

# A Living Lab Model for User Driven Innovation in Urban Communities

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## Abstract

Many innovative information communication technology (ICT) products and services that fail are not for lack of advanced technology but because of a failure to understand real users' needs. The users' experiences and feedbacks on new applications have become important components in the development of new ICT products and services. Therefore, an empirical approach to identify users' needs and underpin the product requirements can support the development of new ICT services significantly. A user-centric multidisciplinary research approach based on real life experiments- "Taiwan Living Lab" has been set up in Minsheng Community in Taipei City, Taiwan. In the Living Lab concept, the lab environment is brought to the users and the experiments are validated in real life contexts. The purpose of Taiwan Living Lab is to work with companies, public sectors, research institutes, and individuals from local communities to test the new ICT applications and promote user driven innovation activities. Context research, user requirements specification, user involvement, and iterative evaluation and modification the business model are the key elements in the new service development. A methodological approach – "Service Experience Engineering (SEE)" has been established to enhance effective open innovation, the three major phases of SEE methodology are: (I) FIND; (II) InnoNet; (III) Design Lab. Phase I "FIND" focuses on context research, observation and collection of users' behavioral data, and trend research of new ICT service and relevant technologies. Phase II "InnoNet" concentrates on business ecosystem analyses and service modeling. Phase III "Design Lab" enables the industries to test new services or products within real life environments. Two projects- "Grandparents Easy Go", and "Wise Household Care & Communication", have been deployed with SEE approach in Minsheng Community to validate the methodology. The processes and outcomes of the projects are introduced and discussed in the paper.

## Keywords

Information Communication Technology (ICT), Service Experience Engineering (SEE), Methodology, Living Lab

## 1 Introduction

In the past days, the development of information technology was mostly driven by the experts and scientists. In the twenty first century, everyone could be the driver of technology innovation. The users' experiences and feedbacks on new applications have become important components in the development of new products and services. Many new products and service development that fail are not for lack of advanced technology but because of a failure to understand real users' need. A new concept called Living Labs that supports the processes of user driven ICT innovations has started to emerge in Europe [Følstad 2008], then sprout globally [ENoLL 2010]. In contrast to technology-centric research and development (R&D), the aim of Living Labs is to facilitate user involvement in innovation processes [Eriksson, et al. 2006], [Kusiak 2007]. Therefore, a user-centric multidisciplinary research approach based on real life experiments- "Taiwan Living Lab" has been set up. The purpose of Taiwan Living Lab is to work with companies, public sectors, research institutes, local habitants and communities to test the new service applications and promote open innovation activities.

Contextual design is one of the core spirits of a living lab experiment. In general, the contextual design process consists of the following major steps: contextual inquiry, work modelling, consolidation, work redesign, user environment design, prototyping, and test/validation [Beyer, et al. 1998], [Holtzblatt 2001]. A methodological approach to Taiwan living lab development and operation – "Service Experience Engineering (SEE)" has been established to enhance

effective open innovation with the concept of contextual design [Gong 2008]. “Service Experience Engineering (SEE)” is a methodological framework developed to conduct the living lab experiments by means of systematic processes, the three major phases of SEE methodology are: (I) FIND; (II) InnoNet; (III) Design Lab.

As many countries are confronting with the aging society problems, market demands of services designed for the seniors are growing. Therefore, two projects (1) “Grandparents Easy Go”, and (2) “Wise Household Care & Communication”, targeting at innovative services designed for senior citizens, have been deployed with SEE protocols to evaluate the effectiveness of the methodology. The paper presents the work undertaken to start up the user driven innovation projects, and establish the collaborative network with local community to create a sustainable business model.

## 2 User driven innovation to create new ICT services

### 2.1 Taiwan Living Lab Approach

Many investments in research and development of new ICT-based products and services fail to produce market valid value. One of the main reasons is that traditional R&D projects are executed in a closed and artificial laboratory environment with limited and late interaction with the potential market and its users. User centric design is a design process in which the demands of end users are given extensive attention at each stage of service or product development. In the Living Lab concept, the lab environment is brought to the users and the experiments are validated in real life contexts [Mirijamdotter, et al. 2006]. A Living Lab environment should have a good relation with users willing to be involved in new service development process. In order to increase the understanding of users’ demands, there is a common need to involve users in the early phase of new innovations. Therefore, “Taiwan Living Lab” has been set up in Minsheng Community in Taipei City, Taiwan with a user-centric multidisciplinary research approach to support ICT-based R&D activities and promote open innovations (<http://www.livinglabs.com.tw/En/index.html>). The total size of Minsheng Community is about 30,000 square kilometers, and it is well-equipped with public facilities, such as schools, post offices, banks, shops, restaurants, swimming pools, tennis courts, baseball fields, and parking towers. The streets are planned in grid network. Currently, there are twenty thousand three hundred households with over fifty thousand residents in the area, and more than fifteen percents of the population are senior citizens [Department of Budget, Accounting, and Statistics 2008].

