Living Labs: a New Tool for Co-production?

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Abstract

Living Labs are places for real-life test and experimentation where users and experts co-create innovative products and services through an ICT-based collaboration. Founded in the context of private firms, LLs evolved into a policy tool implemented to facilitate service innovation also in the public sector. Furthermore, due to their strong focus on user participation, LLs are now increasingly central in the smart-city strategy of various municipalities such as Barcelona, Helsinki, Tallinn and Birmingham. Citizen creativity, in fact, is an integral part of smart cities and the 'laboratory dimension' perfectly fits with this new approach to urban development. Namely, the transformation of the city into a living lab is aimed at supporting the process of policy innovation at the municipal level through local empowerment and the promotion of partnership among enterprises, public administration and citizens. In this respect, LLs can be viewed as a new form of co-production that is a process through which citizens participate in the design and creation of products or services that are less expensive and better tailored to citizens' needs.

Drawing on data related to 59 LLs listed in the database of the European Network of LLs, the paper is aimed at describing the main characteristics of LLs and at examining their strengths and weaknesses as co-production tools.

Keywords: Living Labs; co-production; open innovation; citizen participation; smart cities.

Introduction[1]

The economic crisis that is 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. This policy tool is considered a practical solution both to constraints on public financing and to complex problems, such as environmental pollution, 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).

Even if the LL approach was originally adopted in the industrial context, it now covers different sectors with different applications. For instance, LLs have gradually become part of the smart-city strategy adopted by several municipalities in the EU as a means to promote citizen participation in the creation of a sustainable urban environment. As a consequence, in recent years, LLs have achieved some popularity among scholars and practitioners, especially in the field of local innovation, and the literature on LL methodology has grown impressively. Nevertheless empirical research of LLs' organisation, domains of interests, strengths and weaknesses is still scarce.

The present paper aims to fill this gap by presenting the results of a qualitative survey on 59 Living Labs operating in the EU and listed on the database of the European Network of Living Labs (ENoLL), a Brussels-based non-profit organisation that gathers LLs from all over the world.

Through the qualitative analysis of the database, the paper will attempt to answer to the following research questions: How are LLs organized and which are their domains of interest?; How do LLs operate?; What is their working methodology?; Can LLs be conceptualized as a new tool for co-production?; and if so, what are their main strengths and weaknesses?

The paper proceeds as follows. Part 1 defines the concept of co-production and identifies its core elements, its advantages and its limitations. Part 2 describes LLs, explains their working methodology and focuses on the role they perform in the smart-city approach. Part 3 illustrates the empirical research and presents data collected through the qualitative analysis. It describes how LLs are managed and their activities. Then it points out some key features emerging from the in-depth analysis of some European cases. Part 4 discusses the LL

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approach as a tool for co-production and analyses its main strengths and weaknesses.

What emerges from our analysis is that the concept of LL covers a wide range of experiences across the European Union. LLs are run by different types of organisations and operate in various policy areas. Nevertheless they share a peculiar methodology and certain distinctive characteristics that make them a potential innovative form of co-production. This trend, we conclude, calls for further research and further reflections on the transformation of public governance at the local level.

1. Co-production: A Brief Outline

The idea of co-production was originally developed in the US during the 1970s and 1980s as a means to cut public expenses and to improve service efficiency (see, for instance, the seminal work of Ostrom and Baugh 1973). The core idea of co-production, in fact, is that citizens – individually or organised in groups or associations – participate with professionals in the definition and in the delivery of services or goods that prove to be better tailored to their needs.

In current years, the debate about co-production has gained momentum after the emergence of the economic crisis and the diffusion of new programs of fiscal austerity, both at the national and at the local levels. In parallel, other factors influenced the debate (Loeffer 2009). First, the diffusion of innovations in the ICT sector and, namely, of the Web 2.0 that enable users with more active participation in policy-making. Second, the rise of the so-called "assertive citizen" (Griffiths et al. 2009), that is, a citizen who is aware of his or her rights and who claims more quality. Third, the emergence of the New Public Governance movement, aimed at promoting innovation in public administration, a stronger commitment to improve policy outcomes and a pluralist approach to service delivery, through the involvement of external actors (Osborne 2006).

