Drawing insights for building and managing living labs by using the 4E Framework and the McKinsey 7S Framework

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PREFACE

Dear reader,

Thank you for taking the time for reading what is the result of several months of work. This made the home-confinement due to the COVID-19 pandemic seem less important, as I had some 'restrictions' of my own to deal with. More importantly, this is the result of a process which fundamentally changed my perspective of the world as I learned more than I thought possible.

I grew up in Romania, where I studied civil and environmental engineering. Not the most collaborative country or studies. This is why, subsequent to relocating in Amsterdam for my master's studies, I was attracted by the co-creative nature of living labs. Bringing stakeholders together to develop innovation for the common good implied better solutions for our future. This immediately sparked my interest and made me want to find a way to contribute. It was my way of making a positive change. I hope this thesis goes some way to achieving that by moving the needle regarding living lab organizations.

My 'thesis journey' was only possible thanks to the patience and support of my two supervisors – Iulian and Ljiljana. I am grateful for all our meetings and all the knowledge you shared with me.

It was also made possible by Leendert and Jonas, who made the two case studies possible and gave me something to write about. I would also like to thank the team members of the two living labs: Kenneth, Cornelia, Lizzy, Angelina, and Johan (MALL); Per, Martin, Marco, and Safira (KTH LIL). I hope your time talking to me was put to good use. I admire your work and am a fan of both living labs.

I would also like to thank all interviewees. You illuminated me with regards to what challenges living labs face and in doing so made my supervisors happy as I found focus and stopped trying to revolutionize living labs.

Last but not least, I would like to thank Emma, Wouter, and Julia for reviewing this report. In fact, Julia deserves at least half the credit for this thesis. I hope I can make up for the fact that you now know more about living labs than you were planning to.

On a personal level, writing the thesis represented a period marking the start of an incredible journey built on friendship and support. This is made possible by my friends and family which I dearly love.

To conclude this (lengthy) preface, I hope you enjoy reading this report. For your sake, I hope I managed in writing a not-so-lengthy thesis. But most of all, I hope it is a pleasurable and informative read which gives you a new perspective on living labs.

With friendship,
Daniel Buzatu

SUMMARY

Living labs represent an approach for **developing innovative products** in a **real-life context** by involving **public institutions, private actors, and users** as active participants in **co-creation**. Living labs provide opportunities for learning, a quick iteration process based on direct input from users, and enhanced collaboration. This definition highlights four essential characteristics of any living lab. These are named *Product*, *Real-life context*, *Participants*, and *Co-creation*, respectively. Together, the four form the 4-Element (4E) Framework adopted throughout this research.

Even though living labs are becoming more and more popular, there are still aspects about them which have been understudied. The academic literature lacks in-depth analyses of living lab participants, as well as guidelines for developing and managing such endeavors. Specifically, scarce refences highlighting best practice approaches exist, for practitioners to use when building living labs or tackling specific problems – leading to a low dissemination of knowledge regarding this aspect. Therefore, as a preliminary step of this research, a pilot study was performed for investigating challenges faced by living labs, and to which of the four components of the 4-E Framework these related. Through 20 interviews, this revealed that 82% of the challenges mentioned were rooted in the *Participants* element. Conclusively, the need to focus on this element was confirmed.

In order to address this knowledge gap and help practitioners manage living labs more efficiently, a comparative study was performed. To this end, KTH Live-In Lab (KTH LIL) and Marineterrein Amsterdam Living Lab (MALL) were examined. The two are living lab testbeds – they offer experimentation space for third-parties who want to develop innovation. They were analyzed in a two-step approach, which relied on interviews and document analyses. First, through a single-case analysis, followed by an identification of the similarities and differences between the two cases. The two steps are embodied by the two research questions (RQ):

RQ1: What are the characteristics of the Participants elements of KTH Live-In Lab (KTH LIL) and Marineterrein Amsterdam Living Lab (MALL)?

RQ2: What are the insights for future living labs which can be drawn upon the similarities and differences between the organizations of the two studied cases?

The first research question was addressed by means of the McKinsey 7S Framework, which states that any organization is constituted out of seven components (or S-es):

The first S, named *shared values*, shows that both living labs exhibit real mission and intrinsic values, but only KTH LIL has a clear vision of what they want to achieve.

The second S, *structure*, reveals that the two analyzed cases encompass four structural layers: strategic, advisory, operational, and expert.

The third S, *strategy*, indicates that both living labs pursue developing clear strategies.

Systems, the fourth S, illustrates that both living labs present minimal and flexible operating and experimenting processes.

The fifth S, *style*, shows that management and working are performed in similar manners in both KTH LIL and MALL. However, it reveals decision-making is different.

Staff, the sixth S, shows that individual responsibilities and communication are clear in

SUMMARY

KTH LIL, but not in MALL.

Lastly, the seventh S, *skills*, shows that both living labs heavily rely on internal skills. These represent, however, a secondary criterion for appointing new members – these are primarily appointed for ensuring representation of all involved institutions.

Building upon the similarities and differences of the two cases, eight insights for living lab developers and managers, addressing the second research question. These are:

1. Living labs need to be strongly connected to their real-life context.
2. Living labs should clearly define their mission, vision, and values.
3. Living labs should build their structure to incorporate high-level management (strategic and advisory layers), middle-level management (operational layer), and knowledge and expertise (expert layer).
4. Living labs should clearly define their strategy and continuously evaluate and refine it.
5. Living labs should develop flexible and adaptable systems.
6. The management, decisional, and working styles should be harmonized.
7. Staff responsibilities should be clearly determined.
8. Staff attitude is essential and can be fostered by establishing appropriate values.

While these insights do not provide the full answer to the knowledge gap, they do provide a start in addressing it and creating guidelines for developing and managing living labs. Thus, more such in-depth investigations are needed for a comprehensive solution.

Further research can develop more insights which complement the eight presented above and, in doing so, promote the dissemination of best practices. It could even use the two frameworks of this research, as they were both validated for this field. Regardless of how it is done, it should include more (varied) cases. Then, living labs could truly build strong *Participants* elements thanks to the sharing of knowledge on a wide scale.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1

INTRODUCTION

INTRODUCTION

Living labs are built upon bringing together multiple actors in a co-creative process. They offer benefits to companies, developers, users, and public institutions. By connecting all these parties, living labs offer the prospect of lower costs, swift iteration based on almost instant user feedback, and advancement of societal objectives, while also empowering users (Leminen, 2015). They also provide more flexibility and adaptability than traditional projects (Westerlund & Leminen, 2011). Therefore, it is no surprise that the living lab paradigm is attracting more and more attention. For instance, the European Network of Living Labs (ENoLL) grew from 20 members when it was initially funded in 2006 (ENoLL, n.d.-a), to over 138 active members in 2021 – stretching beyond the borders of Europe (ENoLL, n.d.-b). In other words, as one interviewee stated: "Living labs are appearing like mushrooms". But what exactly are living labs and what makes them interesting?

The term *living lab* was coined at the end of the 1990s by William Mitchell, a professor at Massachusetts Institute of Technology, who proposed moving innovation research to a real-world setting (Dutilleul, Birrer, & Mensink, 2010). In Europe, the establishing of ENoLL represented a pivotal moment. It started the consolidation of a European living lab movement, building upon two living lab projects funded by the European Commission earlier in 2006 (Dutilleul et al., 2010).

Living labs represent an open innovation approach, based on stakeholder collaboration and co-creation (Veeckman, Schuurman, Leminen, & Westerlund, 2013). By emphasizing involvement and engaging users as co-creators, they aim to connect open innovation with user innovation (Schuurman, 2015). They are becoming increasingly established both in academia and practice (Bergvall-Kåreborn, Eriksson, & Ståhlbröst, 2015; Brankaert & den Ouden, 2017; Hakkarainen & Hyysalo, 2016). Living labs are thought to be especially suitable for tackling today's complex challenges – and particularly for increasing sustainability (Della Valle, Gantioler, & Tomasi, 2021; McPhee et al., 2021). Therefore, the interest around living labs is expected to grow further, as society places more and more importance on sustainable behavior.

Scholars refer to living labs as a methodology for innovation (Eriksson, Niitamo, & Kulkki, 2005), an environment for developing innovation (Ballon, Pierson, & Delaere, 2005), an open innovation ecosystem (ENoLL, n.d.-c) or a governance approach (Bulkeley et al., 2016). This allows for versatility and conceptual flexibility – perhaps being one of the reasons why the number of living labs is growing at such a fast rate. But agreement regarding one living lab definition has not yet been reached. However, consensus exists in academic literature regarding four essential characteristics of living labs:

- Living labs take place in a **real-life context** .
- They are aimed at developing innovation as their **product**.
- **Co-creation** is a central part of living labs, and the process adopted for developing innovation.
- Living lab organizations are formed by uniting users, private actors, and public institutions, as active **participants**.

Development of innovation in a real-life context is a key feature. However, such setting does not necessarily refer to the physical dimension, as living labs can exist online as well. In the

INTRODUCTION

context of living labs, innovation is represented by its product, which can be a physical or virtual artefact, a service, a technology, an application, a process or a system (Steen & van Bueren, 2017b). Finally, the very nature of living labs – open innovation – entails the involvement of multiple participants.

These core characteristics form the four-element framework (further named the *4E Framework*) which guides this research. The four elements will be further named: *Real-life context*, *Product*, *Co-creation*, and *Participants*.

Living labs provide opportunities for learning and accessing new knowledge that would otherwise be difficult to gain (Abowd, 1999; Bajgier, Maragah, Saccucci, Verzilli, & Prybutok, 1991; Dutilleul et al., 2010). They promote dialogue and experience sharing among participants (Schaffers & Kulkki, 2007). Moreover, living labs integrate fundamental and applied research (Mulder & Stappers, 2009), therefore being particularly suitable for tackling the complex problems encountered in real life (Bajgier et al., 1991; Mulder, Velthausz, & Kriens, 2008). In doing so, they can further smart city initiatives and contribute to urban developments (Ballon et al., 2011).

Furthermore, living labs promote and enhance multi-actor collaboration (Bergvall-Kåreborn, Eriksson, Ståhlbröst, & Svensson, 2009; Kviselius, 2009). Thus, they can enable new business opportunities (Kviselius, 2009; Niitamo, Westerlund, & Leminen, 2012) and might lead to new market opportunities (Mavridis, Molinari, Vontas, & Crehan, 2009).

Despite all these advantages, the current body of literature lacks practical case studies addressing living lab organizations and good management practices (Hakkarainen & Hyysalo, 2013). Knowledge is indeed lacking about how the public-private-people partnerships can be structured and managed in living labs (Hossain, Leminen, & Westerlund, 2019). Currently, living labs position themselves as an "'everything is possible' concept that resembles an empty box, in the sense that you can put whatever methodology or research approach inside" (Schuurman, De Marez, & Ballon, 2014, p. 12). Guidelines for building and operating living lab organizations are not readily available, thus showing a low dissemination of knowledge regarding this aspect. This can lead to decreased efficiency and increased usage of resources, as well as opening living lab managers up to making the same mistakes as their colleagues from other living labs. More importantly, it can also lead to a slower development of living lab organizations due to information not being shared on a wide scale (Chuang, 2004).

While this report does not argue for standardization and uniformity in the field, it acknowledges the need for the dissemination of lessons as insights regarding living lab organizations. This research therefore explores two living lab testbed organizations – KTH Live-In Lab (KTH LIL) and Marineterrein Amsterdam Living Lab (MALL). The two cases are examined both individually and comparatively by using two frameworks: the 4E Framework and the McKinsey 7S Framework (further named the *7S Framework*). The second framework, developed by McKinsey & Company, is an organizational analysis tool, which states that any organization is composed out of seven components (or S-es):

INTRODUCTION

- **Shared values** – the principles guiding the organization.
- **Structure** – the way in which the living lab is organized.
- **Strategy** – encompassing the objectives and how the living lab is going to attain them.
- **Systems** – the processes and procedures adopted by the living lab.
- **Style** – essentially, the way in which things are done.
- **Staff** – the people who are part of the living lab.
- **Skills** – the capabilities and competences employed by the organization.

Following the case studies, insights are drawn and placed in light of organizational studies literature. These lay the groundwork for the subsequent development of guidelines for living lab organizations. Also, the introduction of the two frameworks provides a methodological contribution, as they can be used by researchers and practitioners for evaluating and/or addressing specific issues of individual living labs.

1.1 Problem statement

The current body of literature in the field of living labs does not address the organizational structures of living labs. Research analyzing the types of involved actors has previously been performed (Leminen, 2013; Leminen, Westerlund, & Nyström, 2012); however, in-depth analyzes of the participants involved in living labs are rare, as (Hakkarainen & Hyysalo, 2013) show. The same authors argue that research-based practical case studies are needed for helping managers, facilitators, and workers of living labs by sharing experiences and knowledge.

Similarly, Hossain et al. (2019) appeal for research studying living lab participants. They explain that the body of literature "lacks comparative studies to identify the best performing and most effective management approaches for living labs" (p. 22). The same authors acknowledge the scarce references for developing and managing living labs. This issue is not new, as the field was already facing a "lack of standardization and adequate performance criteria" several years ago (Schaffers & Turkama, 2012, p. 30).

Due to the lack of references and best practices, living lab developers must often reinvent the proverbial wheel. They are forced to build living labs based on personal experience, without having the possibility of learning from others in their position. Indeed, they cannot rely on information sharing or guidelines which would enable an easier and more efficient development. A lack thereof leads to more resources being necessary for starting and operating living labs. At the same time, the entire field might be advancing at a slower pace due to low dissemination of knowledge regarding living lab organizations.

Furthermore, as a preliminary step of this research, a pilot study was conducted for inquiring into the problems faced by living labs. The study outcomes create an illustration of some of the challenges encountered by living labs. This subsequently emphasized the Participants element as a clear source of problems, thus indicating that this requires more attention.

Aiming to address the knowledge gap identified in this section, this report will provide a comparative case study. To this end, two living lab testbeds will be analyzed with a focus on the

INTRODUCTION

Participants element.

1.2 Research objective and questions

This research is aimed at exploring and understanding the *Participants* elements of two living lab testbeds – KTH Live-In Lab (Stockholm, Sweden) and Marineterrein Amsterdam Living Lab (Amsterdam, the Netherlands). Subsequently, by investigating the two, lessons about how participants work together can be drawn and disseminated.

In order to do so, this research is guided by two questions:

RQ1: What are the characteristics of the Participants elements of KTH Live-In Lab and Marineterrein Amsterdam Living Lab?

RQ2: What are the insights for future living labs which can be drawn upon the similarities and differences between the organizations of the two studied cases?

1.3 Terminology

Before attempting to answer the two research questions, let us define and clarify some of the terms used, in order to avoid possible confusions.

Bureau Marineterrein – the organization managing the Marineterrein area, and one of the founding partners of MALL.

Experimenter – a person or organization performing an experiment or project within MALL. It is the equivalent of *project partners*, in the case of KTH LIL. The distinction is used for showing the different denominations used by the two living labs.

Involved actor – used interchangeably with *participant*, refers to a person or an organization actively engaged in the living lab activities.

Marineterrein – city quarter in Amsterdam, where MALL is located.

Marineterreiner – a person who lives, studies, works, or visits Marineterrein.

Research and development (R&D) – the activities undertaken for innovating and introducing new products and services, or improving existing ones (Investopedia, n.d.).

Staff – individual persons formally involved in and dedicating time to performing living lab activities. They can be either employed by the living lab or by one of the partnering actors but must officially be part of the living lab organization. Experimenters and users are included in this category only if they perform tasks meant to contribute exclusively to the living lab.

INTRODUCTION

Stakeholder – a person or an institution who is participating, has an interest, or may be affected by a living lab.

1.4 Conceptual framework
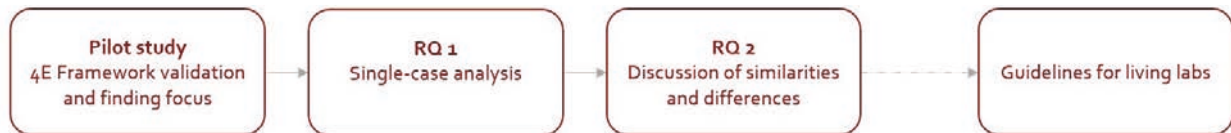
Fig. 1.1 – Conceptual framework of this research.

In achieving the research objective, this research followed a two-step process.

A pilot study was first performed for validating the 4E Framework in practice and establishing the research focus. Consequently, this study is centered on the *Participants* elements of the two studied cases.

Afterwards, the two case studies were performed, encompassing the second and third boxes in Fig. 1.1. Regarding the first research question, the 4E Framework was used for providing an overarching understanding of each case. The 7S Framework was subsequently used for zooming in on the *Participants* element of each case. Next, a cross-case analysis was employed for answering the second research question. Drawing on the similarities and differences between the two cases, insights for future living labs were drawn. These can be used as a start for building field-wide guidelines related to living lab organizations.

The research operationalization is also reflected in the structure of this report. First, the second chapter presents a literature review and introduces the two frameworks. The methodology employed for this research is illustrated in the third section. The chapter detailing the results follows. This first presents the outcomes of the pilot study, followed by the single-case analysis detailing the organizations of KTH LIL and MALL. Afterwards, the cross-case analysis is performed as the discussion section of this report, which presents the insights drawn for future living labs. Finally, conclusions are drawn in the last chapter, which also reviews limitations and avenues of further research.

2

THEORETICAL
FRAMEWORK

THEORETICAL FRAMEWORK

2.1 What are living labs?

The term "living laboratory" was already being used in 1956, and it represented a tool for studying users' responses to television commercials (Billboard, 1956). A meaning which is not very far from today's understanding. However, it was in the 1990s when living labs started to be placed in the attention of scholars on a wider scale (Leminen & Westerlund, 2019). This is no surprise when looking at the evolution of strategic management tactics of organizations. At the end of the 20th century, these were transitioning from *competition* to *cooperation* (Grant, 2016). Hence, the collaborative approach of living labs entered the spotlight in the communities of scientists and practitioners. Since then, it has been continuously developing (Dutilleul et al., 2010).

Living labs belong to the open innovation paradigm (Almirall & Wareham, 2008; Gascó, 2017; Leminen, Nyström, & Westerlund, 2020; Leminen et al., 2012). This implies that multiple entities enter partnerships for generating new products, services, and technologies (Chesbrough & Appleyard, 2007), while also exchanging relevant knowledge among actors (Schuurman, 2015).

Living labs also exhibit particularities of user innovation (Almirall & Wareham, 2008; Bergvall-Kåreborn et al., 2009; Dutilleul et al., 2010). User innovation is performed as design for users (i.e., users are given a voice), with users (i.e., users are involved as co-creators), or by users (i.e., the innovation process is driven by the users themselves) (Kaulio, 1998). Essentially, this means that users are either key or sole contributors to the innovation process. When placing living labs within the user innovation paradigm, Schuurman (2015) found that users are either given a voice or involved as co-creators.

Conclusively, academic literature presents living labs as having a dual character. They represent a bridge between open and user innovation, and exhibit features and challenges characteristic to both paradigms (Schuurman, 2015).

Currently, a variety of concepts and meanings are placed under the living lab umbrella (Bergvall-Kareborn, Hoist, & Stahlbrost, 2009; Dutilleul et al., 2010; Leminen & Westerlund, 2019; Schuurman et al., 2014). As it still lacks a common understanding, it might become a buzzword void of substance. Nevertheless, for the purpose of this research, the following definition of living labs is used:

> *Living labs represent an approach for **developing innovation** in a **co-creative** manner, which can be applied in physical or virtual **real-life spaces** and embody **public-private-people partnerships**.*

2.2 The 4E Framework

The definition presented above will further guide this research through the four highlighted elements. These were identified as the features of living labs in a study of 52 papers, which showed that there is wide agreement regarding their embodying by living labs. (See Appendix A for the detailed analysis, which presents a scan of the definitions of living labs in the 20 most relevant[1] scholarly articles when searching for *living labs* on Google Scholar, on 26

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[1] *As ranked by Google Scholar based on the document text, where the articles were published, who was the author, as well as how often and how recently they were cited (Google Scholar, n.d.).*

THEORETICAL FRAMEWORK

June 2020, as well as all the scientific papers in all the special issues on living labs of the journal Technology Innovation Management Review[2], to the same date).

Constituting the pillars of this research, the four elements entail that a living lab should:

- Be placed in a **real-life context**.
- Be aimed at developing innovative **products**.
- Involve **co-creation**.
- Involve users, public institutions, and private actors as active **participants**.

These four elements constitute the 4E Framework which will further guide this research. This framework has been chosen for clarity purposes and due to the wide agreement in the academic literature. Let us now delve further into each of its components, exploring what exactly do the four mean and how do they inform our understanding of living labs.

2.2.1   Real-life context

Living labs represent a special kind of user-centric approach thanks to the multi-faceted and complex environment in which innovation is developed within them (Feurstein, Hesmer, Hribernik, Thoben, & Schumacher, 2008). The fact that living labs take place in real-life contexts is widely agreed upon by both scholars and practitioners in the field of living labs. Hossain et al. (2019) identify three streams in the scientific literature regarding the concept of real-life context. The first stream sees the living lab as a real-life environment in which actors develop innovation. The second stream portrays the living lab as a methodology with innovation activities taking place in a real-life setting. The third stream analyzes the meaning of real-life environments in living labs. This shows the complex understanding and importance of the real-life context in the field of living labs.

The literal definition of the term *context* is "the interrelated conditions in which something exists or occurs" (Merriam-Webster, n.d.-a). Hence, the real-life context of living labs entails multiple dimensions, as shown in Fig. 2.1.
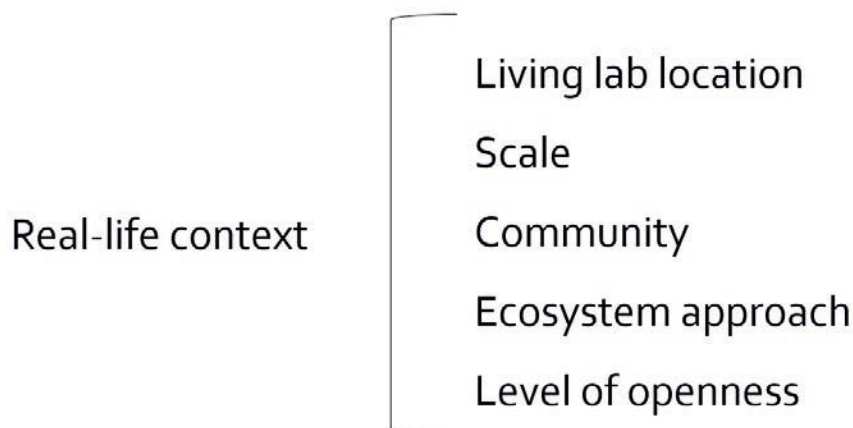
Fig. 2.1 – The dimensions entailed by the Real-life context of living labs.

Living labs can take place in both physical and virtual spaces (Steen & van Bueren, 2017a). The key aspect about these spaces is that interaction should be performed in a setting that reflects the users' natural environment to the greatest extent possible (Veeckman et al., 2013), thus allowing for multiple aspects of their life (e.g., their citizen, parent, or worker roles) to be taken into account (Feurstein et al., 2008).

Besides the physical or virtual location of a living lab, the real-life context includes some of the "characteristics identified on a generic level" by Veeckman et al. (2013, p. 7): the scale, the community, the ecosystem approach, and the level of openness. The other two generic characteristics identified by the authors (technical infrastructure and lifespan) fall outside the *Real-life context* element, as they pertain to the internal dimension of living labs – namely, their organizations. They will therefore be addressed in the corresponding section, dealing with the *Participants* element.

Veeckman et al. (2013) explain that the scale refers to the number of involved users. They also explain that living labs form a community around them, which "can range from a 'community of interest' to a 'community of practice', whether or not it is geographically bound" (p. 8). The ecosystem approach, according to the same authors, refers to the manner in which the multiple actors involved in living labs interact.

Beyond the spatial dimension of living labs, their context may also be characterized by its openness towards potential users. Involvement of users (as well as of other participants) is a key feature of any living lab (Feurstein et al., 2008). It is influenced by whether an open or a closed collaborative architecture (i.e., setting) is chosen, as shown by Pisano and Verganti (2008). The authors explain the positives and negatives, as follows:

An open setting comes with the advantage of producing an increased number of solutions originating from a diverse realm of perspectives. Conversely, a disadvantage of such architecture is the challenging task of attracting participants from a varied range of domains and subsequently screening through all proposed ideas. On the other hand, a closed setting implies a lower number of ideas, all of which originate from experts in their domains; thus, an increased overall quality of ideas, theoretically. The drawback of such architecture is the identification of the right domains and parties to be involved.

Closed living lab	Open living lab

Closed	Open
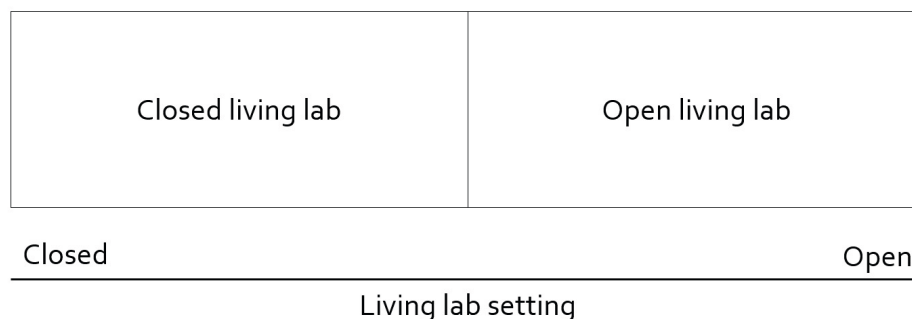
Living lab setting

Fig. 2.2 – Categorization of living labs according to the openness of their setting.

THEORETICAL FRAMEWORK

Living labs can thus be categorized as closed or open. A closed living lab is characterized by the preselection of involved users in the innovation process (Dell'Era & Landoni, 2014). This could result in more focused results but could consequently miss certain aspects with the proposed solution, as not all 'voices' will be heard. This type also implies that there is a deciding entity (for example the initiating partners), which might position users as less influential and thus create power differentials.

Conversely, in an open living lab, the power to include or exclude certain actors lies with no one (Dell'Era & Landoni, 2014). This creates the premises for a more inclusive venture.

