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What do we learn in a living lab?

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Abstract— Living lab, as a user centric and open innovation approach seems to have the required characteristics to improve individual innovation capability. But does it really? In this study, we introduce and articulate the concepts of living lab, individual innovation capability as well as informal learning evaluation methods, before conducting semi-structured interviews with participants from different living lab workshops that we analysed using a thematic analysis method. This exploratory study allowed us to identify some participants' learning process, as well as some required and developed competences that we classified in six categories: communication skills, collaboration skills, open-mindedness, personal characteristics, knowledge/making skills and project management cognitive skills.

Keywords—living lab, individual innovation capability, soft-skills, learning evaluation

I. INTRODUCTION

During the last decades views on innovation have evolved towards concepts such as co-creation or open innovation [10]; [31]. The latter, mainly stress the importance of collaboration and inclusion of users from early on in the innovation process. In other words, users are regarded as important components to develop innovative products and services. This become even more true with [15] democratisation of innovation, considering all users as capable to take active part in the innovation process. In this context, living labs which are open innovation and user centric approaches, have drawn some attention since the last decade. As a matter of fact, living labs could positively impact citizens' quality of life [11]. Moreover, if they are also thought to reinforce organisational innovation capability [37], their impact on the development of the user as a person, its soft-skills remains quite unexplored. In other words, we do not know yet, if living labs have a positive impact on individuals' innovation capability. Therefore, our research aims at filling this gap by answering the following question: what soft-skills do participants learn in a living lab approach? And are these specific to this particular form of group-work? Answering these questions will allow us to see if Living-Labs are a relevant pedagogical modality to develop soft-skills. We will also be able to construct observation/evaluation grids for these skills in order to measure, in a different way, the impact of the different forms of Living-Labs.

First, we will introduce living labs as a potential environment to help participants develop their innovation capability, then, we will define innovation capability from an individual point of view and how this capability could be evaluated, before presenting findings of semi-structured interviews with living lab participants.

II. LITERATURE REVIEW

A. Living lab impact on participants innovation capability

Living lab is a recent concept that has been described in various ways: as an environment, a system, an approach or a method [5]; [1]; [14]. Here, we consider living labs as open innovation and user centric approaches, which main characteristics are openness, or public private, people partnership (PPPPs), an experimentation in a real environment, and the inclusion of users from early on in the innovation process [5]; [40]. One main challenge for living lab today is the evaluation of its impacts on soft-skills [3]. As a matter of fact, research on the topic is still lacking [34] while the methodological, technical and scientific learnings achieved in these contexts are more widely documented [49]. Moreover, no research dealing with living lab evaluation actually concentrates on individual learning impacts, although users being at the heart of the approach. Hence, we conducted a literature review of publications dealing with both living lab approaches and individual learning or skills. This step revealed some research, mainly on education projects using a living lab approach [2]; [4]; [20]. Nevertheless, these studies do not answer our research question for two reasons: 1. They focus on the approach applied to a specific project, that is, in an education context only, and do not try to generalise living labs impacts on participants. They also tend to focus their evaluation on specific learning objectives. For example, [8] use a living lab approach to evaluate the impact of smartphones on self-directed learning. These studies do not offer a solid evaluation framework to evaluate participants learning. For instance, even if [2] shows living lab as a great learning environment for business students the evaluation of the approach remains quite subjective as it only relies on teachers' appreciation and students' acceptability of and motivation for the course. In the same way, [4] focus on students' enunciation of the potential skills they think they have developed, their evaluation of the project and on teachers' normative evaluation of students' complex problem resolution capability. Moreover, [18] explains how living labs could be used to enhance individuals' innovation skills, especially focusing on e-skills, although no evaluation follows this statement.

What this researcher underlines however, is that living labs seem to have the required characteristics to positively impact on participants' learning, and more specifically could even aim at reinforcing participants capability to innovate [18]. As a matter of fact, living lab characteristics are in line with [17] definition of a perfect environment to develop individual innovation capability, namely an environment that promotes multidisciplinary team projects, includes project management competences and offers the possibility to solve problems and generate ideas (see Fig 1). Therefore, participation in a living

lab process could be thought of as a great way to improve innovative capability of individuals. But does it really? The aim of this study, is hence, to evaluate living labs impacts on participants' learning.

