

Master Thesis – Master Innovation Sciences

# Path Creation in the Dutch' Age Friendly Housing Domain

How entrepreneurs, as creators of new socio-technological pathways, use living labs to develop and commercialize technologies for active, healthy, and independent aging.

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From Innovation@Home: A Contest and a Call for Age-Friendly Housing Practices that Work:  
<https://extranet.who.int/agefriendlyworld/age-friendly-practices/innovation-home-afp/>

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December 2020

## Abstract

The continent of Europe is facing major demographic changes. An aging population is the cause of several societal challenges, most importantly in terms of scarcity and accessibility of healthcare and housing services like elderly care facilities and home care services. Increased demand for healthcare and housing services for elderly living in their own homes indicates that it is time to rethink the current way of housing and healthcare for elderly. Several smart technologies exist that are expected to offer a solution to the rising demands and costs for healthcare while enabling the elderly to grow old healthily and pleasantly in their familiar environment. Large-scale adoption and implementation of these smart solutions lack however behind, and it is believed that, in order to solve these societal challenges, a transition towards a new system in which new practices of elderly care and housing take place perhaps is needed. Living labs, presented as initiatives in which citizens, knowledge institutions, companies and governments jointly look for innovative solutions for complex social issues, are phenomena that can contribute to solving societal issues such as an aging population by accelerating socio-technical transitions.

This thesis explores how entrepreneurs, as creators of new socio-technological pathways, develop and commercialize technologies that offer solutions for the challenges of an aging population by participating in Living Labs. It adds to the literature of living labs by studying the unexplored involvement of entrepreneurs in living labs and their attempts to shape and steer future socio-technological pathways through the lens of path creation literature.

A qualitative inductive research approach was used to explore the involvement of ten entrepreneurs in eight living labs. To this end, eight interviews with coordinators of living labs and ten interviews with entrepreneurs took place.

This study examined which different types of living labs exist within the Dutch elderly care sector and found that there are two distinctive types of living labs. This study also found that participating in living lab initiatives offer several benefits for entrepreneurs.

This study adds to the literature of living labs by proposing several statements on how different types of living labs support entrepreneurs in their attempts to shape and steer future socio-technical pathways. It concludes by acknowledging the potential of living labs for socio-technical transitions. However, there are still improvements to be made in various areas. For example, research could be done into how local living lab initiatives can contribute to transitions within the national age friendly housing system.

## Preface

I could never have imagined that my graduation would take place under the strange circumstances of a global pandemic. During this period of COVID-19, physical gatherings at the university were not possible. Although all kinds of useful digital communication tools are available in the modern times we live in, not being able to see and speak to fellow students in person was a challenge. What I especially missed during this period of social distancing were small talks, spontaneous exchange of thoughts and discussing research progress with my student friends in the coffee corner at the university.

Nevertheless, with this master thesis a number of great student years have come to an end. As the first paragraph may already suggest, this master thesis was not realized without the typical ups and downs. This thesis could not have been realized without the expert supervision of dr. ir. Alexander Peine. Therefore, I would like to thank him for his guidance, feedback, and support during this graduation process.

I would also like to express my gratitude to my colleagues from the Maasstad Academy of the Maasstad Hospital in Rotterdam. Although my research has nothing to do with this hospital, the vast majority of this report was written at the Maasstad Academy office. The stimulating environment of this office has allowed me to write this report without distraction and in silence. As a result, many colleagues have experienced my research progress and provided me with the necessary mental support.

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Rotterdam  
December 2020

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## 1. Introduction

The continent of Europe is facing major demographic changes. An aging population is the cause of a number of societal challenges. It is expected that the number of elderly people will double by 2040 (Centraal Bureau Statistiek, 2016). This elderly population is susceptible to a decrease in health and well-being, most prominently in terms of social and cognitive function and mobility. As homecare facilities are already scarce and hard to access, an increasing number of elderly people live at home for a longer period of time. There's an increase in demand of health services at home, which indicates the need for rethinking the way elderly people are living in their own environments at the present time (Tata Consultancy Services, 2016).

There exist several smart technologies that are expected to offer a solution to the rising demands and costs for healthcare while enabling the elderly to grow old healthily and pleasantly in their familiar environment. Among these technologies are smart home-care solutions like digital monitoring applications, teleconsulting systems, and smart mobility solutions. For the sake of convenience, the term "age friendly technologies" will be used in this thesis. The term "age friendly technologies" refers to solutions that try to improve the lives of the elderly by extending their independence, decreasing experienced loneliness and social isolation, offering medical insights that can monitor and predict problems, and help performing tasks that typically require mobility (adopted from Abrhams, 2020). Large scale adoption of these solutions is, however, lacking behind. The barriers to large scale adoption mostly arise at the interface between the incumbent healthcare and housing socio-technical systems, which relate to the combination, integration, and/or replacement of knowledge, experiences, practices, and structures of both systems (Arentshorst & Peine, 2018). In order to overcome these barriers, current day-to-day practices of both system have to change and perhaps even a transition towards a new system is required.