It should, however, be noted that, in practice, living labs can exhibit both open and closed settings, in different activities or development phases (Schuurman, De Marez, & Ballon, 2016).

2.2.2   Co-creation

Co-creation is a crucial element of living labs (Feurstein et al., 2008; Robles, Hirvikoski, Schuurman, & Stokes, 2015; Schuurman, 2015; Steen & van Bueren, 2017a). However, despite being of such special importance, the definition of co-creation has become rather unclear over time due to the increased number of factors that influence the (diverging) outcomes (Franz, Tausz, & Thiel, 2015). Nonetheless, the co-creation philosophy has at its core interaction among stakeholders – which positions users as active participants in the design and development process (Tanev, Knudsen, Bisgaard, & Thomsen, 2011). Co-creation has its foundations on the transition of users "from isolated to connected, from unaware to informed, from passive to active" (Prahalad & Ramaswamy, 2004a, p. 4). This results in a radical change of their role in interacting with organizations.

Co-creation is an approach of creating value by means of interactions among stakeholders, which comes as a fundamental restructure of the traditional supplier-customer relationships (Hurni & Grösser, 2017). It is a development process in which the users' role is not limited to providing feedback – the users become partners in producing a mutually valued outcome (Prahalad & Ramaswamy, 2004b).

As co-creation is a debated topic among both scholars and practitioners, it is important to further understand its specificities. Prahalad and Ramaswamy (2004b) illustrate that co-creation represents the joint creation of value, and not merely the customization of products according to user needs. They also explain that co-creation is about collectively defining the problem and developing a solution, and not outsourcing (some of) the activities to the users. Finally, the same authors emphasize that co-creation implies constructing an environment in which users are actively involved in co-realizing the product and the experiences around it. In some instances, the product might remain unchanged, while the experiences or use-cases might be innovated.

In practice, co-creation is not always seen as a value-creation process, but sometimes as a tool for acquiring user feedback. For example, Veeckman et al. (2013) conducted a study of four living labs, and evaluated them on the basis of multiple characteristics, which included *co-creation* and *user role*. Three of the four living labs are shown to only capture user feedback, without any decision-making power being held by the users. A similar outcome is present in the study performed by Steen and van Bueren (2017a). Therefore, co-creation is one aspect regarding

which the academic and practice communities might be in disagreement. Thus, this living lab element requires special attention, and further investigation is necessary. Consequently, the scope of this research concerning the *Co-creation* element will be broadened to include the full spectrum of the involvement of users, from feedback providers to active partners.

The level of user involvement influences the nature of the co-creation process. Users can play different roles such as informants, testers, contributors or co-creators (Leminen, Westerlund, & Nyström, 2014; Veeckman et al., 2013), process-drivers (Leminen et al., 2012), or feedback-providers (Westerlund & Leminen, 2011).

Ventures with users as source of feedback	Living labs

Feedback providers   Co-creators
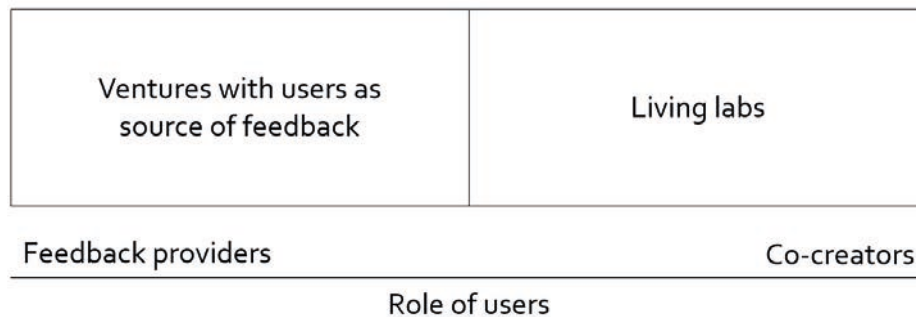
Role of users

Fig. 2.3 – Categorization of living labs according to the role of the users in the co-creation process.

Fig. 2.3 presents a categorization of living labs according to the role of users. As previously illustrated, a collaborative product development process which does not actively involve users as partners cannot be considered co-creative (Prahalad & Ramaswamy, 2004b). Hence, the different roles are grouped according to whether users are feedback-providers or co-creators. Conclusively, the left box presents ventures with users as source of feedback, as they do not meet the living lab conditions of the academic community. They might, however, (claim to) be living labs, according to practice standards.

2.2.3 Participants

The literature regarding the stakeholders involved in living labs seems to be divergent at a first glance. Some articles state that living labs are "engaging companies, academia, government and technological centers, where users are involved in nascent development stages" (Almirall & Wareham, 2011, p. 88). Hence, a public-private partnership (3P) model which also includes users. Others (such as all of the 52 investigated academic papers – see Appendix A) claim that a public-private-people partnership (4P) model is characteristic. One cannot help but notice how a 3P model which includes users becomes a 4P one, thus rendering the two views identical. Steen and van Bueren (2017a) go a step further, detailing what a 4P model entails for living labs, at a minimum: users, private actors, public actors, and knowledge institutes; hence, a quadruple helix model. This extra step in defining the specific participants of a living lab is also taken in 28 of the 52 articles studied (see Appendix A). Nevertheless, knowledge institutes are, essentially, either private or public actors.

Chronéer, Ståhlbröst, and Habibipour (2019) argue that urban living labs are different from living labs with respect to their participants. They state that in urban living labs, citizens

are not necessarily involved as users, but as citizens experiencing or being affected by a solution. This research adopts the 4P model, which serves as the minimum prerequisites for living labs, thus allowing for citizens and users to be involved concomitantly under the 'people' umbrella.

As they are open innovation networks, participation in living labs is built on a voluntary basis and all participants are equally relevant (Chesbrough & Crowther, 2006). However, Möller, Rajala, and Westerlund (2008) argue that, in reality, one or more actors might be taking the lead and further their interests in the co-creation process. Leminen et al. (2012) identify four types of living labs, according to the driving actor. These will further be explained one by one, based on the descriptions provided by the authors. It should, however, be noted that the participant leading the operations might change over time.

I.   Utilizer-driven living labs:
• Leading actor: private – companies.
• Purpose: R&D according to set objectives.
• Outcome: product/service and business development.
• Lifespan: short.

This type of living labs is used by companies for developing and testing products or services; therefore, these are the primary assimilators of the value created. The main activities pertain to collecting information and accumulating knowledge about users, which ultimately leads to business development. Hence, the user role is generally that of feedback-provider. As utilizers strive for rapid product development or refinement, the lifespan of such a living lab is typically short.

II.   Enabler-driven living labs:
• Leading actor: public – (non-)governmental organizations and financiers such as municipalities, regional governments, etc.
• Purpose: development of strategy, usually for societal improvements.
• Outcome: strategy or strategic direction.
• Lifespan: short, medium or long.

Living labs initiated by enablers are typically public sector projects addressing regional or societal needs. Ensuring collaboration among actors can be a goal in itself, as regional development implies the cooperation of multiple actors over extended periods of time. Ensuring the participation of private-sector actors can be problematic for this type of living labs, as these might not directly benefit from the outcomes. Nevertheless, the created value is shared among all participants.

III.   Provider-driven living labs:
- Leading actor: public and private – networks of organizations.
- Purpose: development of operations through knowledge, theory and/or solution creation.
- Outcome: knowledge, theories and/or solutions.
- Lifespan: short, medium or long

Providers can be various organizations such as knowledge institutes or consulting companies. The overarching goal of this type of living labs is to promote research, develop knowledge and theories, or to find solutions to specific problems. The focus is placed on improving users' everyday lives in a manner which is beneficial for all involved parties. However, attracting all types of actors can be problematic due to diverging interests. Moreover, due to the nature of involving actors from different sectors, the duration of this type of living lab can be a source of problems, as companies aim for rapid implementation, while other actors might regard a fast process as undesirable.

IV.   User-driven living labs:
- Leading actor: user communities.
- Purpose: collaborative solving of users' everyday problems.
- Outcome: solutions to users' problems.
- Lifespan: long.

Being established by user communities, these living labs focus on solving everyday challenges, thus placing users in the position of co-creators. Respecting users' values and requirements, living labs of this type are built upon specific issues or common interests. Value creation is beneficial directly for the users, and indirectly for the other parties involved. As these living labs are characterized by bottom-up initiatives, they are generally organized in an informal manner. However, they cannot be managed as such, and consequently a provider is usually facilitating the operations, providing resources, equipment, or knowledge. Being built around user communities, user-driven living labs are durable but uncommon in practice.

2.2.4   Product

The literature on living labs illustrates a great diversity of outcomes of living labs (Hossain et al., 2019). This shows the broad range of results a living lab can produce. Steen and van Bueren (2017a) state that a living lab should be aimed at experimenting and producing knowledge by integrating research and innovation in developing the final product. According to the same authors, the product can be an object, a service, a process, a technology, an application, or a system. Leminen et al. (2012) support this claim and add policy (as a strategic product) on the list, in the case of enabler-driven living labs. This broad range of possible outcomes might also create confusion regarding the living lab concept itself, which might prove challenging for practitioners, as the end goal of their endeavor could seem elusive.

THEORETICAL FRAMEWORK

The type of innovation (i.e., product) does not need to be decided before beginning the activities; establishing this could fall itself within the scope of a living lab (Chronéer et al., 2019). However, a crucial role regarding the product developed is played by the participants, regardless of whether the innovation is incremental or radical (Nyström, Leminen, Westerlund, & Kortelainen, 2014).

Based on their outcomes, Schuurman, De Marez, and Ballon (2016) identified three categories of living labs:

I. Exploration: these living labs are aimed at creating knowledge, ultimately leading to innovation development. This type predominantly includes enabler- and provider-driven living labs, as it does not imply developing a prototype, but only a conceptual-level product.

II. Experimentation: living labs of this sort focus on experimenting with the innovation. Utilizer-, provider- and user-driven living labs correspond to this category, as they produce a prototype. In fact, experimentation living labs are the most encompassing, as strategies could also be implemented for the purpose of testing – in this case, including enabler-driven living labs as well.

III. Evaluation: living labs of this kind are intended for evaluating a certain innovation. Therefore, the result of these living labs is information and knowledge for the refinement of an already-existing prototype. They can encompass all types of living labs according to the driving actor, with a likely focus on utilizer- and provider-driven ones, as their innovations are almost always subjected to evaluation and refinement.

2.3 The McKinsey 7S Framework

The term *organization* is defined as "an administrative and functional structure" (Merriam-Webster, n.d.-b). It also encompasses "the personnel of such a structure" (Merriam-Webster, n.d.-b). Therefore, a living lab organization embodies and overlaps perfectly with the *Participants* element – as this represents the body of people and institutions actively involved.

In order to comprehensively analyze this element, the McKinsey 7S Framework has been used. The McKinsey 7S Framework has been developed by two McKinsey consultants in the late 1970s and has since been widely used by practitioners and academics in a multitude of industries and fields within and beyond the business community, ranging from public institutions (e.g., Mahomed, 2004) to the terrorist organization Al-Qaeda (e.g., Clarke, 2019). It remains one of the most popular tools for strategic planning (Ravanfar, 2015).

The 7S Framework is a simple and straightforward tool for assessing the critical areas of an organization (Clarke, 2019). It is built on the idea that a multiplicity of factors and their interconnectedness influence an organization's effectiveness, as explained by Waterman Jr, Peters, and Phillips (1980), its developers. Perhaps most importantly, the framework places the emphasis to the same extent on human resources as it does on tangible resources and assets, thus regarding both aspects equally important for achieving performance.

THEORETICAL FRAMEWORK
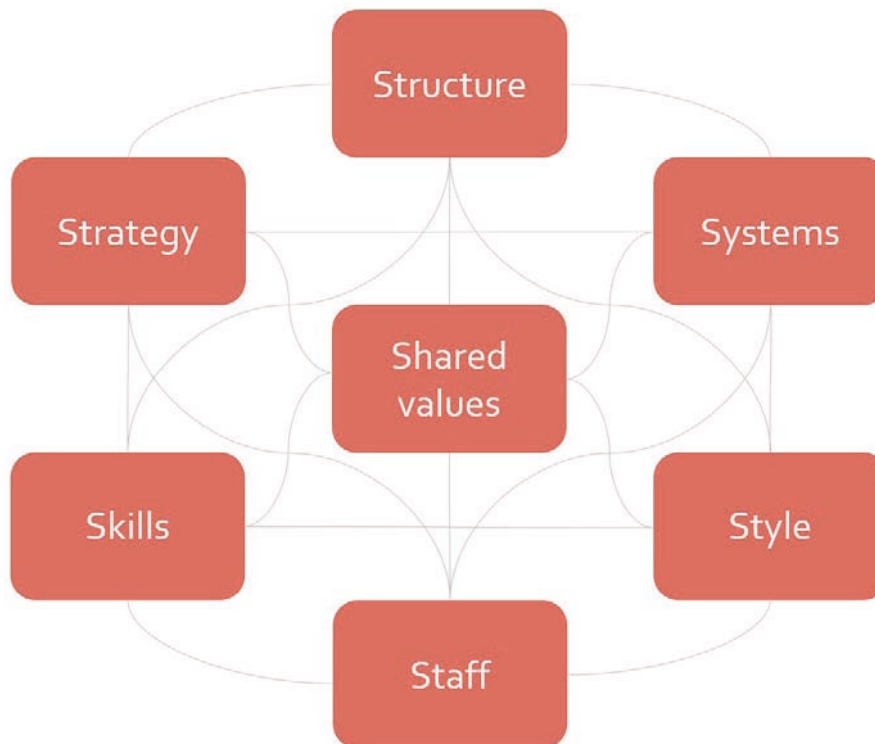
Fig. 2.4 – The McKinsey 7S Framework (Waterman Jr et al., 1980).

Fig. 2.4 presents the 7S Framework and the interconnections among the seven critical areas of organizations, or the seven S-es. The shape of the diagram is also important, as it shows there is no hierarchy among the seven components.

The framework itself serves as a microscope with seven filters when evaluating organizations. However, when pursuing improvements, the seven filters become interconnected, as changes in one area influence the other areas as well (Waterman Jr et al., 1980). For a better understanding, let us establish what each of the seven components means.

Shared values

Initially named *superordinate goals*, the *shared values* represent the fundamental ideas around which an organization is built (Waterman Jr et al., 1980). They are the principles which guide the behavior of both the living lab and its participants (Ravanfar, 2015). They can be implicit or explicit, and represent the broad future directions, going beyond mere objectives (Waterman Jr et al., 1980).

This component of the 7S Framework is perhaps the most stable over time, as mission, vision and inherent values tend to be resilient (Gurley, Peters, Collins, & Fifolt, 2015; Posner, Kouzes, & Schmidt, 1985).

THEORETICAL FRAMEWORK

Structure

The *structure* represents the way in which the living lab is organized (Ravanfar, 2015). It goes beyond the mere organizational chart to include the way in which tasks and responsibilities are divided (Waterman Jr et al., 1980).

Strategy

Strategy is what an organization does to gain advantage and further its own goals and interests (Clarke, 2019). It represents the actions a living lab performs in relation to both its internal and external environment. In short, it is a way in which it says: "Here is how we will create unique value" (Waterman Jr et al., 1980, p. 20).

Systems

The systems represent procedures and processes adopted by the living lab. They essentially embody how daily activities and decisions are made (Ravanfar, 2015), and can be both formal and informal (Waterman Jr et al., 1980).

Style

This essentially represents the way things are done. It incorporates two aspects – how the living lab is managed and how work is performed (Waterman Jr et al., 1980). In this respect, the expression that 'actions speak louder than words' is indeed true.

Staff

This represents the institutional and personal scale of the living lab. This component encompasses institutional responsibility and accountability. It also embodies everything on the individual scale, from training programs to attitude, motivation and behavior (Waterman Jr et al., 1980).

Skills

The *Skills* are the specific capabilities and competences of the staff of an organization (Clarke, 2019; Ravanfar, 2015). They determine the attributes of a living lab, thus decisively influencing its performance (Waterman Jr et al., 1980).

Organizations can be evaluated in manifold ways, with the 7S Framework being only one of them. For instance, even an 8S iteration exists, where *skills* are reshaped as *reSources*, and *strategic performance* is added as an eight element which can be derived from the other seven (Bhatti, 2011). However, for the purpose of this research, the 8S iteration would imply an

unnecessary overcomplication, as establishing the performance of the two studied cases falls outside the scope of this study.

The 7S Framework places the emphasis on human resources and interactions (through the *shared values*, *style*, *staff*, and *skills*) which is suitable for living labs, as they emphasize collaboration among people and institutions. Additionally, this framework has passed the test of time, having been applied in many fields. Therefore, it is the framework of choice for analyzing the *Participants* element in this research.

2.4 The three analysis levels of living labs

Let us finalize this chapter by returning to the 4E Framework and providing more clarity regarding its elements and living labs on a conceptual level. In other words, to which part of living labs does each of the four elements correspond?

Living labs are "complex entities with various activities and interactions taking place between different actors" (Schuurman, De Marez, & Baccarne, 2016, p. 8). It is therefore useful to unpack them and show the skeleton they are built upon. To this end, multiple models exist in literature. For instance, Almirall and Wareham (2008, 2011) adopt a two-level model, arguing that living labs are mid- and low-level innovation producers. However, this model emphasizes the Product of living labs and does not focus on the other three elements to the same extent.

Another analysis model was proposed by Schuurman (2015). It embodies three levels and allows for a comprehensive understanding of the parts of a living lab. Additionally, it sees living labs from a long-term perspective as organizations, and not as single projects. For these reasons, this model is the most suitable for this research, considering that the two studied cases are living lab testbeds – long-term organizations incorporating multiple projects (or experiments).

Macro level	Living lab organization	

Meso level	Individual projects	

Micro level	Specific activities	

Fig. 2.5 – The three levels of analysis of living labs (Schuurman, 2015).

First, living labs contain a *macro level* or an organization consisting of a public-private-people partnership (Schuurman, 2015). This is responsible for managing and operating the living lab, as well as enabling living lab projects.

Second, the *meso level* refers to the individual projects undertaken within a living lab organization (Schuurman, 2015). These can be performed by the organization itself (especially in the case of utilizer-, enabler- and user-driven living labs) or by external parties (particularly for provider-driven living labs such as testbeds).

Third, living labs employ specific methodologies which imply certain activities – forming the *micro level* of analysis (Schuurman, 2015). These can, for example, be aimed at cultivating insights or knowledge from users (Almirall & Wareham, 2011).

Let us now integrate the three levels of analysis with the 4E Framework, for a better understanding of how each of the four elements fits within the living lab concept. This will subsequently provide a basis for a clearer structuring of the case study results.
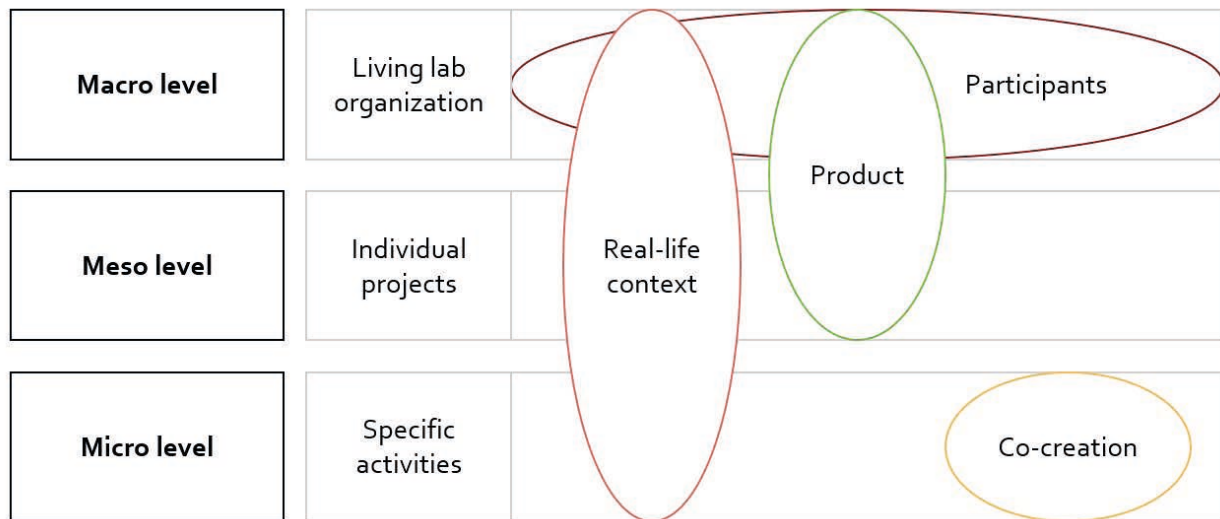
Fig. 2.6 – The four elements of the 4E Framework plotted on the three levels of analysis of living labs.

The *Real-life context* encompasses the entire living lab. This means that the organization, the individual projects, and the activities performed are all placed in a real-life setting. Therefore, this element of the 4E Framework transcends all three levels of analysis as it shapes and is reciprocally shaped by all three levels of a living lab.

The *Product* element corresponds to the meso and the macro levels. On the one hand, individual projects produce outcomes such as prototypes or technologies. On the other hand, the living lab itself can be a product of the organization. This would correspond to testing or interaction infrastructures, to name two examples.

Co-creation is an essential activity of living labs (Schuurman, 2015; Steen & van Bueren, 2017b). It is thus part of the specific methodologies adopted and corresponds to the micro level.

Finally, the *Participants* element is equivalent to the living lab organization. It therefore encompasses the macro level of analysis.

3

RESEARCH
METHODOLOGY

RESEARCH METHODOLOGY

Larrinaga (2017, p. 150) explains that using case study research offers the possibility of "forgetting about the blacks and whites (accept or reject) and opting instead for the full palette of colors". The focus can thus be placed on the qualitative side, embracing the ambiguity of reality. Case study research is preferred when exploring phenomena in their real-life context (Hancock & Algozzine, 2017; Larrinaga, 2017; McCutcheon & Meredith, 1993). This makes it especially suitable and the choice for this research, as the objective is understanding two living lab organizations – KTH LIL and MALL.

Furthermore, Yin (2017) argues that case study research is particularly appropriate for investigating contemporary phenomena when the researcher has little control over the facts. The same author explains that this research method is suitable when studying complex phenomena. Case studies employ multiple sources of information and provide a richly descriptive illustration (Hancock & Algozzine, 2017). As this research is aimed at comprehensively describing two living labs and subsequently drawing insights based on this description, it strengthens the suitability of case study as the chosen research methodology.

Case study research also has its shortcomings. As Flyvbjerg (2006) explains, they provide practical (context-dependent) knowledge instead of theoretical (context-independent) knowledge. For this reason, they might be less suitable for drawing insights to be applied by living labs in different environments. Therefore, generalization of insights could be considered an impossibility. But Flyvbjerg (2006) corrects this misunderstanding showing that it is, in fact, false, as long as a suitable way of generalization is followed. Moreover, the same author argues that "the force of example" should not be underestimated (p. 228).

This research addresses the context-dependent (or generalization) weakness in two ways. First, the two studied cases are only used as examples from lessons are drawn without generating theories. Second, the lessons drawn are subsequently corroborated with organizational studies literature and only then insights are developed for living labs in general.

Having discussed the adopted research method, let us now discuss the step-by-step process adopted throughout this research, as illustrated in Fig. 3.1.

RESEARCH METHODOLOGY
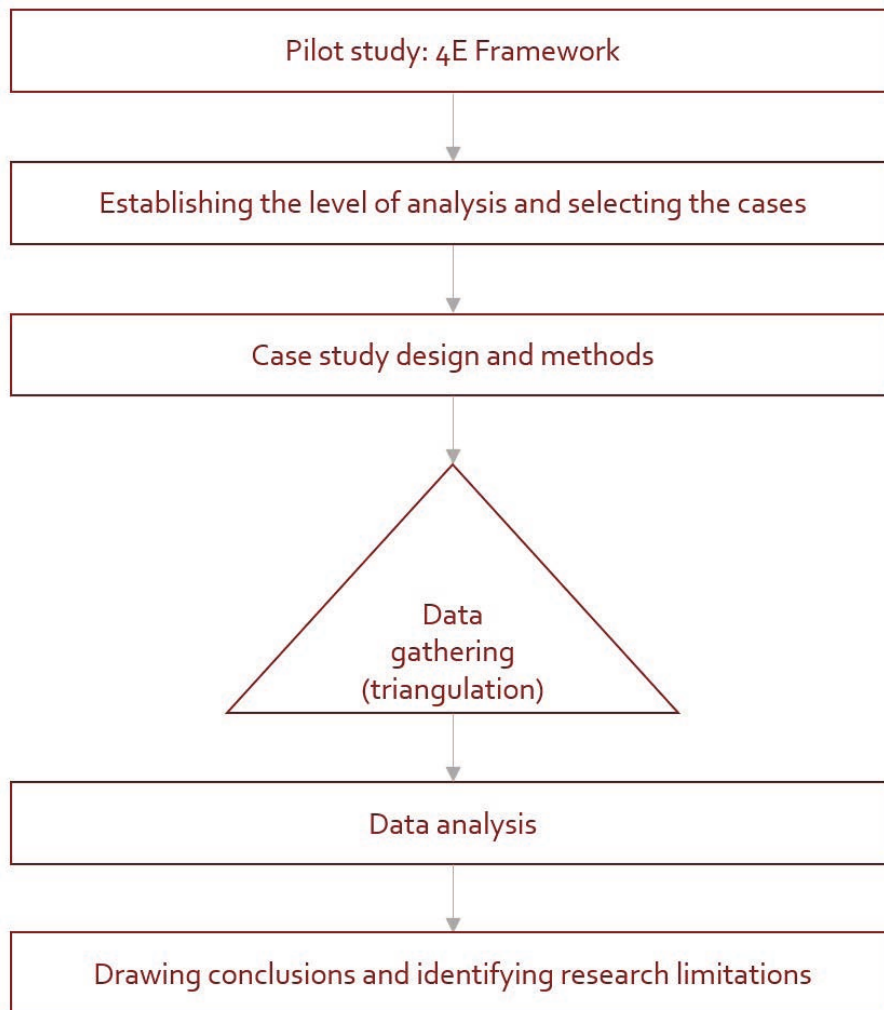
Fig. 3.1 – Research design. Source: own elaboration based on Larrinaga (2017).

3.1 Pilot study: 4E Framework

Even though the 4E Framework was built on (wide agreement in) scientific articles, it also needed to be validated in practice. To this end, a pilot study was conducted. Furthermore, the pilot study established the focus of this research.