The distinctive characteristic of co-production is, in sum, the active participation of users in service provision through collaboration with professionals and experts. Users are actively engaged in the process to contribute their experience and knowledge to define and create services really targeted on their needs and, therefore, more efficient (Loffler 2009). In the word of Boyle and Harris (2009: 11) users are the "vital ingredient which allow public service professionals to be effective".

Operationally, co-production can be conceived as a relationship of collaboration among the public sector, users (individuals or communities) and professionals activated in the pre-production stage (co-planning and co-designing) and in the production stage (co-management and co-delivery) of the service cycle (Bovaird and Downe 2008). Full co-production entails users and professionals totally sharing the task of planning, designing and delivering the service.

Co-production, indeed, holds a strong normative component since it empowers citizens, it enables civic participation and it boosts social capital. Viewed in this terms, the idea of co-production challenges economic and managerial theories of public administration and calls for a new approach to policy-making, where officials, experts and citizens work jointly and where democracy is strengthened through active participation in policy production (Ryan 2012: 321). However co-production also suffers from some limitations. It is, in fact, costly, because it requires professionals and public managers to develop new professional skills, such as networking and co-ordination capacities. It is risky, because often users are not able to engage themselves in co-production practices over a long time. It is complex, because conflicts frequently arise between professionals and users when they do not share the same point of view about how to manage a service. It is democratically weak, because when responsibilities for the delivery of a service are not clearly assigned, accountability is diluted.

All in all, nevertheless, co-production represents an intriguing opportunity for all those who are interested in promoting subsidiarity and in improving civic engagement, in particular when urban innovation is at stake.

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.[2] 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 artefacts, particularly in the ICT market, where innovations are

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[2] See http://livinglabs.mit.edu/

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 LLs 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, using an open-driven approach to innovation.

As a research methodology, LLs usually adopt a four-stage procedure (Pierson & Lievens 2005). In the first stage, *contextualisation*, experts evaluate the state-of-the-art of the sector where the experimentation is going to take place. They define the research framework and select the sample of users to be involved. Then experts assess user needs and collect all the related information. In the second stage, *concretisation*, experts describe the everyday behaviour of users and their perceptions of the scope of the experimentation. In the third stage, *implementation,* users are involved in co-designing and in prototyping products and services through various techniques (brainstorming, questionnaires, focus groups, interviews, etc.). Once they have been designed, products or services are tested in real-life settings to enable experts to iteratively improve the prototype. Testing may cover mock-ups, single features or more complete live testing. In the final stage, *feedback*, users are asked to give their opinion about their experience. The aim of this activity is to assess variations in perceptions and attitudes related to the product or service that has been created. Then recommendations for the diffusion of the product or service are issued.

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, in fact, that the Network was to be seen as a concrete action to put the Lisbon strategy into practice as a large-scale experimentation platform for the creation of new services, business and technologies.[3] The former European Commission strongly encouraged the adoption of LLs as a means to improve EU competitiveness and growth. In 2009, the Directorate-General for the Information Society and Media stated that the LLs concept was to be 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 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. Between 2010 and 2012, the European Commission financed the Coordinating action FIREBALL (Future Internet Research and Experimentation by Adopting Living Labs towards Smart Cities) that acknowledged the importance of LLs as "generators of solutions" to challenges faced by cities and that emphasized the role of LLs in promoting citizens involvement in the development of smart cities.

Interestingly, therefore, the EU approach to LLs goes beyond the traditional idea of an innovative business model. LLs are here conceived as a strategic opportunity to improve the creation of multi-stakeholders partnerships where citizens are at the centre. According to ENoLL, in fact, LLs are public, private and people partnership (PPPP) for user-driven open innovation. For this reason, LLs are tightly coupled with the smart-city strategy adopted by various municipalities (just like Amsterdam, Barcelona, and Helsinki). The concept of smart city designates an innovative paradigm for city governance that aims to integrate the different visions of urban, economic, environmental, institutional, technological and social change into a holistic view of sustainable development. Smart cities are mainly committed to adopt innovative solutions in order to reduce CO_2 emissions, and this goal is achieved through actions in the field of mobility, energy, environment, economy and housing. But sustainability is also pursued through policies aimed at improving citizens' quality of life (like health, care, eGovernment, etc.). The smart-city approach strongly relies on citizen participation in the policy cycle and this is pursued through an extensive use of information and communication technologies. The Web 2.0 paradigm, in fact, puts users at the centre of innovation since users can contribute to the development of technological solutions. By the same token, within smart cities, citizens are encouraged to

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[3] 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*,* accessed at: http://www.tietoyhteiskuntaohjelma.fi/ajankohtaista/news/en_GB/100116_en_1_0/

contribute with their creativity to the proposal of innovative solutions and the "laboratory dimension" perfectly fits with this new model of urban development.

