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Stakeholders' Perception in Early Stages of a Social Housing Retrofit Living Lab

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Abstract. Living Labs (LLs) are social and dynamic environments that allow the development of innovative solutions through intense collaboration and co-creation. In social housing (SH), retrofit initiatives usually consist of top-down approaches, with residents often playing a secondary role in such projects. The use of LLs in SH projects can improve retrofit outcomes through the development of adequate and fit for purpose solutions, co-created with stakeholders. Whereas existing research on LLs reports successful developments in several areas, research findings are often fragmented. They lack an in-depth discussion on the benefits and limitations, as well as how different stakeholders engage in the LLs. This paper aims to discuss stakeholders' perceptions in the early stages of a SH retrofit LL in the UK, focused on improving the energy efficiency of 8 dwellings. We conducted a series of semi-structured interviews with stakeholders involved in the LL (e.g. residents, retrofit coordinator, architects, among others). Findings highlight difficulties associated with the LL initiation, partially due to communication problems and lack of alignment, but also because of intrinsic behavioural, institutional, and technical issues related to construction projects. Results suggest that collaboration is needed in LLs not only to co-create solutions but also to develop the LL itself.

1. Introduction

Living Labs (LLs) consist of user-centred initiatives that focus on the collaborative development of creative solutions in a real-world context [1]. In a LL environment, users and other stakeholders collaborate directly through co-creation activities across all its phases [2,3]. Therefore, their willingness to engage in LL activities influences the development of these projects, as well is fundamental to value generation [4,5]. In fact, existing research highlights that end-users' interactions are intrinsic to LLs [2,5–8], whereas their focus on strengthening collaboration and participatory methods is key to achieve social innovation [9,10].

Social Housing (SH) initiatives usually consist of top-down approaches [11], in which key project drivers and requirements might not be directly defined according to real end-users' needs. This process can lead to a disconnection between housing provision and value generation, compromising the outcome of these projects [12], as well as impacting on the quality of life and wellbeing of residents [13,14]. The use of LLs to support improving SH outcomes has been explored by existing research as a means to shift from traditional top-down initiatives to bottom-up approaches, with a strong focus on end-users (i.e. residents) [15]. This is especially relevant in retrofit projects, as motivations can be varied and

influenced by cultural and social evolutions, evolving comfort needs and standards, as well as the emergence of new housing systems and technologies [11].
Despite reporting on successful outcomes, research findings related to LLs are often fragmented, which might compromise their further application on new initiatives. They usually lack an in-depth discussion of the benefits and limitations of the LLs, as well as how different stakeholders systematically engage in the process. As highlighted above, ensuring that all LL participants are motivated and willing to collaborate during all its phases is essential to successful outcomes. However, there are few reports of their perceptions across the LL process and specifically focused at early stages, which are fundamental to develop meaningful relationships and trust, as well as to create common ground [16].

This paper aims to discuss stakeholders' perceptions during the early stages of a SH retrofit LL in the UK. It reports preliminary findings from interviews developed during the first step (i.e., understanding phase) of an ongoing LL located in West Yorkshire (UK) focused on the retrofit of 8 dwellings aiming to improve their energy efficiency. This work is part of a larger research effort called User-Valued Innovations for Social Housing Upgrades via Trans-Atlantic Living Labs (uVITAL). This initiative brings together institutions from Brazil, England, Germany, and the Netherlands to collaborate on user-valued solutions for social housing upgrades via Living Labs. The paper is structured as follows: after the introduction, the theoretical background associated with the paper is presented by discussing the underlying concept of Living Labs, as well as by highlighting the important role of stakeholders' engagement in this process. Thereafter the research design is described, followed by a discussion on the key findings which have been structured around the main topics emerging from the interviews. The final remarks are presented at the end of the paper, summarising findings, and discussing the way forward of the Living Lab.

2. Theoretical Background

2.1. Conceptual definition of Living Labs

LLs can be generally understood as systems that include tools, processes, and approaches to create innovative environments that are centred on real-world users [17]. Existing literature acknowledges that there are several definitions and understandings for LLs [5,18,19], and therefore, the implemented methodologies are highly diverse, as are the modalities of users' engagement in the co-creation process [20].