The pilot study relied on interviewing researchers and practitioners in the field of living labs. These were aimed at identifying problems faced by living labs and in which of the four elements they are rooted. Additionally, a series of five interviews performed during a previous project were used. These were performed with practitioners involved in MALL, at the end of 2019.

In total, the pilot study consisted of 20 interviews with 19 persons (one of the interviewees was part of MALL at the end of 2019). Interviewees were selected based on accessibility, coupled with either multiple-case or multiple-year experience either as researchers or practitioners.

Each interview lasted for one hour and was conducted online, in a semi-structured

manner. These were conducted according to two corresponding interview protocols – they can both be found in Appendix C.

Interviewee rights were discussed and agreed upon at the beginning of each interview, together with explaining the purpose of the interviews and of the research. Interviewees were granted anonymity regarding their statements. Therefore, the order of the interviewees as cited in this report does not match the one in the table in Appendix B. Each interview was audio recorded and notes were taken during the conversation. Immediately after each interview, the notes were revisited and refined. Finally, all interviews were transcribed.

The interviews performed with practitioners referred to specific living labs. This allowed for an investigation of nine cases during the pilot study. These are: CityStudio Vancouver, ATELIER, Urban Living Lab Breda, R-LINK project, The Green Village Delft, KTH LIL, MALL, China Housing Living Lab, and Transilvania Living Lab.

3.2 Establishing the level of analysis and selecting the cases

The pilot study placed the focus of this research on the *Participants* of living labs. This implies a holistic analysis at the living lab organization level (or the macro level). It was therefore important to select living labs which have a long-term perspective and transcend single projects.

High accessibility enables an in-depth case study, providing a detailed illustration of the studied living lab organizations (Haverland & Blatter, 2012). The two cases were selected after the commencement of this research with this as the primary criterion.

Besides accessibility, the two cases were selected such that they incorporated all four identified elements of living labs. The focus on living lab testbeds was chosen to narrow the scope of the research due to time constraints. Finally, the selected cases had to have existed for at least one year, in order for their organizations to have had enough time to become established.

3.3 Case study design and methods

The selection process resulted in choosing KTH LIL and MALL, making a comparative case study possible. This approach allows for extensively examining and contrasting two cases and developing insights for the broader context of living labs (Lune & Berg, 2017).

A two-step case study approach was adopted. First, each of the two cases was individually studied, with a focus on their organizations. Afterwards, the two cases were jointly examined, relating their similarities and differences with organizational studies literature.

Comparative case studies can adopt three types of designs, according to Yin (2017): exploratory, explanatory, or descriptive. When choosing the design, it is important to view the objectives of the research and what exactly is investigated (Hancock & Algozzine, 2017; Lune & Berg, 2017). As this research aims to provide a comprehensive description of two living lab organizations in their respective context, it follows a descriptive path. Therefore, the appropriate methods are interviews, observations and document analyses (Hancock & Algozzine, 2017). However, due to the COVID-19 pandemic, observations were not feasible. This constitutes a

methodological limitation which could not be avoided. It was mitigated to a certain extent by placing more focus on interviews and document analyses.

3.4 Data gathering (triangulation)

For providing a consistent analysis of the two cases, the gathering of data by means of interviews and documents followed the exact same approach. This process was governed by two principles:

First, a triangulation approach was adopted. This implies corroborating data from at least three sources (Larrinaga, 2017). Therefore, information from one interviewee/document was validated with other interviewees/documents.

Second, a clear line of evidence was kept regarding data collection and handling. This is explained in the remainder of this section, together with section 3.5. Also, interview protocols can be found as appendices of this report.

The case study data was gathered through interviews and documents. The interviews were performed in the exact same manner as the ones of the pilot study (see section 3.1 above). They were conducted by means of a pre-determined protocol which can be found in Appendix D.

Interviewees were selected in order to include at least one member of each structural unit. The selection criteria were developed so as to include all staff working exclusively for the living labs, as well as a representative of each type of partnering institution.

In total, 11 interviews were performed. In the case of KTH LIL, five interviews were performed: with the Director, the Technical Director, the Project manager, the Chairperson of the Board, and a second Board member were interviewed. Six interviews were performed with MALL representatives: one member of the Directors group, the Operations Officer, two Team members, the Project manager, and the Property manager.

Documents were collected from both living labs. All the available documents were requested and subsequently analyzed; thus, no selection criteria were needed.

3.5 Data analysis

The software ATLAS.ti was used for the management and sorting of the data. In total, 41 pages of interview transcripts and 429 pages of documents were analyzed for the two case studies. The process of examining these consisted of the steps detailed in Fig. 3.2, which will be individually detailed below.
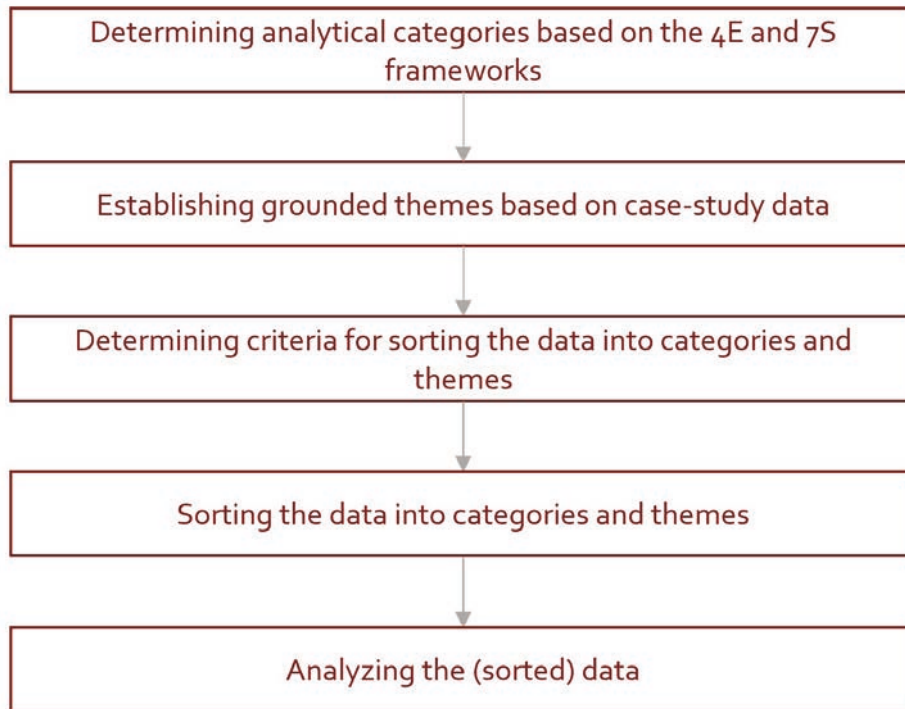
Fig. 3.2 – Data analysis process. Source: own elaboration based on Lune and Berg (2017).

3.5.1 Determining analytical categories based on the 4E and 7S frameworks

The two frameworks used for this research gave the analytical categories in which data was sorted. The 4E Framework offered three categories as its elements, which can be seen at the top of Fig. 3.3 in white boxes on a dark grey background. The *Participants* element in Fig. 3.3 does not have a white background as it does not represent a data analysis category. Instead, it is constituted of the seven categories representing the components of the 7S Framework (distributed vertically in the figure above). While offering a starting point, the categories were broad and not yet connected to the collected data.
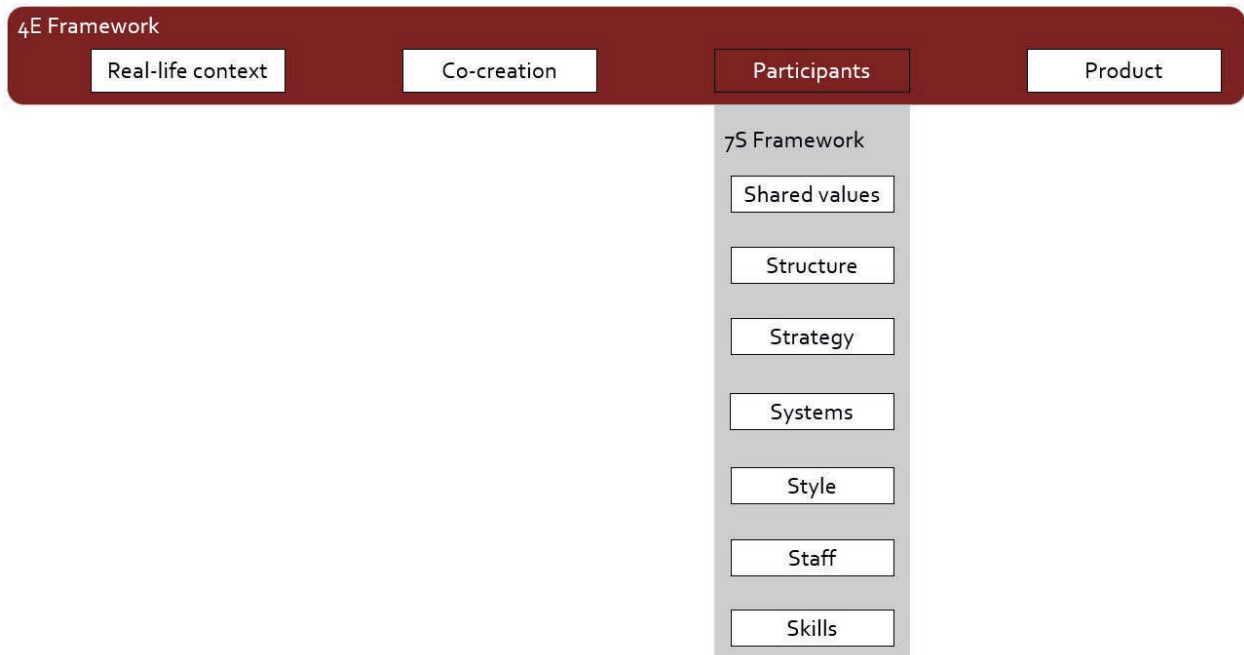
Fig. 3.3 – Illustration of the 10 analytical categories (white boxes) provided by the two frameworks and how they relate to each other.

3.5.2 Establishing themes based on case-study data

Bridging categories and data, as well as further segmenting them was done by reading the gathered information and identifying themes within each category, in an open coding process. The collected data revealed unitary *Real-life context*, *Co-creation*, and *Product* categories, without showing any clusters or division patterns within the three. Moreover, the categories themselves did not pose such complexity levels that they could not be managed without a further partitioning.

On the other hand, the seven categories under the *Participants* element did show emerging themes within them. Thus, the following themes resulted after this step, as shown in Tab. 3.1 and Tab. 3.2.

RESEARCH METHODOLOGY

Tab. 3.1 – The themes within the first four categories given by the 7S Framework.

Category	Shared values	Structure	Strategy	Systems
Themes	• Mission	• Organizational chart	• Development strategy	• Internal systems
	• Vision	• Board or Directors group	• Experimenting strategy	• Systems regarding experimenting
	• Values	• Executive group or Working group	• Communication strategy	
		• Management group or Program partners		
		• Innovation council or Expert community		

Tab. 3.2 – The themes within the other three categories given by the 7S Framework.

Category	Style	Staff	Skills
Themes	• Management style	• Responsibilities	• Internal
	• Decisional style	• Integration of staff	• Externally sourced
	• Working style	• Communication amongst staff	
		• Staff attitude	
		• Staff issues	

3.5.3   Determining criteria for sorting the data into categories and themes

The collected data was sorted into categories and themes based on two criteria. The first was whether a piece of information referred explicitly to a certain theme or category. This was used especially in instances related to Tab. 3.1.

However, relying exclusively on explicit statements was not always possible, especially in instances related to Tab. 3.2. For example, a person's attitude or working style can be, at times, identified more accurately through observations than answers. Hence, a second sorting criterion was employed – if a piece of information implicitly referred to a specific theme or category. This presents the shortcoming of a possible researcher bias (by means of lack of objectivity). To minimize this, the triangulation principle was used – this criterion was employed only if at least three sources or different instances showed a correlation. For instance, an enthusiastic attitude was recorded only if it showed in multiple instances. As this research aims to provide a general understanding of the two organizations, excluding isolated occurrences did not significantly affect the research outcomes.

RESEARCH METHODOLOGY

3.5.4   Sorting the data into categories and themes

According to the previously mentioned criteria, data was sorted into categories following a focused coding process. During this process, codes were manually assigned, and themes were refined whenever necessary.

3.5.5   Analyzing the sorted data

Further, the data was analyzed in a two-step method. First, patterns and deductions were made within individual themes and categories. Subsequently, connections and correlations were identified among themes and categories, showing interdependencies and relationships of influence.

3.6 Drawing conclusions and identifying research limitations

A single-case analysis of the sorted data revealed the results regarding each of the two living labs. The first research question was thus addressed. Subsequently, building upon these results, similarities and differences were identified. They were corroborated with organizational studies literature for answering the second research question. Finally, research limitations were identified, as well as avenues to be pursued in further studies.

4

RESULTS

Single-case analysis of KTH LIL and MALL

RESULTS: PILOT STUDY

This chapter presents the single-case analysis of the two living labs – the KTH Live-In Lab and the Marineterrein Amstedam Living Lab. While an overview of all four elements of the 4E Framework is provided, emphasis is placed on the Participants one. Why is the focus placed on that specific one? Let us first establish that by looking at the results of the pilot study. Subsequently, each case is examined, followed by showing the interconnections of the two frameworks.

Pilot study: Reconciliating the 4E Framework with practice and finding the research focus

4.1 Results: Pilot study

The Real-life context

The *Real-life context* element was investigated in practice with the aim of identifying where living labs are or should be placed.

14 of the 20 interviewees made a mention of the *real-life context* in their definition of living labs, either directly or as *area*, *place*, or *geographic space*. Moreover, all nine living labs investigated in the pilot study were placed in physical areas within cities, therefore in a real-life context. Conclusively, the *Real-life context* element shows a strong presence in the data collected.

Four out of the nine cases exhibited an open setting with the other five showing a closed one. This verifies this element: both its presence and the categorization according to the level of openness.

The living lab Product

The *Product* element was examined with the aim of identifying what outcomes do living labs have, in practice.

Nine of the 20 interviewees mentioned *developing innovation* in their living lab definition. However, 17 mentioned either *test* or *experiment*. This shows that, in practice, living labs can create innovation themselves, but also enable others to do so.

Four of the nine analyzed cases were aimed at exploration, with the other five being experimentation living labs. This shows the categorization according to the outcomes to be accurate. Finally, it also shows that the *Product* element is embodied by living labs in practice.

Co-creation in living labs

The analysis of the *Co-creation* element was aimed at determining the role of users in living labs in practice. The results are as follows:

RESULTS: PILOT STUDY

Four of the 14 interviewees mentioned *co-creation* in their definition of a living lab. Also, four of the nine cases included *users as co-creators*, with the other five regarding *users as feedback providers*. This further verifies this categorization regarding the *Co-creation* element of living labs, and shows that users might not always be involved as co-creators.

The Participants in living labs

The *Participants* element implies who is involved in living labs, and in which role.

Users were involved in all the nine analyzed cases, while public institutions were involved in seven, the same number as for the private actors. This shows a strong presence of the *Participants* element in the analyzed cases.

None of the analyzed cases were utilizer-driven and seven were provider-driven. One enabler-driven and one user-driven living labs were also identified.

Which of the four elements is more problematic?
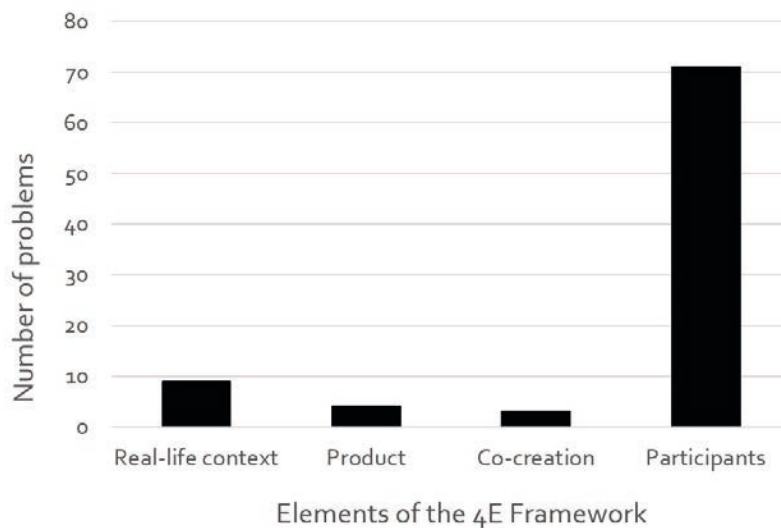
Fig. 4.1 – Number of problems mentioned by element of the 4E Framework.

Fig. 4.1 presents an overview of the number of problems mentioned by interviewees, plotted against the four elements of the 4E Framework. Let us discuss each element one by one:

Problems related to the *Real-life context* element were mentioned nine times. Most of them are related to regulations. For example, a lack of clarity regarding rules to be followed, as living labs are placed in "a mix of public-private ownership space" (Interviewee 16, December 4, 2019), or having to "navigate the bureaucratic process of local governments" (Interviewee 8, September 8, 2020).

The *Product* of living labs was indicated as a source of problem four times. In this case, issues such as a "low societal adoption of the innovation" (Interviewee 1, August 19, 2020),

groundbreaking "products not matching current laws and regulations" (Interviewee 7, September 1, 2020), or a "too early deployment of products for the uptake of people" (Interviewee 12, September 24, 2020) were mentioned.

Co-creation was the least problematic of the four elements, with only three problems mentioned in relation to it. Perhaps the low number of entries is also a consequence of the fact that five of the nine cases investigated did not perform co-creation, as they only involved users in the role of feedback providers. Nonetheless, one interviewee mentioned that they are dealing with an "unclear implementation approach and planning" (Interviewee 4, August 25, 2020). The other issues were caused by the COVID-19 pandemic delaying the co-creative process.

The *Participants* element was by far the most notable source of problems. Issues related to this were mentioned 71 times and incorporated a broad spectrum of difficulties. Examples included combining different management styles as "project developers are totally different than scientists both in terms of expected results and short-term versus long-term thinking" (Interviewee 13, November 20, 2019), and "lack of clarity regarding the roles and responsibilities of involved organizations" (Interviewee 4, August 25, 2020). This element was also affected by the COVID-19 pandemic, as physically "meeting with participants became impossible" (Interviewee 5, August 26, 2020) and a "changing of priorities and living lab plans" (Interviewee 12, September 24, 2020).

KTH LIL: Single-case analysis of KTH LIL

4.2 Results: KTH LIL

4.2.1 Description of KTH LIL

KTH Live-In Lab is located in KTH Campus Valhallavägen. It is composed of three testbeds (presented below), named after the three institutions which provide the space for their operation: Testbed KTH (named after the university KTH Royal Institute of Technology), Testbed Einar Mattsson and Testbed Akademiska Hus. The three eponymous institutions are joined by Schneider Electric, and form the center partners quartet. Together, they lead KTH LIL, with KTH Royal Institute of Technology (KTH) being the driving institution, and having the ultimate say in decisions. It should be noted that the center partners have been in a continuous evolution, at the beginning the partnership being formed by one industry partner and the university, with the other two companies joining at a later date. The ambition is that more center partners will be attracted.

Fig. 4.2 – Presentation of Testbed KTH (KTH Live-In Lab, 2020).

A cross-section through the Testbed KTH is shown in Fig. 4.2, displaying both the apartments in which students live, as well as the annexes where prototypes (e.g., sensors or monitoring systems) can be installed. The facility is composed of approximately 120 square meters of living space, 150 square meters of service space, and an office space of approximately 20 square meters (KTH Live-In Lab, 2020).

Fig. 4.3 – Cross-section of one building of Testbed Einar Mattsson (KTH Live-In Lab, 2020).

RESULTS: KTH LIL

Testbed Einar Mattsson is formed of three buildings similar to the one presented in Fig. 4.3. They total 305 apartments where testing can be performed on multiple levels, from measuring consumption to using building automation for research projects (KTH Live-In Lab, n.d.-e).

Fig. 4.4 – Rendering of Testbed Akademiska Hus (KTH Live-In Lab, 2020).

Testbed Akademiska Hus is formed of one building used for educational purposes. It was designed with input from teachers and students, and contains 363 study spaces, six training rooms and 11 group rooms (KTH Live-In Lab, n.d.-d).

KTH LIL began as a project in KTH's department of Energy Technology. It gradually developed throughout a journey which began in 2015 with an application for funding from VINNOVA (Sweden's innovation agency (Vinnova, n.d.)). The living lab was fully operational in 2018. Interviewees see do not see an end to the living lab, and it is meant to continue at least until 2027. Considering that the living lab has been operational for three years now, it has already passed the starting phase, as interviewees pointed out.

4.2.2 The Real-life context of KTH LIL

KTH's political landscape had a major influence on creating and operating the living lab, and still does. Also, education has a significant influence on the living lab as a whole. Two main types of undergraduate courses have been proposed to run in parallel with the testing activities of the living lab. KTH LIL is thus significantly influenced by its real-life context.

Conversely, KTH LIL aims to be the node and flagship that enables the KTH Campus to become fully sustainable, suggesting a two-way relationship of a rather symbiotic nature. While the living lab benefits from being part of KTH through, for example, financial contributions

or expertise, the university also furthers its sustainability agenda – the university has clear sustainability goals regarding education and its campus (KTH Royal Institute of Technology, n.d.).

KTH LIL is rather peculiar, as it has literally been built into their real-life context. It significantly changed its surroundings through its construction. Physically, KTH Live-In Lab is composed of two parts:

- A passive part (the Einar Mattsson and Akademiska Hus testbeds), which is regarded as "the real user environment". This consists of student housing and educational buildings which have fixed layouts and do not change periodically. They reflect the present paradigm of living and studying.
- An active part (the KTH testbed) which is exempt from building permits and thus designed for total freedom regarding the number of units and their layout. It is a designed or simulated user environment, as it often embodies options of future living situations in small apartments. The physical space is remodeled on a yearly basis in accordance with the projects taking place at that time.

The difference between a traditional laboratory and a living lab is that the latter needs to adhere to a different, and often more diverse, set of rules. Regulations which must be followed in the case of KTH LIL extend beyond health and safety into other domains such as the civil buildings one. Accordingly, KTH LIL also envisions influencing structures and rules by challenging the way buildings are built and used, and by generating the basis for rules and norms. Hence, the living lab is also seen as an instrument for policy development in the building sector.

The test bed is open to anyone within areas affecting real-estate and construction. This suggests an open, but focused, approach to the setting of the living lab. However, in order to test within KTH LIL, one needs to formulate a research project – the setting thus becomes closed.

The three testbeds can be used by all students of KTH. In addition, the living lab actively engages the community around it – professors and industry partner representatives are included in strategic propositions, and events are organized regularly with the aim of either presenting results or exchanging ideas. This suggests a large scale regarding the number of involved stakeholders.

An ecosystem approach means, in practice, " that there should be an added value for all partners involved" (Veeckman et al., 2013, p. 8). Whether only considering the center partners or considering the project partners, value is created for all involved. For the former it is usually intangible value (such as visibility or a connection to academic research). As the latter test and refine products, services, or business models, they benefit in a more tangible way. The living lab offers them a place for product development, data from past experiments, connection to KTH staff, and help with acquiring funding.

The interaction with users is performed in settings embodying their natural environments which allow for multiple facets of their lives to be included. However, when studying user interaction, an important question is: who are the users – the students or the project partners? This will be addressed in the section dealing with co-creation. Before explaining co-creation, let

us first establish what the product of the living lab is, and therefore what exactly should be co-created.

4.2.3 The Product(s) of KTH LIL

KTH LIL is an experimentation living lab. It provides a testbed for research and enables third-party actors to create innovation as industry-academia collaborations. These are divided into R&D and industry projects (KTH Live-In Lab, n.d.-b). In essence, the difference between the two is the entity leading the execution of the project, hence the driving actor. These projects represent the meso level of the testbed.

The testing infrastructure itself can also be considered a product, together with the living lab's database. These constitute the macro-level products of KTH LIL.

4.2.4 Co-creation

Co-creation is the joint creation of value by involving users as active participants in co-realizing the product and the experiences around it. It is thus essential to first understand who the users of living lab testbeds are. Let us consider the users using the distinction made between KTH LIL's products in the previous section.

On the individual project level, the products are the prototypes and technologies created by project partners. Therefore, the users of these products are the students and teaching staff utilizing the buildings constituting the testbeds. As one of the students living in the KTH testbed states, the residents would like to contribute to projects more actively (KTH Live-In Lab, 2020). However, they are not actively involved in the testing and development, thus no co-creation is performed on this level. It should also be noted that the level of user involvement is entirely up to the project partners.

When considering the testing infrastructure, the representation of users needs to be adjusted. Here, the project partners themselves become the users. In this case, active involvement does happen, as the layout of the KTH testbed, for instance, is jointly shaped – therefore, co-creation happens on this level.

4.2.5 Participants

The KTH LIL partnership consists of three private and one public actor. The driving actor is KTH, a public institution. The focus is improving users', and ultimately citizens', lives by enabling innovative building technologies and knowledge surrounding them. Hence, the outcome is both knowledge and solutions. Also, KTH LIL does not have an end-date – it has a long (previsioned) timespan. These are all characteristics of a provider-driven living lab, and KTH LIL belongs to this type.

With the general traits of KTH LIL established, let us further explore the characteristics of its *Participants* element in more detail. In doing so, the first research question is further addressed through the seven components of the 7S Framework.

RESULTS: KTH LIL

Shared values

The mission of KTH LIL

KTH Live-In Lab is a platform for accelerated innovation in the real estate sector. The focus of the living lab is thus established, providing the basis for the *Shared values* element.

KTH LIL is on a mission to:

> *Accelerate the pace of innovation in the construction and real estate sectors, based on excellence in research, education and collaboration (KTH Live-In Lab, n.d.-f).*

This is stated on the living lab's website, which suggests an implicit commitment (Lee, Barker, & Mouasher, 2013). Beyond external communication, the mission is explicitly mentioned in documents and by the staff.

The vision of KTH LIL

The living lab's mission is further aligned with its vision:

> *KTH Live-In Lab ensures that KTH becomes a sustainable campus and that Stockholm retains its leadership in sustainable urban development with a focus on digitization and smart cities. (KTH Live-In Lab, n.d.-f).*

The vision of KTH LIL is projected towards the outside world, hinting towards a greater good. The purpose suggested by this statement is bigger than the living lab itself. It is contributing to advancing KTH and consolidating Stockholm's position as a leading city in urban development. This suggests an ambitious long-term vision which needs supported by a strong strategy in order to be realized.