3. Living Labs in the EU: The ENoLL Database

How are LLs organized and managed? How do they work?

The LLs landscape is quite polyhedric. LLs have experienced a stunning popularity in the last ten years with varied spontaneous experimentation conducted throughout the world. Consequently, in trying to describe them, two problems emerge. The first concerns the selection of the "best practice" 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, I decided to rely on data available on the ENoLL website, a reference point for the LL community operating at the international and 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 made up of 18 members. Membership to ENoLL is granted to those LLS that prove to meet the twenty criteria[4] suggested to apply. Seven teams of experts are charged for the selection of candidates and the admission to the network.

Currently there are 378 LLs listed on the website: 299 (79%) of these are from the EU (79%) and 79 (21%) are from other countries. 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. One hundred and sixty seven LLs are current ENoLL members, i.e. they have the status of adherent or effective members[5], and 135 of them are from the EU and 32 are from other countries. Fig. 1 shows the number of LLs from the EU listed on the ENoLL website, divided between members and non-members.

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[4] The criteria for selection 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).

[5] 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.
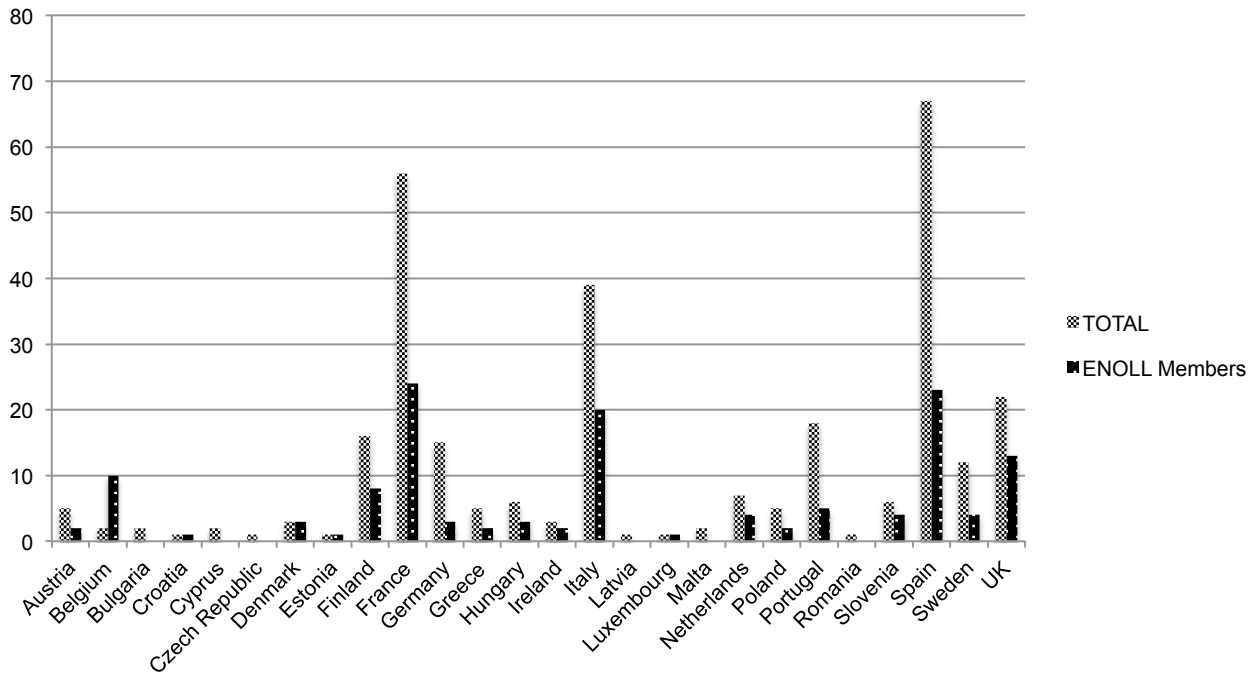
Fig. 1: Living Labs in the European Union.

