only 47 are currently in operation. According to one of the interviewed this problem is caused by three factors. First, LLs are now probably in the down part of the Hype cycle. After their initial popularity and the diffusion of successful stories, interest has declined and people have simply realized that they do not need LLs. The second factor is that LLs have high organization costs due to staffing, selection of users, selection of

[9] http://www.22barcelona.com/
[10] http://amsterdamsmartcity.com/projects/living-labs
[11] See for instance http://amsterdamsmartcity.com/hackathon/.
[12] Like the Ring Ring project created by an Amsterdam citizen: http://amsterdamsmartcity.com/projects/detail/id/54/slug/ring-ring
[13] http://www.ideevoorjebuurt.nl/#start

real settings, etc. There is a lack of public funding and in particular of EU grants, thus there are fewer incentives to create an LL now than ten years ago. The third problem is that LLs do not produce 'disruptive innovation', they do not produce outputs that alter significantly the market, so enterprises do not perceive LLs as a real tool to improve their products.

The second feature is that even if the number of LLs is declining, most of them are still publicly funded. The prevalently public nature of LLs has already been emphasized in the literature (Feurstein et al. 2008; Bergvall-Kåreborn and A. Ståhlbröst, 2009; Alcotra, 2011; Almirall et al. 2012). LLs are often setup by public administrations or research institutions because of the experimental nature of their activities. Particularly in the European Union, where innovation is often costly and risky, enterprises – in particular small and medium – are encouraged to participate in the innovation process transferring the costs for R&D to public institutions and allowing them to test product or services before they have been launched in the market. This is precisely what happens in the case of ULLs where municipalities become testing environment for enterprises in exchange for future investments in the smart city project. Moreover universities are important players simply because they already have structures, technologies and trained staff to implement LLs.

The third feature is that LLs are concentrated in ICT and in health and care areas. This is due to the fact that ICTs are the innovative business sector *par excellence* and there is a wide community of users/developers committed to help industries to improve their products. In the health and care sectors co-production has a long-lasting tradition and LLs represent a sort of 'evolution' from the original model, almost exclusively based on 'human' interaction between users and professionals or volunteers, to a new one, where co-production entails user participation in the application of the IoT.

From the organizational point of view, a critical point is the engagement and long-lasting commitment of users. Experiences reveal that citizens are not interest in participating, so voluntary participation rarely produces a sufficient number of users to be included in the project or else produces a community of 'geeks' who are not really representative of the whole population (Bergvall-Kåreborn and Ståhlbröst, 2009; Juujrvi and Pesso, 2013). Second, co-production is a long-term process and people often abandon the project and turn to other activities. Moreover, if the LL does not produce a service or a product that is actually implemented - such as, for instance in the case of the SMART project in Lulea (Bergvall-Kåreborn and Ståhlbröst, 2009) – it leads to distrust and insecurity and eventually to disengagement. This finding is also consistent with recent research on co-production, which concludes that participation in co-production processes is higher when individuals perceive

they are ‘making the difference’ (Bovaird et al, 2013).

Another problem is how to transform pilot projects into continuous programs (Almirall, 2015). Experimentation in selected urban contexts is facilitated because bureaucratic procedures are kept to a minimum. But scaling up to the whole city requires red tape and other forms of public and private partnerships like, for instance, public procurements. Consequently, the innovative process is slowed down and firms are discouraged to invest in the long term (Almirall, 2015).

4. Living Labs: A New Tool for Co-production?

LLs are environments for end-user involvement in co-design and co-production of products and/or services. For this reason we can already talk about them as co-production policy tools.

But is there any difference between traditional forms of co-production and the methodology adopted by LLs? Interestingly, the literature and our empirical analysis identify more differences than similarities between the two concepts (see Table 3).