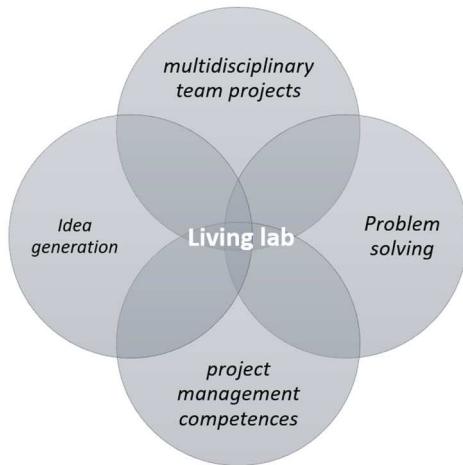


Fig. 1. Link between living lab and ideal environment to develop individual innovation capability. (our research)

B. Individual innovation capability: definition and evaluation

Following previous statement, it seems relevant to first give a definition of individual innovation capability before searching for its evaluation methods. Academic literature contains a large amount of publications from various disciplines, trying to define individual innovation capability, and has particularly gained some interest over the last 20 years [12]. The concept carries various names: individual innovation competence, individual or employee innovation behaviour, individual innovation capability, and has been investigated from various domain, mainly organisational (focusing on employees' innovation behaviour) or educational (focusing on students' innovation capability). The term has long been used interchangeably with "creativity" [38]; [23]; [30]. If the difference between both terms has now been clarified, it is at the root of a division between competences needed for early phases in the innovation process, which are linked to idea generation and hence, creativity, and later phases, which are linked to idea implementation, and are referred as innovation [19]; [30]. A lot of research defines individual innovation competences as a combination of skills, knowledge and aptitudes [47]; [48]; [19]. Some others, however, refer to this same concept as a combination of traits and behaviour [23]; [24]. Edward-Schachter et al. [12] argue that this difference of definition is mainly due to the research adopted theory between trait, behaviourist, or socio-cognitivist theories. In this work, we refer to [17] definition of individual innovation competence, that is: "(...) a set of personal characteristics, knowledge, skills (or abilities) and attitudes that are connected to creating concretised and implemented novelties via collaboration in complex innovation processes." (p. 104). It is also noteworthy that the concept has been described using various categories or dimensions. More precisely, [30] have established that there are mainly two types of categories: those which focus on innovation process phases and those which focus on various subcategories of competences. An example of the first kind is [19] four-dimensional category, namely "exploration, generation, championing and implementation of ideas." An example of the second kind of categorisation is [16] "Personal characteristics, future

orientation, creative thinking skills, social skills, project management skills, knowledge making skills."

Regarding individual innovation capability evaluation, it appears that some tools have been developed. Most of them focus on this capability at work [30]; [24] or in an education context [22]; [25]; [27]. For example, [35] focus on behavioural indicators of individual innovation capability and develop a framework that they consider usable for employees' assessment or self-assessment [30] and [27] realised a thematic analysis, interviewing secondary school teachers to identify indicators for students' innovation competences. Other examples are [25] or [22] questionnaires targeting university students. These last authors also explain how evaluation guides learning [25]; [22]. It is thus important to set learning objectives [21] and to develop self-assessment tools to evaluate individual innovation capability [17]. Moreover, developed evaluation tools still need to be improved. To reach that objective, it is today important to better understand how individuals develop their innovation capability, stressing hence a need to focus on learning process [22]; [47]. Consequently, to better understand how to evaluate living labs impact on participant learning, it seems relevant to better understand what kind of competences are being evaluate and how they can be developed.

C. Informal learning evaluation

This last remark leads us to broaden our research to the evaluation of informal learning. Even if there is no agreed definition of informal learning in the literature, it is usually defined as opposed to formal learning and even to non-formal learning [28]; [32]. According to [32] (p. 389) informal learning assumes the following characteristics: "what distinguishes informal from formal learning is that it is nondidactic, highly collaborative, embedded in meaningful activity, and initiated by the learner's interest or choice (rather than resulting from external demands or requirements) and does not involve assessment external to the activity." Moreover, this learning is context specific [32], and is often linked to learning by doing [39]. Living labs hence, correspond to approaches where participants are expected to develop informal learning.