Detailed descriptions of each LL are available only for members. A pdf document indicating organisation, scopes, domain of interest, contacts and website is provided for each LL. Nevertheless, since there is no standard format for such documents, the type of information provided can vary significantly.

I decided to restrict my analysis to the 135 members established in the European Union, in order to have more comparable data. I went through their descriptions listed in the ENoLL database and I integrated them with information and documents available on each individual LL's website. This 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 recognised as members. Moreover, other organizations have been excluded from the analysis because they did not have the basic characteristic of a LL, i.e. the involvement of users in the process of co-design and/or co-production. The final list of LLs has, thus, been reduced to 59 units, distributed among Member States of the European Union as follows (see Fig. 2):
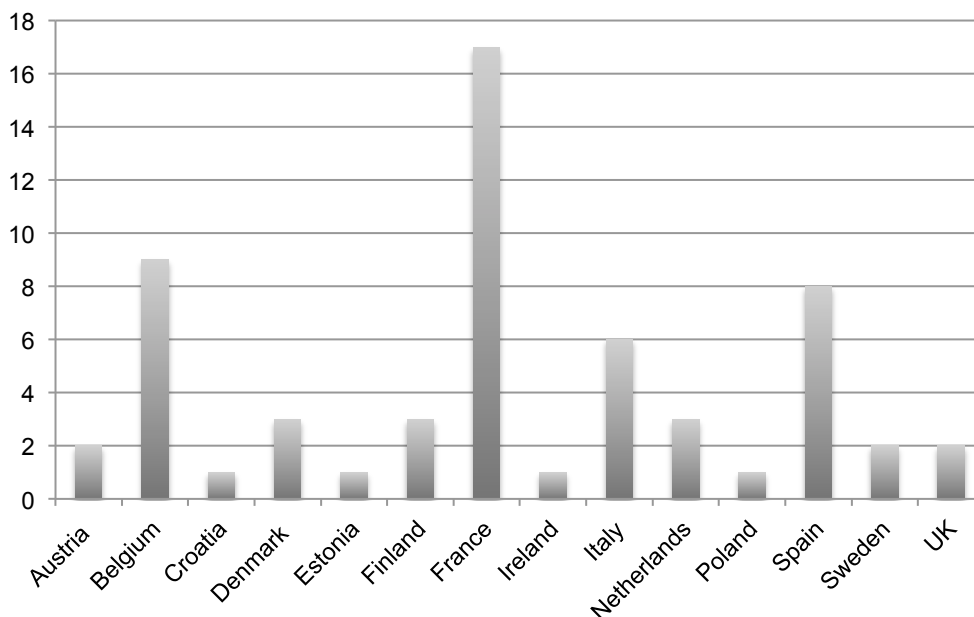

Fig. 2. Distribution of analysed LLs among Member State of the EU

Descriptions have been supplemented by the literature and by some key informant interviews with experts, public officials and LLs' coordinators.

On the basis of the in-depth analysis of the 59 case studies five typologies of organisational structures that manage and fund LLs have been identified (see Fig. 2):

1. enterprises;
2. governments;
3. universities and/or research centres;
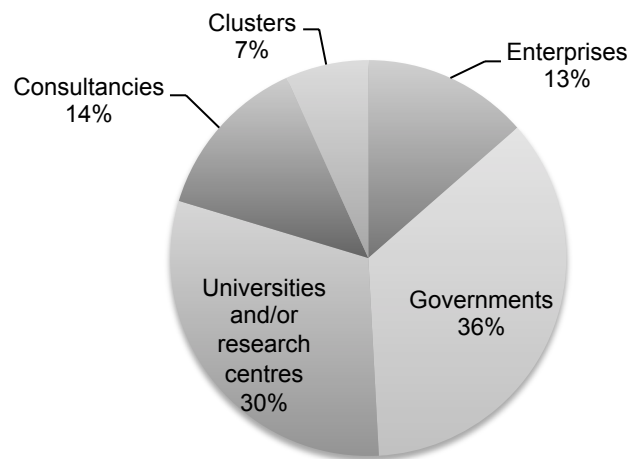4. consultancies;
5. clusters.