The values of KTH LIL

KTH LIL embodies several shared values. Interviews with the living lab's staff reveal these both explicitly and through staff's actions. Moreover, the values are also identified in internal documents, as well as external statements such as the mission or the vision.

The vision itself already hints towards an initial shared value – **altruism**. This is one of the values identified in and embodied by KTH LIL. Statements such as "we want to be seen as something which lifts everyone and provide new opportunities" (Interviewee 19, November 11, 2020), "giving companies and researchers a greater opportunity to reach their full potential" (Interviewee 22, December 3, 2020), and "a living lab should be public and get results for everyone" (Interviewee 21, November 16, 2020) are supported by the ambition of transferring results to society and promoting positive change. To this end, data is shared with parties who

are not involved in the living lab, in case they show good reason and good intentions for using it.

Inclusion and collaboration can also be distinguished in KTH LIL. They are supported by the manner in which the living lab was created. Researchers, professors, and industry representatives were included in the development of KTH LIL, despite this not being a requirement. This approach transpires to this day and to the way work is done – KTH LIL contributes to the initiation of the projects, and also helps with applications for funding. They see themselves as "a platform for collaboration" (Interviewee 22, December 3, 2020), connecting researchers to companies, when necessary.

Trust is seen as "crucial in order to be successful" (Interviewee 22, December 3, 2020), and involvement is highly valued. For example, appointments of new staff are done with broad consent and by listening to all relevant staff members.

Even though in theory KTH has the final say on decisions, **equality** can be observed, as opinions of industry partners are valued to the same extent as the university's. Thus, power differentials are, in practice, minimal.

Transparency can be identified on multiple levels. Evaluation criteria, as well as the names of the members of the evaluating committee are public on the website, and prospective project partners can consult them before applying. Additionally, objectives and performance evaluations are made public by means of the annual report published on the living lab's website.

Structure

KTH LIL began as a project within the Industrial Engineering and Management school of KTH, and is still organized as one. This significantly influenced the development of the living lab's structure.

Even though it began as a project, the intention of becoming a research center within KTH existed from the beginning. "The requirements for a [research] center are formal" (Interviewee 19, November 11, 2020). These include aspects such as the structure required, or the ways of collaboration between the university and industry partners. These were followed since the creation of the living lab, and a corresponding structure was built. Hence, KTH's framework for research centers fundamentally shaped the organizational structure of the living lab.

Moreover, a second reason for the current arrangement of the living lab's structure is the approach of involving an increased number of researchers and professors. These were involved both in the design of the structure, and in the VINNOVA funding application. Consequently, they became permanently involved in the living lab, and most are still involved to a varying extent.

RESULTS: KTH LIL
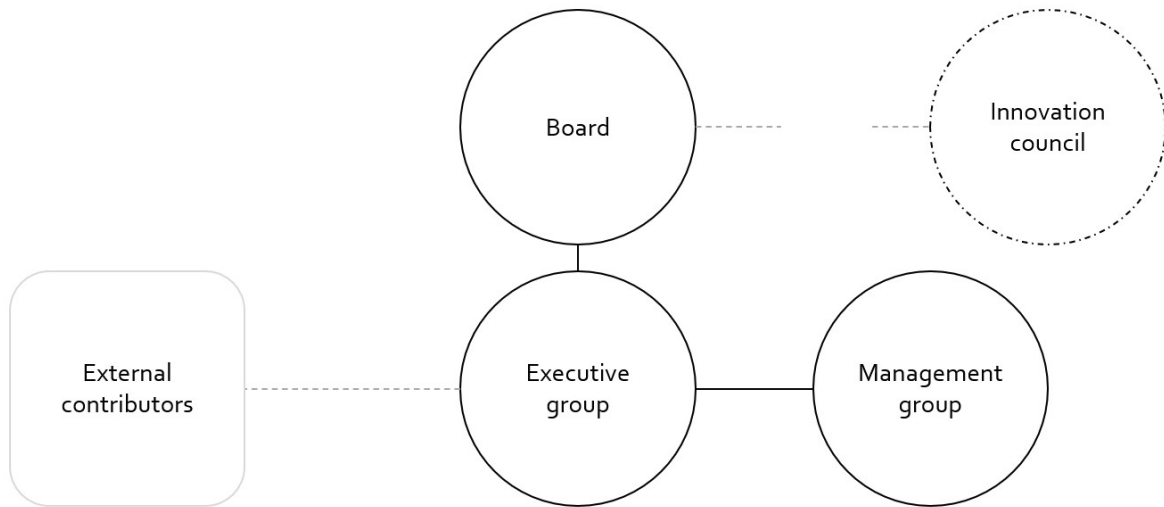
Fig. 4.5 - Organizational structure of KTH LIL

Building upon the standards of research center's within KTH, the living lab's structure consists of three structural units: the Board, the Executive group, the Management group. This resembles, as several interviewees pointed out, a company organizational structure.

External contributors, usually staff of the center partners, help the living lab with performing certain tasks, as well as providing knowledge and expertise. They are technically not part of the living lab but contribute substantially over long periods of time; hence, they are shown in Fig. 4.5. As they are not part of KTH LIL's structure, they are outside the scope of this section. Their contribution will further be detailed in the section referring to skills.

The Board leads the living lab, providing the high-level management and adopting the strategic directions, as well as controlling the finances. It consists of five members: two representatives of KTH and one representative of each of the three industry center partners. The Chairperson is in the lead, and has the additional responsibilities of planning the activities of the Board and supporting the Director regarding strategic issues.

The Executive group manages the daily operations of the living lab, as well as the implementation of projects. It consists of the only two people who are solely employed for KTH LIL – the Director and the Project manager.

The Management group has an advisory role. This unit is responsible for "maintaining the academic height of projects within KTH LIL" (Interviewee 23, November 23, 2020). Additionally, they help the Executive group with their tasks. This group consists of four representatives of KTH and one of each of the industry center partners (KTH live-In Lab, n.d.-a).

Finally, ideas for the creation of an Innovation council existed since the founding of the living lab. This unit is planned to be developed in the future, but the managers "have not had the time" to implement it (Interviewee 22, December 3, 2020). As it has not yet been created, its connection to the Board in Fig. 4.5 is interrupted. Nonetheless, this group is envisioned to have an advisory role, and help with suggesting strategic directions.

RESULTS: KTH LIL

Strategy

Three main pillars can be identified in KTH LIL's strategy: development, experimenting, and communicating. The implementation of strategy is regularly evaluated using pre-determined key performance indicators (KPIs), which are subsequently included in the living lab's yearly report.

The development strategy of KTH LIL

From a strategic perspective, KTH LIL's development is guided by the goals of becoming financially resilient and established in the innovation landscape of Stockholm, as well as within the KTH university. To this end, the living lab pursued and succeeded in becoming a research center, resulting in better access for funding and increased visibility. They did so by building "a sustainable business model, [without] outgrowing themselves" (Interviewee 20, November 26, 2020). Therefore, a path of organic growth has been considered as more beneficial than a rapid-growth one.

Related to consolidating their position within the university, the living lab aims to strengthen their involvement in education activities. The chosen approach for doing so consists of expanding the use of the testing framework from theses and workshops, to be formally incorporated in existing courses.

The strategy regarding experimenting within KTH LIL

Experimenting in KTH LIL is performed in a competition-neutral setting, in which industry and academia actors can work together. To this end, the living lab offers the testing infrastructure, the database, and facilitates collaboration. In exchange, experimenters pay a fee (depending on specific project characteristics) and offer in-kind contributions in the form of man-hours or products to be permanently placed in the living lab. This implies pursuing cost-neutral projects, renouncing any profits – these are reinvested in the living lab.

The living lab offers end-to-end services: from making connections between industry and academia parties, to the implementation and realization of projects. It offers its project partners the testing infrastructure, as well as knowledge and connections to KTH staff, students, and researchers.

Moreover, a digital twin is being built for testing incipient technologies, prior to their placement in real life. This strategic direction is pursued so projects which are in a very incipient phase can be tested, before placing them in the living lab's other testbeds.

Projects implemented in KTH LIL follow an individual path, tailored to their specific needs. This is done by involving partners in two ways:

- Project-based collaboration: small and medium companies develop prototypes and technologies by using the testing infrastructure.
- Strategic collaboration: medium and large companies employ the living lab for developing their internal R&D capabilities.

RESULTS: KTH LIL

A current strategic priority is represented by the living lab becoming more involved in research projects as a partner. This represents a shift from primarily offering a place for and helping with product development, to jointly applying for funding. This would subsequently shift the financial burden of the living lab fees from the project partner to the institution funding the research project – which may be, for example, the European Union or VINNOVA.

The communication strategy of KTH LIL

Communication in KTH LIL employs two types of channels. Informally, project and center partners, as well as staff are expected to "spread the word" (Interviewee 19, November 11, 2020). Consequently, the approach of involving as many people as possible was adopted. On the other hand, formal communication channels are used as well. These include:

- The website – where updates, video recordings, and reports are posted.
- A digital newsletter.
- Events – such as conferences and workshops.

On the experimenting side, however, all communication is performed by the project partners themselves. The living lab helps in this respect with providing templates or developing communication documents.

Systems

As opposed to the formalized, structured way of working of companies, KTH LIL has a rather "laissez-faire" approach (Interviewee 23, November 23, 2020). It relies primarily on implicit processes which are marginally complemented by explicit systems and has an academic approach.

This comes with positive aspects such as allowing the acceptance of certain projects which might be relevant and innovative but would lack in other respects. Additionally, this allows for more productivity due to decreased bureaucracy. Perhaps also due to the very nature of being a living lab, this leads to a resemblance to the Agile way of working – encompassing spatial and temporal flexibility, innovative activities, usage of digital technologies, and integration of resources (Russell & Grant, 2020).

Conversely, disadvantages are manifested especially with respect to attracting and onboarding new staff and project partners. This particularly refers to making sure they do not "redo all the mistakes, and [they benefit from] all the learnings that were experienced and perhaps not always documented" (Interviewee 23, November 23, 2020).

The explicit systems were developed during the VINNOVA funded project and were further developed during the application for becoming a research center within KTH. These two applications were therefore instrumental in developing the living lab's procedures.

RESULTS: KTH LIL

The internal systems of KTH LIL

Internally, KTH LIL practices minimal systems, which embody two central characteristics – flexibility and adaptability. Regular meetings are held within each structural unit, which are complemented by personal conversations.

Explicit and strict procedures exist only in relation to the database. Here, the recording and management of data, as well as using the database itself, are governed by clear systems. These stem from GDPR regulations and have been developed in accordance with the guidelines of the Swedish National Data Service.

Systems regarding experimenting within KTH LIL
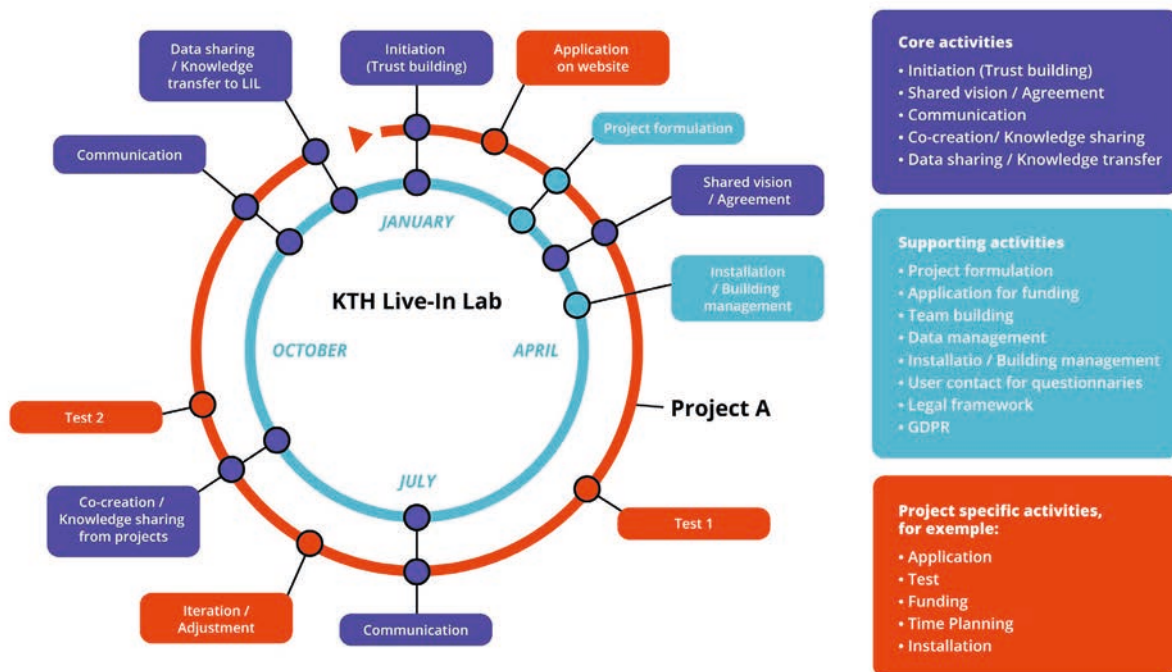
Fig. 4.6 – Process of projects within KTH LIL (KTH Live-In Lab, n.d.-c).

Experimenting in KTH LIL is performed according to a clear process, as shown in Fig. 4.6. Projects follow the academic year, but can also be performed for a shorter or a longer period than one year. This allows for flexibility, as it is tailored to each individual project. The timeline and activities undertaken are jointly established with the project partners. The process thus serves as a guideline, rather than a strict path, and can be found on the living lab's website.

Systems also exist for becoming a project partner and developing products within KTH LIL. Applications are submitted and evaluated according to pre-defined processes, which are detailed in internal documents and shared with applicants.

RESULTS: KTH LIL

Style

Living labs are partnerships involving multiple actors (ENoLL, n.d.-c; Steen & van Bueren, 2017b). This implies a collaboration between persons who come from different organizations. It is therefore essential for KTH LIL to encompass the point of convergence of the different manners of working of its participants. In doing so, power differentials need to be taken into account, together with influences produced by the real-life context (e.g., political situation).

The management style of KTH LIL

Hierarchy is almost non-existent in KTH LIL, in practice. It does exist on paper, but the daily activities do not embody it. They embody a bottom-up management style, which prioritizes impact and collaboration. Structural units manage themselves for the most part, in a less structured style than the one which can be seen in companies. Indeed, rigid guidelines and frameworks do not exist in the living lab. As a result, a gentler approach is adopted, which relies on trust and fosters equality.

The decisional style of KTH LIL

Decisions are taken by consensus, in a process which involves all relevant staff members. The living lab is a research center within KTH – thus an independent group. Additionally, the organizational structure contains a Board, and this provides "freedom" in decisional aspects (Interviewee 19, November 11, 2020). Hence, independence can be observed in the decision-making process, as decisions are made by prioritizing KTH LIL, and not any of the institutions employing where participants are technically employees.

The style of working in KTH LIL

The working style of KTH LIL combines the industry and academia perspectives brought by the center partners. These different ways of working represent one of the main sources of problems for the living lab – dissimilarities are still being mitigated, with progress being made through discussions.

The work is performed by a limited number of staff members, and adopts an "informal" style (Interviewee 21, November 16, 2020). Specifically, the two members of the Executive group carry out the daily tasks, with other members helping with specific tasks, when necessary. This is internally seen as risk-prone, as the living lab becomes heavily dependent on the two – especially as it can lead to certain ideas remaining at the forefront for longer than beneficial.

RESULTS: KTH LIL

Staff

Responsibilities of KTH LIL staff

On an institutional level, KTH holds almost all the responsibilities, along with being solely accountable for the living lab. The university is the one that pays the literal and metaphorical bill, further ensuring participants that it "is not a business or private enterprise" but a setup for producing research (Interviewee 23, November 23, 2020). However, every center partner has representatives in the living lab, participating in all structural units.

Responsibilities of individual staff members are established according to the structural unit they are part of. Apart from the Chairperson of the Board, the Director, and the Project manager, all persons involved in a specific structural unit share the same responsibilities.

Integration of staff in KTH LIL

Turnover regarding representatives of industry center partners is higher, comparative to staff coming from KTH. This is due to employees leaving the companies, which shows that "industry does not have the long-term relationships with individuals" that academia does (Interviewee 22, December 3, 2020).

Staff are personally appointed in KTH LIL, so that all knowledge areas which relate to the focus of the living lab are covered. The appointments are done by consensus among existing staff, without formal criteria. They are done for an indefinite period, which makes units less "dynamic", with people being in certain positions for a long time and losing motivation (Interviewee 19, November 11, 2020).

Communication amongst KTH LIL staff

Interviews performed revealed that staff members are informed regarding all investigated aspects of the living lab. This shows that staff members communicate well – in meetings and through emails or personal conversations. Hence, whenever communications occur, they are caused by misinterpretations, often due to the different backgrounds of the involved people.

The attitude of KTH LIL staff

Staff are "very interested and very keen to respond" (Interviewee 19, November 11, 2020). They show a pleased and committed attitude with respect to KTH LIL. Commitment is, in fact, one of the unwritten prerequisites on becoming a staff member, as explained by one interviewee.

A collaborative and egalitarian attitude can be observed in the living lab. The Board "helps" the Executive group (Interviewee 21, November 16, 2020). The Management group "helps" the Director and the Project manager with the operations of the living lab (Interviewee 21, November 16, 2020). Furthermore, people are encouraged to participate in activities and

decision making, which promotes trust and inclusivity. Thus, an open environment which elicits and values all individual opinions is fostered. Nonetheless, problems among staff still arise.

Issues among KTH LIL staff

The issues among staff stem primarily from involving multiple people from different institutions. Especially since most people are involved in a dual quality – as members of KTH LIL, and employees of the center partners. Therefore, split incentives occurred, leading to low motivation and participation. This was, however, not a general occurrence, as it only scarcely happened, in isolation.

Another cause of problems is represented by the concentrated workload. As only a few staff are performing the tasks, the living lab becomes highly dependent on them. More importantly, this situation might lead to low motivation among staff members, which is one of the reasons why KTH LIL is moving towards a more distributed system.

Skills

Skills provided by staff members

KTH LIL relies exclusively on its staff members to manage and operate the living lab – for example, strategy development and implementation, management, and decision-making are all performed without any external help.

However, staff are not primarily appointed for bringing certain skills to the living lab. Instead, the representation of all center partners and of all relevant KTH departments is the primary criterion. Therefore, even though staff members have technical and research-specific skills, this might entail some limitations.

Skills provided by external contributors

Center partners all contribute with personnel, which becomes part of the living lab. These are referred to as staff members, as they are formally involved in the living lab over a long period of time. However, all center partners also contribute to specific living lab tasks, whenever necessary. Essentially, all center partners provide specific skills such as technical support and data management. Besides this, the accounting and the communication and branding are performed by personnel of KTH. Thus, KTH is the primary external contributor of skills.

Structure

Board ----- ----- Innovation council

Executive group —— Management group

Strategy

- Become a research center in KTH
- Strengthen educational involvement
- Offer end-to-end experimentation services
- Communicate via personal networks, website, and events

Systems

- Minimal internal systems
- Flexible systems for experimenting

Shared values

- Mission: clear
- Vision: clear
- Values: correlated with mission and vision

Skills

- Combining both internal and external skills
- Skills are a secondary appointment criterion

Style

- Management: non-hierarchical and distributed
- Decisional: collaborative and distributed
- Working: informal

Staff

- Clear responsibilities
- No onboarding process
- Good communication
- Committed, collaborative, and egalitarian attitude
- Issues rarely occur

Fig. 4.7 – Overview of the Participants element of KTH LIL

4.2.6 The 4E Framework – 7S Framework relationship in the case of KTH LIL
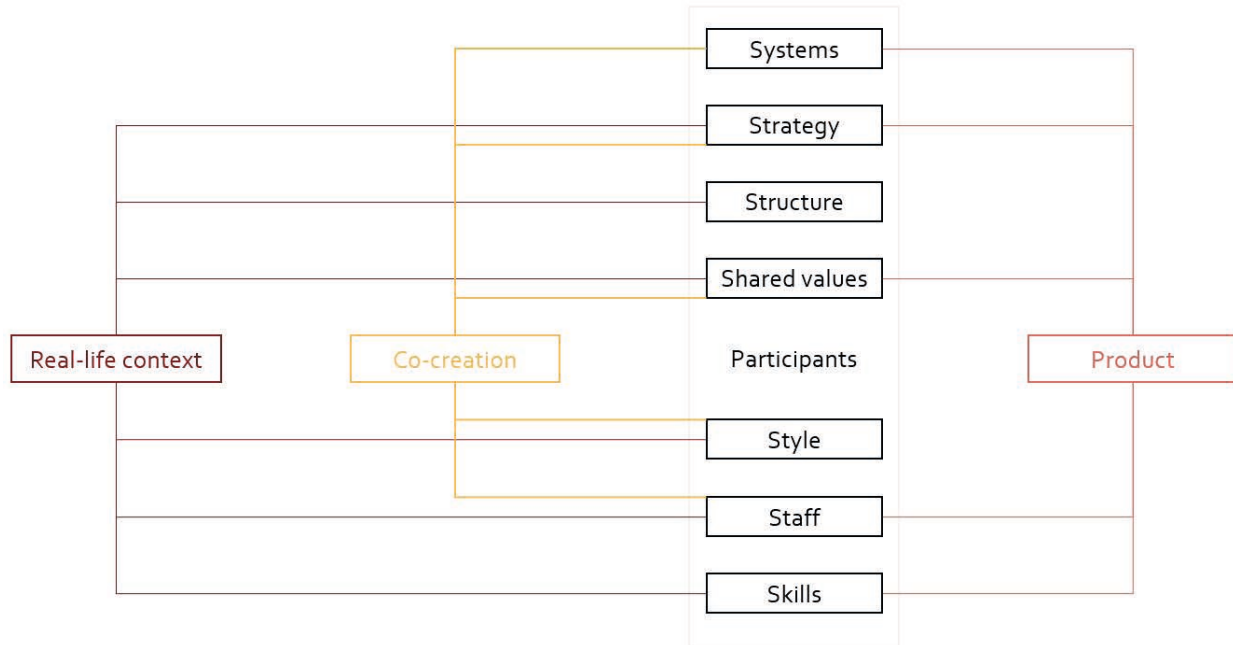
Fig. 4.8 – The interrelationships among the 4E Framework and the 7S one, in the case of KTH LIL.

The Real-life context – 7S Framework interrelationship

The *Real-life context* of KTH LIL is interrelated with its *Shared values* on the vision level, as the living lab envisions contributing to the KTH campus becoming completely sustainable. Besides the vision, the real-life setting had a decisive influence on KTH LIL's *Structure*. The organizational chart itself has been modelled so that value is provided for all parties involved – thus showing the community and ecosystem approach features of the real-life context. Moreover, being a research center within KTH has determined the structural units and their composition – they have been built in accordance with the university's requirements.

The university had great influence on the *Style* as well, as KTH LIL has adopted a management approach which resembles KTH's environment and takes into account KTH's political landscape.

The *Staff* component is also correlated with the *Real-life context* element. KTH is fully responsible on an institutional level and determines individual responsibilities through the requirements for becoming a research center. They do so by determining the structural units and their responsibilities – which translate to the members. Finally, as the university's campus represents the location of the living lab, students are central to KTH LIL. This further shapes the *Skills* component, as the Project manager oversees and is responsible for maintaining the student community which is hosted in one of the living lab's testbeds. Consequently, this position requires a specific set of skills, and the hiring of the current Project manager has been performed accordingly.

RESULTS: KTH LIL

The Co-creation – 7S Framework interrelationship

Co-creation happens in KTH LIL on the macro level, with the project partners as users. These are actively involved by the living lab as it seeks to promote inclusion and collaboration (two of their values) by means of in-kind contributions. Thus, a connection between the *Co-creation* element and the *Shared values* component exists. The yearly reconfiguration of Testbed KTH is one of the activities included in the living lab's *Systems* which favors co-creation. To this end, projects are required to include specific activities which create the prerequisites for co-creation to happen.

The *Co-creation* element is actively pursued externally through the involvement of project partners. Internally, it influences the *Style* component – which is consequently shaped to foster collaboration and involvement in the living lab's management approach. Decisions such as admission of new projects or appointments of staff are made with broad consensus as people are encouraged to contribute and "give their own opinion" (Interviewee 21, November 16, 2020).

Lastly, the *Strategy* of KTH LIL is developed with a clear connection to the *Co-creation* element. Strengthening the co-creative process represents a central strategic goal, as the decision was made to involve project partners in the design of Testbed KTH. Additionally, this connection is projected to be strengthened by the creation of the Innovation council – through which multiple actors can shape the living lab.

The Product – 7S Framework interrelationship

KTH LIL's participants exert significant influence on the macro level of the *Product* element – the testing infrastructure and the database. In this respect, the two are developed by involving all center partners to the same extent, showing a connection to the *Shared values* component through the value of equality.

The living lab has minimal processes; its *Systems* component primarily embodies procedures for operating the database and for experimenting. As the database is itself a product of the living lab, a connection can be identified through the development of special processes.

The testing infrastructure itself is one of KTH LIL's products. This is shaped by the living lab's strategy, especially by the strategic direction regarding experimenting – the living lab offers the possibility of configuring the testbeds according to project needs.

Finally, the skills brought by the living lab's staff have a significant influence on both the testing infrastructure and the database. This connection is established as the two are created and managed according to the capabilities of the KTH LIL staff and of the living lab's external contributors. Indeed, the living lab decided not to employ a third party for developing the infrastructure or the database.

RESULTS: MALL

MALL: Single-case analysis of MALL

4.3 Results: MALL

4.3.1 Description of MALL

MALL is a living lab testbed located at the Marineterrein district of Amsterdam. It is a collaboration among three public institutions (Amsterdam Institute for Advanced Metropolitan Solutions (AMS Institute), Bureau Marineterrein and Amsterdam Smart City) and a private actor (NEMO Science Museum).

