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Title

A Multilevel Evaluation Approach of Agroecological Living Labs: The Occitanum Case

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Abstract

This paper discusses the evaluation of living labs (LLs), which are open innovation systems operating on three principles: stakeholder involvement, co-creation of innovations, and a strong connection with real-life contexts. Evaluating LLs can be challenging due to their pragmatic, complex, and non-standardized nature. We use the example of Occitanum, an agroecosystem LL in France, to show how an evaluation strategy can be engaged at the different levels. The aim of Occitanum is to mobilize digital technologies to accelerate the agroecological transitions of farms and local food systems, through innovative projects (i-projects) built in response of farmers' needs with the help of LL facilitators. The first level of evaluation concerns the benefits and costs of using digital technologies and their impact on farmers, their production system, and their work in the three dimensions of sustainability (environmental, economic and social assessment). The second level of evaluation concerns the innovative project/process implemented in the LL, while the third level is the evaluation of the LL itself and its impacts on societal challenges. The article highlights that evaluation of the emergence of needs is particularly challenging, and we aim to improve this phase of the innovative project through a better understanding of the facilitators' work situations by mobilizing approaches from the field of ergonomics and propose new support tools. Overall, the article shows the importance of evaluation in LLs to measure their effectiveness, impacts, and performance and to improve their processes and allow replicability.

Introduction

Living labs (LL) are open innovation systems that operate on three key principles: stakeholder involvement, co-creation of innovations and a strong connexion with real-life contexts. Although LLs are widely used in all sectors of activity, including agriculture where agroecological living labs (AELL) are increasingly present [1], their pragmatic, complex, quite new and non-standardized nature requires multiple evaluation instances to assess their effectiveness, impacts and performance.

LLs are complex systems, and the question of evaluation is not simple [2]. Evaluation can be defined as the “*act of assessing the process and outcomes of a living lab, and effectiveness as the level at which a living laboratory succeeds in achieving a certain desirable process or outcome*” [3].

Objectives

Our paper aims to demonstrate, show casing Occitanum, a French AELL, how and when the question of evaluation is raised, as well as how it serves different processes at various levels of the LL. To achieve this, we utilize three formative evaluation approaches that enable continuous learning loops, improve and adjust the implementation of the LL and its projects, and support adaptation to complex and dynamic conditions by promoting innovative solutions [4].

Method

Occitanum [5] is an AELL that aims to mobilize digital technologies to accelerate the agroecological transitions of farms and local food systems. It is organized to create a territorial ecosystem to assess how digital technologies change farmer's practices and agricultural processes in real-life situations, in the three dimensions of sustainability (economic, environmental, and social). It is structured in two main components that interact: the 13 real-life sites, grouped into 7 Open-Labs (OL), one per agricultural production sector, and the CORE, which is the resource centre for supporting actions (organization, methodologies, capitalization, assessment, dissemination of results).

The evaluation is performed at different levels of the LL, with objectives and temporalities that may differ. Indeed the original structure of Occitanum (archipelago of territorial innovation labs interacting with the CORE) requests a specific multilevel assessment and tensions might exist between the different levels as objectives and actors differ.

(i) First level - Evaluation of the innovations produced by Occitanum: the digital technologies

Through its OL, Occitanum creates spaces of open-innovation to identify the needs of farmers and to propose digital technologies that can address them, whether they are existing (off-the-shelf) or co-constructed. These technologies are evaluated in real-life conditions for environmental, economic, and social sustainability.

The first level of evaluation in Occitanum therefore concerns the benefits and costs of using the technologies, and their impact on farmers, their production system and their work. Methods include Life Cycle Analysis [6], Cost-Benefit Analysis [7], and, as no methods were relevant [8] a proposed framework for social and human impacts.

Analyses use quantitative and qualitative data collection during test phases conducted in real conditions of use.

Thanks to these evaluations, Occitanum is able to provide information on the efficiency of these innovations, as a means to stimulate the adoption of innovative digital technologies to accompany and accelerate the transition of agriculture and food systems towards greater sustainability and resilience [1].

(ii) Second level - Evaluation of the processes in the Open Labs: the innovative project (i-project)

The second level of evaluation concerns the innovative project (*i-project*) of the OL which are the real ground-working unit of Occitanum. The general process of the *i-projects* is based on the following steps: i) raising farmer's needs, ii) choosing most priority topics, (iii) identifying existing digital innovations or needs for developing new ones, iv) formalizing a contractual framework between the involved actors, v) testing and evaluating (see first level). The CORE of Occitanum has produced a whole set of tools and methods for the OL facilitators, to harmonize the processes occurring in the OL and to accompany them in the different phases of the *i-project*.

Organizational ergonomics [9] is used to understand how groups of actors interact with each other in a specific work environment (here OL) to fulfil a common goal using the tools developed in the CORE. In Occitanum, the first phase of the *i-project* process (emergence of farmer's needs) was particularly challenging for the facilitators and crucial for the following phases. This evaluation phase aim at taking a reflective look at this process through a better understanding of the facilitators' work situations, interactions with the stakeholders and finally to propose relevant supporting tools and methods for the *i-project*.

(iii) Third level - Evaluation of the LL and its societal impacts: fulfilling funders request and help strategic management of the project

The evaluation of Occitanum involves a third approach, which takes place both at the project level and LL level. This project has ambitious goals of achieving a convergence between agroecological and digital transitions while addressing societal challenges such as reducing the environmental impact of agriculture, ensuring consistent incomes for producers, and restoring agriculture's valuable place in society. The LL level evaluation has different objectives, each requiring specific methodologies.

The primary objective of LL evaluation is to demonstrate the positive relationship between funds allocated to the LL and their impacts. To achieve this, our main funder has implemented an evaluation system to provide, through indicators, the necessary metrics for program evaluation. However, this framework is insufficient to understand if the LL organization is generating desirable impacts.

LL evaluation should also serve to pilot the LL itself and be conducted in real-time. ASIRPA^{RT} [4], [10], a real-time assessment tool, is being adapted to LL contexts to help project managers maximize the societal impacts of transformative research. This framework allows formative evaluation and adaptative management. It is designed to help project managers for adjusting the implementation of the program and the projects, and support adaptation in complex and dynamic conditions.

Conclusion

Evaluating a LL structure is far from straightforward. This paper suggests that evaluation of such complex and emerging systems require mobilizing and articulating different tools and approaches. Using Occitanum we provide an original experimentation of an innovative formative evaluation process at different levels and describe some tools. This can serve as a reference for other LL.

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