Existing literature on technological transitions acknowledges the importance of institutional and historical circumstances that shape innovation journeys (W. Arthur, 1988; P. A. David, 1985). Technological innovation does not occur in isolation. Instead, this occurs in a dynamic process in interaction with a set of heterogeneous actors (Raghu Garud & Rappa, 1994). Furthermore, path creation theory acknowledges that actors are embedded in dominant structures. However, it argues that entrepreneurs seek for ways to deliberately deviate from these embeddings. This mindful deviation implies that entrepreneurs have the agency to disembed from dominant structures with their actions.

This research uses path creation literature to explore how entrepreneurs, as creators of new socio-technological pathways, engage in activities that translate and transform their ideas for technological change to their respective contexts and how they try to convince these contexts about the potential of this technological change. It further adopts the perspective of Garud and Karnoe (2001) in assuming that "entrepreneurs create innovation pathways in real-time, attempting to shape institutional, social, and technical facets of an emerging technological field". The path creation literature argues that entrepreneurs face many challenges in the creation of innovation pathways. The entrepreneurs first have to disembed from embedded relevance structures and objects making it difficult to create a vision of the future that is different from their

present practice. Furthermore, disembedding or deviations initiated by entrepreneurs may disturb the status quo causing resistance to change.

The “living lab” is a phenomenon that can contribute to solving major societal challenges (such as an aging population) by accelerating socio-technical transitions. These living labs are often presented as initiatives in which citizens, knowledge institutions, companies and governments jointly look for innovative solutions for complex social issues, which is in this case thus an aging population (Deuten et al., 2017). Living labs are defined as *“Both physical locations and a joint approach, that involve different parties that experiment, co-create and test in lifelike environments, delineated by geographic and institutional boundaries”* (Voytenko et al., 2016). The main added value of these living labs is for entrepreneurs that they provide innovation services which introduce entrepreneurs to a collaborative working environment that would otherwise not be available for them (Hronszky & Kovács, 2011). Furthermore Eriksson et al. (2005) acknowledge that “the strengths of living labs lay in their openness and neutrality in respect to technology or business models”. They argue that the reason for this is mainly to enable maximum innovation by avoiding problems of path dependency (i.e. the tendency of actors to stay with the existing paradigm of operation as it is so difficult to disembed from embedded relevance structures and objects). In addition to contributing to a solution for major societal challenges, the open and neutral nature of living labs suggest that these might also offer solutions to the challenges of entrepreneurs that were identified by Garud & Karnøe (2001).

How entrepreneurs exactly use living labs to overcome these entrepreneurial challenges (i.e.: challenges related to breaking away from embedding structures and overcoming resistance to change from the status quo) remains unclear. To this end, the involvement of entrepreneurs in living labs seems understudied. Literature on path creation processes, on the contrary, is relatively rich and the roles of institutional and historical circumstances and agency in this have often been the central point of study. Path creation theory therefore offers opportunities to investigate how entrepreneurs use living labs to break away from embedded relevance structures and overcome resistance to change from the status quo. This thesis provides an extension to the literature on living labs and the involvement of entrepreneurs in these. It tries to understand how participation in living labs supports entrepreneurs in their attempts to shape and steer future socio-technical pathways. Insight in this helps to understand how entrepreneurs use living labs to their advantage in their attempts to shape and steer emerging socio-technological paths.

The Netherlands have a wide variety of living lab-like initiatives that focus on finding solutions for the increasing demand for care and housing for the elderly. It was therefore taken as an empirical boundary to explore the roles of living labs in supporting entrepreneurial innovation. It did this by answering the following research questions:

1. *What different types of living labs exist within the Dutch age friendly housing sector?;*
2. *What advantages do entrepreneurs experience when participating in such a living lab?;*
3. *How do entrepreneurs use living labs in the in the creation of socio technological pathways.*

Now that the objective and the research questions of this study are clear, this thesis is structured as follows: Chapter two will describe the theory used in this research. The third chapter describes the methods and techniques used to conduct this research. Chapter 4 presents the results from the interviews conducted. Chapter 5 then discusses what these results mean in the light of the established theory. Furthermore, the limitations and implications of this research are discussed here and advice for further research is given. The thesis logically ends with a conclusion in which all research questions are answered.