First of all, traditional forms of co-production are usually described as complex processes, with an unclear methodology, blurred organisational boundaries and loose relations among actors. Living Labs, on the other hand, are small-scale projects implemented in spatially delimited organisations for a defined period of time, with strong relational ties among participants and adopting a specific working method. It follows that while co-ordination and networking in traditional co-production are critical issues, in LLs, due to their tightly knit nature, they are more simple tasks to manage.

Another difference involves citizen engagement. In traditional co-production user empowerment and the individual desire to co-operate for non-material rewards are fundamental. In the LL approach co-production is not an end in itself but a means through which tangible results are achieved at a micro-level, with the creation of a product or a service, and at a macro-level with the improvement of the economic attractiveness of a specific territory. User empowerment is also evident, but it is not the primary goal of a LL. As a result, co-production primarily benefits users while LLs would produce positive externalities inside – for participants – but most of all outside – for the territory – their boundaries.

Table 3 – A comparison between traditional forms of co-production and LLs

Main Characteristics	Traditional co-production	Living Labs
Organisational boundaries	*Not delimited*	*Delimited*
Type of relational ties	*Loosely coupled*	*Tightly coupled*
Methodology	*Not specified*	*Specified*
Aim of user participation	*Non material rewards*	*Tangible results*
Benefits	*Related to users*	*Related to the territory*
Role of ICTs	*Secondary*	*Central*

An interesting question concerns the role performed by ICTs in both processes. The literature on co-production portrays ICTs as a tool through which new possibilities to engage citizens are created. They are instrumental, therefore, in the process. In LL environments, on the other hand, ICTs are central. They are at the core of the project. In contrast with scholars emphasising the potential role of ICTs in enhancing citizen participation (Bovaird and Loeffler, 2010: 246), moreover, LL experiences suggest that ICTs do not solve the problem of user engagement, since they introduce a bias in participant self-selection.

The differences between the two models tell us that co-production is an evolving concept. In contrast with past experiences, LLs are a new tool for co-production with well-defined organisational characteristics, operating for a limited time frame and with pragmatic scopes. This shift to high specialization, nevertheless, has some implication for public governance.

Conclusion

LLs are integral part of the Smart city strategy. They represent a methodology that combines a user-centric with a technology-driven approach to urban innovation. City Mayors and public officials are called to adopt them to solve the 'mismatch between the technology system's implicit structure and the real workings of city life [… that] most often leads to problems' (Eskelinen et al, 2015: 26). But our empirical research reveals that LLs are often very specific and limited experimentations. Once again, the problem is how to boost the scaling up of every single experiment to the whole city level.

A particular feature of smart cities, moreover, is their transformative power (Nesti, 2015). Smart cities strongly rely on ICTs and the application of IoT to all their policy domains, i.e. environment, energy, mobility, government, society, economy. New technologies have a strong potential as a means to engage citizens in the policy-process to co-develop services with public administrators. But a strong focus on ICTs modifies the way policies are designed. What is happening is a gradual shift of attention from services to the tools through which services are delivered. The result is that policies are parcelled out: Within smart cities they are increasingly conceived as the sum of very discrete units where technologies *are* the

service. How can this fragmentation be recomposed?

The answer falls outside the scope of this paper and data here presented are not sufficient to draw conclusions about it. Nevertheless, other research (Nesti, 2015) suggests that successful smart cities adopt new administrative setups that try to overcome the traditional silo-based organisation. Amsterdam and Barcelona, for instance, have created ad hoc structures where public officials from different departments collaborate under the co-ordination of the Chief Technology Officer. But this is probably only part of the solution. The growing relevance of the topic suggests that further research on Living Labs and Smart cities is certainly needed.