Fig. 3: Who manages LLs

In the first category, there are eight LLs coordinated by private firms or foundations. The second category is the most numerous with 21 LLs financed by local, regional and/or national governments. 18 LLs are hosted by universities or public research institutions. Eight LLs are managed and financed by a cluster of enterprises, universities, consultancies and local authorities. Four LLs are managed by private consultancies. Thus, most LLs (39 out of 59, 66%) are of a public nature, but public institutions are also present in the eight clusters. "Pure" private LLs are the minority (12 out of 59).

The prevalently public nature of LLs has already been emphasized in the literature (Feurstein et al. 2008; Bergvall-Kåreborn and 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 enabling them to test product or services before they have been launched in the market. Moreover, universities are important players simply because they already have structures, technologies and trained staff to implement LLs.

Ten thematic domains of interest have also been identified for these 59 LLs. The areas cover:

1. Information and communications technologies (apps, telecommunications and mobile services, new media and internet services) of which there are 21 LLs;
2. e-Health and eCare (innovative services for the elderly and the disadvantaged, Internet-of-Things for the elderly) of which there are 30 LLs;
3. Energy, smart grid and sustainable buildings (solar panel, etc.) of which there are eight LLs;
4. Transport, logistics and automotive (e-mobility) with six LLs;
5. eGovernment (mainly web-portal for public communications) with five LLs;
6. Creative industries and culture (online platforms) with nine LLs;
7. Tourism (touristic guides for mobile phones, online platforms) with five LLs;
8. Food and agriculture (an experimental restaurant, a service laboratory) with two LLs;
9. Planning, housing and urban regeneration with five LLs;
10. Services for business and commerce (assistance systems for production, iBeacons, online catalogues, etc.) with four LLs.

The resulting number of LLs is higher than 59 because some of them operate across multiple domains. Fig. 4 illustrates the distribution of LLs according to their typology and their domain of interest.
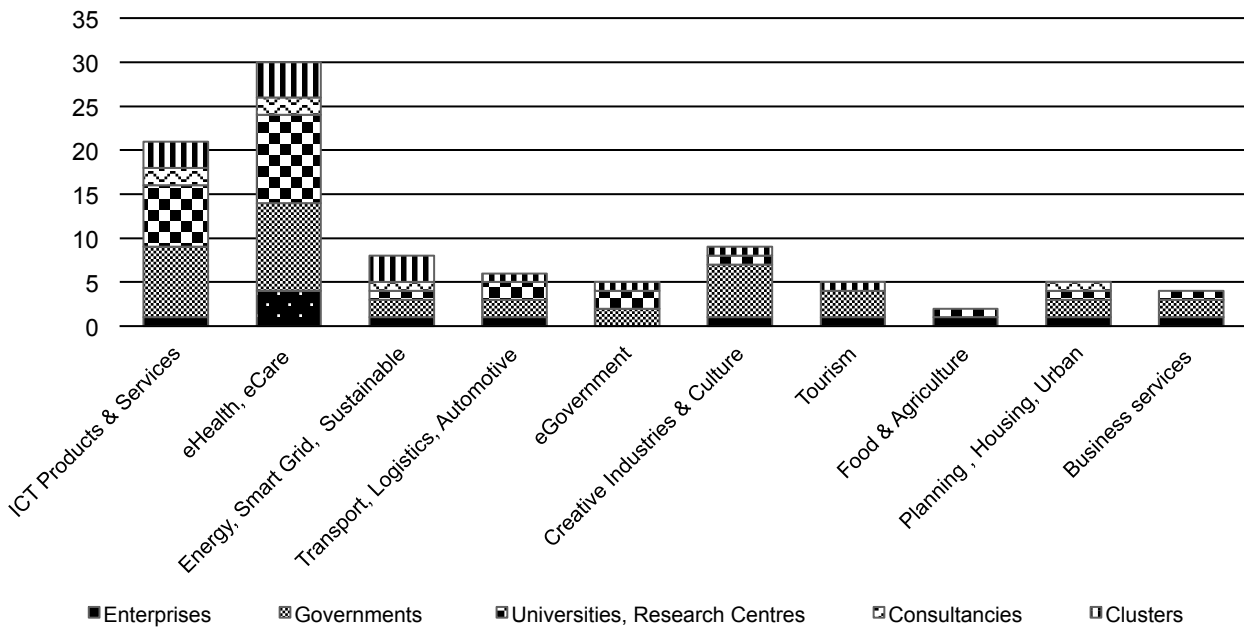

Fig. 4: Domains of interest of LLs.

