

Living Lab for Smart Territory

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Abstract—This document describe some of the most important aspects of the living lab proposal for a smart territory, our proposal include the development of a solution for both city and rural areas, we depict some efforts already available in rural and city and make a proposal to integrate a solution which combine several problems shared by cities and rural areas. Our proposal is based on a model that promotes the open innovation as an strategic axis for the involvement of the people in the solutions of their surrounding environment problems. In order to achieve the goals, three phases of development are proposed. The process to gather information, would promote the first open data framework repository and the development of skills for analytics and visualization. Finally, the educational process is engaged in all of the phases of the project progress.

Keywords—Living Lab, Open Innovation, Smart Territory.

1 INTRODUCTION

THIS document is dedicated to review some important aspects of the Guadalajara Living Lab Project proposal. This is an initiative that have emerged from citizens in the interest of developing proposals to solve, or alleviate the impact of, the problems that affect not only the city but also the rural areas that coexists with cities in an interrelation that affect both places, this arise the concept called *Smart Territory* with regard to bring intelligence not only to the cities but also integrate their related rural areas as part of a complex system.

1.1 Aim of the white paper

The aim of this white paper is to review and document the strategies for developing an infrastructure able to provide information of a region/territory in the interest of finding a productive and environmental correlation. To see how the absence of employment in the field of rural area impact on the willing of population to migrates to the city. This relationship is also important because rural areas are providers of goods for the city with an impact in health and the quality of life. The products from the agroindustry

could be seen as a supply chain system for the cities.

The main goals of the Guadalajara (GDL) Living Lab Project are:

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- Establish a network of sensors in cities and rural areas and mastering the technology to make it profitable and sustainable in its cycles. This network of sensors measured several variables that are of interest in social and environmental terms for sustainable production in the city connected/correlated to the rural areas.
- Using gathered information to modeling the behavior of ecosystems and to perform simulations on possible trends, in order to improve decision-making in the rural area and the city. This is required to establish development cycles between rural and city areas to reduce risks and generate improvements in quality of life in both areas.
- Support a particular organization that will best boost synergies between the different subsystems of the territory.
- Establish a digital platform to identify supply chain / demand, and incorporate ICTs into mainstream for food markets, where the goals are to optimize the supply chain processes between rural and urban regions in the smart territory.
- Promote the use of alternative sustainable

sources of energy that mitigate the environmental impact.

- The living lab will be one of the enablers of the open data framework project ensuring open data repositories, schemes of data provisioning and identifying legal issues to add value to the open data.
- Boosting regional technological development to the development and productive capacity sensors and devices at the lowest cost, supported by spinoffs and entrepreneurs developing innovative infrastructure. A technological transfer process is expected, resulting from the innovation of researchers at the network of universities in Guadalajara.

All of these issues have their scope and field of study, it should be interesting a deeper research on each field but at the moment it is being treated quite superficially.

1.2 Definition of the Smart Territory concept

Being aware of the consequences derived from the human activities, specially those that involve a radical change to the natural environment, is a way to start identifying how to generate smart solutions.

A smart territory can be described as a livable space for all of the living beings, neighbors of the environment; and not only habitable but also can be diminished the negative impact by a better and optimal use of the existing resources, which leads to a sustainable environment and environmentally friendly actions. Thus, it becomes attractive to use technological solutions that allow to identify dangerous situations and if possible to mitigate the negative effects of such event, these solutions require innovation, knowledge and consciousness of the involved people. Hence, a smart territory is a connected place between the city and its rural areas as a complex system, where their inhabitants are aware of their resources and how to exploit them in a sustainable balance.

1.3 The proposal of Living Lab for Smart Territory

A living laboratory is the key element that allows the execution of a strategy of open innovation focused on people. Basically operates within a territorial context, which can be a city or part of it or a region where a concurrent integration based on

knowledge and innovation through the collaboration that is performed by stakeholders belonging to public and private entities and civil society.