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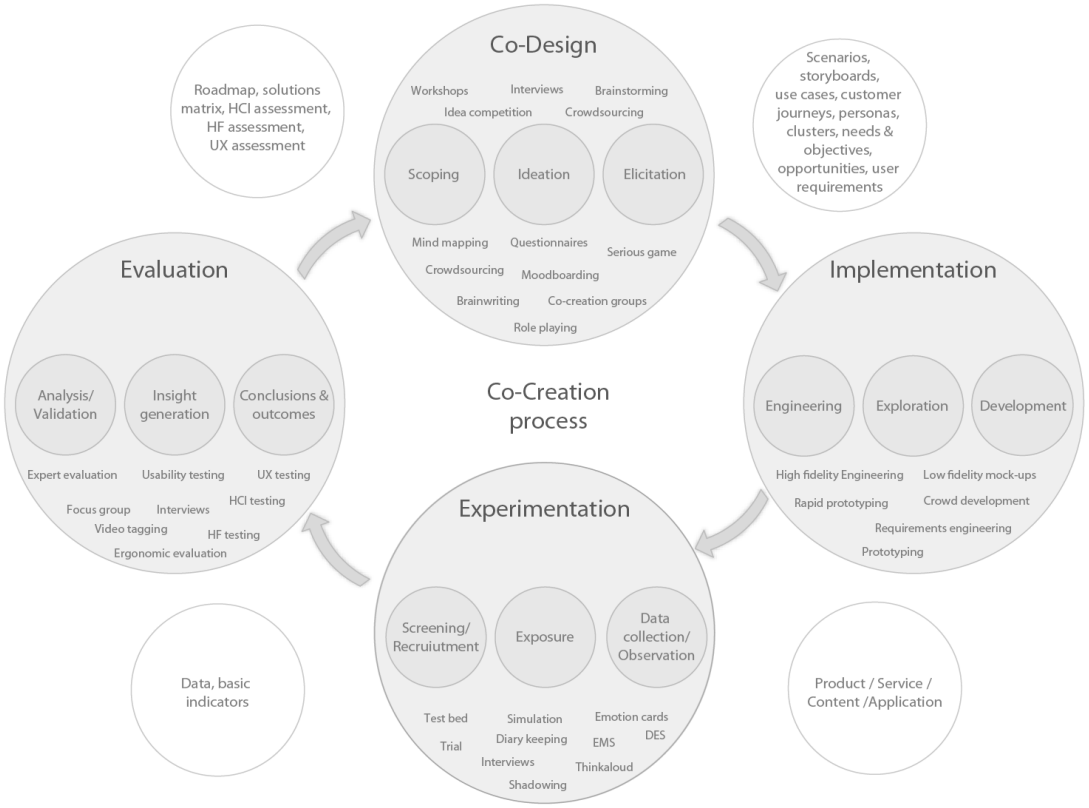
APPENDIX

1. *List of LLs from ENOLL database*

COUNTRY	TOTAL	ENOLL Members
Australia	2	2
Austria	3	1
Belgium	10	8
Brazil	12	1
Bulgaria	2	0
Canada	6	3
China	4	1
Colombia	9	2
Croatia	1	1
Cyprus	2	0
Czech Republic	1	0
Denmark	2	2
Egypt	3	0
Finland	16	8
France	54	26
Germany	12	3
Greece	5	2
Hungary	6	3
Iceland	1	0
Ireland	3	2
Italy	34	17
Japan	1	1
Latvia	1	0
Lebanon	1	1
Luxembourg	1	1
Malta	2	0
Mexico	4	2
Mozambique	1	0
Netherlands	6	4
Norway	4	1
Paraguay	1	0
Peru	1	0
Poland	4	1
Portugal	16	4
Republic of Cameroon	1	0
Romania	1	0
Saudi Arabia	1	0
Senegal	1	1
Serbia	1	1
Slovenia	6	3
South Africa	2	1

COUNTRY	TOTAL	ENOLL Members
Spain	64	21
Sweden	10	4
Switzerland	7	4
Taiwan	3	1
Trinidad and Tobago	1	1
Tunisia	1	0
Turkey	2	2
UK	21	11
USA	1	1
TOTAL	**354**	**148**

2. *The City of the Future's LL approach*



Source: http://www.cityofthefuturelab.org/