The different conceptualisations of LLs are usually built on the principles of user involvement, knowledge sharing, collaboration, and experimentation in open real-world settings [2,6–8,17]. As end-users and stakeholders actively participate in the LL process, their real needs and values can be fully addressed [8] whereas the process transparency enables the development of an environment that fully supports co-creation [3,16]

LLs enable the development of innovative solutions through collective efforts from the different actors that participate or are influenced by this process [21,22]. This allows the development of collaborative learning among the multiple actors involved in the LL, including, for instance, end-users, public and commercial organisations, financiers, and regulators [3,7].

Even though LLs share similar conceptual aspects, they are implemented in multiple ways in practice [23]. When used as a methodology, they are often structured similarly to a design process under an iterative way, with initial stages around identifying and understanding requirements, co-design, prototyping and evaluation and refinement e.g. [2,18].

Different principles should be part of LLs implementation to ensure achieving their aim, such as those pinpointed by Thees *et al.* (2020, p. 14) [24]: (1) the innovation process should be as open as possible, (2) users should play a key role, (3) community interactions should be meaningful and sustainable, (4) should be in a human-centric setting that provides space for empathy but also (5) for observation and analysis, and (6) to provide an adequate technological infrastructure that assists all lab processes. These principles highlight the importance of engaging and motivating the different

stakeholders who are part of LLs across the process, as they have an impact on the development of relationships between these actors and ultimately affect collaboration and co-creation activities [25].

2.2. Stakeholders' Engagement in Living Labs

LLs foster collaborative learning among the different actors which are part of these initiatives [3]. A key LL characteristic that has been highlighted in housing cases is that it enables the active involvement of residents from early planning stages [26]. The early involvement of end-users in LLs is actually acknowledged to minimise risks in LLs, as there is an increased likelihood to effectively fulfil customers' needs [27].

In fact, multiple studies reporting LL cases highlight the importance of engaging and motivating stakeholders right at the outset of these initiatives due to their fundamental role in the development of a collaborative and focused group of actors e.g. [28,29]. As such commitment is often unformalized, Claude *et al.* (2017) [30] suggest that in addition to their collective interest, participants also need to be personally involved and related to the process. Unfortunately, this is often not the case in most of LL cases, as deeply motivated participants who can personally relate to the subject are often not a representative sample of the population as a whole [28].

While analysing the LL case reported in [31], the referred authors acknowledge that outcomes could have been improved and acceptance would have been greater if residents were more actively involved in all stages of decision-making and production, even though this could have led to an increase in the overall duration of the LL. Zimmerling *et al.* (2017) [27] highlight that such early end-user involvement might be hindered due to the organisations' disbelief in the benefits of such integration, as they often rely on end-users to evaluate products and innovations. The referred authors argue this is generally not the case of research institutes, as the benefits emerging from their integration are more easily acknowledged by organisations.

Despite the importance of stakeholders' engagement in LLs, as reported by the literature multiple factors can influence and impact this process, ranging from political and organisational issues (such as the example from [27] above) to personal and cultural attributes [30]. It is evident that acknowledging stakeholders' perception during the LL is an important activity, which can positively impact their motivation, as well as increase empowerment [24,26] – ultimately contributing to the success of a LL. As highlighted above, this process might be especially relevant during early LL stages, as there are important links with users' needs and value generation, team formation, initiation, and the development of key meaningful and trustful relationships, as well as the development of common ground and shared understanding among the LL participants.

3. Research Design

As discussed in the previous section, LLs can be understood as an umbrella concept-methodology, combining many forms of research methods, including traditional and ICT-enabled approaches [2,8]. The methodological understanding of LLs highlights the use of user-centred approaches to collaboratively develop and validate innovations in real environments [6].

The context in which this paper is developed consists of an ongoing LL situated in West Yorkshire (UK) and is related to the retrofit of 8 social housing terraced dwellings. The focus of this LL is to explore how social innovations can be achieved in relation to users' values by using this approach. From a methodological perspective, the LL process has been structured based on the major steps proposed by [2,18], and including four key and common steps as highlighted by [19] (i.e. (i) understanding; (ii) ideation; (iii) co-creation; and (iv) evaluation) which are organised iteratively according to insight, innovation and feedback phases. As this paper is reporting on the first step of the Living Lab process (i.e., understanding), the remaining phases and activities will not be presented (the reader is strongly encouraged to access the complementary paper published in the conference proceedings entitled "Social Housing Retrofit Living Lab: Methodological Approach"). Nevertheless, a broader and more comprehensive understanding of the LL is beneficial as it aids fully understanding the context in which the LL is developed, its characteristics and planned activities.