The Living Lab concept is based on a systematic approach, in addition to the traditional knowledge, based on the integration of research and innovation processes that motivate the creative abilities of people. Moreover, the people, the environment and the ethnical conditions; are reflected in processes integrated through co-creation, exploration, experimentation and evaluation of innovative ideas, scenarios, concepts and technological artifacts related to use cases in real life. These use cases include user communities, not only as subjects observed, but also as a source of creation. This approach enables all stakeholders to consider simultaneously both the overall performance of a product or service and its potential for adoption by users.

2 CONTEXT

2.1 Previous work in the rural area

Within the current context of the study region, it is mentioned that some efforts have been made which are briefly mentioned below:

- INIFAP (National Institute of Crop and livestock forestry research) establishing a database having information related to temperatures in different municipalities in the region. Information is a grouping of different data sources, which is outdated and is marginal. Their scheme, lacks a constantly updated stream of data.
- Through the Rural Extension state department, people has been sent to the field to review the information and processed it locally. This strategy has limited scope and the information is not available to third party instances at real time and depends on the degree of error added by data gatherers.
- The *oeidrus*¹ section through the Mexican department of agriculture and cattle, has a database about the stocktaking of the agricultural and cattle activities. These data is solely managed and updated by government instances, no collaborative efforts are identified, and some informative and fixed statistical analysis can be deployed.

The world of information in both the countryside and the city is in information silos. Therefore based

1. <http://www.oeidrus-jalisco.gob.mx/index.php>

in the current Mexican context, the Living Lab for smart territories is an area of opportunity for the development on the internet of things, also to promote the value of the open data framework and finally a pool resources for big data analytics for the smart city.

2.2 Previous work in the city

- The SEMADET (Department of environment and territorial growth) through the *simaj* (Jalisco atmospheric monitoring system) manages a web site that inform and graph to the public the status about certain atmospheric variables in defined zones of the urban area for the current day. Nevertheless, the sensors network lack of granularity and the stream of information is not available in an open repository with the historic data collected throughout the time.
- Since 2013 Guadalajara Digital Creative City initiative is focusing efforts to deploy a combined rural-city relation which will be monitored by a set of multivariable sensors using Intel Galileo (or Arduino) development board.

Although these works in Rural and City they both have mostly been driven by government or respective instances, also the are just being to start to develop an open data initiative that may regulate the legal certainty, identity and privacy of the gathered data. Finally, an enabler of this proposal is the Mexican Digital Plan recently published by the federal government.

2.3 The intention of Mexico and its national digital plan

In november 2013, the Mexican digital strategy was published by the federal government in the country. Information Technologies are related to the economic grow. The main goals to achieve during the period 2014-2018 will be to reinforce the telecommunications and IT infrastructure in all the public offices, hospitals, schools as well as to improve citizens security around the country. Also, is the first step to support open data repositories to enable strategic sectors as the internet of things and cloud infrastructure for a new digital economy. Hence, the Living Lab for a Smart Territory is aligned with the proposals of the national digital plan.

Risk	City	Rural Area	Note
Flooding	X	X	In small towns, due to the lack of land use planning and the city for exceeding the capabilities originally planned
Drought	X	X	Due to climate change and mismanagement of natural resources
Water Quality	X	X	Mismanagement of toxic waste and agrochemical industry
Air Quality	X	X	Vehicle emissions in cities and countryside by organic wastes
Soil Quality	X	X	Mismanagement of toxic waste and agrochemical industry
Noise Pollution	X		By human activity, vehicles and machinery
Solar Radiation	X	X	Impact of chemicals released into the local atmosphere
Wind Gusts	X	X	Associated with the air quality
Fire	X	X	In hot seasons, forest areas near the city are vulnerable to fires and the amount of pollution impacts the city and the near agroindustry places

TABLE 1
Issues between City and Rural Areas

2.4 Issues between city and rural areas

Table 1 shows a summary of the problems encountered in town and country and that are related to this GDL Living Lab Project for Smart Territory. The related table depict the correlation about those risks applicable for both. Furthermore, some of the risks can displace from the rural to the city, or vice versa, becoming a possible threat depending on the intensity of the risk. Moreover, the Living Lab for the smart territory should help to define the action protocols in case of a detected risk, support the decision makers to react and mitigate in a efficient way every damage affecting the quality of life, safety and economic development of the smart territory. It will be also a tool for strategic planning and public policies for the government.

