eHealth Living Lab Micro Innovation Strategy: A Case Study of Prototypes through Co-creation

Josep Ma. Monguet[1], Marco Ferruzca[2], Joaquín Fernández[1], and Eduardo Huerta[1]

[1] UPC-Barcelona Tech,
Diagonal 647, 08028 Barcelona, Spain
{monguet.upc,jfernandezupclam,eduardohuertavasquez}@gmail.com
[2] UAM, CyAD,
San Pablo 180, 02200 México City, México
marco.ferruzca@gmail.com

Abstract. Innovation has evolved towards a more democratic model, but there is a lack of tools and strategies that help organizations to manage the inclusion of citizens/experts/stakeholders/researchers in their innovation process. This is the case of the eHealth domain where design and delivery of new solutions to patients, beg for innovative solutions. This paper presents the "Living Lab Micro Innovation Cell" (iCell), a framework to co-create innovative eHealth services. iCell has a nucleus composed of a multidisciplinary junior team supported by a group of senior consultants coming from businesses, health institutions and research centers. All of them collaborate with patients in the co-creation process. The iCell integrates different core competences and manages "knowledge and work flows" through 2.0 internet tools. The iCell framework is the result of a qualitative research based in a case study of six eHealth service prototypes developed in the area of Barcelona during the last three years.

Keywords: Business health, Business model innovation, Living Lab, health 2.0.

1 Introduction

The development of eHealth applications is an enormous field, full of opportunities, but the design, development and what is most difficult, the real incorporation of innovations in the health system, has to overcome many barriers [1].

Innovation in this domain represents a challenge for creating opportunities in its value chain, innovative new forms to support services (education, prevention, therapy, monitoring and so on) in the diverse states of a disease. It is necessary to generate solutions that change the ways patients use health care, to use technology for improving care, and to produce new business models that motivates collaboration between disparate parties [2].

This paper presents a Living Lab-based co-creation strategy [3] [4] which is the results of qualitative research conducted in the last years in order to find better ways to produce, test and market eHealth systems.

2   Case Study

During the period 2007-2009 a case study on the development of six eHealth service prototypes was conducted in the region of Barcelona. See Table 1. Several organizations have participated following an ad hoc co-creation framework denominated as "Living Lab Micro Innovation Cell (iCell)". This framework has been formalized gradually throughout this period of time as a result of the interaction with all the participants involved in the projects listed.

Table 1. EHealth service prototypes developed with the support of the iCell framework

eHealth service	Description
E-FREN	Knowledge management system for a community of experts in nephrology (life-long learning program).
E-DIS	System for rehabilitation therapy from dysphagia.
E-BLOOD	Blood transfusion process simulator.
CISMA	System to simulate the physician-patient interviews and therefore improve the diagnostic process of a disease.
E-FER	Knowledge management system in a community of experts in sores.
E-TONA	Mobile devices to support cognitive-behavioral therapies for the treatment of obesity in children and adolescents.

2.1   iCell Framework

The iCell framework can be explained as a hybrid Living Lab strategy with physical and online activities. The aim is to co-design prototypes of new eHealth services with the participation of real patients, health institutions, research centers, and businesses[1].

Instead of macro infrastructures and massive participation like most Living Lab implies, an innovation cell can be considered as a small basic unit of it. An iCell is integrated by a multidisciplinary technical/creative team and a group of senior consultants from businesses, health institutions and research centers (Fig. 1 shows a representation of an iCell). The first one, also understood as a junnior team, includes people with different and complementary backgrounds engineering, health, business and design, who share entrepreneurship orientation. They play a leading role in the iCell framework, provoking design, development and test of eHealth prototypes.

The co-creation process of a prototype consists of various stages as shown in Fig. 2. It follows an incremental design methodology where each of its stages details and improves the eHealth solution proposed until a prototype is tested and validated. Co-creation activities of each stage involve distinct expertise and levels of participation of the different actors. Also, every stage engages an agreement, a definition of components, a mock-up or a functional prototype (System), and a validation by consultants and users. Details of this design methodology have already been published somewhere else [5].