## 2. Theoretical background

Several barriers hinder large scale adoption of technologies that support elderly to live independently and worthy in their own homes. These barriers mostly arise at the interface between the incumbent healthcare and housing socio-technical systems and relate to the combination, integration, and/or replacement of knowledge, experiences, practices, and structures of both systems (Arentshorst & Peine, 2018). To overcome these barriers, current day-to-day practices of both system have to change and a transition towards a new system is needed. Living labs can contribute to the accelerated development and commercialization and large scale adoption of age friendly technologies. These living labs are often presented as initiatives in which citizens, knowledge institutions, companies and governments jointly look for innovative solutions for complex social issues, in this case thus an aging population (Deuten et al., 2017).

As mentioned earlier in the introduction of this thesis, living labs are recognized for their strengths as being open and neutral in respect to existing technologies or business models. Eriksson et al. (2005) argue that the reason for this is mainly to enable maximum innovation by avoiding problems of path dependency and lock-in. These problems are related to the tendency of firms to stay with the existing paradigm of operations as it is so difficult to break into new grounds and change the direction of technology development which is currently predominant. (Ballon & Delaere, 2011).

Path dependency relates to a phenomenon where actors that share certain guiding visions, routines, and practices tend to follow a specific technology path or technological trajectory. It refers to “a set of complex processes that are unable to shake free of their history (David & Foray, 2001). From a path dependence perspective, “actors become locked in by self-reinforcing mechanisms into paths whose evolution is determined by contingencies (historical change events)” (Garud & Karnøe, 2001). Arthur (1989) and David (1985) studied the development of the sociotechnical path of the QWERTY keyboard and used their findings to develop the path dependency perspective. These authors propose that historical events lead to the phenomenon where a (sometimes inferior) product becomes the standard in its field. Their perspective also denotes that positive feedback mechanisms and profit-maximizing behavior by actors lead some technologies into lock-in while other technologies become locked-out. In the first case, technologies, institutions, and organizations become persistent to change. In such an ‘equilibrium’, all choices regarding the development and diffusion of a certain technology reproduce it’s’ given sociotechnical path. Entrepreneurs that comply with the path are rewarded and entrepreneurs that deviate from the path are not favored (P. A. David, 1985).

Assuming that living labs, being open and neutral in respect to existing technologies or business models, truly do avoid problems of path dependency and lock-in and can help solving societal issues by supporting technological transitions, it remains unclear how exactly this is the case. Living labs have been mentioned as potential tools that may contribute to social-technological transitions as these initiatives might offer innovations able to break through current dominant practices and radically change rules and routine structures within their contexts. To accelerate transitions, large disruptive changes are needed within existing systems and established practices.

This research embraces the idea that the living lab initiatives support the entrepreneur to mobilize the resources and support he needs to break away from existing rules and routines to create or steer socio-technological paths. The roles of entrepreneurs participating in living lab initiatives have not been empirically studied through the lens of path creation literature before. It can therefore be regarded as an explorative act, aiming to further elaborate on the literature living labs and the involvement of entrepreneurs in these.

In order to be able to provide an answer to the research questions, the following section will discuss the used theories and concepts. First, section 2.1 will describe what living labs are, how they operate and whether the literature distinguishes different types. Following, section 2.2 continues with an explanation of path creation processes and the relevant theoretical concepts. Subsequently, section 2.3 will provide an explanation on the core theory and concepts of the creation of legitimacy for social change and new technologies. Finally, section 2.4 will explain the operationalization of the discussed theories and concepts in order to eventually answer the research questions.

## 2.1 Living labs

Living labs can be perceived as workshops for cocreation and socio technological-innovation. However, literature on living labs does not consent about a shared, leading definition about the phenomenon living lab (Deuten et al., 2017). There are two dimensions that are frequently mentioned within the existing strand of literature. The first dimension that distinguishes living labs from other public-private R&D collaborations describes the involvement of citizens within the innovation processes in these living labs. This citizen involvement is referred to as *cocreation*, and is defined as “*a form of knowledge development from which researcher come from different scientific areas and cooperate with societal stakeholders to develop concrete solutions for societal challenges*” (Merkx 2012). The second dimension that characterizes a living lab is the *experimental and learning approach* that the majority of these living labs apply. Voytenko et al. (2016) describe a living lab as: “*Both a physical location and a joint approach, that involves different parties that experiment, co-create and test in a lifelike environment, delineated by geographic and institutional boundaries*”. Taking the cocreation dimension in mind, actors that are frequently seem to be involved within living lab projects are: (local) governments; universities; SME and corporates; societal actors such as housing corporation; healthcare organizations; non-governmental organizations, and citizens’ initiatives (Deuten et al., 2017).

