Open innovation for future Internet-enabled services in "smart" cities

Discussion Paper

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Context

User-driven open innovation methodologies have proven that they can significantly improve the efficiency of the innovation process by bridging between R&D and market entry supporting better and faster take-up of R&D results. They are rapidly becoming the new mainstream method of innovating. Living Labs are examples of such open innovation environments in real-life settings, in which user-driven innovation is fully integrated within the co-creation process of new services, products and societal infrastructures. By placing the user at the centre of the innovation lifecycle, the concept of user-driven open innovation is tightly linked to the second pillar "Strengthening innovation and investment in ICT research" of i2010. The European Network of Living Labs ENoLL - founded in 2006 and reaching in 2009 the number of 129 members - facilitates the cooperation and the exploitation of synergies between the members through offering networking possibilities, deriving and sharing benchmarking experience, sharing best practices, provisioning of services and tools, and accessing different user communities.

In the past years, the Information Society and Media Directorate-General of the European Commission (INFSO) has supported the promotion and piloting of user-driven open innovation methodologies in the ICT Policy Support Programme of the Competitiveness and Innovation Programme (CIP):

- *Under ICT-PSP Work Programme 2008*, Thematic Network CO-LLABS is supported to promote Europe-wide the adoption of ICT-based Living Lab services and practices allowing SMEs to improve their innovation capabilities and processes and to become part of "open innovation" environments. The network brings together a selection of Europe's most advanced Living Labs with regional SME-innovation oriented organisations to exchange practices of Living Lab support services, and to identify and to derive first plans for specific pilots in domains such as e-health, energy, media, e-business and e-inclusion.

- *Under ICT-PSP Work Programme 2009*, Pilot B project APOLLON (currently under negotiation) plans to explore further the European dimension of Living Labs sharing thematic interests joining forces by sharing knowledge, services and developments based on win-win strategies which pave the way for co-selling developments and services on the European or global market - rather than just on their local or regional market. Four complementary cross-border multi-Living-Lab experiments in e-health, energy, e-manufacturing, and e-participation each aim at demonstrating the particular value of "networked Living Labs" for SMEs and micro-entrepreneurs, which do not have the expertise and resources to expand their activities to other regions or across Europe due to different structural characteristics, regulations, or societal and economic structures in the respective regions and countries.

In the recent INFSO Communication "A Strategy for ICT R&D and Innovation in Europe: Raising the Game", under the actions which support facilitating the emergence of markets for innovation, it is recommended that "the CIP will also support SMEs piloting highly innovative technologies, and the development of open platforms for user-driven innovation". Under this vision, DG INFSO is considering broadening its support for piloting efforts under **one of the next ICT-PSP Work Programmes**. In this context DG INFSO is exploring further the idea of potential Pilot B projects on "Open innovation for future Internet-enabled services in "smart" cities".

Motivation

Through the evolution of the Internet with its services and social networks, the Internet has become a significant part of our daily life. **Internet–based services** are at the centre of our society and economy. They are changing the way on how we do business, how we interact with our government and actively participate in our democracies, how we care for our well-being in terms of health and ageing, how we organise our life in terms of transport and living, how we protect our environment and how we best use our scarce energy resources. Today, the development status of internet-based services can be best characterised as a market of island solutions in many application areas leading to a user-unfriendly situation, in which the user has to familiarise himself with each service he is using. This leads to a barrier in even broader take-up of internet based services, which is difficult to overcome. Therefore, interoperability, integration, standardised user interfaces, and - more general - **common open platforms** for internet-based services have become major priorities in the development of internet-based services.

In this trend towards common open platforms, cities have gained an important role. Many cities in Europe and across the world significantly invest in common platforms for internet-based services cutting across groups of application domains of importance for them to become **"smart" cities**. Again the situation can be best described as fragmented. Though cities are networked in city networks, due to different local situations and regulations, most developments are local to the individual cities.

Currently, **new and in some way revolutionary internet technologies are maturing**: location-based technologies, Internet-of-things technologies, new trust and security platforms, multimodal user interfaces, and simulation technologies, just to name some of them. They are gradually entering the market through being used in innovative applications. In the next years **a new wave of internet-based services** is expected, which has the potential of transforming our life, society and business in the "smart" city and in general. In order to speed-up the take-up of these new services and to allow everybody to be included in this transformation of our way of living, a significant effort has to be undertaken towards common open platforms for internet-based services.

As neither the individual application areas nor individual cities have the resources and the potential to address this issue alone, it is necessary that applications and **cities connect**, share best practices, join forces, and exploit synergies to become the pathfinders for this new wave of technologies and services.