During the first step (i.e., understanding), a series of interviews are under development with the aim of better defining users' and stakeholders' requirements and values that will support further stages of the LL. This process is illustrated in Figure 1, which consists of a detailed representation of this specific step, highlighting the role of the interviews in the LL case. Four interviews with stakeholders were developed up to date, they were voice-recorded and followed a semi-structured protocol which was adjusted according to their role in the project. The protocol was structured around topics such as: (i) stakeholders' involvement and role in the project; (ii) communication with other stakeholders; (iii) strategies to support end-user involvement; and (iv) stakeholders' empowerment.

The interviews that supported the development of the paper correspond to: 2 interviews with the project manager, 1 interview with the retrofit coordinator and 1 interview with the lead architectural designer. Interview participants have been selected as they are part of the retrofit project and, therefore, are also involved in the Living Lab. From the 8 households which are involved in the project, 6 have agreed to participate in the LL whereas 3 interviews with residents have been developed up to date. Immediately after the interviews, researchers' notes were incorporated into a database to support a preliminary analysis and definition of key constructs to be explored during the preliminary coding process.

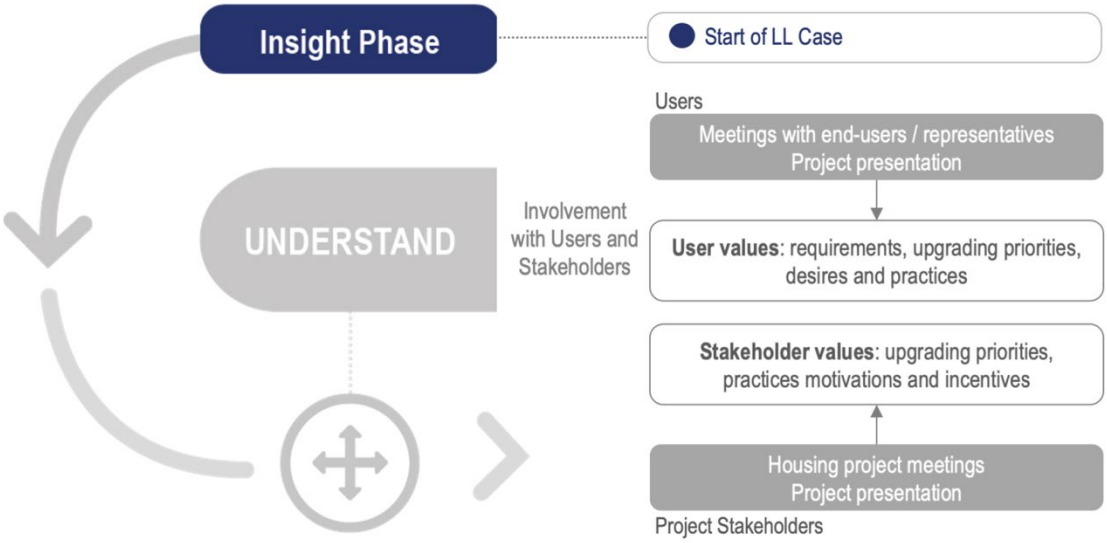

Figure 1. Detailed representation of the research process

Preliminary findings of the interview analysis developed so far during the 'understanding' stage are reported in this paper. They highlight the users' and stakeholders' perceptions at the early stages of this specific LL case. This initial qualitative analysis was developed with support of the notes stored in a database, as well through an initial coding process developed in NVivo 20. It supported acknowledging key topics observed during the interviews, which can help to draw 'preliminary connections' from a methodological perspective [32], and is one of the first steps in reviewing data for qualitative analysis. This process will also further support the development of a more robust coding process [33].

