

---

## Theorizing Living Lab research: The way forward

---

### Abdolrasoul Habibipour\*

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [abdolrasoul.habibipour@ltu.se](mailto:abdolrasoul.habibipour@ltu.se)

### Yomn Elmistikawy

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [yomn.elmistikawy@ltu.se](mailto:yomn.elmistikawy@ltu.se)

### Anna Ståhlbröst

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [anna.stahlbrost@ltu.se](mailto:anna.stahlbrost@ltu.se)

### Mari Runardotter

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [mari.runardotter@ltu.se](mailto:mari.runardotter@ltu.se)

### Diana Chronéer

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [diana.chroneer@ltu.se](mailto:diana.chroneer@ltu.se)

### Johanna Lindberg

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [johanna.lindberg@ltu.se](mailto:johanna.lindberg@ltu.se)

### Jennie Gelter

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [jennie.gelter@ltu.se](mailto:jennie.gelter@ltu.se)

### Shaghayegh Shirkhani

Luleå University of Technology, 971 87 Luleå, Sweden.  
E-mail: [shaghayegh.shirkhani@ltu.se](mailto:shaghayegh.shirkhani@ltu.se)

\* Corresponding author

#### Abstract:

Living Labs have become a popular approach to facilitate multi-stakeholder engagement in open innovation processes in real-life settings. Despite their extensive application across various research fields, there is still a lack of theoretical understanding in this area. This study aims to take the first step towards developing a theory for Living Labs. In doing so, we will review the current state of the art of Living Lab theories as well as identify areas where

further theoretical support is required. To achieve this, grounded theory will be used as the overarching approach to rigorously review literature. The outcome of this research will be a taxonomy of Living Lab theories, classified according to the emerged themes from grounded theory analysis. Additionally, the study will identify areas where Living Lab research needs to be theorized to support both researchers and practitioners in this area.

**Keywords:** Living Lab; Theorizing; Literature review; Grounded theory, citizen science.

---

## 1 Introduction

Living Labs are one of the most well-known approaches that aim to facilitate multi-stakeholder engagement in open innovation processes in real life setting (Bergvall-Kareborn and Stahlbrost, 2009; Leminen et al., 2012; Schuurman, 2015). Various researchers from different disciplines have touched upon Living Lab studies, including but not limited to information systems, innovation management, business administration, product and service design, marketing and so forth. This diversity had led to applying and adapting several theories to support Living Lab research. Examples of applied theories in Living Lab research are socio-technical systems theory, actor network theory, design thinking, technology acceptance model, technology-organization-environment theory, and many more. Despite this, there is a dearth of research on theoretical understandings of Living Lab research, and further study is required on this topic (Hossain et al., 2019; Schuurman et al., 2015).

Accordingly, the overarching aim for this study is to develop a theory for Living Labs that can guide future research and practice in the field. As the first step of this goal, this research-in-progress aims to review the current state of the art of Living Lab theories (i.e., what theories are often used by Living Lab researchers), and the way forward (i.e., what kind of theories or theoretical support are needed by researchers and practitioners). To achieve this goal, grounded theory is used as the overarching approach for rigorously reviewing literature (Wolfswinkel et al., 2013), which leads to more integrated and fruitful theory emergence, and enriches Living Lab research fields. Even though grounded theory mostly deals with empirical data, but it can be a suitable approach for the early stages of theory development, using available literature as the data, and several studies have adopted this approach (Wolfswinkel et al., 2013). The grounded theory literature review method is then supported by a comprehensive concept centric literature review methodology, as outlined by Webster and Watson (Webster and Watson, 2002). The outcome of this research will be a taxonomy of Living Lab theories, according to the emerged themes from grounded theory analysis, as well as identifying areas that Living Lab research needs to be theorized to support both researchers and practitioners within this area. The article will also specifically investigate how the achieved theoretical understanding can be put into practical use by Living Lab practitioners, for example for developing future Living Lab guidelines for stakeholder engagement, co-creation, real-life experimentation, and so on. A research agenda for future steps towards the goal of this study is also outlined.