Even though all four institutions have been with the living lab since the start, now only AMS Institute and Bureau Marineterrein are named *the founding partners*. The other two organizations are considered *program partners*.
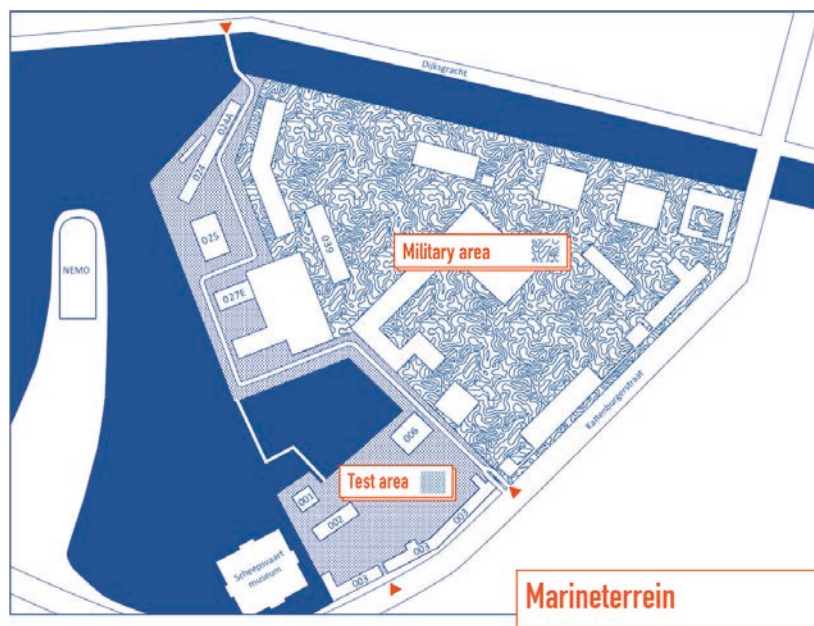
Fig. 4.9 - Map of Marineterrein Amsterdam displaying the land area of the MALL testbed – *Test area* and the area outside the scope of the living lab – *Military area*. Adapted from Marineterrein Amsterdam by Bureau Marineterrein (2018). Retrieved March 23, 2021, from https://www.marineterrein.nl/wp-content/uploads/2018/09/Marineterrein-Magazine-nr.2-EN.pdf.

MALL occupies part of the Marineterrein area and consists of one outdoor testbed – the *Test area* in Fig. 4.9. The land area itself is controlled by Bureau Marineterrein in the name of the City of Amsterdam. Additionally, the living lab can make use of the water around it for experiments. However, this requires additional agreements with Waternet – the water company operating in Amsterdam.

RESULTS: MALL

The living lab receives applications from potential experimenters, subsequently evaluates them and allocates a certain place for experimenting. It does not perform experiments itself. It is thus an environment for producing innovation.

4.3.2 The Real-life context of MALL

The Marineterrein area entered under the ownership of the City of Amsterdam several years ago. Hitherto, it has been a military area, and was owned by the Dutch Ministry of Defense. Since then, no zoning plan was created and therefore has more relaxed regulations. Physical constructions are not, however, exempt from obtaining permits. Hence, laws and guidelines still need to be followed regarding some domains such as building or safety.

MALL is seen as "an important part" (Interviewee 28, December 11, 2020) in developing the Marineterrein area into "the living district of the future" (Interviewee 25, January 8, 2021). It is located on a public area, and may therefore be influenced by the city's political landscape. Its placement also implies that it benefits of increased visibility. It also has access to a broad network through the 4 partners, as well as through its connection to the City of Amsterdam.

From a physical perspective, some experiments need to be literally built on the ground, while others are placed on buildings or in the water. This subsequently influences the physical landscape. However, all these changes are performed by the experimenters themselves.

The living lab focuses primarily on the initial phases of product development. Restrictions are, however, not established regarding who is allowed to test products. Therefore, the living lab has an open setting, even though the ultimate responsibility regarding who will be allowed to experiment lies with the MALL organization.

Another aspect of the real-life context of living labs is their community (Veeckman et al., 2013). It is still unclear what the community includes in the case of MALL, despite the living lab's intentions of engaging those who "are doing or are interested in doing experiments" (Interviewee 27, January 12, 2021). Currently, the community around the living lab "is not necessarily aware of the fact that there is a living lab [on Marineterrein]" (Interviewee 25, January 8, 2021). Therefore, engagement is desired (and even planned) but has not yet happened. "MALL is supposed to build a community, but [they] do not know how to do it, yet" (Interviewee 26, December 14, 2020). This suggests that the living lab is still in its incipient phases and has yet to become completely established.

Veeckman et al. (2013) explain that an ecosystem approach (i.e., creating value for all participants) is key. As the living lab aims to contribute to the development of Marineterrein as an area, it is clearly intended to create value for all the participants. The interviews conducted show that this is, in fact, the overarching goal of the living lab. AMS Institute and Bureau Marineterrein are the main beneficiaries of the value produced by the living lab. The two other partners benefit as well, but to a lesser extent.

MALL strengthens the connections among the four partnering institutions. Additionally, it should create more visibility for the four partners. However, the increase in visibility produced by the living lab is limited – "[people] do not know there is a living lab" (Interviewee 29, January 12, 2021).

RESULTS: MALL

Through the experiments taking place within it, MALL is intended to further the agenda of the four partners. These do contribute to reaching the goals of AMS Institute, Bureau Marineterrein and Amsterdam Smart City – they all aim to ultimately play a role in improving (part of) the city of Amsterdam. However, it is still unclear what NEMO Science Museum gains from the living lab.

On the other hand, MALL provides experimenters with benefits of a more tangible nature. It offers a space for experimentation in Amsterdam and a connection to the four partnering institutions.

MALL is located on an area which contains outdoor spaces for recreation, exercise, as well as offices and housing. This reflects users' natural environment, embodying various aspects such as working, living, and leisure.

4.3.3 The Product(s) of MALL

MALL is a place where innovative solutions are produced with the aim of ultimately being applied in urban environments (Marineterrein Amsterdam Living Lab, n.d.-b). It is therefore an enabler of innovation and not a producer itself.

The creation of innovation is made possible by providing experimenting space and connections and expertise. The experimenters themselves are responsible for the creation and the development of prototypes. Thus, innovation is yielded through the meso layer of the living lab – through individual projects.

On the other hand, the testbed itself can be considered a product of the living lab. This belongs to the macro layer.

MALL is a framework for enabling the production of innovation. Thus, it is an experimentation living lab. It has the aim of supporting the creation of prototypes and technologies aimed at scaling up for the improvement of urban areas.

4.3.4 Co-creation

Before analyzing the process of co-creation in MALL, let us first establish who this process should involve. Through the collaboration among the four institutions involved in MALL, part of the co-creation requirements is provided. For the remainder, the role of users is essential.

On the meso level of living labs, individual projects are performed (Schuurman, 2015). In the case of MALL, third parties develop innovation in projects ranging from recycling urine to studying the interaction between robots and pedestrians (Marineterrein Amsterdam Living Lab, n.d.-a). Therefore, the spectrum of end users is broad – virtually any category of persons can be considered a user. However, users have not been co-creators in any of the projects performed so far – they have rather been studied. Therefore, no co-creation has been performed at MALL's meso level.

The testing infrastructure (i.e., the macro level) of MALL has been created in a joint effort by the four partnering institutions. This has been done without involving the intended users of the testbed (the experimenters). Therefore, no co-creation happened on the macro level, either.

RESULTS: MALL

4.3.5 Participants

The living lab has been officially opened in 2019 and has no projected end date, thus a lifespan projected to be long. It is aimed at developing knowledge and solutions for better urban environments. It is led by two of the four partnering institutions – AMS Institute and Bureau Marineterrein. MALL exhibits the characteristics of provider-driven living labs. It is one, but a special case of such a living lab, as it has two public institutions at the helm.

Effects of this peculiar configuration will be shown in the subsequent sections of this report in which we examine the *Participants* element of MALL through the seven lenses of the 7S Framework.

Shared values

The mission of MALL

Having a mission-oriented approach is central to MALL. This is preferred over a business-oriented one. In fact, the living lab adopted in the past a business way of working. However, this was abandoned, as it created internal divergences. The living lab is indeed following an impact-creation approach and pursuing a mission, even though it is not explicitly communicated externally as a statement. It is, however, stated by interviewees:

> *To improve Marineterrein and help it become the living district of the future, subsequently contributing to future-proof neighborhoods or cities of the future.*

Naturally, this needs to be aligned with the mission for Marineterrein itself. As Bureau Marineterrein is the administrator of the area, value is directly created for them, and indirectly for the three other partners as they are located there.

The ambition of the administrator is indeed developing the area into "a future-proof city district featuring open innovation, accessible and flexible living and working spaces, unique housing, sports, recreation, and greenery" (Bureau Marineterrein, n.d.). Hence, the two are correlated.

The change from a business-like approach to an impact-creation one implied a rethinking of the position of MALL. It led to rethinking the living lab's role in achieving Marineterrein's mission – and subsequently its own. This is still unclear at the moment; it is currently being discussed. Conclusively, a high-level alignment exists but how that will be realized is yet to be established.

The vision of MALL

The mission of MALL is closely related to Marienterrein as an area. Therefore, the same intertwinement would be expected regarding the living lab's vision. Interviewees have indeed

pointed towards this connection, with the living lab even seen as a vehicle for implementing the vision for Marineterrein.

MALL strives to have a vision in accordance with the one for the area. However, a lack of vision for the area is perceived. As a result, the living lab does not yet have a clear vision. Efforts are currently being made for the creation of one.

The values of MALL

MALL does not explicitly state their values. They can be identified in discussions with staff. As a result, the values identified are embodied and not merely stated, making them all the more relevant.

A key value of MALL is **producing positive impact** in urban areas (and contributing to Marineterrein). This already becomes clear with the living lab's mission. It is one of the main drivers and is held in high regard by the participants. One instance in which this could be observed was the moment when the living lab adopted a business-like approach. This was conflicting with this value and, as a result, resulted in internal tensions and issues.

Developing a strong Marineterrein community is a second value, closely related to the previous one. To this end, the living lab can be seen as a bridging tool among the four partners, as well as beyond them. It pursues an involvement of all interested Marineterreiners. Even the application form for experimenters includes a question related to the collaboration with the Marineterrein community.

Lastly, the living lab is seen as a value producer for AMS Institute and Bureau Marineterrein. This already creates a distinction between the two and the two other partners. Additionally, discrepancies between the two leading institutions existed. In general, pooling resources and working together for the benefit of MALL is not the status-quo within the living lab. Rather, **institutional individualism** can be observed in many aspects – these will be discussed in the subsequent sections.

RESULTS: MALL

Structure
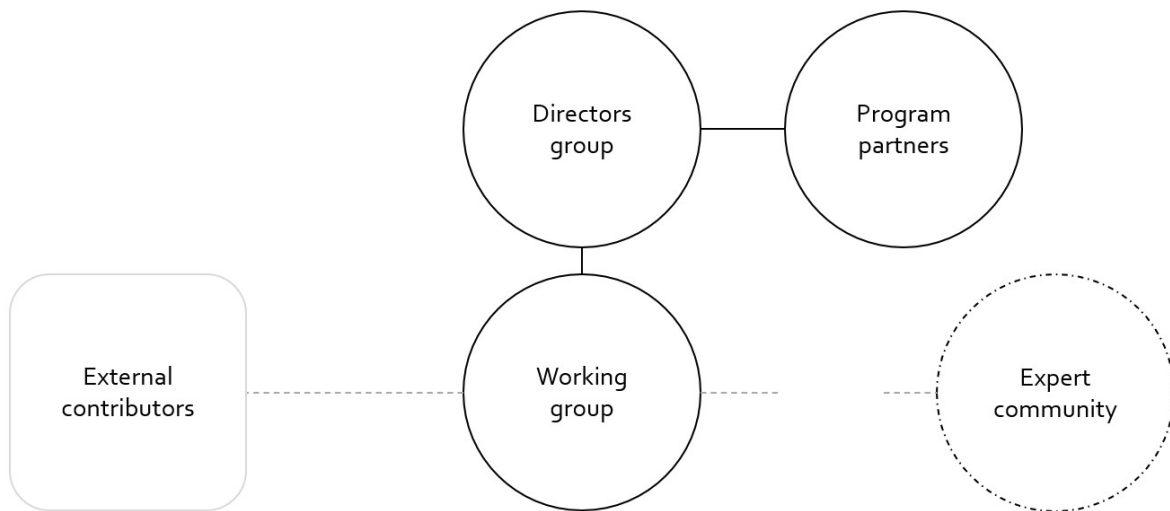
Fig. 4.10 – Organizational structure of MALL

The organizational structure of MALL consists of three units – the Directors group, the Program partners, and the Working group. As the External contributors provide specific capabilities, they will be addressed in the subsequent section dealing with skills. They are not part of the living lab's organization, but due to their continuous contribution, they are shown in Fig. 4.10.

This structure is considered beneficial, as it contains a mechanism of addressing certain issues in the Directors group whenever disagreements exist in the Working group. No formal document establishing this or other mechanisms, nor roles or responsibilities within MALL exists. These have all been established "organically and iteratively" (Interviewee 26, December 14, 2020).

The Directors groups provide the high-level management of the living lab, establishing the strategic directions adopted, as well as making financial decisions and accepting experimenting applications. This structural unit consists of one representative of Bureau Marineterrein and one of AMS Institute.

The Program partners help the Board with their tasks. Their responsibilities overlap but the former do not have decision power. This unit is composed of a representative of Amsterdam Smart City and one NEMO Science Museum.

The Working group oversees the daily operations of the living lab and the implementation of projects. This group consists of one representative of AMS Institute, NEMO Science Museum and Amsterdam Smart City. This is completed by two people from Bureau Marineterrein, out of which one is dedicated entirely to MALL – the living lab Coordinator. Most of the operational tasks fall within the Coordinator role, who is the only person employed for MALL. The other members of this group are helping with specific tasks, but are mostly involved in meetings.

Finally, the Expert community is envisioned to help consult on field-specific issues such

as deciding whether a certain experiment is innovative – subsequently contributing to deciding whether it will be accepted in the living lab or not. This is a loosely formed community around the living lab which has not yet been formally developed and engaged – hence the interrupted connection in Fig. 4.10.

Strategy

The intention of MALL is to be strategically aligned with Marineterrein. For example, as the living lab is currently in the process of determining their experimentation focus, their main criterion for establishing that is "if Marineterrein itself has a mission to achieve that" (Interviewee 27, January 12, 2021). Therefore, the strategy component displays the value of creating positive impact.

The strategy creation process has so far followed a trial-and-error approach. Continuously iterating and refining, the living lab develops its strategy in what can be considered a bottom-up approach – they start with the resources and capabilities possessed and establish directions based on that. Whenever the adopted strategies prove to be unsuitable, they are changed.

Regular assessments are performed, but the strategy is not evaluated according to performance metrics. Instead, this is done retrospectively, with team members reflecting upon the period previous to the assessment. Consequently, establishing whether the living lab is successful (and in what respects) does not seem to be a priority.

The development strategy of MALL

In the summer of 2020, the living lab changed its approach and became more impact-driven. Therefore, the old strategic paths needed to be adjusted. A new strategy has not yet been articulated, as the living lab is still trying to establish its focus. Nonetheless, this new strategic direction will be centered around creating value for both Marineterrein and for the founding partners.

The strategy regarding experimenting within MALL

MALL aims to attract more experimenters, planning to do so by attending meetings of the Marineterrein community. While the living lab wants to focus on specific experimentation themes, all experiments should contribute to "future-proof neighborhoods or cities" (Interviewee 26, December 14, 2020), which displays the living lab's inherent value of creating impact.

Focusing on themes is expected to create value for both MALL and the experimenters, while allowing for a better, more directed manner of creating impact. This is yet another instance where this driving value is observed. However, it is still unclear what the adopted themes will be. Their implementation is also unclear, considering that "if there are interesting experiments that do not fit the theme(s) [MALL is] focusing on at that time, it does not mean that [they] will not implement it" (Interviewee 24, December 14, 2020).

The strategic goals regarding experimentation include increased transparency regarding

the application procedure and what experimenters can expect with regards to aspects such as payment or sharing of collected data. Until now, transparency has not yet been achieved, as explained by one of the interviewees.

The living lab is not currently involved in the implementation process of experiments – they "facilitate the space and the possibility to do the experiments but are not involved in the way the experiment is performed" (Interviewee 27, January 12, 2021). The ambition is for this to change, and to increase the involvement and cooperation throughout the entire experimentation process.

The strategy regarding experimentation in MALL is continuously being developed. It can currently be characterized as a work in progress: for example, the target groups are not yet defined, value propositions are not completely clear, and data is required to be shared but no framework for doing so exists. The lack of clarity, as Collis (2019) explains, is likely to lead to the failure of executing the strategy. More importantly, in the same author's words, an unclear strategy leads to frustrations among the staff.

The communication strategy of MALL

MALL relies on both formal and informal communication channels. Informally, the participants are communicating about the living lab through their networks. In this respect, the living lab benefits from access to the vast networks of the four partnering institutions.

Formal communication channels are also employed. MALL's website and the ones of the partnering institutions are used for external communication. Similar to KTH LIL, announcements related to experimenting activities are made with the experimenters themselves, and not the living lab.

Currently, communication is done in an "opportunistic" (Interviewee 26, December 14, 2020) manner. Experiments are placed within the living lab based on "what is most convenient" (Interviewee 26, December 14, 2020). For example, MALL's website shows the Amsterdam Drone Lab under its experiments section (Marineterrein Amsterdam Living Lab, n.d.-a), when in reality it is an independent lab dealing with drones.

Since its inception, the living lab has not had a communication strategy; however, one is currently under development. In fact, external communication has been one of the particularly problematic aspects of MALL. This has been because of the involvement of different institutions, with different communication styles and agendas, as several interviewees pointed out. The living lab was often used for the promotion of individual institutions. In this regard, the value of institutional individualism can be observed.

A good and well-understood strategy aligns the participants, and enables choices that build on each other and reinforce one another (Collis, 2019). Therefore, the development of a joint strategy could potentially solve the problems regarding external communication.

RESULTS: MALL

Systems

Since the very beginning, MALL developed and operating adopting an organicapproach. Its development followed a trial-and-error path, without clear procedures to follow. Therefore, a minimal level of systems exists – and when they are present, they are informal by nature. While this allows for iteration, interaction and feedback, as well as relational views (Farjoun, 2002), in the case of MALL it also presents disadvantages. For example, onboarding is a non-existent process. As a result, the transmission of learnings is hampered, subsequently opening new staff to repeating the mistakes of others.

The internal systems of MALL

From an internal perspective, MALL relies primarily on meetings. These are jointly held with multiple structural units, as well as individually, with the members of one single unit. Meetings are complemented by personal discussions. Thus, an increased level of flexibility can be observed.

Systems regarding experimenting within MALL

Fig. 4.11 – Experimentation process in MALL (Marineterrein Amsterdam Living Lab, n.d.-b).

Experimenting in MALL takes place in a four-step process. This offer structure, doing so in a flexible way – each step can be tailored to the needs of every experiment. Experimenters decide on the specific activities they undertake, so the process only serves as an indication of contact points between experimenters and the living lab (the first two steps) and general phases undertaken by all projects (steps three and four).

Style

MALL is a collaboration among four institutions. Moreover, only two of the four are driving the living lab, which results in power differentials. Therefore, it combines the styles of different types of actors in different positions. This has proven problematic at times, which could be one of the pitfalls of living labs. This shows that Style is indeed one of the aspects which requires special attention in such endeavors and, more specifically, in MALL.

RESULTS: MALL

The management style of MALL

Before the summer of 2020, the management of the living lab was done in a top-down manner. Back then, the Directors group had not been formalized. The Program Lead was in charge. (This is position does not exist anymore.) This style became problematic and created tensions within the group. Subsequently, the Directors group was formed, and a "change of leadership style" occurred (Interviewee 27, January 12, 2021).

Now, the management style has become a gentler one. Staff are listened to, and tasks are jointly established "so that everyone is comfortable" (Interviewee 24, December 14, 2020). Moreover, goals are set in accordance with personal ambitions. This suggests an egalitarian approach in which the hierarchy is horizontal. Consequently, a bottom-up management approach was adopted, which is seen staff as more suitable and effective.

The decisional style of MALL

While the management style can be characterized as bottom-up and distributed, not the same can be said about the manner in which decisions are taken. Here, a discrepancy exists within the living lab.

In certain respects, such as division of tasks within the Working group, decisions are made by consensus and inclusivity. High-level decisions are, however, taken in the Directors group. Even decisions taken at the Working group level can be revisited and changed by the Directors. Therefore, the decision process is concentrated.

The decisional style is "opportunistic" (Interviewee 26, December 14, 2020). Decisions are often considered first and foremost from the perspective of the individual partners, and only afterwards from the one of the living lab. This leads to lack of clarity and is even a source of tensions. Additionally, decisions which have the potential of affecting the living lab are, at times, taken without consultation among partners, as long as they are technically outside MALL's scope.

The decisional style is one of the aspects in which the values of developing a strong community and institutional individualism clash. On the one hand, a collaborative attitude is adopted, and every partner is given a voice. On the other hand, staff do not seem to view themselves as part of MALL and pursue its interests above all. Instead, they primarily regard themselves as part of the organizations they represent, and act accordingly.

The style of working in MALL

Most of the work within MALL is performed by the Coordinator of the living lab. Her colleagues and her adopt a manner of working which "does not have a formal character" (Interviewee 28, December 11, 2020). It is organic and dynamic, and clear boundaries have not been established. This is seen as positive and as "the only way to go" in the living lab's current institutional context (Interviewee 28, December 11, 2020).

The style of working can be described as "enthusiastic" (Interviewee 24, December

14, 2020). "Things are often in the air" without being concrete (Interviewee 24, December 14, 2020). This is, however, not seen as a problem in itself, but as an aspect which slows down the living lab. Another cause of the slow pace is represented by "the different rhythms and different timelines" of the institutions involved (Interviewee 26, December 14, 2020). Indeed, combining the different cultures of the partners has proven difficult for MALL.

Staff

Responsibilities of MALL staff

On an institutional level, responsibilities are mainly divided between the founding partners. The program partners only share a small part of the responsibilities. However, as the living lab is not an entity from a legal standpoint, Bureau Marineterrein is the accountable party, as signatory of contracts.

The institutional responsibilities have only recently started to take shape. They were hitherto unclear, which was a cause of internal issues. So far, the collaboration of multiple institutions in MALL implied "different agendas and interests outside of the living lab" (Interviewee 29, January 12, 2021). This shows one of the previously identified values – institutional individualism. The same interviewee mentioned that a formal agreement detailing the responsibilities would have led to the avoidance of these problems.

The living lab's website mentions different roles for individual staff members, but responsibilities are shared among members of a structural unit – these are not individually determined. Moreover, responsibilities are unclear, which makes "it is easy not to make [living lab tasks] a high priority in all the things [one] has to do. So, if they would be more concrete, it gives [staff members] a more steady way of approaching things" (Interviewee 25, January 8, 2021).

Integration of staff in MALL

As the living lab has undergone several transformations during its existence so far, staff have also changed. The living lab therefore had a significant level of turnover, but not necessarily for reasons confined to its boundaries. Most changes of staff have occurred as a result of people not working further for the partner institution who has been employing them.

The appointment of staff is done based on involving representatives from each of the four partners and for an indefinite period. Participation in MALL is part of the responsibilities of the position held at the partnering institution. Thus "it is not their primary function to be in the living lab team", but to do their job at the organization which is their employer (Interviewee 25, January 8, 2021).

Communication amongst MALL staff

The MALL organization is small – it consists of nine people. It is closely connected,

with staff frequently being in contact with each other. This allows for informal channels to be extensively used, which are complemented by meetings as a means to communicate and update each other.

Internal communication is, however, one of the less performing aspects of the living lab. Staff are not informed about all matters regarding the living lab. For example, not everyone knows the process experimenters must follow from application to implementation, or what permits are required for experimenting within MALL.

The attitude of MALL staff

The predominant attitude within MALL is one of inclusiveness. Representatives of all four partners are involved at all levels of the living lab. Moreover, the Program partners' suggestions are taken into consideration and often influence the direction of the living lab. Here, the value of creating a strong community can be identified.

The staff wants to be involved in experiments and collaborate with experimenters. They want experiments to succeed and to be scaled up, and to ultimately create positive impact. However, their attitude is rather detached in all this process, as they are only providers of experimentation space. The communication itself already shows this, as the actors testing and developing prototypes are named *experimenters*, and not *partners*, *contributors*, or a similar denomination, showing a detachment between the living lab and them.

Issues among MALL staff

Since its creation, MALL faced several staff-related issues. Most of these stem from the living lab incorporating different institutions as partners. This has been especially problematic, considering that one of the driving values is institutional individualism. For example, lack of transparency or split incentives among staff were some of the issues encountered. However, discussions helped in tackling these, and progress is continuously being made, especially since MALL is seen as a long-term endeavor.

Another source of problems comes from the limited involvement of staff members, as per the agreements among the partners. This consequently creates capacity limitations, which could be seen when MALL tried to accommodate an increased number of experiments at once. This can be a potential problem in the future as well, as the living lab wants to "scale up and be more acknowledged. [In this case, it] also needs to scale up the team, and to make a clearer organizational structure" (Interviewee 25, January 8, 2021).

Skills

Skills provided by staff members

Almost all skills are provided by staff members, in MALL. Strategy development, decision-making and community-building skills are all internally provided, as are all other skills necessary

for managing and operating the living lab.

MALL heavily relies on the skills of its staff. However, acquiring skills is not the primary criterion of appointment. Instead, the representation of all partnering institutions is the deciding factor, which consequently implies certain limitations. One instance in which these can be seen is regarding specific technical and research expertise, which the living lab tries to mitigate through the creation of the Expert community.

Skills provided by external contributors

External contributors are generally employees of the partnering institutions, who help MALL with specific skills. Thus far, this only happened for developing the communication strategy of the living lab, which is a joint effort of the Communication Officers of all four partners.