4. Findings

The main findings reported in this paper relate to the users' and stakeholders' perceptions emerging after the interviewing process at early stages of the SH retrofit LL. This section has been structured according to key constructs identified in the literature review, as well as important topics discussed during the interviews in relation to the LL case (i.e. communication; motivation and engagement; alignment of expectations; users' empowerment; and project constraints).

4.1. Communication

During the early stages of the project, there were still many Covid-19 related restrictions in place in the UK, and residents were informed that communication would be made through a tablet device that should be provided by the local authority. As there was a delay in purchasing and providing these devices, residents highlighted that communication was insufficient and they felt less motivated to participate in the process. This situation also introduced a sense of dissatisfaction between some of the residents, as they felt it hindered the development of adequate communication and data sharing channels with them.

Whereas communication with residents has been challenging, happening mostly through letter announcements, other stakeholders involved in the project were more easily contacted. The use of online video calls, emails and storage systems supported exchanging files, conducting meetings and interviews. This process was facilitated to some extent by the switch to remote working and the widespread use of online resources and platforms emerging due to Covid-19. Nevertheless, the research team perceived a better response and more adequate project planning and progress tracking associated with video calls and group meetings in contrast to emails and instant messaging applications.

4.2. Motivation and Engagement

Despite the communication challenges, end-users expressed they were highly motivated with the project and expected outcomes to be exceptional, as they would improve both aesthetic and functional aspects of their homes, impacting their quality of life as well as on the dwellings' appearance. During the interviews, residents mentioned they felt honoured to take part in the project, as due to the benefits that will be achieved upon its completion, there is an increasing interest manifesting across the local neighbourhood with other residents expressing their desire of taking part in similar initiatives. Key factors that contributed to increasing residents' motivation at early stages are mostly related to the potential of achieving a great improvement on the dwellings' appearance (aesthetics), the opportunity to address sustainable and more cost-efficient systems and solutions (function), as well as the feeling of being privileged and acknowledgement on taking part of the project.

Notwithstanding their motivation, early engagement might have been compromised to some extent due to communication issues. According to the retrofit coordinator, user's engagement is a significant factor that helps the execution of construction projects, whereas it is well acknowledged by the literature e.g., [4,17,28] that personal interactions are needed to develop common ground and trustful connections. In this context, the external factors that constrained early project stages might have potentially jeopardised the development of such relationships and impacted engagement during early LL stages. As face-to-face meetings could not occur at the beginning of the project, there were difficulties in engaging with stakeholders in general and residents in particular.

4.3. Alignment of Expectations

During the early stages of Living Labs, the different stakeholders who are involved in the project typically undergo a series of activities to better define the context and scope of such initiatives. Their main purpose is to support the development of trustful and meaningful relationships as well as to create common ground and shared understanding between the different people and organisations involved in the project [16]. As part of this 'setup', an important element relates to aligning expectations between those involved in the LL, and how the different perceptions of the problem being addressed contribute to exchange and co-create ideas, mitigate risks and reveal hidden agendas [3,4].

During the interviews, stakeholders highlighted they would expect different inputs from those involved in the LL according to the topics being discussed. They also indicated their participation in the project was expanding beyond their original scope, highlighting an extension of their original 'roles' due to the Living Lab interactions. These topics are well aligned with the overall purposes of the LLs and highlight specific characteristics of these dynamic environments observed in practice.

Stakeholders also expressed that some decision-making in the project might not be completely open for discussion with all those involved in the LL, such as topics related to project budget and major scope of the retrofit works. In a way, these aspects highlight an imbalance of power among stakeholders, as it

is often observed in construction projects, and do not entirely fit within the Living Lab approach. In the context reported in this paper, there is an emerging need to understand and explore LLs as a flexible approach, in which the clear definition of scopes and responsibilities as well as the alignment of expectations is fundamental towards successful outcomes.

4.4. Users' Empowerment

As presented in the literature review, LLs are centred on end-users' needs and inputs, with their engagement being fundamental in the course of these initiatives. Therefore, ensuring that users feel empowered and that their voice is heard contribute not only in terms of improving motivation and engagement but also supports co-creation, collaboration and innovation [26].