The components of Taiwan Living Lab (Figure 1) are as follows: (1) research organization/institution to lead and coordinate the new innovations between different stakeholders; (2) user community, who play the role as the co-creators and evaluators of new innovations/products; (3) “Service Experience Engineering (SEE)” methodology to emerge best practices within the Living Lab environment; (4) ICT technology and infrastructure to support the development of new ideas and the delivery of service models; (5) professionals who bring their own specific domains of expertise and knowledge in both technical and humanity aspects to contribute to the Living Lab.

### 2.2 Service Experience Engineering (SEE) Methodology

The domain of living lab research lacks empirical research, a methodological approach to living lab development and operation – “Service Experience Engineering (SEE)” has been established in Taiwan Living Lab to enhance effective open innovation. “SEE” is a methodological framework developed to realize the living lab experiments by means of systematic processes, the three major components of the methodology are: (I) FIND; (II) InnoNet; (III) Design Lab. (Figure 2)

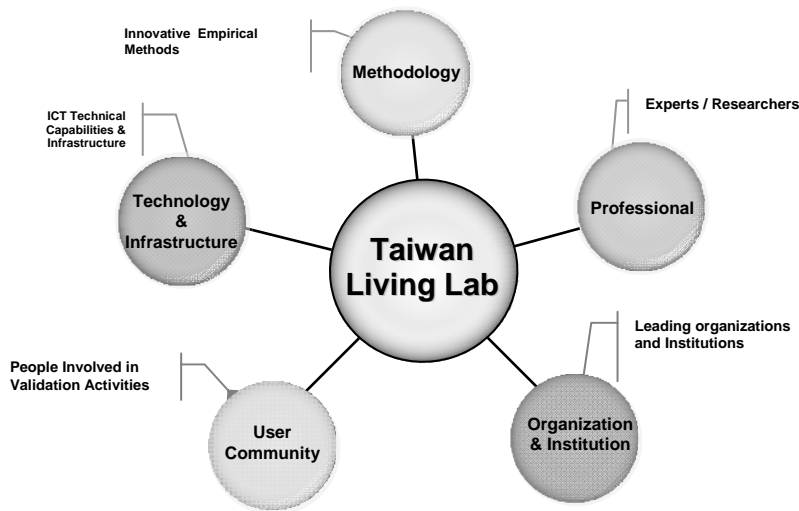


Figure 1: Infrastructure of Taiwan Living Lab

The methodology involves multidisciplinary expertise and collaboration. The goal of SEE is to help software designers to understand user requirements, in order to fulfil the goal of a product or service engineered for their users. A set of tool kit with useful instruments has also been developed to support the implementation of SEE methodology.

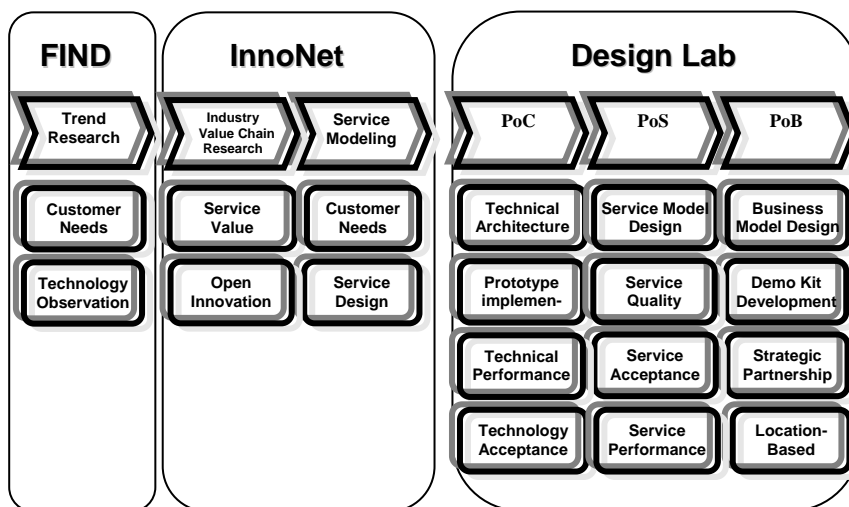


Figure 2: Service Experience Engineering (SEE) Methodology

- **FIND:** Phase I “FIND” focuses on context research, observation and collection of users’ behavioral data, and trend research of new ICT service and relevant technologies. An important contribution to an innovation process in the early stage is to study the context of use, including the users’ behaviors and their environments. The purposes of “FIND” are to discover insight into unexpected ICT uses and new service opportunities by means of customer demands and market trend analyses.
- **InnoNet:** Phase II “InnoNet” concentrates on business ecosystem analyses and service modeling. Business ecosystem analyses include industry information survey, and value chain analysis of target business. Key components of service modeling are exploration of service requirements specifications, gap analysis of the service chain on both demand and