[1] Public Administration has also participated in some of these prototypes through research funding.
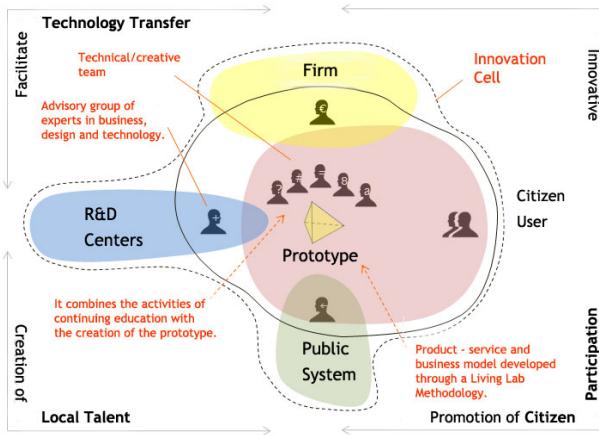
Fig. 1. Scheme of the iCell model
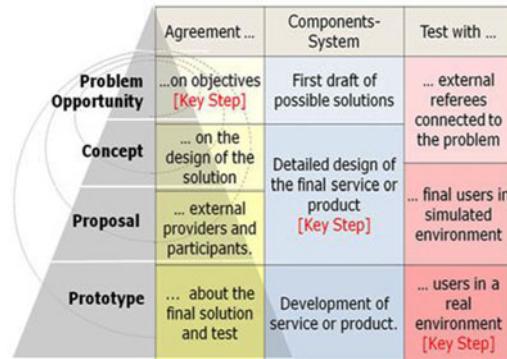
Fig. 2. Incremental design methodology

A virtual platform was specifically built to manage the co-creation process. The platform is composed of several modules: a user module, a content module, and a control module for managing web 2.0 services and communities [6]. The platform facilitates:

- Presenting ideas, concepts and prototypes with different means (text, image,
- video, clickable mock-ups or prototypes)
- Discussing through forums, chats or video conferences
- Managing design and development processes through a workflow system
- Promoting social network awareness

The research work consisted of analyzing qualitatively the outcomes of the six eHealth prototypes developed through the iCell framework, in order to assess its impact on the innovation process of eHealth services.

2.2 Design

The research question was: What can we learn after applying an iCell framework to improve innovation in the eHealth domain? Our proposition is that it improves innovation in this sector. The configuration of the iCell for each of the eHealth prototypes developed and the outcomes produced represents the unit of analysis.

The prototypes of the case study share many of the members of the junior team as well as the senior research team. Based on this fact, the main difference between the prototypes may be related with the way the iCell works in each of the eHealth services developed.

The technical/creative team was represented by Ph.D. students working in the ICT field. They were engineers, designers and health specialists. The group of consultants was integrated by engineers with innovation experience. There were physicians and therapists from different hospitals and from different specialties depending on the prototypes. Several types of users, including patients were involved too. In some of the prototypes a business which provides e-services was engaged in the whole process of co-creation and commercialization.

Several information sources were consulted and designed. Technical memories were used to identify the participants in each prototype. Interviews were also used to discuss with consultants about the outcomes produced during the prototypes development. Overall, the aim was to asses if there had been a positive effect on the innovation performance and if participants had gained some benefit from the iCell framework. Several surveys were also designed to obtain data from participants about the impact of the prototype developed. Each prototype had its own survey. Finally, the production of scientific knowledge was also considered.

2.3 Data Organization and Analysis

Innovation performance in each of the prototypes was classified according to the three dimensions of innovation proposed in the European Innovation Scoreboard (EIS): Enablers, Firms Activities and Outputs. The first group captures the main drivers of innovation that are external to businesses. The second group captures innovation efforts that firms undertake recognizing the fundamental importance of firms' activities in the innovation process. Finally, the third group captures the outputs of firms' activities. There are a total of 29 indicators in the EIS. A full description of

Table 2. Participants and innovation scores obtained for each of the eHealth services

iCell Case	Participants				Innovation Performance Score			
	R&D Center	Firms	Hospital	Users Patients	Enablers	Firms Activities	Outputs	Total
E-FREN	√	√	√	√	3	4	4	11
E-DIS	√	√	√	√	2	4	4	10
E-BLOOD	√	√	√	√	3	3	3	9
CISMA	√	√	√	-	1	2	2	5
E-FER	√	-	-	√	2	0	1	3
E-TONA	√	-	-	√	1	0	2	3

Table 3. List of innovation indicators identified

Innovation Metric	Criteria applied in relation to the projects
ENABLERS	
1.1 Human Resources	
1.1.1 S&E and SSH doctorate graduates	At least one doctoral dissertation has been produced as a direct consequence of the project
1.1.2 Participation in life-long learning	The focus of the project has a direct effect in incrementing the number of people involved in LLL.
1.2 Finance and support	
1.2.1 Public R&D expenditures	Capture directly public funds for the project covering at least 30% of the budget
1.2.2 Venture capital	Capture directly private funds for the project covering at least 60% of the budget
FIRM ACTIVITIES	
2.1 Firm investments	
2.1.1 IT expenditures	The project leads to qualitative improvement in the IT resources of the organization.
2.2 Linkages & entrepreneurship	
2.2.1 Innovative SMEs collaborating with others	At least two private SME's collaborate on the project.
2.2.2 Firm renewal	A spin off is established as a result of the project.
2.2.3 Public-private co-publications	At least one indexed paper is published.
OUTPUTS	
3.1 Innovators	
3.1.1 SME introducing innovations	A new product or service is marketed
3.1.2 Resource efficiency innovators	The new product or service improves the performance of human resources.
3.2 Economic effects	
3.2.1 Employment in knowledge-intensive services	Hiring new people as a result of the project.
3.2.2 Knowledge-intensive services exports	The product or service is exported to other countries.
3.2.3 New-to-market sales	Involved firms increase their sales volume.

each indicator can be found at [7]. The first issue was to identify which were the agents involved in each of the prototypes and to obtain their innovation performance score. See Table 2. The model of analysis applied to each of the eHealth services developed is summarized in Table 3.