LLs run by private companies are concentrated in the health and care sector (four LLs). Consultancies cover mainly the health-and-care sector (2 LLs) and ICTs (2 LLs). LLs financed by governments deal with eHealth and eCare (ten LLs), ICTs (eight LLs), culture and creative industries (six LLs), tourism (three LLs) and with transports, eGovernment, planning, and business services (two LLs each). Universities run LLs operating in the eHealth and eCare sector (ten LLs) and in ICTs (seven LLs). Clusters manage LLs for health and care (four LLs), ICTs (three LLs), and energy (three LLs).

The majority of LLs offers services, i.e., advice and service engineering (33 out of 59). Ten LLs plan and manufacture products while 16 LLs produce both products and services. A particular relevant feature of LLs is that, regardless of the thematic domain, they concern mainly the application of ICTs and the Internet-of-Things (IoT) to service delivery. This obviously explains why there are so many LLs operating in the ICTs (21 LLs): 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. But the adoption of new technologies characterizes also other domains such as health and care (see below), energy, mobility, tourism, business, and commerce, that is to say, all those policy sectors where the application of ICT and IoT has been already successfully tested.

Interestingly, 14 out of 59 LLs explicitly identify smart cities among their targets of action. LLs in Graz, Brussels, Ghent, Aarhus, Albertslund, Tartu, Helsinki, Paris, Trento, Krakow, Portugal, Barcelona, Manchester, and Birmingham offer a testing environment for services (e.g., urban planning, renewable energies solutions, communication and branding, and e-government) and products (apps, smart grids, and lighting solutions). The smart-city approach, in fact, puts citizens at the center of urban innovation, and LLs are places where municipalities can involve citizens and industries in developing new solutions to improve the quality of city life. Through ICTs and Web 2.0, people can participate with local governments and firms in planning, designing, and developing products and services that are better tailored to their needs, that can contribute to render urban development more sustainable, and that are less expensive.

Another important aspect is that LLs are concentrated in eHealth and eCare area (30 LLs). A possible explanation is that here collaboration between professional and users has a long-standing tradition, and LLs represent a sort of evolution from the original model, which was almost exclusively based on human interaction among people, to a new one. This new type of collaboration entails user participation in the development and application of the IoT to service delivery, in particular in the creation and implementation of digital devices to assist the elderly.

Concerning methodology, LLs are always portrayed on their websites as highly innovative systems to develop, test, and prototype products or services and their user-centered perspective is emphasized as *the* added value of their approach. Yet, the methodology adopted by each LL is seldom explicit. Most of the LLs state that they promote open innovation, but they do not clarify how this takes place. A few cases describe their methodology in terms of co-production. The process entails ideation and co-design, engineering, development and implementation, experimentation, and evaluation. Different qualitative and quantitative techniques are adopted in each stage of the process to create the service: brainstorming, interviews, questionnaires, prototyping, mock-ups, indicators, etc. Users are involved in the process offline, through ethnographic techniques, or online through platforms and/or social networks where they register themselves on a voluntary basis.

4. Living Labs and Co-production: Promises and Pitfalls

The data presented above confirms the multi-faceted nature of the LL approach. Created in the context of private firms, as a new way to test products, LLs evolved into a policy tool implemented to facilitate service innovation also in the public sector.

So can we conceive LLs as a new form of co-production? We can answer affirmatively to our question. According to Tonurist et al. (2015), in fact, the creation of LLs runs in parallel to the diffusion of the paradigm of co-production. Namely, LLs can be conceived as small-scale projects of co-production based on an extensive use of ICTs and on models of open innovation. They are lean organizations, often characterized as start-ups, with few workers and an autonomous budget, specifically aimed at rapid planning and prototyping. For these reasons, LLs can also be considered as quick experimental forms of innovation (Tonurist et al. 2015).

Main strengths of the LL approach are all those related to co-production practices, such as: their relative low cost compared to traditional co-production services due to their strong focalized nature; the involvement and empowerment of users; and the strong orientation towards outcome efficiency.