Structure

Directors group —— Program partners

Working group ----- ----- Expert community

Strategy

- Development strategy under development
- Unclear experimenting strategy
- Communication strategy under development

Systems

- Minimal internal systems
- Flexible systems for experimenting

Shared values

- Mission: clear
- Vision: non-existent
- Values: correlated with mission; contradictory amongst themselves

Skills

- Combining both internal and external skills
- Skills are a secondary appointment criteria

Style

- Management: non-hierarchical and distributed
- Decisional: individual and concentrated
- Working: informal

Staff

- Unclear responsibilities
- No onboarding process
- Communication can be improved
- Inclusive attitude within the team; detached from experimenters
- Issues rarely occur

Fig. 4.12 – Overview of the Participants element of MALL

RESULTS: MALL

4.3.6 The 4E Framework — 7S Framework relationship in the case of MALL

As it could already be observed from the previous sections analyzing MALL, there are several interconnections between the living lab's *Real-life context*, *Co-creation*, and *Product* and its *Participants* element (as investigated through the 7S Framework). Fig. 4.13 below shows an overview of these interrelationships.
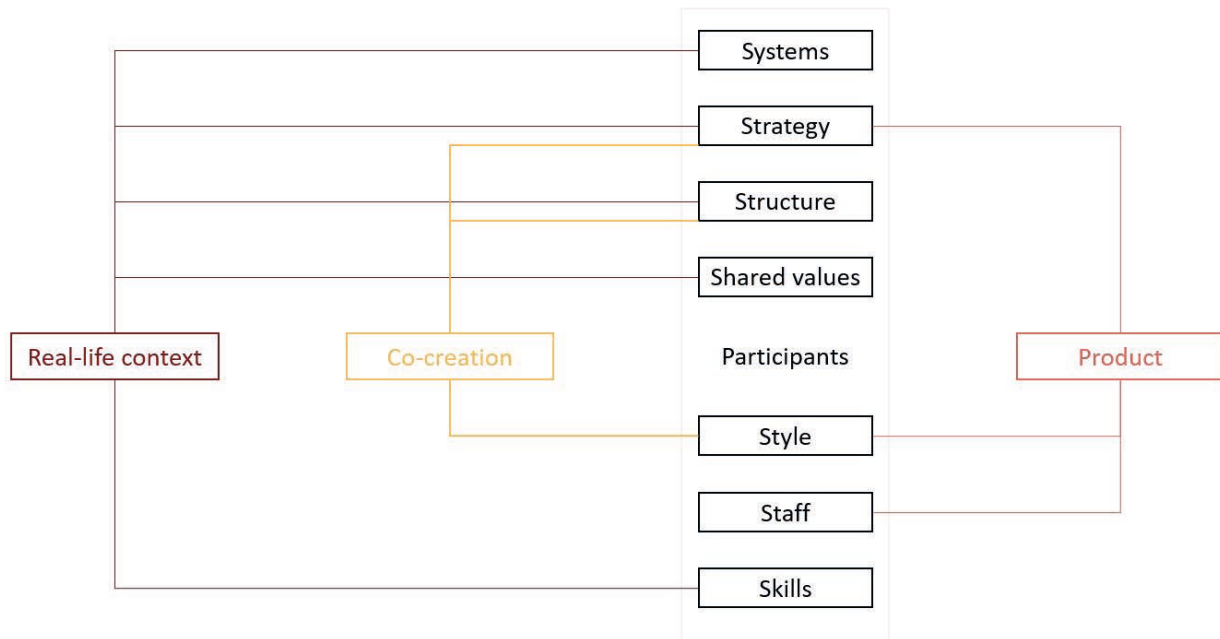
Fig. 4.13 – The interrelationships among the 4E Framework and the 7S one, in the case of MALL.

The Real-life context — 7S Framework interrelationship

The *Real-life context* of MALL is, in fact, one of the main focuses of the living lab's *Shared values*. The living lab's mission itself is aimed at improving its location, with key values such as creating impact and developing a strong Marineterrein community. Of course, the realization of this mission relies on the *Skills* present in the living lab. Moreover, the very *Structure* of MALL is shaped in such a way to include community members – the Expert group is intended to exceed the boundaries of the four partners and involve experts among the Marineterreiners.

The living lab's *Strategy* is aimed to be aligned with the one for its *Real-life context*. The living lab establishes its focus based on whether "the Marineterrein itself has a mission to achieve that" (Interviewee 27, January 12, 2021). This might be, in fact, one of the reasons why the strategy development process has proven to be tedious – the connection to the area's strategic goals is yet to be made.

Not only is MALL's strategy shaped by the *Real-life context*, but it also aims to reciprocally alter the setting itself. The living lab's strategy for experimentation is designed for contributing to "future-proof neighborhoods and cities" (Interviewee 26, December 14, 2020) starting with

Marineterrein: "we are doing this to improve Marineterrein [and] to showcase what can be done here" (Interviewee 28, December 11, 2020).

Also, as the living lab is placed in a real-life setting, it must follow a different set of regulations than traditional laboratories. For this reason, the *Systems* component has been altered to include, as a final step of the application process, a site visit together with the property manager for deciding the placement of experiments in accordance with the rules and regulations established by the City of Amsterdam.

The Co-creation – 7S Framework interrelationship

As previously explained, the *Co-creation* element of MALL is not exhibiting a particularly strong presence. Nonetheless, co-creation is envisioned, especially as the process of developing the living lab's future *Strategy*. Also, the *Structure* of the living lab has been shaped such that all partners are equally involved, thus creating the premises for a co-creative process – all that is still required is the involvement of users. Perhaps one of the reasons why co-creation has not yet happened is the *Style*. Specifically, the issues regarding this component, as the living lab is still working towards integrating the different styles of the four partnering institutions. Dealing with such problems hampers co-creation, as it includes collaboration and working together.

The Product – 7S Framework interrelationship

The *Product* element of MALL is also correlated with some of the components of the 7S Framework, as Fig. 4.13 shows. *Strategy* determines the development of the living lab itself, including the testing infrastructure. Moreover, it influences the experimentation focus and subsequently which prototypes are tested and developed. The *Strategy* therefore impacts the products of MALL on both the meso and macro levels.

The living lab's *Style* can be, at times, enthusiastic and abstract. It also conciliates "different rhythms and different timelines" (Interviewee 26, December 14, 2020). Additionally, the *Staff* element presents capacity limitations, as people are only involved for a reduced number of hours per week. These lead to a slower pace of development, subsequently influencing the development of the testbed infrastructure – the living lab's macro-level product.

5

DISCUSSION

Comparative analysis of KTH LIL and MALL

DISCUSSION: COMPARATIVE ANALYSIS

We have so far explored the two case-studies: KTH LIL and MALL. We have seen the inner workings of their *Participants* elements, and we even know how this relates to the other three elements of the 4E Framework. But the question remains: how can this help living labs beyond the two cases? Let us explore this throughout this chapter.

This chapter does not aim to establish how one case performs in relation to the other. For this reason, an evaluation of the two cases is not performed. Instead, the similarities and differences of the *Participants* elements of the two cases will be discussed – thus using the 7S Framework again, for structure and clarity. These will subsequently be placed in light of theory regarding organizations, generating insights for building and managing living labs. This part will directly address the second research question:

RQ2: What are the insights for future living labs which can be drawn upon the similarities and differences between the organizations of the two studied cases?

Afterwards, the implications of the 7S Framework will be discussed, as well as how this can be integrated with the 4E Framework. Lastly, this chapter will be finalized by addressing the ways in which the 7S Framework can help in improving our understanding of living labs.

5.1 What do the similarities and differences between the Participants elements of KTH LIL and MALL reveal?

Shared values

In order to discuss the shared values of the two cases in light of organizational studies theory, an overview of the similarities and differences of the two cases is needed. Tab. 5.1 provides this, emphasizing the three dimensions of the Shared values component – mission, vision, and values.

DISCUSSION: COMPARATIVE ANALYSIS

Tab. 5.1 – The Shared values of the two cases in short. Similarities and differences.

	KTH LIL	MALL
Mission	To accelerate the pace of innovation in the construction and real estate sectors, based on excellence in research, education, and collaboration.	To improve Marineterrein and help it become the living district of the future, subsequently contributing to future-proof neighborhoods or cities of the future.
Vision	KTH Live-In Lab ensures that KTH becomes a sustainable campus and that Stockholm retains its leadership in sustainable urban development with a focus on digitization and smart cities.	-
Values	• Altruism • Inclusion • Collaboration • Trust • Equality • Transparency	• Producing positive impact • Developing a strong Marineterrein community • Institutional individualism

The vision of an organization, together with its mission, express why the organization exists, what it is aiming to realize, and what it stands for (Cady, Wheeler, DeWolf, & Brodke, 2011). They embody the living lab's inherent nature (Verma, 2009). Therefore, a clear mission and vision, and a correlation between the two is crucial.

Both living labs have an outward-focused mission: contributing to a certain domain or a specific area, something bigger than themselves. This implies a connection to the real-life context in which they are placed, as collaboration is necessary for this to happen. It would be impossible for KTH LIL to improve the construction and real-estate sectors in isolation. Similarly, changing Marineterrein (and future neighborhoods and cities) for the better would not be feasible without the uptake by the actors of the real-life context of technologies and products developed in MALL.

Additionally, the results of the pilot study show that the stakeholders need to be carefully considered for the adoption of results. They also show that results of living labs are often on the forefront of innovations and therefore their development pace exceeds current regulations.

Considering the pilot study outcomes and that both cases want to ultimately bring a contribution to their environment, a first insight can be drawn:

Living labs need to be well-anchored in and have strong connections with their real-life context (e.g., community and regulations) for creating positive impact.

The vision is a framework for strategy development and it articulates the desired future for the living lab (Mirvis, Googins, & Kinnicutt, 2010). Consequently, it guides the development

of the living lab itself. It is no surprise then, that a clear vision is imperative – it is easier to arrive somewhere, anywhere, if one knows where they are headed.

Also, values are a driving force behind the attitude, behavior and character of an organization (Kaplan & Norton, 2008; Mirvis et al., 2010). They also provide a set of principles guiding the strategic directions (Kanter, 2010). It is therefore essential to have shared values within a living lab and, more importantly, practice those values. As neither KTH LIL nor MALL had explicitly stated them, the values presented in Tab. 5.1 are indeed a reflection of the norms practiced within the two living labs.

In short, the constituents of the *Shared values* component can be defined as (adapted from Kaplan & Norton, 2008; Mirvis et al., 2010; Salge, 2020; Senge, 1990):

- Mission: the reason for the living lab's existence. (Why)
- Vision: an illustration of the future the living lab pursues. (What)
- Shared values: the way the living lab pursues that future. (How)

Considering this, a second insight ensues:

Living labs should clearly define their 'Why', their 'What', and their 'How'.

Even though clear mission, vision, and values are essential for longevity and success they are not flawless, as Mirvis et al. (2010) show. The same authors explain that they can be used for public relationship purposes, only being stated on organization's procedural documents or websites. Therefore, their execution takes precedence as words without actions cannot build successful living labs.

Ahlstrand, Lampel, and Mintzberg (2001) explain that mission, vision, and values, as well as strategy in general, need to be developed with special care for avoiding three fallacies:

- The fallacy of prediction: the future remains unknown and cannot be predicted.
- The fallacy of detachment: strategy development and implementation are (and must remain) interconnected.
- The fallacy of formalization: formalization often inhibits learning.

Generally, living labs need not worry about the fallacy of detachment as they are often small and very-well connected organizations. They do, however, need to remain flexible and adaptive, and maintain their focus on learning and disseminating knowledge. One of the aspects in which living labs should be flexible (as showed by the two studied cases) is their organizational structure.

DISCUSSION: COMPARATIVE ANALYSIS

Structure

The structures of the two cases are almost identical, as Tab. 5.2 shows. They are both composed of the same four layers, which display similar responsibilities for both cases. Indeed, the Structure component presents the highest similarity between KTH LIL and MALL.

Tab. 5.2 – The Structure of the two cases. Similarities and differences

	KTH LIL	*MALL*
Decisional layer	**Board** *Responsibilities:* *• decision-making* *• strategy development* *• overall management* *• deciding regarding applications*	**Board** *Responsibilities:* *• decision-making* *• strategy development* *• overall management* *• deciding regarding applications*
Strategic advisory layer	**Innovation council** (to be formed) *Responsibilities:* *• suggesting strategy*	**Program partners** *Responsibilities:* *• suggesting strategy*
Operational layer	**Executive group** *Responsibilities:* *• managing the testing infrastructure* *• operating the testing infrastructure*	**Working group** *Responsibilities:* *• managing the testing infrastructure* *• operating the testing infrastructure* *• preliminary evaluation of applications*
Expert layer	**Management group** *Responsibilities:* *• preliminary evaluation of applications* *• helping in operating the testing infrastructure*	**Expert community** (to be consolidated and engaged) *Responsibilities:* *• preliminary evaluation of applications*

The *Structure* element describes the roles of an organization and their interrelationships (Grossi, Royakkers, & Dignum, 2007). It is a manner of dividing responsibilities, as well as organizing and coordinating them.

KTH LIL and MALL present highly similar organizational structures which are composed of four layers: decisional, advisory, operational, and expert. As several interviewees pointed out, this is similar to the way in which companies are structured. It can be, in fact, traced back to the seminal work of Mintzberg (1993), who proposed five layers to organizational structures:

DISCUSSION: COMPARATIVE ANALYSIS

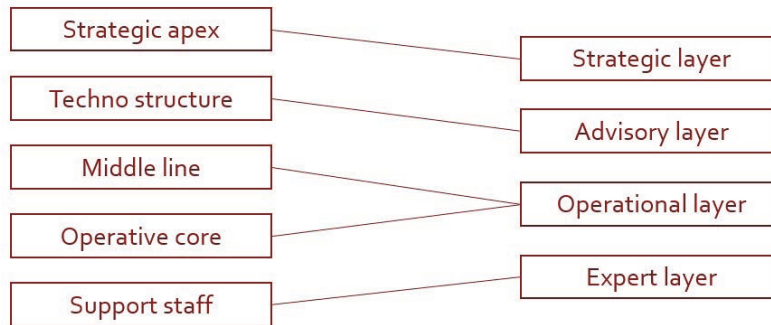| Strategic apex | → | Strategic layer |
Techno structure	→	Advisory layer
Middle line		Operational layer
Operative core		
Support staff	→	Expert layer

Fig. 5.1 – The five layers proposed by Mintzberg and their corresponding layers of the Structure components of KTH LIL and MALL.

The *strategic apex* represents the high-level management. On this layer, the decision-making process ultimately takes places and strategic directions are adopted. In the case of KTH LIL and MALL this directly corresponds to the *Strategic layer*.

The *techno structure* refers to the layer helping the high-level management with their responsibilities. In the case of MALL, this corresponds to the Program partners. In KTH LIL, the advisory role has so far been performed by the Board itself, with input from the Management group. This shows that performing the activities is more important than having a clear layer distinction. Moreover, it confirms the views of Mintzberg (1993) that small organizations may exhibit little or no *techno structures*.

The *middle line* and the *operative core* form the middle-level management. This is concerned with the operational management and execution of daily tasks. In both two studied cases, this is ensured by parts of the *Operational layer*.

The *support staff* is embodied by the *Expert layer* of the two living labs. This provides knowledge and expertise for specific tasks such as scientifically evaluating applications.

Besides both living labs exhibiting almost identical structures, the principles on which they have been built have also passed the test of time – these are still shaping organizations almost 40 years after they were first published. However, it is not the clear distinction of the layers themselves one should look at, but at the roles meant to be performed, especially as living labs usually consist of small organizations.

Furthermore, the pilot study revealed a problem currently present in living labs: several interviewees stated that they face issues due to roles and responsibilities being unclear. To this end, a third insight can be drawn:

> *Living labs should build their structures to incorporate three layers: high-level management, middle-level management, and knowledge and expertise.*

Living labs are fundamentally experimental and flexible. Therefore, the roles presented above should accommodate these two traits and only be regarded as guidelines and not fixed. For instance, perhaps in some cases a middle-level management would be beneficial, while in others it might only slow the process down. Hence, a case-specific conciliation of the roles should be performed.

DISCUSSION: COMPARATIVE ANALYSIS

Small organizations adopt simple structures which exhibit informal ways of working (the *Style* component), usage of minimal processes (the *Systems* component), as well as minimal differentiation of tasks among *Staff* members (Kumar, 2015). Additionally, the *Structures* of KTH LIL and MALL are based on high collaboration and participation, flexible tasks, and informal internal communication (parts of the *Staff* component) (Ahmady, Mehrpour, & Nikooravesh, 2016). Another characteristic of simple structures is the way in which strategy is developed – centralized, within their *strategic apex* (Kumar, 2015).

Strategy

The two living labs are in different development phases, as Tab. 5.3 shows. While KTH LIL already has clarified their strategic goals and their execution, MALL is still in the process of doing so. Nonetheless, another aspect is of paramount importance: the fact that both pursue a clear strategy in terms of development, experimenting, communicating, as well as the fact that they measure their success.

Tab. 5.3 – The Strategy element of the two cases. Similarities and differences.

	KTH LIL	*MALL*
Development strategy	*• Development goals: clear* *• Development strategy: clear*	*• Development goals: not defined* *• Development strategy: not defined* Note: both goals and strategy are desirable and currently being developed
Strategy for experimenting	*• Experimentation goals: clear* *• Experimentation strategy: clear*	*• Experimentation goals: unclear* *• Experimentation strategy: unclear* Note: both goals and strategy are desirable and currently being developed
Communication strategy	*Communication strategy: clear*	*Communication strategy: not developed* Note: communication strategy is currently being developed
Success measurement	*By annual KPIs connected to strategic goals for development and experimenting*	*By annual reflection without pre-determined success indicators*

Strategy is important as enables organizations to perform. In most cases, underperforming is a direct result of a breakdown (or absence) of strategy (Kaplan & Norton, 2008). Whether it establishes the direction, focuses the effort, helps coordinate the activities, defines the living lab, or provides consistency (or all of them), strategy is vital for organizations (Mintzberg, 1987b).

Mintzberg (1987a) defines strategy as a plan (i.e., an intended course of action), a ploy (i.e., a specific action), a pattern (as a stream of actions), a position (of the living lab in its

environment), or a perspective (i.e., a specific way of perceiving the world). Irrespective of which definition is adopted, "an organization without a strategy would be like an individual without a personality – unknown, and unknowable" (Mintzberg, 1987b, p. 28). Therefore, a fourth insight arises:

> *Living labs should clearly define their strategy: both the goals and how they will be achieved. Moreover, they should also continuously evaluate and improve their strategy.*

Mintzberg (1987b) argues that strategies rely on stability. The same author makes the parallel between strategies and horse blinders: they keep organizations on track but may impede peripheral vision. As living labs are part of continuously evolving environments, strategies need to be continuously evaluated and refined.

Strategy can be developed in multiple manners. One simple and straightforward course of action is the following (adapted from Kaplan & Norton, 2008):

1. Define mission, vision, and values: they provide the basis for the strategy development.
2. Analyze external and internal factors affecting the living lab (e.g., political, economic, social, technological, environmental, and legal).
3. Formulate the strategy: define strategic goals and how the living lab proposes to realize them.
4. Establish performance metrics and perpetually evaluate the strategy.

For establishing whether the adopted strategic direction is performing well and ensuring the achievement of results, organizations can use KPIs (Marr, 2012). These can be employed for determining the areas of success and, more importantly, the ones with improvement potential (Lindberg, Tan, Yan, & Starfelt, 2015; Velimirović, Velimirović, & Stanković, 2011). This subsequently enables living labs to reach their full potential. Hence, the establishment of evaluation (qualitative and/or quantitative) criteria is essential.

Systems

In terms of *Systems*, both living labs are essentially identical, as Tab. 5.4 shows. Internally, they use minimal systems and operate informally. This is indeed characteristic for small organizations, as explained by Kumar (2015). On the experimenting side, however, both the application process and the implementation of projects is done according to a predetermined process.

DISCUSSION: COMPARATIVE ANALYSIS

Tab. 5.4 – The Systems element of the two cases. Similarities and differences.

	KTH LIL	*MALL*
Internal systems	*Minimal systems within the living lab's structural units*	*Minimal systems within the living lab's structural units*
Systems regarding experimenting	*Clear experimentation process in six steps*	*Clear experimentation system in four steps*

While academic literature presents processes such as the Process Reference Model (Guzmán, del Carpio, Colomo-Palacios, & de Diego, 2013), neither of the two cases has adopted clear internal systems. Perhaps this relates to two core aspects of living labs: iteration and flexibility. The two are indeed essential in both KTH LIL and MALL in aspects such as managing daily operations or distribution of tasks.

The processes regarding experimenting in both living labs are flexible as well. They do provide guidelines and steps to be followed but they are continuously adapted to match each individual project.

Overall, the systems of the two living labs are minimal and their core trait is flexibility. Entire steps can be skipped if necessary, and the whole process can be reimagined if required. Therefore, a fifth insight can be drawn:

Flexibility and adaptability should be at the core of living labs' systems.

Style

Tab. 5.5 below shows an overview of the Style components of the two cases. This presents both similarities (in terms of management and working) and one difference (regarding the decisional style).

Tab. 5.5 – The Style of the two cases. Similarities and differences.

	KTH LIL	*MALL*
Management style	• *Distributed* • *Less structured than companies'* • *Non-hierarchical*	• *Distributed* • *Less structured than companies'* • *Non-hierarchical*
Decisional style	• *Distributed* • *Collective* • *Independent*	• *Concentrated* • *Individual* • *Dependent*
Working style	• *Informal* • *Relying on two persons* • *Conciliating industry and academia styles*	• *Informal* • *Relying on one person* • *Conciliating different working styles*

The *Style* component is closely associated with performance. It has even been shown to be correlated with the health status of patients, in the case of general practitioners (Huygen

et al., 1992). In organizations, it influences, for instance, the financial performance (Flamholtz, 2001) or the implementation of management approaches (Dahlgaard & Dahlgaard-Park, 2006).

In the very case of MALL, the disconnection between the adopted management style and the organization's decisional and working styles has led to a complete rethinking of the living lab. Correlation among the three styles – management, decisional, and working – is indeed essential (Moslehpour, Altantsetseg, Mou, & Wong, 2019). Moreover, considering that *Style* is an integral part (together with *Systems*) of the execution of *Strategy* (Wilkins, 1984), the importance of this correlation cannot be overstated.

Tab. 5.5 presents essentially similar management and working styles in the cases of KTH LIL and MALL. In both cases, management is performed without fixed hierarchies, as well as on multiple levels thus having a distributed character. This further increases satisfaction among the participants of both living labs, as suggested by several interviewees.

Also virtually identical, the working approach is informal and relies on a low number of persons. More importantly, living labs need to conciliate the different working styles of the involved partners. This requires special attention, as it can create tensions or slow down the living lab, as was the case in KTH LIL and MALL. Developers of living labs should, perhaps, consider this carefully from the very creation of the living lab for minimizing the risk of facing such issues.

Conversely, KTH LIL and MALL differ in their decisional style. In the case of the former, decisions are taken across all levels and with the living lab's interests prevailing over the ones of the individual partnering institutions.

In the case of the latter, all decisions are taken in the strategic layer (i.e., the Board), and often depending on the partner institutions' interests. This subsequently conflicts with the distributed and non-hierarchical management style. It also creates further tensions, adding to the negative consequences of having to mitigate different working styles.

Considering the abovementioned correlation among the styles, as well as the living labs' nature of bringing together multiple institutions, a sixth insight ensues:

> *The management, decisional, and working styles need to be harmonized; and they also need to take into account the different working styles of participating institutions.*

Staff

Staff is the component which displays the most significant difference between the two living labs, as illustrated by Tab. 5.6. Differences regarding staff responsibilities stem from each case's creation approach: while KTH LIL was created according to the clear guidelines of KTH, MALL was created organically in a trial-and-error bottom-up process. The other significant difference, regarding attitude, comes from the two living labs' values, as they dictate staff behavior.

DISCUSSION: COMPARATIVE ANALYSIS

Tab. 5.6 – The Staff of the two cases. Similarities and differences.

	KTH LIL	*MALL*
Responsibilities of staff	*Clearly established in the Rules of procedure*	*Unclear for staff members*
Integration of staff	*• Staff represent center partners* *• Turnover rates differ between academia and industry* *• No onboarding process*	*• Staff represent founding and program partners* *• Significant turnover* *• No onboarding process*
Communication amongst staff	*• Employs both formal and informal channels* *• Errors mainly due to misinterpretation*	*• Employs both formal and informal channels* *• Staff not fully informed on all aspects*
Attitude	*• Committed* *• Collaborative* *• Egalitarian*	*• Inclusive* *• Detached*

KTH LIL communicates the core of responsibilities through the Rules of procedure, which is continuously adapted and complemented by informal duties. Therefore, even though they are formally established, responsibilities are flexible and perpetually evolving.

On the other hand, in the case of MALL there is no document outlining staff responsibilities. This should allow for even more flexibility. However, responsibilities are still "not clearly established" (Interviewee 25, January 8, 2021; Interviewee 26, December 14, 2020) – leading to work being "deprioritized" (Interviewee 25, January 8, 2021). It also creates tensions among staff (and subsequently partner institutions), which could have been avoided if responsibilities were established "from the outset" (Interviewee 29, January 12, 2021).

Living labs should consider their own real-life context, the desired outcome, the co-creation trajectory, and the partnering organizations. This will consequently determine which approach to establishing responsibilities should be adopted. No approach is intrinsically better than another, but more suitable to the respective living lab. Nonetheless, determining responsibilities is important as it ensures work is performed efficiently and at a high qualitative standard (Brillhart & Sills, 1994).

Hence, a seventh insight ensues:

> *Living labs should determine individual and institutional responsibilities, and take into account the real-life context, the desired product, co-creation and participants in doing so.*

The integration of staff is similar in the case of the two living labs. In this respect, the most notable aspect is the lack of onboarding processes – thus not disseminating tacit knowledge within the living lab and possibly leading to new staff members repeating mistakes previously made. Moreover, onboarding is directly correlated with organizational effectiveness and staff attitude (Salau, Falola, & Akinbode, 2014).

Staff attitude is important and should be carefully considered as it ultimately influences the results of an organization (Abukhzam & Lee, 2010; Hogg, Hanley, & Smith, 2018), be it the

testing infrastructure of a living lab (i.e., macro-level product) or the project results (i.e., the meso-level products). It is closely correlated with the *Shared values*, as it is in fact driven by them. For instance, in the case of MALL institutional individualism leads to an individual attitude of staff, as well as detachment between the living lab and experimenters. Consequently, communication amongst staff is affected as levels of involvement and interaction decrease.

The attention paid to staff attitude gave the rise to the term *organizational culture* (Ouchi & Wilkins, 1985). Since then, managers have been dedicating a significant part of their time to building and improving organizational culture by development of shared values and cultivation of attitude standards (Kaplan & Norton, 2008; Schein, 1986).