SMEs and entrepreneurs are expected to benefit remarkably from participation within open-innovation environment such as living lab. Small firms are usually experiencing major challenges in gaining access to ecosystems and markets, dealing with contextual diversity, and having to ensure scalability and integration of initiatives. Although SME are often highly innovative and flexible, they often struggle upon these challenges due to a lack of knowledge and experience (Leminen & Mika, 2012). SME participation in living labs can help overcome these challenges. Existing literature acknowledges that there exist several benefits that entrepreneurs experience when participating in living lab initiatives.

Firstly there are several market related benefits of living labs that might motivate an entrepreneur to participate in one. According to authors Deuten et. al. (2017), these benefits are:

- *Access to knowledge, competencies, resources and research facilities;*
- *Increased competitive advantage by enabling and stimulating cooperative learning about the implementation and application of new technologies; and*
- *Opportunities for development, validation and demonstration of innovative solutions.*

In addition to benefits relating to the access to resources such as test facilities, knowledge, competencies and value chains Leminen & Mika (2012) found that living labs also might gain firms access to *markets and ecosystems*.

Secondly, next to the market related benefits such as access to resources and markets and ecosystems, living labs also enable SMEs to involve users in their innovation process. According to Erik von Hippel (1986) customer participation within the design processes, and interaction with the producers is vital in service innovations. Furthermore, the integration of customers and users as subjects to learn from and with during the design process of innovations is considered as a key success factor in all industries (Heinonen et al., 2010). In addition, Fisher, Peine, and Östlund (2020) found that the involvement of seniors within the design processes of technologies that might help increase the quality of life, benefit the development and

commercialization of technologies in three ways. First, involving senior users enables technology designers to learn about senior users' needs and lives (Johnson et al., 2014; Righi et al., 2017). Second, the insights provided by senior users might lead to adjustments in the design of technologies. Third, senior user involvement also leads to "an increased sense of participation", as senior users might feel that are "being part of a technologically advanced generation" (Hakobyan et al., 2013).

To sum up, there exist several benefits that entrepreneurs might experience when participating in LL initiatives. First, there seem to be benefits such as access to markets and resources. Second, there seem to be benefits of involving users such as insight into users' needs and lives and increased sense of participation.

## 2.2 Path creation

### 2.2.1 Path creation processes

The path dependence perspective argues that “the past intrudes into the present as a constraining force, contingencies that arise are experienced as unanticipated unprepared moments, and the future presents itself as a fundamentally uncertain terrain” (Garud & Karnøe, 2001). The authors note that this perspective does not acknowledge the ‘reflexive capacity’ or agency of actors: “the path dependence perspective – serves to rob actors of any agency, as they find themselves pushed and pulled from one state to another” (Garud and Karnoe, 2001), and as deviations from the path are not favorable (David, 1985).

In response, Garud and Karnoe have come up with a complementing perspective. The path creation perspective acknowledges that actors are embedded in dominant structures. However, this perspective argues that entrepreneurs seek for ways to deliberately deviate from these embeddings. This mindful deviation holds that entrepreneurs have the agency (i.e. the notion that actors may organize themselves and develop identities in ways that confer capacities to imagine and anticipate future states and mobilize the past to accomplish their objectives (Maiden & Blackwell, 1999) to disembed from dominant structures with their actions. This way, the authors view the happening of historical change events as sometimes “cultivated and nurtured to create something of value”.

Furthermore, the path creation perspective argues that entrepreneurs face two types of challenges in the process of creating alternative technological pathways. First, sensing and creating opportunities to deviate from existing paths is extremely hard as entrepreneurs might become so deeply embedded in the current technological field that a vision that is different from the present is difficult to muster (Garud & Karnoe, 2001). Embedded actors continue to reproduce existing practices and avoid new structures because deviating from these existing practices and structures might not be favorable for the entrepreneur (Webb & Weick, 1979). Furthermore, impulses to stay on an already existing pathway and exploit the already known practices might be so great that the thought to explore what is unknown and create new opportunities maybe not that attractive (March, 1991). The second challenge that entrepreneurs need to overcome is that deviations from existing paths may also disturb the status quo, thereby unchaining a reaction from interdependent actors. For example, powerful threatened actors can generate negative feedback in order to resist the deviation (Garud & Karnoe, 2001).