In the analysis of the innovation performance a point was given for each indicator that clearly applies to the prototype that was being analyzed. See Table 4.

There is a clear gap in performance depending on whether or not all the agents where present in the prototype project. According to data, only three of the six prototypes were developed with the participation of all kind of agents in the "iCell": E-FREN, E-DIS and E-BLOOD. Besides, these had a better innovation performance in comparison with the other cases with a lack of one or two of the agents during co-creation process.

Table 4. Innovation performance indicators for the three prototypes top rated

	E-FREN	E-DIS	E-BLOOD
ENABLERS	**3**	**2**	**3**
Human resources	1.1.1, 1.1.2	1.1.1	1.1.1, 1.1.2
Finance and support	1.2.2	1.2.2	1.2.1
FIRM ACTIVITIES	**4**	**4**	**3**
Firm investments	2.1.1	2.1.1	
Linkages & entrepreneurship	2.2.1, 2.2.2, 2.2.3	2.2.1, 2.2.2, 2.2.3	2.2.1, 2.2.2, 2.2.3
OUTPUTS	**4**	**4**	**3**
Innovators	3.1.1	3.1.1, 3.1.2	3.1.1
Economic effects	3.2.1, 3.2.2, 3.2.3	3.2.1, 3.2.3	3.2.1, 3.2.3
TOTAL (Indicators)	**11**	**10**	**9**

Besides, the three prototypes top rated were developed with the support of public or private funds.

In relation to the firms' activities indicators, E-FREN and E-DIS lead to qualitative improvement in the IT resources of the organization. Also collaboration between firms was identified, indexed papers signed by public and private organizations have been published and a spin off has been created specially to deal with E-FREN.

Finally, the output dimension also presents indicators of growth in some cases because they are the result of SME's introduction of new innovations in hospitals or clinics and because in some cases the prototypes help to improve human resources performance. This is the case of E-DIS which facilitates to distribute therapy services through Internet. Some of them have become products for commercialization or are in the process of being commercialized.

3   Conclusions

The iCell model has been accepted by participants as a comprehensible framework of what goes on in an innovation process, where co-creation is absolutely critical and relevant to get results. And as has already been pointed out, the best results are related with of all agents present.

Assuming that research must go more deeply, entering into quantitative analysis of the cases, this first step of the research provides a general framework and method for future action- research studies.

On the other hand, the development of such tools and research in the eHealth area is of particular interest for many reasons, mainly because of its social sensitivity, and the fact that expenses in health care and dependency will increase in the future at the same time as general wealth.

Finally the model would be eventually useful and of interest in other areas different from eHealth. In such a case, exploratory research to adapt the model to a particular field of innovation would be the first step.

References

1. Redefining Health Care, `http://www.hbs.edu/rhc/index.html`
2. Sarasohn-Kahn, J.: The Wisdom of Patients: Health Care Meets Online Social Media. ihealth reports, California HealthCare Foundation (2008)
3. Følstad, A.: Co-creation through User feedback in an Online Living Lab. In: Proceedings of the International Workshop on Open Design Spaces (ODS 2009), pp. 1–5. IISI – International Institute for Socio-Informatics, Germany (2009)
4. Eriksson, M., Niitamo V.-P., Kulkki, S.: State-of-the-art in utilizing Living Labs approach to user-centric ICT innovation - a European approach. Center for Distance-spanning Technology. Lulea University of Technology, Nokia Oy, Centre for Knowledge and Innovation Research at Helsinki School of Economics, Sweden, Finland (2005)
5. Huerta, E., Monguet, J.M., Ferruzca, M..: eHealth business models prototyping by incremental design. In: E-Business Issues Challenges and Opportunities for SMEs: Driving Competitiveness, USA (2010)
6. Rivero, Y., Sampieri, M., Ferruzca, M., Fernández, J., Monguet, J., Blanco, B..: A SaaS-based framework to support the management and deploy of web applications for exchanging information and sharing knowledge. In: Proceedings of the International Conference on Engineering and Meta-Engineering (ICEME 2010), USA (2010)
7. European Innovation Scoreboard 2009 | PRO INNO Europe ® (2009), `http://www.hbs.edu/rhc/index.html`