Consequently, to show what participants could learn in a living lab, one should be able to understand how to evaluate informal learning. Some evaluation models have been developed, for instance to evaluate informal learning in the workplace [13]; [36]; [46]. One general remark is that informal learning assessment mainly uses qualitative methods, such as semi-structured interviews that help people to become conscious of their learning [34]. The concept is in fact, closely related to self-directed learning, which necessitate a reflexion on action [9], thus confirming the need to focus on participants practices and learning process.

III. METHOD

As we already said, this study aims at answering the following question: what soft-skills participants learn when taking part in a living lab approach? To start to answer this question and following recommendations and examples from the previously described literature, we have conducted semi-structured interviews with participants in living lab collaborative sessions. As this study is qualitative and exploratory in nature, we used a data driven method to analyse interviews. More specifically, our study aims at

identifying: 1) what personal competences participants perceive as essential to make a living lab approach successful (inputs); 2) how participants learn (process); 3) what they learn (outputs).

Fifteen participants from four different living lab projects have been recruited and semi-structured interviews based on [45] Explication method have been realised between April 2021 and January 2022. They have been transcribed, anonymised and analysed following [7] protocol for thematic analysis. Seeking to clear the field and to highlight cross-disciplinary skills and processes, we chose to interview people who had taken part in various forms of living labs (lasting from one day to several months; face-to-face or online, with different degrees of autonomy left to the participants, etc.) and on different themes (education, sustainable development, climate, forestry sector).

IV. FIRST FINDINGS

Our interviews enabled us to identify three main themes, which are the elements on which their reflection focused, namely: group dynamic, organisation and facilitation, and participants' individual behaviour

A. Group dynamic

First, during interviews, participants reflected on group dynamics. For example, one participant said *"if someone speaks all the time and speaks to themselves, if there is no real exchange, I think it is not good. But it was not the case here, no one said things should be done like this or that."* And another: *"No, everyone has participated, everyone has given their ideas, we all have collaborated."* Both examples show how group dynamic positively impacted their collaborative work.

Some other reflections on group dynamic implied questioning and comparison with other groups, for instance when a participant realises that her group could have taken another direction: *"(...) but then, when I heard the first group, I thought we could actually have worked... I was rather focused on the idea to develop the seminar content, but again, this was not what we have been asked to do."*; or when group interactions make a participant reflect on his-self: *"it was actually very instructive to see again these interactions, which made me think again that in my profession we have to deal with various profiles."*

Tensions due to hierarchical or power positions have also been subject of reflexion. For example, a participant said about a teacher working with students during the living lab session: *"we could clearly feel that teachers had a higher status of knowers, and I tried to have this vision (of an egalitarian collaboration)." This last point informs us about the participant's awareness of group tension and a willingness to solve it.*

B. Organisation and facilitation

A second category of learning process relates to participants' reflection on facilitators' behaviour and more generally on the sessions' organisation. In some cases, participants analysed facilitators behaviour and criticised or were surprised by their way of doing things. For example, one participant stresses out the need for facilitators to clarify sessions goals and guide participants throughout the workshop: *"at first, we did not clearly understand what was expected from us, and then, I don't remember his name (...) came to explain us once more what we had to do, and it was*

complicated because we had thought that we had to say what to do during the week."

Then, some comments were more generally based on sessions organisation, following the same model of positive and negative criticism. For example, one participant expressed how the session could have been improved: *"And so I had already taken part in things in line with open democracy or about things implying new technologies. I have found that some... intermixing was missing, I don't know how to say... there is often a system that allow people to present in few words their project and offer them the opportunity to take part in different... they have some initiatives."* here the participant explains how to create a more favourable environment for the session by comparing it with some previous similar experiences.