## **2 Current understanding**

One application of living labs is in the field of citizen science (Veeckman and Temmerman, 2021). Citizen science refers to the active participation of the public in scientific research activities, typically through crowdsourcing, data collection, and analysis (Silvertown, 2009). Living labs can provide a unique platform for citizen science projects, enabling citizens to participate in the research process in a collaborative and experiential manner science (Veeckman and Temmerman, 2021). For example, a living lab activity which is focused on environmental sustainability could engage citizens in monitoring air quality or water pollution levels, collecting and analyzing data using sensors and other tools. This type of citizen science project not only generates valuable data for scientific research but also promotes public awareness and engagement in environmental issues. By combining living labs and citizen science, we can create innovative solutions that are both scientifically rigorous and socially responsible (Fraisl et al., 2022).

Thus far, Living Lab research has been more practically than theoretically based. According to the literature review of the top cited Living Lab articles by Schuurman and his colleagues (Schuurman et al., 2015), 18 out of 45 papers had no theoretical framework. This is because literature in Living Labs largely covers project descriptions and case studies using Living Lab approach, as well as, focusing on Living Labs as the subject of the research (Hossain et al., 2019; Leminen et al., 2012; Schuurman, 2015). On the other hand, papers that implicitly or explicitly had a theoretical framework have primarily made use of theory from open innovation, user innovation (Hossain et al., 2019; Schuurman, 2015), and participatory design (Bergvall-Kareborn and Stahlbrost, 2009), as well as other theories including role theory, technology acceptance model, actor network theory, stakeholder theory, and many more. However, even though Living Labs is a multi-disciplinary phenomenon with use in smart city, healthcare, community, and sustainability applications (Hossain et al., 2019), typically Living Lab literature relied on open innovation, user innovation, and participatory design. This indicates a potential opportunity to investigate theories from other disciplines or developing theories for the Living Lab discipline.

Instead of focusing on open innovation, user innovation, and participatory design, the paper aims to delve beyond these three disciplines. It will take a multidisciplinary perspective to identify the theories most used in its literature. This would enable the identification of possible theory gaps, that need to be filled by existing theories or by developing new theories.

## **3 Research questions**

As stated, this research-in-progress is the first step towards developing a new theory for Living Labs that can guide future research and practice in the field. To achieve this aim, the study will address the following research questions:

RQ1: What is the current state of the art regarding theories in Living Lab research?

RQ2: What kinds of theories or theoretical support are needed by Living Lab researchers and practitioners?

By addressing these research questions, the study will develop a comprehensive understanding of the existing theories in Living Lab research, as well as identify the gaps

and limitations in the current theoretical frameworks. Based on these findings, the study will generate a new theory for Living Labs that can provide a more robust and holistic understanding of the field. This new theory will be grounded in insights from Living Lab researchers and practitioners, and will have both theoretical and practical implications for the design and implementation of Living Lab projects and activities.

#### 4 Research design

In an overarching level, this study uses grounded theory as a method for rigorously reviewing literature (Wolfswinkel et al., 2013). In so doing, a set of well selected scientific articles constitutes the data to explore in order to extract the relevant 'selections' for generating the theory corresponding to the grounded theory method. To extract the relevant pool of articles, a concept centric literature review approach will be followed, as outlined by Webster and Watson (Webster and Watson, 2002).

Accordingly, the literature review process starts by identifying the core journals and conferences in Living Lab research and a manual table of contents search will be done. Afterwards, the three online databases (namely, Google Scholar, Scopus and Web of Science) will be used to extract more relevant article. Finally, backward and forward citation analysis based on Webster and Watson's (Webster and Watson, 2002) recommendation will be conducted.

#### 5 Results

According to the first round of manual literature search as explained in the methodology section, and to start with, 31 Living Lab articles have been explored to get an overview of the most common used theories. The backward and forward citation then applied which resulted in 28 more articles. In total, so far, 59 articles are investigated. The articles that have not used or stated any specific theory were excluded from the review. According to the preliminary results, various theories have been used by Living Lab researchers which can be summarized in table 1.

**Table 1** summary of preliminary results

<i>Theory name</i>	<i>Number of articles applied the theory</i>
<i>Socio-technical systems theory</i>	6
<i>Participatory design</i>	5
<i>Stakeholder theory</i>	4
<i>Actor-network theory</i>	3
<i>Technology-organization-environment theory (TOE)</i>	3
<i>Innovation diffusion theory</i>	3
<i>Technology Acceptance Model</i>	3
<i>Open innovation</i>	3

<i>Public sector innovation theory</i>	2
<i>Social innovation theory</i>	2
<i>Social practice theory</i>	2
<i>Self-determination Theory Role theory</i>	2
<i>Expectation Confirmation Theory</i>	2
<i>Organizational dynamics theory</i>	2
<i>Corporate Governance theory</i>	2
<i>Theory of Planned Behavior</i>	2
<i>Transitions Theory</i>	2
<i>Other theories</i>	11
<b><i>Total scanned article</i></b>	<b>59</b>

These findings are preliminary as this research is still in progress. The results will then be carefully examined following grounded theory literature search and analysis.