Opportunities for technological path creation are created endogenously by the actions and reactions of entrepreneurs exploring ways to produce new products or services (Alvarez & Barney, 2008). The path creation perspective describes that there are several processes that entrepreneurs go through in their attempts to disembed from existing technological pathways.

First, the entrepreneur needs to deviate from existing conventional wisdom and break away from his or her localized context of meaning by experimenting with new ways of using, reusing, and recombining of available resources.

Second, the entrepreneur must be able to “mobilize minds”. He or she must convince his or her context to mobilize a collective behind the deviation from the traditional practices. To deal

with resistance and apathy from the context, the entrepreneurs have to remain persistent with flexibility (Garrud and Karnoe, 2001). Entrepreneurs are therefore acting as boundary spanners: They have to translate their ideas into shared spaces, i.e., the translation of their ideas in such ways that they are understandable by others. Furthermore, translation also implies the transformation of ideas to overcome resistance and indifference. This transformation of ideas happens through interaction with the context. The boundary spanning role here offers entrepreneurs the opportunity to look at ideas dispassionately even as they remain steadfastly resolute about the overall potential of their ideas. This tenacity provides entrepreneurs an ability to present their ideas to others with conviction even while incorporating feedback generated by others to modify the idea.

Third, the entrepreneur needs to translate his or her idea so that it creates a “shared understanding” or “shared space”. This shared understanding of space has to be understandable by others that have not yet disembedded from the existing technological field. The presentation of this shared understanding has to match the others’ past and experiences so that the idea will become supported by others. In this process, the idea transforms through interaction with others so that it overcomes resistance and indifferences.

Fourth, path creation is never a straight forwarded process. Path creation involves a repeating cycle of disembedding, translation, and mobilization of support. For a new technological path to be created, the idea has to generate momentum. This holds that the entrepreneur builds ideas and then deflects these ideas over and over again. For this process, flexible minds are required, as relevance structures need to change in the process of mobilization for support and the translation of ideas to shared understandings.

Lastly, the concepts of time, timing, and temporality are important in path creation processes. Long time frames are key to the exploration of ideas; An exploratory act requires an appropriate timeframe with which and within which exploration takes place; Timeframe and degree of novelty must be matched in order to prevent needless deployment of resources. Table 1 gives an overview of concepts that illustrate path creation processes.

<i>Path creation processes</i>	
<i>Deviation</i>	Deviate from existing conventional wisdom and break away from his or her localized context of meaning by experimenting with new ways of using, reusing, and recombining of available resources.
<i>Mobilization of minds</i>	Convince context of importance or potential of deviation from traditional practices in order to mobilize a collective being de deviation. Entrepreneur needs to have persistence to maintain the original idea. Yet the entrepreneur has to remain flexible to modify his or her vision and expectations on the original idea to the feedback of others surrounding the entrepreneur.
<i>Creation of shared space</i>	The entrepreneurs idea has to be understandable by others that have not yet disembedded from the existing technological field. The presentation of the idea has to match others' past and experiences so that the idea is supported by others. Idea has to be transformed and translated through interaction with others so that it overcomes resistance and indifferences.
<i>Generation of momentum</i>	Entrepreneur builds ideas and then deflects these ideas again and again. Flexible minds are needed as relevance structures need to change in the process of mobilization for support and translation of ideas to shared understandings.
<i>Time, Timing, and Temporality</i>	Long time frames are key to the exploration of ideas exploratory act requires an appropriate timeframe with which and within which exploration takes place Timeframe and degree of novelty must be matched in order to prevent needless deployment of resources.

*Table 1: Concepts to illustrate path creation processes (taken from Garrud & Karnoe, 2001)*

## 2.3 Institutional change and the creation of legitimacy

The processes and practices of institutional change have been studied by a wide range of scholars. Hargrave and van de Ven (2006) analyzed the most important models of institutional change and proposed their collective action model for institutional innovation. This model views institutional change “as a dialectical process in which partisan actors espousing conflicting views confront each other and engage in political behaviors to create and change institutions” (Hargrave & Van De Ven, 2006). The model offers helpful insights into the various processes and phases of institutional change and acknowledges that the process of institutional change often is a political process of mobilizing campaigns to legitimate a social or technical innovation.

According to Aldrich & Fiol (1994), legitimacy is an important factor influencing whether an industry successfully moves beyond the stage of a few pioneers. Access to capital, markets, and governmental protection are all partially dependent on the level of legitimacy achieved by an emerging industry. Aldrich and Fiol separate legitimacy into two dimensions and propose that both dimensions require different legitimization strategies.