However, LLs show also many weaknesses. As data suggests, the first striking feature of LLs is that they have a high mortality rate. There are 378 LLs in the ENOLL database, but de facto not all the LLs are currently in operation. According to one of the experts I interviewed, this problem is caused by three factors. First, LLs are now probably in the down part of the '"Gartner's Hype cycle" that characterizes the development of ICTs. Particularly in the business sector, after their initial popularity (the "Technology Trigger" stage) and the diffusion of successful stories (the "Peak of inflated expectations" stage), interest in LLs has physiologically declined (the "Through of Disillusionment" stage). In the following years, we will probably witness a re-launch and consolidation of the LL experience (the "Slope of Enlightenment" and the "Plateau of Productivity" stages), but so far, LLs have lost part of their initial attractiveness. The second problem is that LLs do not produce "disruptive innovation", i.e., they do not produce outputs that alter significantly the market, so firms do not perceive LLs as a real tool to improve their products and are not encouraged to invest in this type of innovation. Moreover, and this is the third factor influencing LLs mortality, there are fewer incentives to create a LL now than ten years ago, due to the lack of public funding and in particular of EU grants, and private actors do not want to bear the costs for staffing, selection of users, selection of real settings, etc. Fourth, LLs are focused on the creation and application of ICTs, a sector where innovations rapidly become obsolete, and this also applies to the Labs where they are created. Finally, LLs with a public nature suffer from a high mortality rate because they are often "sponsored" by politicians (i.e., ministries, mayors, etc.), or chief-executive officials create them to carry out specific projects. Thus, when they have fulfilled their tasks, and/or they miss the political or bureaucratic support, they close (Tonurist et al. 2015). Furthermore, long-term survival would require changes in the LLs' structure, staff and budget that would be too expensive for a public organization.

Another critical point in the LL approach is the engagement and long-lasting commitment of users. Even if user empowerment is viewed as the key benefit of co-production, experience reveal that citizens often are not too concerned with participation. Consequently, voluntary participation rarely produces a sufficient number of users to be included in the project or else it 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 in LLs can be a relatively long process so people often get tired of it and abandon the project to turn to other activities. Third, if the LL does not produce a service or a product that is quickly implemented, the process leads to distrust and insecurity and eventually to disengagement (Bergvall-

Kåreborn and Ståhlbröst 2009). This latest 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).

A final problem, in particular for LLs managed by the public sector, relates to the prevalent culture diffused in the organization. The co-production approach adopted by LLs requires public administration to rethink and re-design traditional models of service delivery and to change its mind-set towards more openness and transparency, a transformation that is difficult to engender. Moreover, the smart-city approach runs the risk of "technology determinism". For some mayors or chief officers of smart cities, in fact, the temptation could be to chase the latest infrastructure or ICT without first defining for what purposes it should serve. Thus LLs should be part of smart-city strategies that have to be steered by local administrators and that must integrate both technical and political goals.

Conclusions

The paper is aimed at describing the main characteristics of the LL approach and at examining its strengths and weaknesses as a co-production tool.

My analysis reveals that LLs existing on EU territory were established after 2006 with the creation of ENOLL. In general term, these LLs are small-scale organizations, with few employers and an autonomous budget. They are managed by public institutions, namely local governments and universities that run them both singularly or within a wider cluster of public and private actors. They work primarily in the area of eHealth, eCare, and ICTs offering services and, to a lesser extent, on products based on the application of the IoT. Their methodology has, at its starting point, the involvement of users in the creation, development, and production of a "prototype" of a product or a service. For this reason, they can be conceived as form of co-production. Moreover, due to their experimental nature, LLs activities are increasingly utilized in developing urban innovation policies and, namely, in the context of the smart-city approach, to improve the quality of the urban environment and citizens' lives.

The principal advantage of using LLs for testing new services or products is that they focus on peoples' needs and that they have a strong commitment to integrate users' knowledge within the policy-process. A second advantage is that they represent a relatively low-cost solution for the experimentation on innovative projects.

The main limitations of the LL approach concern the difficulty to engage citizens in experimentations for a relatively long time, and their high mortality due to lack of funding, of political support, and of long-term planning.

A relatively unexplored area of research is the impact LLs could have on public administration. Some preliminary experiences in the implementation of the LLs methodology within smart cities suggest that policy-makers should change their behavior and the organizational culture in order to grasp all the potential benefits of LLs. But the extent to which this should take place and the costs associated with such a transformation call for further empirical and theoretical research.

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