C. Participants' individual behaviour

More often however, interviewees reflected on participants' individual behaviour, that is on their own as well as other participants' behaviour. For example, one interviewee was surprised to see that a student from her group could do a great presentation of the group ideas: *"she volunteered to do the restitution. It was very brave, yes it was great! Well, I would have done it, but I would not have done it so well, honestly (...) she used all post-it that she calmly commented without forgetting anything from what we said."* Some other criticised what others did and, hence, identified what behaviours should be avoided in living lab collaborations: *"teachers had questions that I have found very academic. There were no open questions, they were rather waiting for students to give the correct answer."*

Finally, for some participants, this reflection also allowed them to reflect on themselves. One interviewee explained that younger participants, who were not familiar with the project topic, had to read some documents that they could not understand, when she took only few minutes to skim through them. This observation led her to the following conclusions: *"that nothing replaces experience" and "it confirms me that I did not make any mistake regarding my choices in terms of studies (...)"* Hence, less experienced participants acted as a mirror for the interviewee, enabling her to assess the progress made and confirm her past choices.

4.2. Learning inputs

This analysis of participants' learning process has made it possible to enlist some required individual competences to succeed with a living lab approach from their perspective. 17 competences have been identified as relevant. Among those, "listening skills", "knowledge of participants and their environment", "ability to make and let others speak"; "openness to others' ideas", and "ability to ask relevant questions" have been defined as prerequisite skills, knowledge and aptitudes by most participants. They have been cited more often (more than 20 times) by all participants compared to other competences. For example: "listening skills" has been cited by 12 participants out of 15 and appears 27 times in total. Then, we have classified all competences in six categories, namely: 1) knowledge and technical skills, 2) communication skills, 3) collaborative skills, 4) open mindedness, 5) personal characteristics and 6) project management skills. Fig. 2 shows these general competences and their most cited related sub-competences.

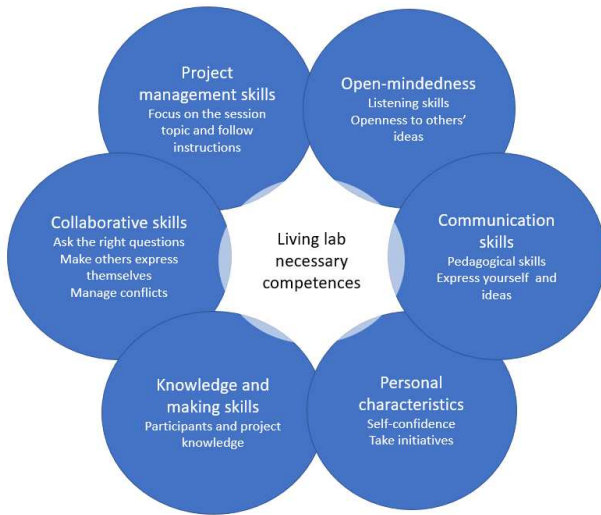


Fig. 2. Living lab main individual required competences from a participant point of view. (our research)

4.3. Learning outcomes

Furthermore, focusing on participants learning process also allowed them to express some learning outcomes. Here as well, we quantified and classified them according to our six-dimensional classification. Most cited learning concern methods and tools, open mindedness, a new way to work with a team, and a need to further consider users' needs. Other competences appear in Fig. 3. For example, presentation skills, self-confidence and self-awareness, or information searching skills.

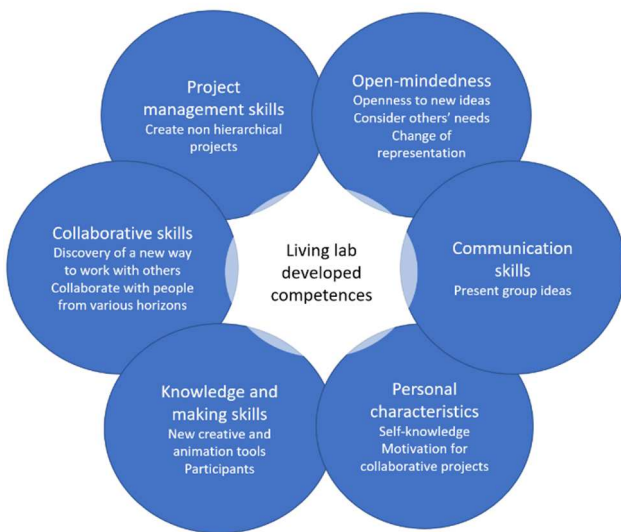


Fig. 3. Living lab main individual developed competences from a participant point of view. (our research)