First, cognitive legitimacy refers to the taken-for-granted assumption that an institutional change is desirable, proper, and appropriate within a widely shared system of norms and values (Scott, 1995; Stryker, 1994). It can also be described as how knowledgeable people are of the new industry, how likely new entrants are to copy the existing organizational form rather than experiment with new ones. Cognitive legitimacy strategies encompass knowledge base development by using symbolic language and behaviors, encouraging convergence around a dominant design, promoting activity through third-party actors and creating linkages with established educational curricula.

Second, socio-political legitimacy consists of endorsements and the support of key constituents, such as financial investors, government officials, consumers and others who play key roles in developing and implementing an innovation (Carroll & Hannan, 2004; Rao et al., 2001). It can also be described as a process by which these key constituents accept a venture as appropriate and right, given existing norms and laws (Aldrich and Fiol, 2006). New institutions – or new technologies - gain cognitive legitimacy when entrepreneurs or activists succeed in framing their projects as valid, reliable, and useful (Rao et al., 2001). Therefore, socio-political strategies encompass the development of trust, perception, and reputation (Aldrich & Fiol, 1994).

Within this thesis, it is studied how entrepreneurs make use of living lab environments in the creation of legitimacy for their socio-technological configurations. This was done using the two dimensions of legitimacy as proposed by Aldrich and Fiol (1994) taken into account. Table 3 gives an overview of these dimensions.

*Dimensions of legitimacy*

<i>Cognitive legitimacy</i>	<p>The taken-for-granted assumption that an institutional change is desirable, proper, and appropriate within a widely shared system of norms and values (Scott, 2001; Stryker, 1994).</p> <p>How knowledgeable people are of the new industry, how likely new entrants are to copy the existing organizational form rather than experiment with new ones (Aldrich and Fiol, 1994).</p>
<i>Socio-political legitimacy</i>	<p>Endorsements and support of key constituents, such as financial investors, government officials, consumers and others who play key roles in developing and implementing an innovation (Aldrich and Fiol, 1994).</p> <p>The process by which key constituents accept a venture as appropriate and right, given existing norms and laws (Aldrich and Fiol, 1994)</p>

*Table 2: Dimensions of legitimacy (taken from Aldrich and Fiol, 1994)*



## 2.4 Operationalization of theoretical concepts

The theories that are discussed in this section provide several concepts that can be used to explore how living labs support entrepreneurs in their attempts to break away from existing practices and routines. The most important concepts from these theories provided a starting point for finding answers to the earlier formulated research questions. The following section explains per research question how this is done.

### 2.4.1 Operationalization research question 1

The first research question is formulated as: *“What different types of living labs exist within the Dutch age-friendly housing sector?”*. Central in this question is the typology of living labs that can be identified within the Dutch age-friendly housing domain. In the literature, two dimensions of living labs were identified. The first dimension relates to the degree of co-creation that characterizes the nature of the living labs. The second dimension relates to the degree of cooperative learning about the implementation and adoption of technologies that characterize the nature of the living labs. The first dimension is studied by looking at the active participation of users (elderly, caregivers, and informal caregivers) within the development of new technologies. The second dimension is studied by looking at practices or situations in the living lab projects in which learning and exploring with and between actors plays an important role. Information about these dimensions helps to find an answer to research question 1. Table 3 provides an overview of the dimension of the nature of living labs. The table defines the dimensions and also shows how these dimensions can be observed during data collection and analysis.

<i>Theme and relating Research Question</i>	<i>Concept/dimension</i>	<i>Description</i>	<i>Example</i>
<i>Type of Living Lab (SQ1)</i>	Cocreation	<i>“A form of knowledge development from which researcher come from different scientific areas and cooperate with societal stakeholders to develop concrete solutions for societal challenges” (Merks 2012).</i>	References that the living lab project involves actors from multiple disciplines that together develop solutions for societal issues.
	Learning	Environments that stimulate cooperative learning about the implementation and application of new technologies	References to practices or situation in the living lab projects in which learning and exploring with and between actors plays an important role.

*Table 3: Operationalization of used concepts for data collection and analysis on research question 1*

## 2.4.2 Operationalization research question 2

The second research question is formulated as: “*What benefits do entrepreneurs experience when participating in such a living lab?*”. These benefits are classified as market-related benefits and benefits related to user involvement. This classification is based on existing literature. The market-related benefits entail benefits for entrepreneurs such as access to resources like knowledge, competencies, complex technologies (Arvanitis, 2012), and access to markets and ecosystems (Leminen & Mika, 2012). The benefits for entrepreneurs that relate to user involvement entail user participation and user producer interaction in the design and commercialization processes of products and services with the aim to learn about users’ needs and lives (von Hippel, 1986). Table 4 gives an overview of the benefits for entrepreneurs of participation in a living lab initiative. The table describes the benefits and also shows how these benefits can be recognized during data collection and analysis.