During the interviews, residents mentioned that despite communication issues, they were consulted multiple times so far in the project and they felt like an important part of it. In fact, during the interviews with stakeholders, a key project driver was mentioned as related to ensuring that residents' needs, and insights were properly incorporated in the project as early as in scope and definition. As discussed above, stakeholders highlighted that not all LL participants would be consulted in all project decisions, but they indicated that residents would be prioritised whenever possible (especially during early stages).

In the interviews, residents expressed their motivation was also influenced by the potential improvements on the building envelope, regarding the aesthetics and appearance of their homes. Because of the importance attributed by end-users to this subject, it was defined they would be able to choose between different colours for façade elements in their houses, according to their preference. This highlights and provides a practical example of how strategies can be drawn from early stages in LLs aiming to foster user's empowerment and, consequently, improve their motivation and engagement in the process.

4.5. Retrofit Project Constraints

As the LL initiative presented in this paper consists of a construction project (retrofit), there are many constraints typical of this type of endeavour that might affect and influence the process. During the interviews, the design team mentioned that some of the needed changes expressed by the residents could not be implemented as part of the project due to cost and programme constraints. Additionally, as the project consists of a retrofit, it is expected that some level of disruption will affect the residents' daily lives, and eventual mitigation strategies might be put in place according to the profile of each household (e.g. due to special medical needs).

During the project early stages, multiple site visits were conducted with the aim of better understanding users' needs and to assess the key needed improvements in the dwellings from a technical perspective (e.g. thermographic surveys and technical reports). These activities, while typical of construction projects, support gathering information to feed further LL stages, as well as to eventually mediate emerging conflicting requirements and opinions.

Covid-19 had a large impact on the retrofit project, especially from (i) the communication perspective as discussed above, affecting engagement, and having a negative effect on the LL process; as well as from (ii) a programme perspective, which led to multiple delays and supply chain issues due to lockdowns and other social distancing restrictions. Regardless of the Covid-19 pandemic, the project manager mentioned at a very early stage that delivering the project on time was challenging due to the complexity of the dwellings to be retrofitted. This is also due to the fact this LL is developed within a pilot project which might be extended to the broader housing estate, leading to uncertainty in relation to costs, duration, and satisfaction.

5. Final Remarks

The analysis reported in this paper provides evidence that understanding the characteristics of LLs from the start, in terms of how stakeholders, researchers and end-users communicate and engage with each

other is fundamental to support the development of the following stages through co-creation. As discussed by the literature, each LL is unique, impacting the way participants develop relationships, exchange ideas and opinions, collaborate and discuss towards a problem resolution.

The challenges described in the previous section relate to the initiation and early stages of a Social Housing retrofit Living Lab in the UK, and they demonstrate the importance of having clear and efficient communication strategies defined from the very beginning of these initiatives. Whereas Covid-19 introduced a series of difficulties in establishing adequate communication among the LL participants, its impacts on motivation, engagement and empowerment are noteworthy. Existing literature acknowledges that early stages are fundamental in LL initiatives because during their course participants get to know each other, understanding their role in the process, creating common ground, and expressing their needs towards the co-creation of a solution.

Findings presented in this paper, reporting on different participants' perceptions during the early stages of a LL demonstrate that the main difficulties and challenges observed in practice associated with the LL initiation are partially due to communication problems arising from Covid-19 and lack of alignment between stakeholders, but also because of intrinsic behavioural, institutional, and technical issues related to construction projects. The examples discussed in the findings section synthesise these challenges and their influence in the LL process, identifying key aspects which were successful so far, as well as highlighting improvement opportunities to be explored in the following stages of this initiative and in future LLs. This reasoning suggests that collaboration between all participants is needed in LLs not only to co-create solutions to a specific problem but also to develop the LL itself, designing its stages and which activities shall be developed.

From a Living Lab perspective, some of the future activities associated with this study will be undertaken in a retrospective way, which consists of a limitation of the research. Such strategy was required because of incompatibilities between the programmes of the original retrofit project and the LL (also affected by Covid-19). Nevertheless, since this project consists of a pilot initiative which might be further expanded to the broader housing estate, lessons learned in the LL so far and reported in this paper (especially during early stages) shall provide support to future endeavours in this context, as well as to other projects exploring LLs in the construction domain.

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