V. Discussion

One first and general remark is that it is difficult to determine and, not surprisingly difficult for participants to express what has been learned during the living lab session. This is a recurring problem as one main challenge with informal learning as it has no proper beginning nor end, and as the activity main objective is not learning [42]. One great example of this difficulty in the present research is the question “what have you learned during this living lab session?” that has been asked at the beginning of each

interview and which let some participants with the impression that they have not learned anything (5 participants out of 15). Nevertheless, investigating participants' practices and focusing on their learning process allow us to identify some learning outcomes as well as a description of necessary competences that could be used as an evaluation framework.

Moreover, a notable difference seems to appear between “novices” and “experts”, that is, participants familiar with living lab or other similar collaborative and creative approaches and those who discovered the method. For example, there is a need for participants who master creativity methods to guide others for whom the method may be new. Following participants reflection on group dynamic: a participant also compared her group results with others and explained that other groups had better results because they had experts with required methods in their team. Expertise has also been stressed as important to guide and manage the collaboration or even as regarded the topic of the project to facilitate idea generation and group communication. Only one participant however, pointed out that having novices, especially in terms of project topic knowledge could favour new idea generation and even spontaneity. In this respect, peer learning could be seen as a way to develop living lab learning and enable everyone to take part in such a collaborative approach. Indeed, peer learning processes are proven to enhance participants transferable, and more specifically social skills [43]. These points also raise some questions, namely regarding required competences level: what level of living lab required competences is needed for an individual to be successful with a living lab approach? And from a group perspective: how many “experts” are needed for the group to increase its innovation capability?

Another relevant point that needs further investigation is the different dynamics and intervention mode of facilitators and their influence on participants' learning process. For example, during its interview a participant greatly reflected and learned from the facilitator's technique, whereas in other interviews, participants mainly reported learning from group dynamics and concentrated less on facilitators when expressing their learning. Having observed all different workshops, it appears that the facilitator in this first interviewee's group was very present. For example, he played a role of translator, and sat directly at the participants' table, which was not the case in other observed workshops. One possible explanation could hence, be this difference in terms of facilitator's intervention mode.

Consequently, whether these competences have been analysed from group dynamics, facilitators (organisation) or from participants behaviours could possibly depend on: participants' level of competences and of facilitation model, that is, whether the facilitator plays an active role during the collaboration. We recognise however, that the link between expressed competences (inputs or outcomes) and process thematic (group dynamic, facilitators and organisation or participant individual behaviour) needs to be strengthened. For example, would it be possible to create categories of participants according to the way (the element of reflection) they develop their competences? Or even to link categories of required and developed competences to specific ways of learning?

Finally, our findings on participants' learning process show that some competences could have been developed during this collaborative work. However, even if interviewers have been very careful to ensure that participants related to previous experiences such as when asking “is it something you

have done before?”, “is it a method you are familiar with?”, “are you used to working like this, with people from various horizons”, more evaluation is needed, and especially self-assessment tools, as suggested by [17] to determine and compare participants’ level of competences before and after the session.

VI. Conclusion

This study is a first step towards living lab evaluation in terms of participants soft-skills learning. We have put living labs in perspective with individual innovation capability and showed that the approach could be a great learning environment for participants to become more innovative individuals. By conducting semi-structured interviews, we have shown different themes of reflection, which could be seen as ways for participants to learn, namely: reflection on group dynamic, on facilitators behaviour and session organisation, and on participants’ individual behaviour. This exploration allowed us to extract and categorise required competences: communication skills, collaboration skills, open-mindedness, personal characteristics, and knowledge and technical skills, as well as some developed competences. In fact, interviewees mainly mentioned having learned from themselves, from new methods or techniques. These findings invite us to further investigate on participants’ required level of competences to be efficient in a living lab, as well as to compare the soft-skills developed through Living-Lab approaches and those acquired during other group-work.

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