<i>Theme and relating Research Question</i>	<i>Concept/dimension</i>	<i>Description</i>	<i>Example</i>
<i>Benefits (SQ2)</i>	Market related benefits	Access to knowledge, competencies, and/or complex technologies as additional resources (Arvanitis, 2009) Access to markets and ecosystems (Leminen & Mika, 2012)	References where entrepreneurs or seek connections through living lab environments to gain access to knowledge, competencies, finance, research facilities, or to markets/ecosystems.
	Benefits related to user involvement	Customer participation within the design processes of innovations, and interaction between users and producers to learn about users’ needs and lives (Von Hippel, 1986)	Efforts of entrepreneurs to involve users (seniors, (informal) caregivers and students in order to gain insight into users’ needs, lives or to improve the design of solutions.

*Table 4: Operationalization of used concepts for data collection and analysis on research question 2*

### 2.4.3 Operationalization research question 3

The third research question is formulated as: “*How entrepreneurs use living labs in the the creation of socio technological pathways?*”. Central in this question are the processes of path creation and the role of living labs in these. Path creation theory offers insights into how entrepreneurs can break away from existing socio-technological trajectories and how they can create or steer alternative paths. As it is assumed that entrepreneurs only participate in living labs after they came with an idea for a new product or service, the process of mindful deviation is not taken into account in this study. Especially important for answering research question three are the concepts: Mobilizing minds, creation of a shared space, and generation of momentum. These concepts are operationalized by researching what participation in living labs means for entrepreneurs. It looks at how entrepreneurs try to convince their environment of the importance and potential of their ideas with the help of the living labs. It also looks at how living labs support entrepreneurs in translating, adapting, and presenting these ideas so that they can be understood by others. In addition, it can be used to investigate how living labs help entrepreneurs to find support for their ideas within the context. Table 5 provides an overview of the main concepts of path creation theory. The table provides a definition of the concepts and also shows how these concepts can be recognized during data collection and analysis.

<i>Theory</i>	<i>Concept</i>	<i>Definition</i>	<i>Points of analysis</i>
<i>Path creation</i>	Mobilizing minds	Entrepreneurs need to convince context of importance or potential of deviation from traditional practices in order to mobilize a collective behind the deviation.	Attempts of the entrepreneur to convince his/her context of the potential or possibilities of his/her innovations and to gain support from key actors.
	Creation of shared space	Idea have to be understandable by others that have not yet disembedded.  Presentation of the idea has to match others' past and experiences so that the idea is supported by others.  Idea has to be transformed and translated through interaction with others so that it overcomes resistance and indifferences.	Efforts of the entrepreneur to translate or transform his innovations/ideas so that they become understandable by others and so that they fit the expectations and beliefs of his/her context.  References of situations where the entrepreneur modifies his idea (the design of products) so that these better fit users' needs and practices.
	Generation of momentum	ideas have to generate momentum: Entrepreneur must build ideas and then deflect these ideas again and again.  Flexible minds are needed as relevance structures need to change in the process of mobilization for support and translation of ideas to shared understandings.	References to situations where the scale of a technology or firm seemed to change from initial development and validation towards a scale-up and implementation phase where the large scale adoption of the innovation takes place and the firms seemed to capture a notable place in the market.

*Table 5: Operationalization of used concepts for data collection and analysis on research question 3*

Also important in path creation and institutional change are processes that legitimize a social or technical innovation. Legitimacy is operationalized and separated in two dimensions according the literature (Aldrich & Fiol, 1994). The first dimension, cognitive legitimacy indicates that technologies or firms are recognized, visible and wanted within the context of the living labs or within regional markets. The second dimension, socio-political legitimacy indicates that technologies or firms are supported by important actors such as insurers, (large) healthcare organizations, and (local) governments/municipalities. Table 6 provides an overview of the two dimensions of legitimacy. The table defines the dimensions and also shows how these concepts can be recognized during data collection and analysis.