3 LIVING LABS AND SMART CITIES: A REVIEW OF STRATEGIES IN OTHER COUNTRIES

The implantation of Living Labs as executive elements of innovation strategies has been exploited in many places. Some very representative cases of these efforts are described below.

- MIT Living Labs - The MIT Living Labs project uses an approach that combines a number of expert human resources in various

disciplines in order to develop, deploy and test new technologies and strategies in order to respond to actual challenges on energy, health and creative arts. On the issue of energy, most of the research is dedicated to developing new sources, however, work focused on reducing the energy consumption are also performed. Within the theme of health, Living MIT research lab focuses on the development of the particular needs of people in terms of physical, cognitive and social aspects also developing systems that can monitor and respond to changes in the health status and the development of technology to promote health and social relationships.

- Philips Research Open Innovation HomeLab - Philips aims to develop technological innovations that strengthen its business divisions and has incorporated this approach called open innovation where his own expertise is shared with academia, institutes and other companies with the goal of developing better ideas. Open innovation by Philips is managed in two approaches, the inside-out approach where skills and resources of their property are shared to the outside world and the outside-in approach, which seeks to leverage the capabilities of individuals, organizations and small shared emerging companies seeking new sources of innovation expanding the window to the world through strategies such as crowdsourcing and social networks.
- Barcelona Smart Citizen Project - Barcelona is coupling a collaborative living lab from sensors implemented by volunteers through the smart citizen project
- Open Smart Rural is an initiative in Spain that includes an open platform for users to collaborate by addressing and defining zones about territorial planning using an open geo spatial data base

4 LIVING LABS AS OPEN INNOVATION ECOSYSTEM

The Living Lab for the Smart Territory project seeks to establish a territorial coverage between the city and the countryside, connected through geographical and Open Data Information Systems. Living Lab first actors emerged as a citizen initiative for open innovation, backed by industry, academia and government. Participants in this

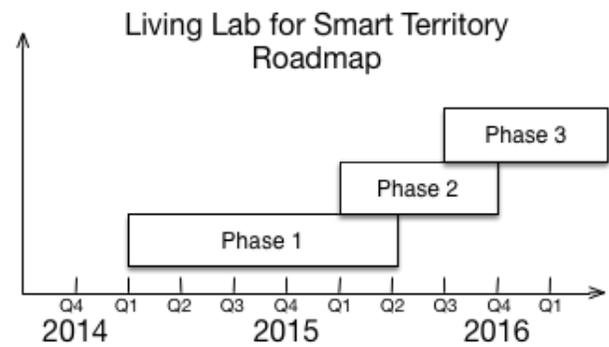


Fig. 1. Roadmap for Living Lab proposal deployment

project should come from users and consumers of information as well as developers of the platform and open databases. Current efforts are driven towards the identification of a set of variables to measure and establish a project evolution by the development of its phases.

As a first step we are proposing to measure: temperature, relative humidity, light conditions, noise pollution, and air quality. In order to test the value of the historic data, a project to measure the efficiency on the usage of water for a laboratory of sustainable green area in the city and agricultural area in the countryside is devised. As a second phase, a project related to each risk element of the table 1, will be addressed by the living lab in both city and rural areas. Figure 1, shows the timeline for the project development in its different phases.