## 5 Contribution

The theory perspective adopted in this literature review differs from existing Living Lab literature reviews. For instance, in (Schuurman et al., 2015) Schuurman and colleagues have discussed the lack of theoretical foundation in Living Lab literature, but mostly focused further on the use of two innovation theories (i.e., open innovation, user innovation). Other literature reviews focused on Living Labs in specific fields, such as healthcare, social sciences, marketing, etc. However, this research's aim to uncover the state-of-the-art in the use of theories in Living Lab research would enable researchers to see how theories have been used thus far and help them discover opportunities for next-generation theorizing in Living Lab research. As explained by Burton-Jones et al. (Burton-Jones et al., 2021), researchers could then use the existing theories covered in the literature review in studying Living Lab phenomena. They could reformulate the theory to offer new insights about existing Living Lab phenomena, or they could extend the theory to explain and reveal new phenomena. They could also use the literature review as a point of departure, where they identify areas that lack theories. They could then replace existing theories with new ones that better suit the existing Living Lab phenomena, or they could envision new theories that leads to producing new phenomena.

## 6 Practical implications

This paper will enable practitioners to put a name (i.e., a theory) to the experience and tacit knowledge they have, as they might already be using a theory to some extent, without being aware of it. Thus, they will know that their expertise is backed up by research. It would also enable them to discover new theories that they could put into practical use. This state-of-the-art review will also discuss what is currently happening in the field which enables them to become aware of the status quo, avoid repetition of what has already been achieved by others, make use of other's research results, and discover new opportunities.

## Acknowledgments

This work was funded by the European Commission in the context of the Horizon Europe project SYNPAIR-G (Grant Agreement No. 101057271), which is gratefully acknowledged.

## References

- Bergvall-Kareborn, B., Stahlbrost, A., 2009. Living Lab: an open and citizen-centric approach for innovation. *International Journal of Innovation and Regional Development* 1, 356–370. <https://doi.org/10.1504/IJIRD.2009.022727>
- Burton-Jones, A., Butler, B., Scott, S., Xu, S.X., 2021. Next-Generation Information Systems Theorizing: A Call to Action. *Management Information Systems Quarterly* 45, 301–314.
- Fraisl, D., Hager, G., Bedessem, B., Gold, M., Hsing, P.-Y., Danielsen, F., Hitchcock, C.B., Hulbert, J.M., Piera, J., Spiers, H., Thiel, M., Haklay, M., 2022. Citizen science in environmental and ecological sciences. *Nat Rev Methods Primers* 2, 1–20. <https://doi.org/10.1038/s43586-022-00144-4>
- Hossain, M., Leminen, S., Westerlund, M., 2019. A systematic review of living lab literature. *Journal of Cleaner Production* 213, 976–988. <https://doi.org/10.1016/j.jclepro.2018.12.257>
- Leminen, S., Westerlund, M., Nyström, A.-G., 2012. Living Labs as Open-Innovation Networks. *Technology Innovation Management Review* 6–11.
- Schuurman, D., 2015. Bridging the gap between Open and User Innovation? : exploring the value of Living Labs as a means to structure user contribution and manage distributed innovation (dissertation). Ghent University.
- Schuurman, D., De Marez, L., Ballon, P., 2015. Living Labs: a systematic literature review, in: *Open Living Lab Days 2015*.
- Silvertown, J., 2009. A new dawn for citizen science. *Trends in Ecology & Evolution* 24, 467–471. <https://doi.org/10.1016/j.tree.2009.03.017>
- Veeckman, C., Temmerman, L., 2021. Urban Living Labs and Citizen Science: From Innovation and Science towards Policy Impacts. *Sustainability* 13, 526. <https://doi.org/10.3390/su13020526>
- Webster, J., Watson, R.T., 2002. Analyzing the past to prepare for the future: Writing a literature review. *MIS quarterly* 26, 13–23.
- Wolfswinkel, J.F., Furtmueller, E., Wilderom, C.P.M., 2013. Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems* 22, 45–55. <https://doi.org/10.1057/ejis.2011.51>