Living Lab for Designing Behavior A-Change

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Abstract. Changing behavior, from changing bad habits or forming good habits takes time. Last decades, many researches on behavior change and human habits have been conducted, and knowledge for forming and replacing habits and good behavior have been accumulated. By focusing two key aspects of behavior change supports, the article proposes to apply Living Lab as design approach for designing behavior A-Change. Based on two Living Lab cases, the article introduces potentials of supporting in-depth understanding of the target user and their motivations, needs and their transition over long-term period in order to design Behavior Change Support System by means of Living Lab.

Keywords: Behavior Change Support System, Habits, A-Change, Living Lab.

1 Introduction

Changing behavior, from changing bad habits or forming good habits, takes time. Last decades, academic researches on bahavior change and human habit have drastic progresses, which provide us in-depth understanding about the nature of human behavior and habits. Now, we have known, to some extent, how human behavior and habits are formed over time [1]. The importance of accessing neurological pattern that governs any habits, and of utilizing spaced repetition for tapping into neurological pattern should not be neglected. By repeating what you are trying to retain over several days rather than 20 hours a day, a habit can be stabilized in human behavior. This habit patterns [2, 3], the repetition over time, can help people to store conscious short-term memory process to long-term memory, which could lead forming habits and possibly lead to behavior changes. Similarly, Golden Rule [1] for behavior change, which utilizes existing habits and its habit loop could be another key. The Golden Rule often requires in-depth understanding of current behavior pattern as it is easier to replace negative addictive habits with new ones, rather than erasing the negative habits.

The above-mentioned researches on human behavior introduce two key critical aspects for behavior change: (1) the importance of understanding existing individual habits and behavior, and (2) the importance of long-term perspectives for forming and replacing behavior. Naturally, the key aspects should be incorporated when persuasive technology is designed. So, what kind of design methods could support understanding individual behavior and long-term perspectives in the continuous process of design. This paper tackles these aspects and introduces Living Lab as a design approach to support designing Behavior Change Support System (BCSS).

2 Two Keys for Behavior Change Support Systems

Seeing human behavior as unique to each individual and continuous transition from one stage to the other, we need to consider its individuality as well as transitional continuity of behavior change in designing BCSS.

2.1 Understanding individual behavior

Typical persuasive technology is designed from system designers' point of view rather than the actual behavior change objectives of the users [4]. Due to the fact, typical researches on persuasive technology often regard users as homogenous group rather than individuals with diversity. However, when it comes to BCSS, individual unique behavior and purpose of a use of the system have closely related to the design principle of BCSS. Thus, it becomes of critical importance to understand individual human behavior [5] or at least groups with varied user segments [6] and gender and age [7] in the design process of BCSS.

2.2 Understanding transition and continuity of behavior change

Another important aspect of design BCSS is to understand transition of behavior change and support its transition continuously. Oinas-Kukkonen [4], categorizes its transition into three change stages; an act of complying, a behavior change, and an attitude change, which are named as C-Change, B-Change and A-Change respectively. Current persuasive technology often targets at one-time behavior change (C-Change) or repeated but not sustained behavior change on certain period (B-Change). Although C-Change focuses on instant reaction (it can be few seconds) of the targeted users through persuasion, nudge, or coercion, some of B-Change and attitude change by acquiring habits (A-Change) could span over longer time such as few weeks op few months. For supporting behavior change and its system design, we should have long-term perspective.

3 Living Lab as a design eco-system and a method

To support the design process of BCSS with its individuality as well as transition and continuity of behavior change perspectives, I would like to suggest applying Living Lab as a design approach. In this context, Living Lab is defined as design eco-system for long-term, interactive, end-user involvement design process, and a method for understanding people in stake over time.

Living Lab is a demonstration space in daily life context [fx.8,9]. In Scandinavia, it is generally regarded as a part of participatory design, and co-creation (Co- Design) approach for solving social problems with complex and high uncertainty. It can be used as innovative test bed in organizational context of IT development [10], and as a social innovation space [11]. Ultimate goal of Living Lab is to design socially embedded IT systems in real life context with wider stakeholders. Thus, Living Lab often defines

with social and human centered perspective, as shown in Bergvall- Kåreborn and colleagues definition; "a user-centric innovation milieu built on everyday practice and research, with and approach that facilities user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values.".