5 ELEMENTS REQUIRED TO SETUP AN OPEN INNOVATION ECOSYSTEM: LIVING LAB INFRASTRUCTURE AND PEOPLE ENGAGEMENT

Our proposal for a living lab is based on the reference model for intelligent planning of cities, of Zygiaris . It is based on the territory of context in this case represents the city and rural area with inter - acting elements among them . From this basis it is determined that the objectives of the proposal should aim to create a sustainable environment (Green environment) both in matters relating to the environment and with regard to the social and economic side . To achieve this will require layers of technological elements itself such as the layers of connectivity and sensors and other layers of elements that combine technological and social participation within the pillars defined as open and intelligence.

Phases	Rural Area	City	Note
Phase 1	A cottage at the marsh	Show in a public building. Inside a room and outside. To be hosted at the Smart Cities Innovation Center at the University of Guadalajara and replicated at least in four universities in the metropolitan area.	It is set a first prototype in both zones along with a web page that show the data (Mapbox/OpenStreet). It is defined the standard for the open data repository, and the models for the first prototype of the board (it may include an informative sign). It has an approach as an educative project, similar to an environmental educational IT centre. Also is proposed a development scheme for entrepreneurs and set the basis for an open innovation model. Mobile laboratory with portables and servers. The focus will be the awareness of risks affecting the territory as cited in table1, enabling the sensor network and developing skills in data analytics and visualization.
Phase 2	Measure several ha at rural area. Outdoors	Measure a smaller but similar instance but inside the city boundaries	Actual relation among city and countryside is about 1/3 because there is less interference on lectures because human activity. Sensors shall be distributed according the area to measure, and there is the possibility of energy issues, communications, etc. All the sensors must be autonomous and supported by incubated spinoffs to sustain the life cycle of the products, services needed to keep operating the sensor network in rural and city areas.
Phase 3	ecosystems	ecosystems in the area	Sensors should measure variables in a wider region. Identify the achieved effects. A defined business model that fulfill a sustainable project.

TABLE 2
Phases of the roadmap for two years

These elements are the foundation on which open innovation is encouraged through the living laboratory approach and seeks to turn fomenter participation and empowerment of people to propose solutions to the known problems of the environment and the pursuit of profitability through new business models.

6 PERSPECTIVES

Next steps include the development of MOOC’s, study workshops, designing ad hoc and general purpose sensors that gather measurements about those variables that impact both areas city-rural; in order to share and display the data is necessary an interface or platform.

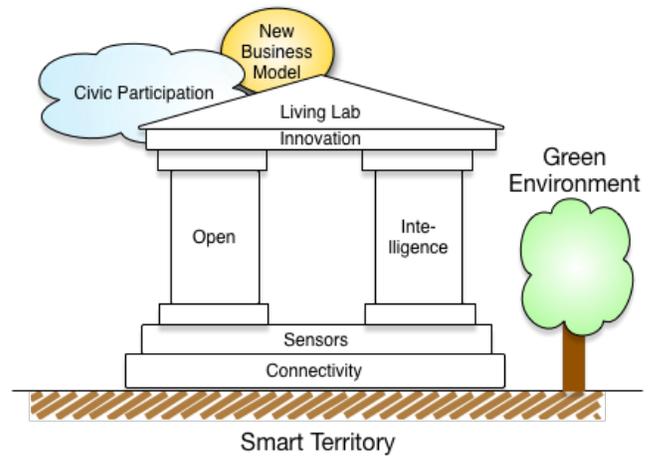


Fig. 2. Components of an innovation Ecosystem

Former activities are included and guided by a roadmap that synthesize the whole project which should take into account the afore mentioned pilots.

First achievement is the smart cities innovation center at the University of Guadalajara is setting up the first headquarter to host and develop the project, starting with a computer equipment donated by IBM which is intended for the data storage and analytics. Also several efforts are being held with other local universities to establish a consortium or network of living labs to share experiences and best practices in order to provide a wider coverage. Likewise, it can be possible to contact entrepreneur incubators to sustain the technological transference of the project to spinoffs, and is expected that this project supports other working groups of the current initiative.

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