supply sites, and design of new service models. The purpose of “InnoNet” is to promote a user-centric co-creation and innovation process by bringing different stakeholders with a common interest together, in which public sectors, researchers, industry partners, and consumers are all involved to co-create a new business.

- **Design Lab:** Phase III “Design Lab” enables the industries to test new services or products within real life environments in the order of “Proof of Concept” (PoC), “Proof of Service” (PoS) and “Proof of Business” (PoB). Technical usability testing is the focus of the PoC stage. Technical architecture design, technical performance analysis, prototype implementation, and technology acceptance study are conducted to explore the possibility of new technology. In the PoS stage, service model design, service quality and performance analysis, and service acceptance analysis are achieved to evaluate the feasibility of a new service model. Furthermore, business model design, demo kit development, strategic partners’ alliance and marketing strategy are validated in the PoB stage. The emphases of “Design Lab” are to identify pre-commercial problems, reduce market risks of uncertainty, and find the right combination of partners to develop a successful business model. Many new products and service development that fail are not for lack of advanced technology but because of a failure to understand real users’ need.

### 3 Empirical Studies to Validation SEE Methodology

As many countries are confronting with the aging society problems, market demands of services designed for the seniors are growing. Two projects targeting at senior citizens, “Grandparents Easy Go” and “Wise Household Communication”, have been deployed with SEE methodology in Minsheng Community to validate and refine the new services in real life environment.

#### 3.1 “Grandparents Easy Go” Project

The purpose of “Grandparents Easy Go” project is to develop a city bus information service kiosk specifically for the senior people. In Taipei, senior citizens over 65 years old can ride public buses for free. However, after the interviews with the senior residents, we found that the utilization of free bus service is restricted due to the complexity of the public transportation network. As many senior people are unfamiliar with working on computers, “Grandparents Easy Go” kiosk is developed to provide a handy online service that helps seniors to find the bus routes easily, and therefore, travel in the city conveniently. Usability of the service and appearance of the interfaces are specially considered during the system development stage. The two main characteristics of the bus information service system are intuitive touch-based user interface, and built-in point of interests (PoIs) service. The kiosk has been optimized for use with a 20 inches touch screen, with big icons and readouts, and other touch friendly elements. In addition, the hierarchical layouts and colourful design allows the senior citizens to find a bus route without hassle.

In addition, the system is built in with PoIs that senior citizens visit frequently, and landmarks in Taipei area to provide bus routes and transfer information through a few icon clicks. The service aims to help the seniors to find the public bus route information easily despite the unfamiliarity with modern technologies. Currently, two bus information kiosks are placed in the community center and Songshan train station, respectively; the users’ comments are being collected with an on-line questionnaire to evaluate the effectiveness of the service.

#### 3.2 “Wise Household Care & Communication” Project

Many senior people live alone and maintain very little social interaction or contacts with the outside world. Based on many scientific findings, loneliness and isolation are two risk factors that contribute to depression among the elderly. Although the advanced information technologies have made the communication between people become easier and faster; most of the seniors still do not enjoy the advantages of the high-tech products because the technologies themselves are

not very senior friendly. Moreover, many elderly people often misunderstand even fear of the usage of new high-tech products. The goal of "Wise Household Care & Communication" project is to provide a service with key features of caring senior citizens' physical and psychological health at the same time. An easy-to-use-in-home product has been uniquely developed to enable senior citizens to monitor the personal health conditions while communicate with their families/friends easily with the same device. In this project, we have developed a wireless device with a 7 inches touch panel and an embedded video communication application. The innovative design features streamlined user interfaces, flows, and easy operation that are more accessible and senior friendly. The featured functions of the device include (1) personal health management: health monitoring, food diary, and exercise journal; (2) wise family communication: online photo sharing, video communication, and reminder message setup (Figure 3).