In a conceptual model the author proposed (Fig 1), characteristics of Living Lab is described as ten critical aspects; they are 1. Familiar Context 2. Activity with multilayer 3. Co-Creation 4. Dialogue and Reflection 5. Evaluation 6. Discovery 7. Long-term Engagement, 8. Purpose and Vision 9. Empowerment 10.Openness.

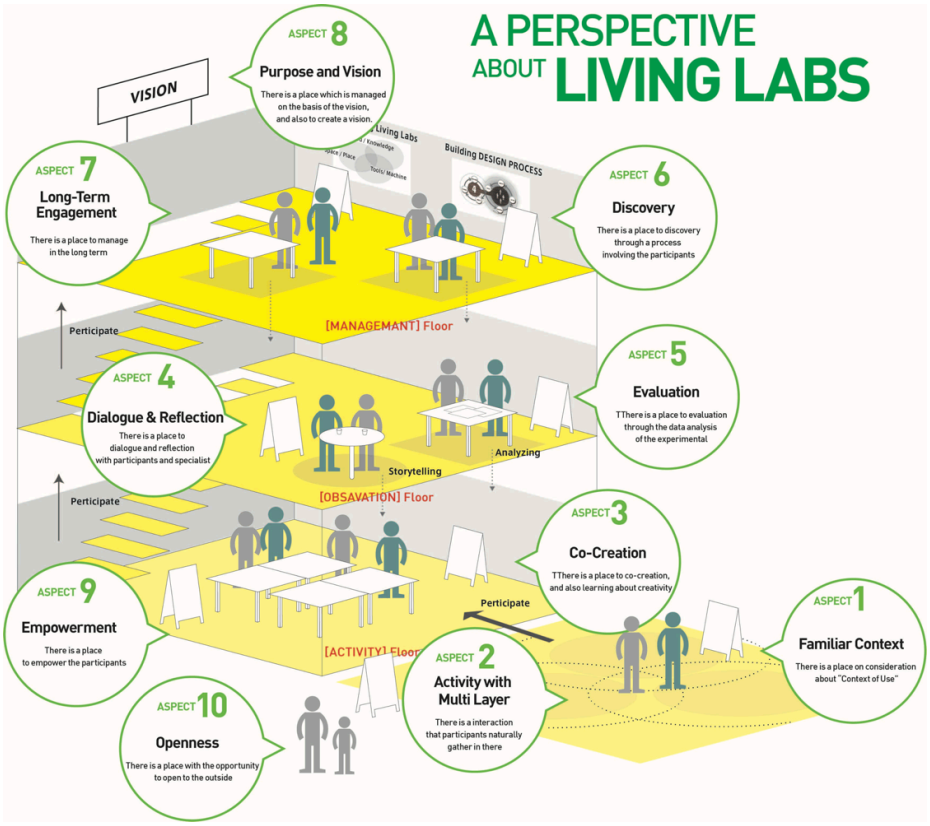

Fig. 1. Conceptual Model of Living Lab.

The infographic in Fig1 utilizes a building metaphor with three floors, indicating community structure and its user involvements. Three floors consist of activity floor, observation floor and management floor. In this building metaphor, one user enters the building (community) and views each floor step by step. This presentation indicates importance of; 1) widening view to understand current activities and plan future activities, and then acquire holistic view; 2) recognizing a progressive involvement process to the community; 3) categorizing and organizing activities with certain perspectives.

So how we can utilize Living Lab for designing BCSS? Considering environment for BCSS, Living Lab have a potential to become a great contribution to provide sustainable understanding of the fields and people, and continuous development aligned with the behavior changes of individuals over time. To name a few, Long-term engagement (Aspect 7) is needed to understand people's behavior in-depth, while co-creation (Aspect 3) is necessary for user-centered system design and accumulate better usability.

4 Cases: Behavior Change in Living Lab

Cases introduced in this section intends to articulate potentials to utilize Living Lab for designing BCSS and lead ultimate behavior change, A-Change. The cases are two; Case 1: REACH Project and Case 2: Family Communication Support project. The two projects applied Living Lab approach for a few months in understanding and designing digital tools which influence behaviors of the system users one way or the other. In both cases, field investigations and individual user understandings were initiated, and co-creation with end-users was conducted through participatory workshops. Later, experiments with proposed system were carried out for a few weeks or six months, and evaluations were made within Living Lab eco-system.