Open innovation has the potential to become the key driver for this transformation: U**ser-driven open innovation** methodologies or ecosystems, such as Living Labs, have enormous potential in bridging the innovation gap between technology development and the rapid active use of new Internet-based services. Being part of the city ecosystem, Living Labs engage the users early into the human-centric and participatory ideation and innovation process. This allows old and new technology and service providers to better discover new and emerging behaviours and use patterns. Through being networked across Europe, Living Labs can bridge language barriers and expose the cross-border similarities and differences, a crucial element to take into account if platform and service development is to succeed. With a broad technological expertise, they assess in business-citizens-government-academia partnership, at an early stage, the socio-economic implications of new technological solutions by validating innovative services, business models, processes and value networks.

First ideas for piloting activities

The pilots under consideration would aim at proving the concept of a cross-border network of connected smart cities, adding significant value through user-driven open innovation to boost the deployment of open smart city platforms for Internet-based services addressing larger groups of application domains.

Each pilot would combine all three of the following synergistic elements: 1) *user-driven open innovation*, 2) *connected smart cities*, and 3) *Internet-based services*, as follows:

1) **User-driven open innovation** methodologies or ecosystems, such as Living Labs, aiming at bridging the innovation gap between technology/platform development and the rapid active use of new Internet-based services via common open platforms.
- They are an integral part of the local city ecosystem, while at the same time being networked across Europe.
- They engage the user early into the human-centric andparticipatory ideation and innovation process (e.g. rapid interaction and prototyping). This allows old and new providers to better discover new and emerging behaviours and user patterns.
- They expose the cross-border similarities and differences crucial to take into account for service and platform development and deployment to succeed.
- They assess in business-citizens-government-academia partnership, at an early stage, the socio-economic implications of new technological solutions by validating innovative services, business models, processes and value networks.

2) A **cross-border network of smart cities** should support the sharing of experiences and best practices in the implementation of open platforms for new Internet-based services in a set of key areas for cities. Examples of themes include:
- *Smart living*, including participatory urban planning of smart living areas or environments, and co-design of smart homes or living spaces.
- *Green digital agenda*, facilitating innovation through digital planning, such as 'Digital Masterplans', for digital infrastructures to enable low carbon activities for example in energy production, environmental monitoring, buildings and facility management, traffic and transport.
- *The citizen in transformation*, empowering the citizen to engage as an active co-producer, as well as consumer, of content and services for the benefit of transformational government, to strongly advance areas such as wellbeing, health, inclusion and participative democracy.
- *Generic open smart city platform* for Internet-based services with ubiquitous access for anybody at any time, distinguishing between different levels of access and privacy, for example for tourists, for citizens, for SMEs and companies, and for public authorities.

3) Internet-based services in each of the above-mentioned common themes will be based on an appropriate combination of multiple **advanced Internet-related technologies**, such as:
- Mobile and location based technologies, including mobile and wireless devices and wideband networks, Mobile Web 2.0 and Near Field Communication.
- The Internet of Things, Radio Frequency Identification and sensor networks.
- Trustworthiness, security, identity and privacy management technologies.
- Multimodal user interfaces; 3D Internet of virtual worlds
- Urban computing and communication infrastructures, including computing resources, mesh networking, middleware and displays.
- Modelling and simulation technologies.

Open questions and issues for further discussion

The above concepts for piloting activities would need to be evaluated and discussed from the perspective of:

–   City authorities;

–   Living Labs and open innovation ecosystem actors;

–   Web-services application experts;

–   Internet technology experts.

Among others, the following questions appear:

–   How would current innovation ecosystems and business-citizens-government-academia partnerships in cities need to be extended and connected across borders? Is it possible to start from advanced existing city ecosystems and city networks?

–   In how far could existing services platforms in cities be used as a starting point for adaptation, integration or extension towards the development and validation in real settings of innovative Internet-based services?

–   To what extent could potential pilots build on existing or emerging initiatives (e.g. individual Living Labs or open city platform projects; demonstration activities within research projects; etc.)?

–   How can industrial stakeholders including in particular potential high-growth SMEs, and large user groups be involved?

–   How many cities would need to be connected in such pilots to prove the innovation concepts and to stimulate the take-up of open platforms for Internet-based services without becoming too complex to handle (e.g. 3-5 cities)? Should urban regions with city focus as well be considered as "cities"? Would the association of advanced smaller 'satellite' cities or towns add value?

–   What would be the expected impact of such potential pilot activities along all of the three dimensions and in qualitative as well as in quantitative terms?

–   How could synergies be best exploited between several 'connected smart cities' pilots of this type? How would the dissemination of best practices and lessons learnt best be organised and targeted?