An eighth insight can thus be drawn:

> *Staff attitude is essential, and it can be fostered by establishing appropriate shared values.*

Skills

Both living labs employ diverse sets of skills, as shown in Tab. 5.7. They do so primarily by internal capabilities which are complemented by specific knowledge and expertise from the partnering institutions. Therefore, both KTH LIL and MALL heavily rely on these institutions, with the former also depending on project partners whenever these perform tasks for the living lab.

Tab. 5.7 – The Skills of the two cases. Similarities and differences.

	KTH LIL	MALL
Internal	• *Management* • *Decision-making* • *Strategy* • *Operations* • *Community-building* • *Field-specific expertise*	• *Management* • *Decision-making* • *Strategy* • *Operations* • *Community-building*
External	• *Finances* • *Communication* • *Technical support* • *Data management*	• *Communication* • *Field-specific expertise (previsioned)*
Skills as appointment criteria?	*Secondary*	*Secondary*

Many essential skills such as management and strategy are provided by living lab staff. However, acquiring skills is not the main appointment criterion. Instead, representation of partners is. This might be a consequence of the interpretation of the two living labs as research-enabling instruments which are meant to bring together different institutions and bridge industry and academia. The most important outcomes are not successful prototypes or technologies, in any way success is defined by the living labs. Whether this is a widely shared viewpoint in the field of living labs is outside the scope of this research. This represents a further avenue of

research which could possibly even contribute to the ongoing process of defining living labs.

Besides successful connection of industry and academia, the existence of KTH LIL "depends on external funding" (Interviewee 22, January 12, 2021). MALL also needs "outside financing to keep the living lab going" (Interviewee 27, January 12, 2021). However, funding comes without any requirements for producing results. This allows for the unique position in which the two cases find themselves: they have low pressure of outcome. Consequently, the pursuit of specific (levels of) skills becomes secondary. Therefore, the *Skills* component is the least important among the seven.

5.2 Does the 7S Framework only inform the Participants element?

This research implied the use of two different frameworks: the 7S and the 4E. Throughout this report, the spotlight often moves from one to the other. This is possible as they are interconnected and reinforce each other. Their link and relevance were strengthened by the pilot study, as it established the focus on the *Participants* element. Consequently, this focus not only allows for the use of the two frameworks, but makes this a necessity.

The 7S Framework constitutes a tool which can be used to analyze the *Participants* element of the 4E Framework. It therefore enables depth of analysis and provides a holistic understanding of how the participants of a living lab work together and how living lab organizations function.

As the 4E Framework is composed of four elements, it might seem that the two frameworks only overlap with respect to one element – the *Participants*. However, that is not the case. Living labs are not the merely the sum of four elements. Instead, they represent the synergy of the four as they coexist and reciprocally influence each other.

Thus, the 7S Framework provides a better understanding of all four elements and not only of one of them. Fig. 5.2 show the interrelationships and influence patterns. For instance, understanding the strategy of a living lab gives a better insight regarding why the products of a living lab are successful or not, or why only certain outcomes are reached. Hence, by having deeper knowledge about the components of the 7S Framework (and thus of the living lab participants), one gets a better understanding of the entire living lab: the Real-life context, the Product, and the Co-creation.

DISCUSSION: COMPARATIVE ANALYSIS
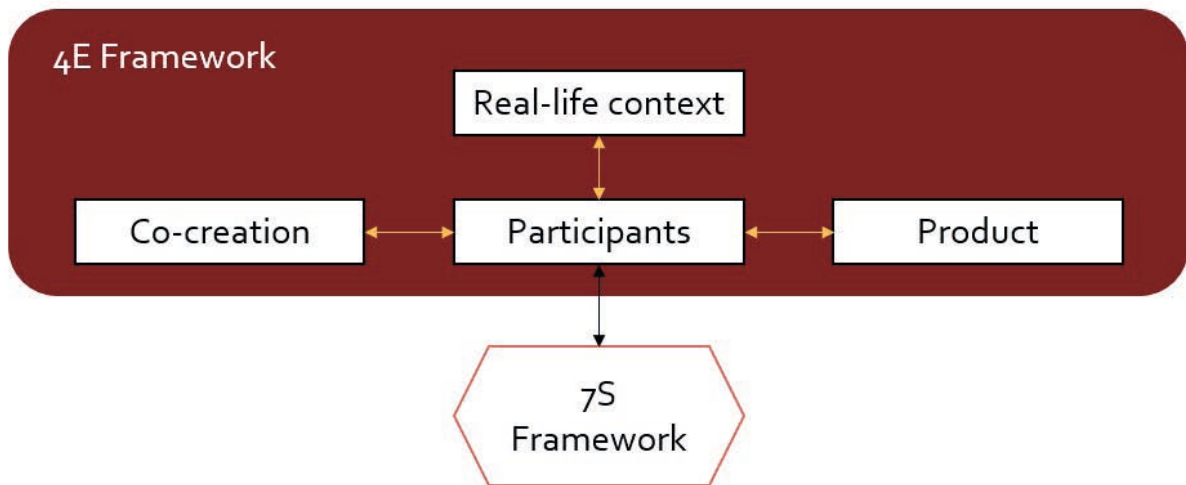
Fig. 5.2 – The interconnections and reciprocal influences between the 4E and 7S frameworks.

5.3 Discussing KTH LIL and MALL through the 4E Framework

The *Real-life context* element has had a decisive influence in both living labs. On the one hand, it shaped both living labs to become what they currently are. For instance, KTH LIL has been built to include education and research from within the KTH university, as all projects take place as research. Also, the collaboration of the institutions involved in MALL stems from its real-life setting. The decision of involving these specific partners has been taken partly as they are part of the Marineterrein area. Moreover, both living labs are influenced by the political landscapes they relate to, either of KTH or of Amsterdam, respectively.

Conversely, both living labs are seen as vehicles for the further development of their real-life context. They both aim to improve sustainability and livability in their areas and are committed to this as a long-term endeavor: for example, the *Shared values* and *Strategy* components of their organizations are created accordingly. This shows the particularly strong presence of the *Real-life context* element in both KTH LIL and MALL. It also indicates the purpose of both living labs – which we will shortly come back to.

As both KTH LIL and MALL are living lab testbeds, they provide a framework for the development of innovation. They therefore rely on their project partners or experimenters to create and generate this innovation, which would ultimately contribute to improving their living lab contexts through the *Product* element of the living labs. This implies that collaboration is key for reaching this goal, otherwise results might be created but either not be suitable or applied to the living labs' real-life contexts. Moreover, the living labs themselves do not have control over how these outcomes are produced and therefore they cannot ensure a co-creative process in this respect. They can, however, ensure it in the development of the testbed.

While involvement of stakeholders is actively pursued, true co-creation (i.e., involving users as co-developers) is achieved only to a limited extent. This is consistent with the purpose of the living labs, as neither have been created for empowering users (or, on a broader scale,

citizens), but for the development of certain domains (the real estate sector) or spatially defined areas (Stockholm or Marineterrein). This suggests that the two studied cases exhibit the user innovation feature of living labs less, and more focus is placed on their open innovation feature. The limited number of cases studied in this research makes it impossible to draw field-wide conclusions, but further research might shed light on how present the two features proposed by Schuurman (2015) are in living labs.

The predominant open innovation nature of the two living labs is seen in their *Participants* elements as well. They include a variety of public and private institutions, but do not involve users to the same extent. They do, however, intend to provide value for all stakeholders, including users and citizens. Nonetheless, this exclusive focus on institutions points to the same avenue of research – are living labs truly bridging open and user innovation? This cannot be answered here due to limitations and has consequently been outside the scope of this research. These limitations, as well as further avenues of research, will be discussed after the next chapter in which conclusions will also be drawn.

6

CONCLUSIONS

CONCLUSIONS

Living labs are becoming an established field both academically and practically. After taking shape at the beginning of the third millennium they have now been studied many times and a plethora of scientific publications exist. The practice has also seen increased support from both society and governmental bodies, and now living labs are "appearing like mushrooms" (Interviewee 6, August 31, 2020). Further research is nonetheless needed before building and developing living labs can take place without knowledge gaps, and practitioners can make use of guidelines based on successful approaches.

The two frameworks

For this research, a new framework for describing and understanding living labs was developed – the 4E Framework. This can be used for qualitatively assessing living labs, as well as the extent to which they correlate with the academic requirements. This could subsequently help strengthen the connection between the practice of living labs and their respective academic field. The 4E Framework consists of four elements:

- *Real-life context* – the setting in which living labs are placed.
- *Product* – the outcomes generated by living labs.
- *Co-creation* – the involvement of all participants as co-creators of the living lab products.
- *Participants* – the actively engaged users, private organizations, and public institutions in living labs.

In addition to this, a second framework was used – the McKinsey 7S Framework. This enabled a thorough and comprehensive analysis of the *Participants* element through seven lenses: shared values, structure, strategy, systems, style, staff, and skills.

The 7S Framework is an effectively-used and time-tested framework for studying organizations. However, this research represents the first time it has been used on assessing living lab organizations. It was both introduced and validated through this research. It can consequently be further used by researchers and practitioners for evaluating living lab organizations or addressing specific participant-related issues.

While the 7S Framework has already been used on a plethora of organizations, the 4E one needed to be validated. To this end, a pilot study was performed. Equally important, this study established the research focus on one of the elements of the 4E Framework:

> *The Participants element was identified as a clear root of problems, as 71 of the 86 issues mentioned were related to it.*

Drawing insights for future living labs

This research aimed to disseminate lessons generated by examining the *Participants* of KTH LIL and MALL. This was achieved by considering the similarities and

CONCLUSIONS

differences between the two and subsequently linking these with organizational studies literature. Eight insights resulted, which can be used especially when building living labs, but also when managing them. They can serve as guidelines for the general organization, if taken as a whole, or for addressing specific issues. They serve as learnings and should be applied as needed. They are presented in the next figure in no particular order, as illustrated by our friend *Living lab* and its journey. Living lab managers should decide the implementation order based on their specific situation and needs.

As they were drawn upon a limited number of case studies, these insights are by no means a panacea for building living labs. Nor are they a comprehensive solution to the current lack of guidelines for living lab managers and operators. They are, however, a start to tackling this problem, and provide a basis upon which best practices can be built. Further research complementing the eight insights is needed for a definitive solution, as well as addressing how these can be implemented in practice.

CONCLUSIONS

Hi! I am Living Lab

I need to be strongly connected my real-life context, so I can produce positive impact!

I should determine institutional and individual responsibilities, and make sure they are in accordance with my real-life context, my desired product, and my co-creation trajectory

I should clearly define my strategic goals and how I will achieved them. Also, I should monitor them constantly, so I can refine and improve them!

My organizational structure should include three levels: high-level management, middle-level management, and knowledge and expertise.

I should clearly establish my mission, vision, and values

My management, decisional, and working styles need to be harmonized. Oh, and they should also consider the participants' different working styles!

With these values, I can foster a good staff attitude. I should keep an eye on this!

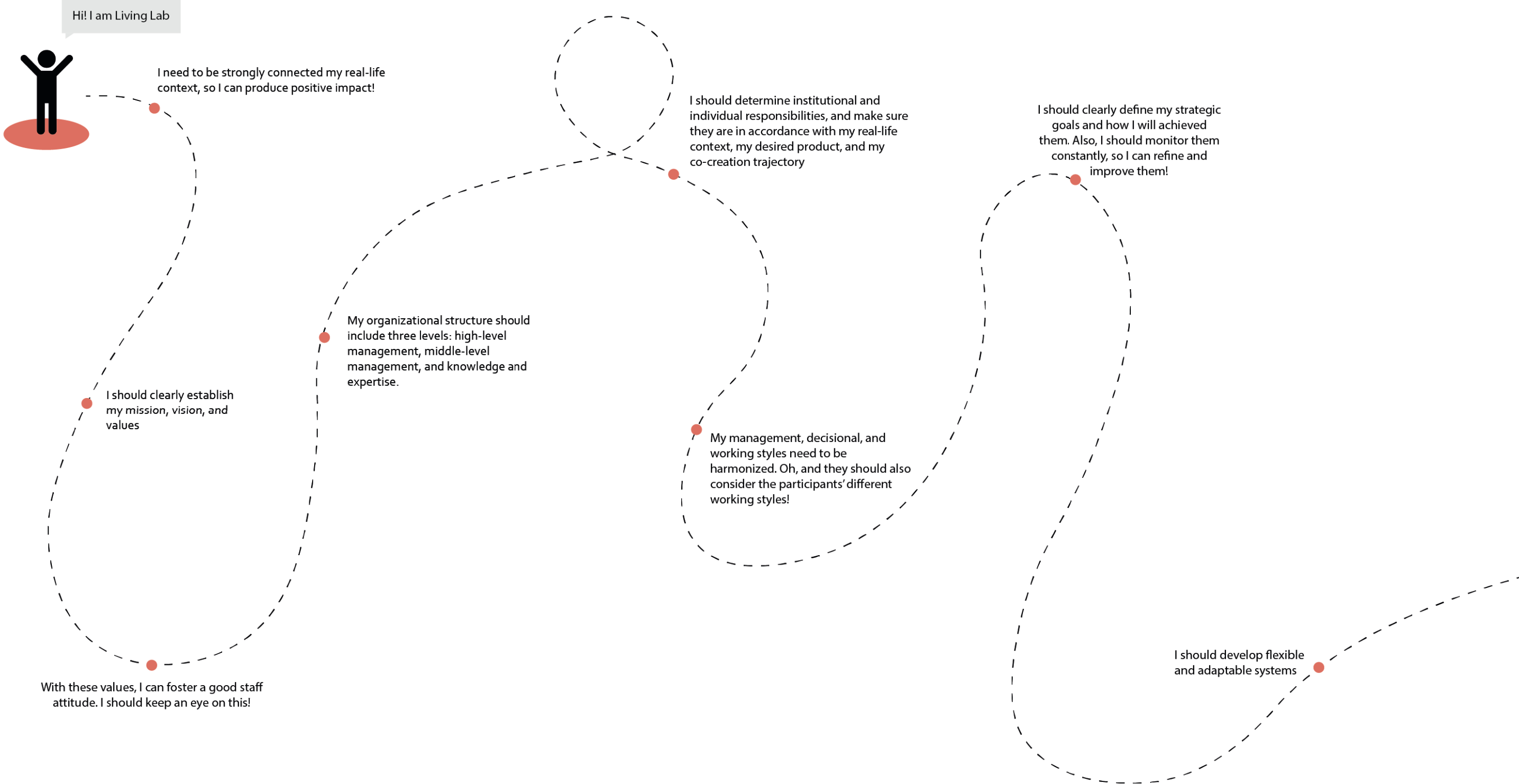I should develop flexible and adaptable systems

Fig. 6.1 - A possible living lab roadmap showing the insights as different steps

REFERENCES

REFERENCES

Abowd, G. D. (1999). Classroom 2000: An experiment with the instrumentation of a living educational environment. *IBM systems journal, 38*(4), 508-530.

Abukhzam, M., & Lee, A. (2010). Factors affecting bank staff attitude towards E-banking adoption in Libya. *The Electronic Journal of Information Systems in Developing Countries, 42*(1), 1-15.

Ahlstrand, B., Lampel, J., & Mintzberg, H. (2001). *Strategy safari: A guided tour through the wilds of strategic mangament*: Simon and Schuster.

Ahmady, G. A., Mehrpour, M., & Nikooravesh, A. (2016). Organizational structure. *Procedia-Social and Behavioral Sciences, 230*, 455-462.

Almirall, E., Lee, M., & Wareham, J. (2012). Mapping living labs in the landscape of innovation methodologies. *Technology Innovation Management Review, 2*(9).

Almirall, E., & Wareham, J. (2008). Living labs and open innovation: Roles and applicability. *eJOV: The Electronic Journal for Virtual Organization & Networks, 10*.

Almirall, E., & Wareham, J. (2011). Living Labs: arbiters of mid-and ground-level innovation. *Technology Analysis & Strategic Management, 23*(1), 87-102.

Bajgier, S. M., Maragah, H. D., Saccucci, M. S., Verzilli, A., & Prybutok, V. R. (1991). Introducing students to community operations research by using a city neighborhood as a living laboratory. *Operations research, 39*(5), 701-709.

Ballon, P., Glidden, J., Kranas, P., Menychtas, A., Ruston, S., & Van Der Graaf, S. (2011). *Is there a need for a cloud platform for european smart cities?* Paper presented at the eChallenges e-2011 Conference Proceedings, IIMC International Information Management Corporation.

Ballon, P., Pierson, J., & Delaere, S. (2005). Test and experimentation platforms for broadband innovation: Examining European practice. *Available at SSRN 1331557*.

Bergvall-Kåreborn, B., Eriksson, C. I., & Ståhlbröst, A. (2015). Places and spaces within living labs. *Technology Innovation Management Review, 5*(12).

Bergvall-Kåreborn, B., Eriksson, C. I., Ståhlbröst, A., & Svensson, J. (2009). *A milieu for innovation: defining living labs.* Paper presented at the ISPIM Innovation Symposium: 06/12/2009-09/12/2009.

Bergvall-Kareborn, B., Hoist, M., & Stahlbrost, A. (2009). *Concept design with a living lab approach.* Paper presented at the 2009 42nd Hawaii international conference on system sciences.

Bhatti, O. K. (2011). Strategy implementation: An alternative choice of 8S's. *Annals of Management Research, 1*(2), 52-59.

Billboard, T. (1956). Motivation research invades area from viewing to sale. *The Billboard: TV commercials quarterly*.

Brankaert, R., & den Ouden, E. (2017). The design-driven living lab: a new approach to exploring solutions to complex societal challenges. *Technology Innovation Management Review, 7*(1).

Brillhart, B., & Sills, F. B. (1994). Analysis of the roles and responsibilities of rehabilitation nursing staff. *Rehabilitation Nursing, 19*(3), 145-150.

Buhr, K., Federley, M., & Karlsson, A. (2016). Urban living labs for sustainability in suburbs in need of modernization and social uplift. *Technology Innovation Management Review*, 27-34.

REFERENCES

Bulkeley, H., Coenen, L., Frantzeskaki, N., Hartmann, C., Kronsell, A., Mai, L., . . . Palgan, Y. V. (2016). Urban living labs: governing urban sustainability transitions. *Current Opinion in Environmental Sustainability, 22*, 13-17.

Bureau Marineterrein. (2018). Marineterrein Amsterdam. In. Amsterdam.

Bureau Marineterrein. (n.d., 17 October 2018). Questions and answers. Retrieved from https://www.marineterrein.nl/en/questions-and-answers/

Cady, S. H., Wheeler, J. V., DeWolf, J., & Brodke, M. (2011). Mission, vision, and values: What do they say? *Organization Development Journal, 29*(1).

Callari, T. C., Moody, L., Saunders, J., Ward, G., Holliday, N., & Woodley, J. (2019). Exploring participation needs and motivational requirements when engaging older adults in an emerging Living Lab. *Technology Innovation Management Review, 9*(3), 38-49.

Chesbrough, H., & Appleyard, M. (2007). Open innovation and strategy. *California management review, 50*(1), 57-76.

Chesbrough, H., & Crowther, A. K. (2006). Beyond high tech: early adopters of open innovation in other industries. *R&d Management, 36*(3), 229-236.

Chronéer, D., Ståhlbröst, A., & Habibipour, A. (2019). Urban living labs: Towards an integrated understanding of their key components. *Technology Innovation Management Review, 9*(3), 50-62.

Chuang, S.-H. (2004). A resource-based perspective on knowledge management capability and competitive advantage: an empirical investigation. *Expert systems with applications, 27*(3), 459-465.

Clarke, C. P. (2019). *Using the McKinsey 7S Framework to Assess Al-Qaeda Over Three Decades: Lessons for the Future*: JSTOR.

Collis, D. J. (2019). Can you say what your strategy is?

Coorevits, L., Georges, A., & Schuurman, D. (2018). A framework for field testing in living lab innovation projects. *Technology Innovation Management Review, 8*(12).

Dahlgaard, J. J., & Dahlgaard-Park, S. M. (2006). Lean production, six sigma quality, TQM and company culture. *The TQM magazine*.

Dell'Era, C., & Landoni, P. (2014). Living Lab: A methodology between user-centred design and participatory design. *Creativity and Innovation Management, 23*(2), 137-154.

Della Valle, N., Gantioler, S., & Tomasi, S. (2021). Can Behaviorally Informed Urban Living Labs Foster the Energy Transition in Cities? Front. Sustain. *Cities, 3*, 573174.

Dutilleul, B., Birrer, F. A., & Mensink, W. (2010). UNPACKING EUROPEAN LIVING LABS: ANALYSING INNOVATION'S SOCIAL DIMENSIONS. *Central European journal of public policy, 4*(1).

ENoLL. (n.d.-a). About us. Retrieved from https://enoll.org/about-us/

ENoLL. (n.d.-b). Living Labs. Retrieved from https://enoll.org/network/living-labs/

ENoLL. (n.d.-c). What are Living Labs. Retrieved from https://enoll.org/about-us/

Eriksson, M., Niitamo, V.-P., & Kulkki, S. (2005). State-of-the-art in utilizing Living Labs approach to user-centric ICT innovation-a European approach. *Lulea: Center for Distance-spanning Technology. Lulea University of Technology Sweden: Lulea*.

Eriksson, M., Niitamo, V.-P., Kulkki, S., & Hribernik, K. A. (2006). *Living labs as a multi-contextual R&D methodology.* Paper presented at the 2006 IEEE International Technology Management Conference (ICE).

REFERENCES

Evans, J., Jones, R., Karvonen, A., Millard, L., & Wendler, J. (2015). Living labs and co-production: university campuses as platforms for sustainability science. *Current Opinion in Environmental Sustainability, 16*, 1-6.

Farjoun, M. (2002). Towards an organic perspective on strategy. *Strategic management journal, 23*(7), 561-594.

Femenías, P., & Hagbert, P. (2013). The habitation lab: Using a design approach to foster innovation for sustainable living. *Technology Innovation Management Review, 3*(11).

Feurstein, K., Hesmer, A., Hribernik, K. A., Thoben, K., & Schumacher, J. (2008). Living Labs: a new development strategy. *European Living Labs-a new approach for human centric regional innovation*, 1-14.

Flamholtz, E. (2001). Corporate culture and the bottom line. *European Management Journal, 19*(3), 268-275.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry, 12*(2), 219-245.

Følstad, A. (2008). Living labs for innovation and development of information and communication technology: a literature review.

Franz, Y., Tausz, K., & Thiel, S.-K. (2015). Contextuality and co-creation matter: A qualitative case study comparison of living lab concepts in urban research. *Technology Innovation Management Review, 5*(12).

Gascó, M. (2017). Living labs: Implementing open innovation in the public sector. *Government Information Quarterly, 34*(1), 90-98.

Georges, A., Schuurman, D., & Vervoort, K. (2016). Factors affecting the attrition of test users during living lab field trials. *Technology Innovation Management Review*, 35-44.

Google Scholar. (n.d.). About. Retrieved from https://scholar.google.com/intl/en/scholar/about.html

Grant, R. M. (2016). *Contemporary strategy analysis: Text and cases edition*: John Wiley & Sons.

Grossi, D., Royakkers, L., & Dignum, F. (2007). Organizational structure and responsibility. *Artificial Intelligence and Law, 15*(3), 223-249.

Gurley, D. K., Peters, G. B., Collins, L., & Fifolt, M. (2015). Mission, vision, values, and goals: An exploration of key organizational statements and daily practice in schools. *Journal of Educational Change, 16*(2), 217-242.

Guzmán, J. G., del Carpio, A. F., Colomo-Palacios, R., & de Diego, M. V. (2013). Living labs for user-driven innovation: a process reference model. *Research-Technology Management, 56*(3), 29-39.

Hakkarainen, L., & Hyysalo, S. (2013). How do we keep the living laboratory alive? Learning and conflicts in living lab collaboration. *Technology Innovation Management Review, 3*(12).

Hakkarainen, L., & Hyysalo, S. (2016). The evolution of intermediary activities: Broadening the concept of facilitation in living labs. *Technology Innovation Management Review, 6*(1).

Hancock, D. R., & Algozzine, B. (2017). *Doing case study research: A practical guide for beginning researchers*: Teachers College Press.

Haukipuro, L., Väinämö, S., Arhippainen, L., & Ojala, T. (2019). Applying a living lab approach within an eHealth accelerator. *Technology Innovation Management Review, 9*(3), 6-19.

Haverland, M., & Blatter, J. (2012). *Two or three approaches to explanatory case study research?* Paper presented at the APSA 2012 Annual Meeting Paper.

REFERENCES

Hogg, R., Hanley, J., & Smith, P. (2018). Learning lessons from the analysis of patient complaints relating to staff attitudes, behaviour and communication, using the concept of emotional labour. *Journal of clinical nursing, 27*(5-6), e1004-e1012.

Hossain, M., Leminen, S., & Westerlund, M. (2019). A systematic review of living lab literature. *Journal of cleaner production, 213*, 976-988.

Hurni, D., & Grösser, S. N. (2017). Innovation Management with an Emphasis on Co-creation. In *Dynamics of Long-Life Assets* (pp. 45-68): Springer, Cham.

Huygen, F., Mokkink, H., Smits, A., Van Son, J., Meyboom, W., & Van Eyk, J. (1992). Relationship between the working styles of general practitioners and the health status of their patients. *British Journal of General Practice, 42*(357), 141-144.

Imset, M., Haavardtun, P., & Tannum, M. S. (2018). Exploring the Use of Stakeholder Analysis Methodology in the Establishment of a Living Lab.

Investopedia. (n.d., 9 May 2021). Research and development (R&D) - Definition. Retrieved from https://www.investopedia.com/terms/r/randd.asp#:~:text=Research%20and%20development%20(R%26D)%20includes,stage%20in%20the%20development%20process.

Juujärvi, S., & Lund, V. (2016). Enhancing early innovation in an urban living lab: Lessons from Espoo, Finland.

Juujärvi, S., & Pesso, K. (2013). Actor roles in an urban living lab: what can we learn from Suurpelto, Finland?

Kanter, R. M. (2010). *Supercorp: How vanguard companies create innovation, profits, growth, and social good*: Profile Books.

Kaplan, R. S., & Norton, D. P. (2008). Mastering the management system. *Harvard business review, 86*(1), 62.

Katzy, B. (2012). Designing viable business models for living labs. *Technology Innovation Management Review, 2*(9).