4.1 Case 1: REACH Project

The utilization of human activity data such as vital data for supporting behaviour change has attracted attentions. By collecting and analyzing human behavior data from wearable sensors, AI deep learning might identify outliers in human behavior and improve quality of life through BCSS. The REACH project[1] is a five-year EU Horizon 2020 project [12], conducted by a consortium consisting of academic institutions, medical and healthcare organizations, healthcare IT companies, insurance companies, municipalities, and citizens from Denmark, Switzerland, Netherlands and Germany. The objective of the project is to develop REACH health eco system which supports senior citizens behavior change. The BCSS for senior citizens aim at improving their quality of life, through detecting outliers and intervening in daily activities through monitoring and big data analysis of health conditions based on real data from installed and wearable sensors. To achieve this goal, REACH applied Living Lab approach for co-design the motivation support application and collecting the feedback from users in the experiment.

By developing the application together with stakeholders, the REACH experienced various changes in data collection methods, data utilization, implementation of field inputs to REACH eco system design in earlier system development stage. For example, a good balance on adequacy of behavior advice and ethics towards implicit motivation push (nudge) was a few challenge that have been negotiated along the way together with the users. This project implies that interaction with users at stake in Living Lab

[1] http://www.reach2020.eu/ REACH (Responsive Engagement of the elderly promoting Activity and Customized Health care)

can clarify users' motivations and reasons of the BCSS usage over time, and provide better process of software design and development.

4.2 Case 2: Family Communication Support Project

The possibility of supporting busy families in means of digital tools has been expanding as different human relations require different granularity and sensibility of communication. This Family Communication Support project with KDDI Research aims at designing an application for better close-family communication with small children (up to 12 years old). Starting with a field study and a qualitative data collection in 2017, the project conducted a six-months Living Lab experiment with a preliminary family communication support application, which aimed at motivate family members to share quality time together. Together with target families, the project conducted a few concept development workshops, using concept design workshop methods such as design games [13]. While the majority of proposed ideas at the workshop seemed to be novice and creative, many ideas focused only on either convenience or efficiency in communication. Interestingly, quantitative fields data from long-term Living Lab experiments with the developed original apps, and interviews showed the importance of "role play" among family members and interactive communication through represented family role. All families with own roles (37% of all target families) tend to successfully utilize the system for longer periods with higher satisfaction rate.

This project implies that it is critical to understand values acquired in real-life contexts to get design implications. Value of closed laboratory settings or innovation workshops should not be neglected; however, they can only offer limited understanding of real social relations, in comparison of potential findings through Living Lab approach.

Discussions and Implications

Changing behavior and forming new habits take time. If persuasive applications ought to change human behavior or attitudes through the power of software design, its design sholud consider individual users' unique needs and characteristics as well as archetypes of behavior change, especially considering not only C-Change, and B-Change but also A-Change [4]. The design of BCSS ought to be improved over a long period of time along the shift of behavior change archetypes, and through understandings of the targeted community and people. Similarly, it is indispensable that design eco system can provide a stage for those who are involved to show commitment, co-create, and develop the support system for their own behavior change.

Two cases introduced in this paper imply what Living Lab can do for designing BCSS. Living Lab allowed us to comprehend the characteristics and habits of the user for considering what kind of persuasion would be effective, valuable as well as ethical, and to develop behavior support application continuously over time. In Case 1, B-Change was achieved over a long period of time, and in Case 2, the close interaction with the targeted users provided new insights and influenced system design. It is still unknown how to continuously develop BCSS to support A-Change through Living Lab, and there are a lot of rooms left to consider.

This article presented the preliminary idea that Living Lab approach might add value in designing BCSS by introducing some thoughts and two cases the author conducted. The cases intend to show potentials rather than validity of Living Lab as a method. Up to now, the use of Living Labs to design BCSS and to promote A-Change has not been practiced in real-world settings, and it is not yet clear how it can become an effective method for designing BCSS. The author will continue working on how Living Lab can be effectively utilized to support BCSS for A-Change in the future.

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