- **Personal Health Management:** By inputting the results of blood pressure and blood sugar measurements periodically, the readings will be recorded and plotted into clear graphical pictures by user's choice to monitor the variations overtime. The indicator will show the blood pressure and blood sugar statuses relative to medical standards. The appliance also provides users an easy food calorie counter for oriental and western foods, and a complete calorie calculator for total fitness. A food diary makes it easy to track the foods intake and stay under individual's diet limits. The exercise journal shows the user how many calories are burned. The colourful and easy-to-follow charts can be shown to help the user to visualize the progress.
- **Wise Family Communication:** The family communication function is designed to help senior citizens to maintain sufficient social interaction and connection with their family members. The seniors can interact and talk with the other people face to face in real time through the embedded video function. Family members and friends can push the photos and messages over internet to be shown on the devices designated for certain users, in that way, family and friends can stay in touch all the time. In addition, the system will check for new updates whenever it turns on to display new photos and messages.



Figure 3: Overview of the device and user interfaces

"Wise Household Care & Communication" is a service that can provide both physical and mental care for the elderly. Ten appliances are demonstrated in the Senior Activity Center in Ming Sheng Community in Taipei City in the first phase; the users' feedbacks on the service are collected periodically to evaluate acceptance of the new service. Later phase validation activities will be arranged according to the results delivered from the first phase experiment.

## 4 Feedbacks from Users to the Projects

### 4.1 “Grandparents Easy Go” Project

Based on results of the 140 online questionnaires collected voluntarily from 1180 users, 66% of the users are males, 40% of the users have used the “Grandparents Easy Go” kiosk to look for bus routes before, and 67% of the users will recommend the service to other people. The age distribution of the users is as follows: less than 25 years old (30%), 25 to 39 years old (39%), 40-49 years old (3%), 50-59 years old (7%), and above 60 years old (20%) (Figure 4). The results indicate that young males are more interested in new IT services. For the design of the interface and workflow, 33% of the users suggested making the font size larger on the screen, and 61% of the users suggested simplifying the hierarchy of the pages for bus route inquiry. In addition, 37% of the users prefer to have speech input interface for the kiosk, 39% of the users would like to get print outs of the suggested bus routes, and 10% of the users prefer to receive the bus information by SMS messages. According to the users’ feedbacks, we will add the necessary software and hardware enhancements to make the service as simple to use as possible in the next stage, in order to make sure the system is optimized for the users.

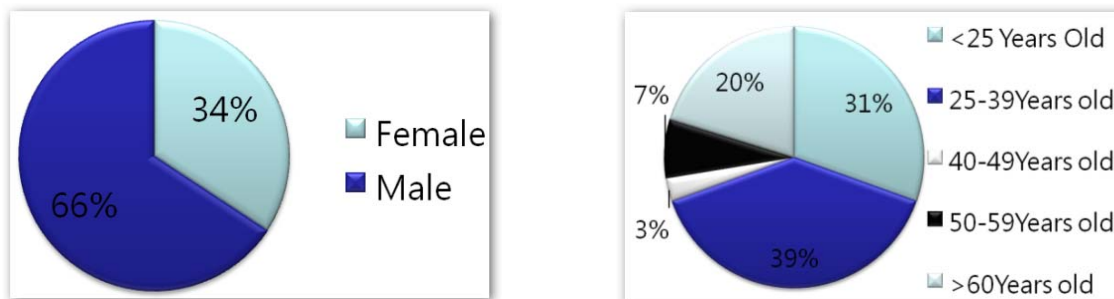


Figure 4: Age and gender distribution charts of the users’ profiles in “Grandparents Easy Go” project

### 4.2 “Wise Household Care & Communication” Project

A good product idea comes from a coupling of the detailed understanding of a customer need with the in-depth understanding of the technology. In the project, the prototype of the device has been developed by Taiwan Living Lab, and produced by a local OEM company. Ten appliances are being demonstrated in the Senior Activity Center in Ming Sheng Community in Taipei City from April. The feedback from the senior users is collected by face to face questionnaire interviews. The responses from the users can help close the gap between current level of performance and expectation to the new service. A cross-functional team consists of contextual interviewers, engineers, and service designers will work together to improve the functions of the device and redesign the user interfaces if necessary, in order to make sure everything is optimized before the product comes into the market.

## 5 Conclusion

Context research, user requirements specification, user involvement, and iterative evaluation and modification the business model are the key elements in the new service development. Living Lab is an innovative research tool to improve the research and development process of the products and services through the real life experiments, and thereby to increase the market applicability and contribute to marketing and promotion of the new products. “SEE” methodology including “FIND”, “InnoNet”, and “Design Lab” has been developed to provide a structural framework for conducting living lab experiments. In the paper, two projects aimed at the senior citizens that are deployed with “SEE” methodology are presented, particular focuses are on initial ideas generation, user demands observation, service model design, and experimentation processes. The effectiveness and performance of the projects, stability of the

hardware devices, and the market acceptance of the potential business model will be evaluated in the follow-up studies.

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