Kaulio, M. A. (1998). Customer, consumer and user involvement in product development: A framework and a review of selected methods. *Total quality management, 9*(1), 141-149.

KTH Live-In Lab. (2020). *Annual Report 2019*. Retrieved from https://www.liveinlab.kth.se/polopoly_fs/1.847060.1591948211!/Annual%20Report%202019_webb.pdf

KTH live-In Lab. (n.d.-a, 9 November 2020). Contact. Retrieved from https://www.kth.se/en/2.88186/om-kth-live-in-lab/kontakt-1.894573

KTH Live-In Lab. (n.d.-b, 7 October 2020). Project process at KTH LIL. Retrieved from https://www.liveinlab.kth.se/en/projekt

KTH Live-In Lab. (n.d.-c, 7 October 2020). Project process at KTH LIL. Retrieved from https://www.liveinlab.kth.se/en/projekt/projektprocess-pa-kth-lil-1.893944

KTH Live-In Lab. (n.d.-d, 12 April 2021). Testbed AH. Retrieved from https://www.liveinlab.kth.se/infrastruktur/testbed-infrastructure/testbed-ah-1.976307

KTH Live-In Lab. (n.d.-e, 12 April 2021). Testbed EM. Retrieved from https://www.liveinlab.kth.se/infrastruktur/testbed-infrastructure/testbed-em-1.976308

KTH Live-In Lab. (n.d.-f, 20 April 2020). Vision, Purpose and Goal. Retrieved from https://www.kth.se/en/2.88186/om-kth-live-in-lab/syfte-mal-och-bakgrund-1.894511

KTH Royal Institute of Technology. (n.d., 9 March 2021). University-wide sustainability goals 2021-2025 and climate goals 2021-2045. Retrieved from https://www.kth.se/om/miljo-

REFERENCES

hallbar-utveckling/overgripande-hallbar-klimat

Kumar, P. (2015). An analytical study on mintzberg's framework: Managerial roles. *International Journal of Research in Management & Business Studies, 2*(3), 12-19.

Kviselius, N. Z. (2009). Living labs as tools for open innovation. *Communications & Strategies*(74), 75.

Larrinaga, O. V. (2017). Is it desirable, necessary and possible to perform research using case studies? *Cuadernos de Gestión, 17*(1), 147-171.

Lee, K.-H., Barker, M., & Mouasher, A. (2013). Is it even espoused? An exploratory study of commitment to sustainability as evidenced in vision, mission, and graduate attribute statements in Australian universities. *Journal of cleaner production, 48*, 20-28.

Leminen, S. (2013). Coordination and participation in living lab networks. *Technology Innovation Management Review, 3*(11).

Leminen, S. (2015). Q&A. What Are Living Labs? *Technology Innovation Management Review, 5*, 29-35.

Leminen, S., Nyström, A.-G., & Westerlund, M. (2020). Change processes in open innovation networks–Exploring living labs. *Industrial Marketing Management, 91*, 701-718.

Leminen, S., Turunen, T., & Westerlund, M. (2015). The grey areas between open and closed in innovation networks.

Leminen, S., & Westerlund, M. (2012). Towards innovation in Living Labs networks. *International Journal of Product Development, 17*(1-2), 43-59.

Leminen, S., & Westerlund, M. (2017). Categorization of innovation tools in living labs.

Leminen, S., & Westerlund, M. (2019). Living labs: From scattered initiatives to a global movement. *Creativity and Innovation Management, 28*(2), 250-264.

Leminen, S., Westerlund, M., & Nyström, A.-G. (2012). Living Labs as open-innovation networks.

Leminen, S., Westerlund, M., & Nyström, A.-G. (2014). On becoming creative consumers–user roles in living labs networks. *International Journal of Technology Marketing, 9*(1), 33-52.

Lindberg, C.-F., Tan, S., Yan, J., & Starfelt, F. (2015). Key performance indicators improve industrial performance. *Energy procedia, 75*, 1785-1790.

Lune, H., & Berg, B. L. (2017). *Qualitative research methods for the social sciences*: Pearson.

Mahomed, A. M. (2004). An Analysis of The Johannesburg Regional Office of the Government Communication and Information System using The Mc Kinsey 7s Framework. *Disertation. Faculty of Economic and Management Sciences. Demontford University. South Africa*.

Marineterrein Amsterdam Living Lab. (n.d.-a). Experiments. Retrieved from https://www.living-lab.nl/experimentgrid

Marineterrein Amsterdam Living Lab. (n.d.-b). Living Lab. Retrieved from https://www.living-lab.nl/

Marr, B. (2012). *Key Performance Indicators (KPI): The 75 measures every manager needs to know*: Pearson UK.

Mavridis, A., Molinari, F., Vontas, A., & Crehan, P. (2009). *A practical model for the study of living labs complex environment*. Paper presented at the 2009 3rd IEEE International Conference on Digital Ecosystems and Technologies.

McCutcheon, D. M., & Meredith, J. R. (1993). Conducting case study research in operations

REFERENCES

management. *Journal of operations management, 11*(3), 239-256.

McPhee, C., Bancerz, M., Mambrini-Doudet, M., Chrétien, F., Huyghe, C., & Gracia-Garza, J. (2021). The Defining Characteristics of Agroecosystem Living Labs. *Sustainability, 13*(4), 1718.

Merriam-Webster. (n.d.-a). Context | Definition of Context by Merriam-Webster. Retrieved from https://www.merriam-webster.com/dictionary/context

Merriam-Webster. (n.d.-b). Organization. Retrieved from https://www.merriam-webster.com/dictionary/organization

Mintzberg, H. (1987a). The strategy concept I: Five Ps for strategy. *California management review, 30*(1), 11-24.

Mintzberg, H. (1987b). The strategy concept II: another look at why organizations need strategies. *California management review, 30*(1), 25-32.

Mintzberg, H. (1993). *Structure in fives: Designing effective organizations*: Prentice-Hall, Inc.

Mirvis, P., Googins, B., & Kinnicutt, S. (2010). Vision, mission, values. *Organizational dynamics, 39*(4), 316.

Möller, K., Rajala, R., & Westerlund, M. (2008). Service innovation myopia? A new recipe for client-provider value creation. *California management review, 50*(3), 31-48.

Moslehpour, M., Altantsetseg, P., Mou, W., & Wong, W.-K. (2019). Organizational climate and work style: The missing links for sustainability of leadership and satisfied employees. *Sustainability, 11*(1), 125.

Mulder, I. (2012). Living labbing the Rotterdam way: Co-creation as an enabler for urban innovation. *Technology Innovation Management Review, 2*(9).

Mulder, I., & Stappers, P. J. (2009). *Co-creating in practice: results and challenges.* Paper presented at the 2009 IEEE International Technology Management Conference (ICE).

Mulder, I., Velthausz, D., & Kriens, M. (2008). The living labs harmonization cube: Communicating living lab's essentials. *The Electronic Journal for Virtual Organizations and Networks, 10*, 1-14.

Niitamo, V.-P., Westerlund, M., & Leminen, S. (2012). A small-firm perspective on the benefits of living labs.

Nyström, A.-G., Leminen, S., Westerlund, M., & Kortelainen, M. (2014). Actor roles and role patterns influencing innovation in living labs. *Industrial Marketing Management, 43*(3), 483-495.

Ouchi, W. G., & Wilkins, A. L. (1985). Organizational culture. *Annual review of sociology, 11*(1), 457-483.

Pierson, J., & Lievens, B. (2005). *Configuring living labs for a 'thick' understanding of innovation.* Paper presented at the Ethnographic Praxis in Industry Conference Proceedings.

Pisano, G. P., & Verganti, R. (2008). Which kind of collaboration is right for you. *Harvard business review, 86*(12), 78-86.

Posner, B. Z., Kouzes, J. M., & Schmidt, W. H. (1985). Shared values make a difference: An empirical test of corporate culture. *Human Resource Management, 24*(3), 293-309.

Prahalad, C. K., & Ramaswamy, V. (2004a). Co-creating unique value with customers. *Strategy & leadership*.

Prahalad, C. K., & Ramaswamy, V. (2004b). Co-creation experiences: The next practice in value creation. *Journal of interactive marketing, 18*(3), 5-14.

REFERENCES

Ravanfar, M. M. (2015). Analyzing Organizational Structure based on 7s model of McKinsey. *Global Journal of Management and Business Research*.

Robles, A. G., Hirvikoski, T., Schuurman, D., & Stokes, L. (2015). Introducing ENoLL and its living lab community. *European Network of Living Labs, Brussels*.

Russell, E., & Grant, C. (2020). Introduction to Agile Working and Well-Being in the Digital Age. In *Agile working and well-being in the digital age* (pp. 3-17): Springer.

Salau, O. P., Falola, H. O., & Akinbode, J. (2014). Induction and staff attitude towards retention and organizational effectiveness. *IOSR Journal of Business and Management (IOSR-JBM), 16*(4), 47-52.

Salge, T. O. (2020). RWTHx - MTI005x Strategic Management: From Intuition to Insight. Lecture 2. Unpacking strategy processes. Strategy process I: Strategy models. In. Edx. org [Online].

Schaffers, H., & Kulkki, S. (2007). Living labs, An Open Innovation concept fostering rural development. *Asia-Pacific Tech Monitor*, 30-38.

Schaffers, H., & Turkama, P. (2012). Living Labs for cross-border systemic innovation. *Technology Innovation Management Review, 2*(9).

Schein, E. H. (1986). What you need to know about organizational culture. *Training & Development Journal*.

Schumacher, J., & Feurstein, K. (2007). *Living Labs-the user as co-creator.* Paper presented at the 2007 IEEE International Technology Management Conference (ICE).

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.* Ghent University,

Schuurman, D., & De Marez, L. (2012). Structuring user involvement in panel-based Living Labs. *Technology Innovation Management Review, 2*(9), 31-38.

Schuurman, D., De Marez, L., & Baccarne, B. (2016). *Impact assessment of interactive coupled open innovation in living labs.* Paper presented at the XXVII ISPIM Innovation Conference.

Schuurman, D., De Marez, L., & Ballon, P. (2013). Open innovation processes in living lab innovation systems: insights from the LeYLab. *Technology Innovation Management Review, 3*(11).

Schuurman, D., De Marez, L., & Ballon, P. (2014). Living Labs: a systematic literature review.

Schuurman, D., De Marez, L., & Ballon, P. (2016). The impact of living lab methodology on open innovation contributions and outcomes. *Technology Innovation Management Review, 6*(1).

Schuurman, D., Herregodts, A.-L., Georges, A., & Rits, O. (2019). Innovation Management in Living Lab Projects: The Innovatrix Framework. *Technology Innovation Management Review, 9*(3).

Schuurman, D., & Protic, S. M. (2018). Living Labs versus Lean Startups: An Empirical Investigation. *Technology Innovation Management Review, 8*(12).

Schuurman, D., & Tõnurist, P. (2016). *Innovation in the public sector: Exploring the characteristics and potential of living labs and innovation labs.* Paper presented at the OpenLivingLab Days 2016.

Senge, P. M. (1990). The art and practice of the learning organization. In: New York: Doubleday.

REFERENCES

Ståhlbröst, A. (2013). A living lab as a service: Creating value for micro-enterprises through collaboration and innovation. *Technology Innovation Management Review, 3*(11).

Ståhlbröst, A., & Lassinantti, J. (2015). Leveraging living lab innovation processes through crowdsourcing. *Technology Innovation Management Review, 5*(12).

Steen, K., & van Bueren, E. (2017a). The defining characteristics of urban living labs. *Technology Innovation Management Review, 7*(7).

Steen, K., & van Bueren, E. (2017b). Urban Living Labs: A living lab way of working.

Tanev, S., Knudsen, M. P., Bisgaard, T., & Thomsen, M. S. (2011). Innovation Policy Development and the Emergence of New Innovation Paradigms. *Technology Innovation Management Review, 1*(2).

Tukiainen, T., Leminen, S., & Westerlund, M. (2015). Cities as collaborative innovation platforms.

Veeckman, C., Schuurman, D., Leminen, S., & Westerlund, M. (2013). Linking living lab characteristics and their outcomes: Towards a conceptual framework. *Technology Innovation Management Review, 3*(12 december), 6-15.

Veeckman, C., & Van Der Graaf, S. (2015). The city as living laboratory: Empowering citizens with the citadel toolkit. *Technology Innovation Management Review, 5*(3).

Velimirović, D., Velimirović, M., & Stanković, R. (2011). Role and importance of key performance indicators measurement. *Serbian Journal of Management, 6*(1), 63-72.

Verma, H. V. (2009). MISSION STATEMENTS-A STUDY OF INTENT AND INFLUENCE. *Journal of Services Research, 9*(2).

Vilariño, F., Karatzas, D., & Valcarce, A. (2018). The Library Living Lab: A Collaborative Innovation Model for Public Libraries. *Technology Innovation Management Review, 8*(12), 17.

Vinnova. (n.d., 19 February 2021). Our activities | Vinnova. Retrieved from https://www.vinnova.se/en/about-us/

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2016). Urban living labs for sustainability and low carbon cities in Europe: Towards a research agenda. *Journal of cleaner production, 123*, 45-54.

Waterman Jr, R. H., Peters, T. J., & Phillips, J. R. (1980). Structure is not organization. *Business horizons, 23*(3), 14-26.

Westerlund, M., & Leminen, S. (2011). Managing the challenges of becoming an open innovation company: experiences from Living Labs. *Technology Innovation Management Review, 1*(1).

Westerlund, M., Leminen, S., & Habib, C. (2018). Key constructs and a definition of Living Labs as innovation platforms. *Technology Innovation Management Review, 8*(12).

Wilkins, A. L. (1984). The creation of company cultures: The role of stories and human resource systems. *Human Resource Management, 23*(1), 41-60.

Yin, R. K. (2017). *Case study research and applications: Design and methods*: Sage publications.

APPENDICES

Appendix A – Analysis of academic papers for identifying living lab characteristics

Note: *x* means the characteristic is present; empty field means the characteristic is not explicitly stated.

Tab. A.1 – Overview of academic papers including the identification of the four elements.

Paper	Co-creation	Real-life context	Develop innovation	Quadruple Helix	4P
Pierson and Lievens (2005): Configuring living labs for a 'thick' understanding of innovation	x	x	x		x
Eriksson, Niitamo, and Kulkki (2005): State-of-the-Art and Good Practice in the Field of Living Labs	x	x	x		x
Eriksson, Niitamo, Kulkki, and Hribernik (2006): Living labs as a multi-contextual R&D methodology	x	x	x	x	x
Schumacher and Feurstein (2007): Living Labs – the user as co-creator	x	x	x		x
Følstad (2008): Living labs for innovation and development of information and communication technology: a literature review		x	x		x
Feurstein, Hesmer, Hribernik, Thoben, and Schumacher (2008): Living Labs: A New Development Strategy	x	x	x		x
Mulder, Velthausz, and Kriens (2008): The living labs Harmonization cube: communicating living labs' essentials		x	x		x
Bergvall-Kåreborn, Eriksson, Ståhlbröst, and Svensson (2009): A Milieu for Innovation – Defining Living Labs	x	x	x		x
Dutilleul, Birrer, and Mensink (2010): Unpacking European Living Labs: Analysing Innovation's Social Dimensions	x	x	x	x	x
Almirall and Wareham (2011): Living Labs: arbiters of mid- and ground-level innovation	x	x	x	x	x
Westerlund and Leminen (2011): Managing the Challenges of Becoming an Open Innovation Company: Experiences from Living Labs	x	x	x	x	x
Leminen, Westerlund, and Nyström (2012): Living Labs as Open-Innovation Networks	x	x	x	x	x
Almirall, Lee, and Wareham (2012): Mapping Living Labs in the Landscape of Innovation Methodologies	x	x	x		x
Katzy (2012): Designing Viable Business Models for Living Labs	x		x		x
Schaffers and Turkama (2012): Living Labs for Cross-Border Systemic Innovation	x	x	x		x
Schuurman and De Marez (2012): Structuring User Involvement in Panel-Based Living Labs			x	x	x
Mulder (2012): Living Labbing the Rotterdam Way: Co-Creation as an Enabler for Urban Innovation		x	x		x
Niitamo, Westerlund, and Leminen (2012): A Small-Firm Perspective on the Benefits of Living Labs	x	x	x		x
Leminen and Westerlund (2012): Towards innovation in Living Labs networks	x	x	x	x	x

Paper	Co-creation	Real-life context	Develop innovation	Quadruple Helix	4P
Ståhlbröst (2013): A Living Lab as a Service: Creating Value for Micro-enterprises through Collaboration and Innovation		x	x	x	x
Schuurman, De Marez, and Ballon (2013): Open Innovation Processes in Living Lab Innovation Systems: Insights from the LeYLab	x	x		x	x
Juujärvi and Pesso (2013): Actor roles in an urban living lab: what can we learn from Suurpelto, Finland?	x	x	x	x	x
Femenías and Hagbert (2013): The habitation lab: Using a design approach to foster innovation for sustainable living	x	x	x	x	x
Leminen (2013): Coordination and Participation in Living Lab Networks	x	x	x	x	x
Veeckman, Schuurman, Leminen, and Westerlund (2013): Linking living lab characteristics and their outcomes: Towards a conceptual framework	x	x	x	x	x
Hakkarainen and Hyysalo (2013): How do we keep the living laboratory alive? Learning and conflicts in living lab collaboration	x	x	x		x
Nyström, Leminen, Westerlund, and Kortelainen (2014): Actor roles and role patterns influencing innovation in living labs	x	x	x	x	x
Veeckman and Van Der Graaf (2015): The City as Living Laboratory: Empowering Citizens with the Citadel Toolkit	x	x	x	x	x
Tukiainen, Leminen, and Westerlund (2015): Cities as collaborative innovation platforms	x	x	x	x	x
Franz, Tausz, and Thiel (2015): Contextuality and co-creation matter: A qualitative case study comparison of living lab concepts in urban research	x	x	x	x	x
Bergvall-Kåreborn, Eriksson, and Ståhlbröst (2015): Places and spaces within living labs	x	x	x		x
Leminen, Turunen, and Westerlund (2015): The Grey Areas Between Open and Closed in Innovation Networks	x	x	x	x	x
Ståhlbröst and Lassinantti (2015): Leveraging Living Lab Innovation Processes through Crowdsourcing	x	x	x		x
Evans, Jones, Karvonen, Millard, and Wendler (2015): Living labs and co-production: university campuses as platforms for sustainability science	x	x	x		x
Hakkarainen and Hyysalo (2016): The Evolution of Intermediary Activities: Broadening the Concept of Facilitation in Living Labs	x	x	x	x	x
Georges, Schuurman, and Vervoort (2016): Factors Affecting the Attrition of Test Users During Living Lab Field Trial	x	x	x	x	x
Schuurman, De Marez, and Ballon (2016): The Impact of Living Lab Methodology on Open Innovation Contributions and Outcomes	x	x	x	x	x
Juujärvi and Lund (2016): Enhancing Early Innovation in an Urban Living Lab: Lessons from Espoo, Finland	x	x	x		x
Buhr, Federley, and Karlsson (2016): Urban Living Labs for Sustainability in Suburbs in Need of Modernization and Social Uplift	x	x	x		x
Voytenko, McCormick, Evans, and Schliwa (2016): Urban living labs for sustainability and low carbon cities in Europe: towards a research agenda	x	x	x	x	x
Schuurman and Tõnurist (2016): Innovation in the Public Sector: Exploring the Characteristics and Potential of Living Labs and Innovation Labs	x	x	x	x	x

Paper	Co-creation	Real-life context	Develop innovation	Quadruple Helix	4P
Leminen and Westerlund (2017): Categorization of Innovation Tools in Living Labs	x	x	x	x	x
Gascó (2017): Living labs: Implementing open innovation in the public sector	x	x	x	x	x
Schuurman and Protic (2018): Living Labs versus Lean Startups: An Empirical Investigation	x	x	x		x
Vilariño, Karatzas, and Valcarce (2018): The Library Living Lab: A Collaborative Innovation Model for Public Libraries	x				x
Imset, Haavardtun, and Tannum (2018): Exploring the Use of Stakeholder Analysis Methodology in the Establishment of a Living Lab	x			x	x
Coorevits, Georges, and Schuurman (2018): A Framework for Field Testing in Living Lab Innovation Projects	x	x	x		x
Westerlund, Leminen, and Habib (2018): Key Constructs and a Definition of Living Labs as Innovation Platforms	x	x	x		x
Haukipuro, Väinämö, Arhippainen, and Ojala (2019): Applying a Living Lab Approach Within an eHealth Accelerator	x	x	x		x
Callari et al. (2019): Exploring Participation Needs and Motivational Requirements When Engaging Older Adults in an Emerging Living Lab	x	x	x		x
Chronéer, Ståhlbröst, & Habibipour (2019): Urban Living Labs: Towards an Integrated Understanding of their Key Components	x	x	x	x	x
Schuurman, Herregodts, Georges, and Rits (2019): Management in Living Lab Projects: The Innovatrix Framework	x	x	x	x	x
No. of appearances	47	48	49	28	52
Percentage of appearance (%)	90,38	92,31	94,23	53,85	

Appendix B – List of interviewees

Tab. B.1 – Overview of interviewees and the respective organizations.

Name	Organization
Pilot study	
Jos van den Broek	Rathenau Instituut
Duane Elverum	CityStudio Vancouver
Aranka Dijkstra	Amsterdam Institute for Advanced Metropolitan Solutions / ATELIER
Marcel Kesselring	Urban Living Lab Breda
Dimitri Schuurman	imec
Hank Kune	Educore
Wendy Tan	Wageningen University and Research / R-LINK
Willy Spanjer	The Green Village
Alexandru Roja	Transilvania Living Lab
Koen Vervoort	European Network of Living Labs
Marije Wassenaar	Marineterrein Amsterdam Living Lab
Ruud Moesbergen	Marineterrein Amsterdam Living Lab
Liu Zhengjie	China Housing Living Lab
Andras Gabor	Flexilab
Puspalata Pattojoshi	Smart Village Living Lab
Case study	
Per Lundqvist	KTH Live-In Lab
Marco Molinari	KTH Live-In Lab
Safira Figueiredo	KTH Live-In Lab
Jonas Anund Vogel	KTH Live-In Lab
Martin Fors	KTH Live-In Lab
Angelina Kroft	Marineterrein Amsterdam Living Lab
Lizzy Bakker	Marineterrein Amsterdam Living Lab
Cornelia Dinca	Marineterrein Amsterdam Living Lab
Leendert Verhoef	Amsterdam Institute for Advanced Metropolitan Solutions / Marineterrein Amsterdam Living Lab
Kenneth Heijns	Marineterrein Amsterdam Living Lab
Johan van Dijk	Marineterrein Amsterdam Living Lab

Note: the order of the interviewees in this list does not correspond to the interview numbers presented in the text.

Appendix C – Pilot study interview guide

Interview goals
1. Validate the 4E Framework.
2. Understand the challenges faced by living labs in practice, and to which element of the 4E Framework are they related.

Interview organization
- Interviews were guided by the sections below. Whenever relevant, new sections stemming from the discussion were added.
- Information was anonymized.

Tab. C.1 – Interview protocol for interviews performed as part of this research project. These interviews were performed in 2020.

Interview section	Examples of questions or statements
Introduction	Who are you?
	What is your work focusing on?
Research presentation and consent	Presentation of the research and of how the interview will be used.
	Explanation of interviewee rights (e.g., anonymity).
	Asking for recording consent.
Living lab definition	How would you define a living lab?
	Can you please explain what your living lab is doing? (if applicable)
Real-life context	Who can participate in your living lab? (if applicable)
Co-creation	Who are the users of your living lab? (if applicable)
	How are they involved? (if applicable)
Participants	What stakeholders should be involved in a living lab?
	What organizations are involved in your living lab? (if applicable)
Product	What are the outcomes of a/your living lab?
	How are these outcomes achieved in your living lab? (if applicable)
Challenges faced by living labs	What are the problems you have encountered in your (research about) living lab(s)?
Closing	Informing the interviewee of the research timeline and that they will receive the final report.

Note: the protocol does not include follow-up questions.

Appendix C – Pilot study interview guide

Tab. C.2 – Interview protocol for interviews performed during a different project before this research. These interviews were performed in 2019.

Interview section	Examples of questions or statements
General questions related to the living lab	Can you please describe how the living lab was created?
	Can you please describe the tasks and areas of responsibility within the living lab?
	Can you please describe what each institution is responsible for, in relation to the living lab?
	How do different stakeholders participate in the living lab process?
	What results has the living lab produces, thus far?
	What are the challenges you have faced in the living lab, so far?
	What are the aspects which worked without any issues, so far?
Value propositions and business model of the living lab	What value does the living lab create for its experimenters?
	What types of experimenters do you want to attract?
	How many people are currently involved in the living lab?
Closing	Informing the interviewees of the research timeline and that they will receive the final result.

Note: the protocol does not include follow-up questions.

Appendix D – Case study interview guide

Interview goal

Exploring the living lab organization of which the interviewee was a part of.

Interview organization
- Interviews were guided by the sections below. Whenever relevant, new sections stemming from the discussion were added.
- Each phrase between < > was replaced with the name of the structural unit of which the interviewee was a part of.
- Information was anonymized.

Tab. D.1 – Interview protocol for the case study interviews.

Interview section	Example of questions or statements
Introduction	Who are you?
Research presentation and consent	Presentation of the research and how the interview will be used.
	Explanation of interviewee rights (e.g., anonymity).
	Asking for recording consent.
General level: entire organization	What are the objectives of your living lab?
	How is your living lab interacting with its surroundings (people, space, etc.)?
	How is your living lab interacting with the experimenters?
	Can you please describe the organizational structure of your living lab?
	What is the hierarchical structure within this organization? Who answers to whom?
	What does each unit of this structure do?
Focused level: Interviewee's structural unit	What are the responsibilities of the <interviewee's structural unit>?
	How have these responsibilities been established?
	How does <interviewee's structural unit> interact with the other members of the other units?
	How does someone become a member of <interviewee's structural unit>?
	What are the roles of the individual members of <interviewee's structural unit>?
	How are tasks divided among members of <interviewee's structural unit>?
	How is <interviewee's structural unit> working? (meetings only, full-time, part-time)
	What challenges have you faced within <interviewee's structural unit>?
Closing	Informing the interviewee of the research timeline and that they will receive the final report.

Note: the protocol does not include follow-up questions.