<i>CONCEPT</i>	<i>DIMENSION</i>	<i>DEFINITION</i>	<i>POINTS OF ANALYSIS</i>
<i>legitimacy</i>	Cognitive legitimacy	The taken-for-granted assumption that an institutional change is desirable, proper, and appropriate within a widely shared system of norms and values (Scott, 2001; Stryker, 1994).  How knowledgeable people are of the new industry, how likely new entrants are to copy the existing organizational form rather than experiment with new ones (Aldrich and Fiol, 1994).	References that indicate that technologies or firms are recognized, visible and wanted within the context of the living labs or within regional markets.
	Socio-political legitimacy	Endorsements and support of key constituents, such as financial investors, government officials, consumers and others who play key roles in developing and implementing an innovation (Aldrich and Fiol, 1994).  The process by which key constituents accept a venture as appropriate and right, given existing norms and laws (Aldrich and Fiol, 1994)	References that indicate technologies or firms are supported by important actors such as insurers, (large) healthcare organizations, and (local) governments/municipalities

*Table 6: extended operationalization of used concepts for data collection and analysis on research question 3*

## 2 Research Method

To answer the formulated research questions, a qualitative inductive research methodology was applied. The aim of this study is was to analyze how living labs support entrepreneurs in the steering or shaping of their innovation pathways through legitimization processes. To this end, the theory and concepts associated with path creation and institutional change were used as guiding heuristics in order to create theory from the collected data. Within this chapter the used research strategies, methods and approaches are described. The first section will give a description of the used data collection strategy. The second section will explain the qualitative data analysis deployed in this study.

In order to answer the formulated research questions, a first requirement was to examine the different types of living labs within the Dutch age friendly housing sector. In examining these different types of living labs, eight interviews coordinators of living labs have taken place. In addition to insights about the types, nature and functionalities of these living labs, the key figures of these living labs proved to be valuable sources trough which entrepreneurs could be reached. To identify the most important benefits for entrepreneurs of participating in a living lab, ten in-depth interviews with entrepreneurs have taken place.

### 2.1 Data collection

The data used for this study was collected through eight in-depth qualitative interviews with coordinators of living labs and ten in-depth qualitative interviews with entrepreneurs participating within these living labs. If necessary, additional document analyses based on websites and public sources were performed with the goal of obtaining a complete picture of the living lab initiatives and the firms and solutions of entrepreneurs.

#### 2.1.1 Sampling

The eight living lab initiatives included in this study were purposefully selected based on five selection criteria: First, initiatives must be (whether or not self-proclaimed) living labs; Second, initiatives must be actively engaged in the development and commercialization of smart home-care solutions. Those are solutions that try to improve the lives of the elderly by extending their independence, decreasing experienced loneliness and social isolation, offering medical insights that can monitor and predict problems, and help to perform tasks that typically require mobility (adopted from Abrhams, 2020); Third, initiatives must all be based in the Netherlands. Fourth, initiatives must all be operational at the time being; Fifth, initiatives must have active involvement of entrepreneurs and their technologies.

The initiatives were identified and selected through desk research on the internet. Important internet sources that were consulted to find suitable living lab initiatives were for example the database from the Dutch knowledge center of living and care (Kenniscentrum wonen en zorg, KCWZ) Aedes-Actis with a collection of experiments aimed at developing and implementing technologies to enable independent living, and the database of the European Network of Living Labs (ENOLL). Furthermore a web search using search terms like “living lab

langer thuis wonen”, “living lab gezond thuis”, and “living lab gezond ouder worden” was also used to identify living lab initiatives in the Netherlands. The desk research resulted in the identification of fifteen different initiatives within the Netherlands that called themselves living labs and were actively involved with the development and commercialization of smart home care technologies. All the identified initiatives could be found on the internet and had webpages on which the goals, status, telephone and email addresses were mentioned. Three of the fifteen living lab initiatives were excluded from the study as there were strong indications that initiatives were not operational anymore. The remaining twelve living labs were contacted through phone or email with the aim of gaining more insights about the background and the operability of these living labs. Of these twelve contacted living labs, ten living labs responded, eventually leading to eight interviews with coordinators or project leaders of the living labs. In all cases, the interviewees at the living labs held the position of innovation manager, project leader healthcare technology, or founder was employed by a healthcare organization, university, knowledge institute or municipality. For the sake of convenience, the term "living lab coordinator" will be used in this thesis to refer to the individuals interviewed at the living labs.

With the help of living lab coordinators, a snowball sampling technique was used to identify entrepreneurs or other key individuals participating within the previously selected living lab initiatives. There were two inclusion criteria for entrepreneurs or key individuals at these firms to be included in the sample maintained. First, firm activities included the development and commercialization of smart home-care solutions as defined above. To this end, firms operate within the (health) care, IT software or hardware sector. Second, the firm participated in at least one living lab project. The scope and aim of this study required insights into the management of technological development and firm strategic behavior rather than operational processes. Therefore, contact was sought with founders, executives, or other top managers as those individuals are believed to have the most understanding of the strategic decisions and activities of their firms. Furthermore, individuals within the selected firms were contacted (if necessary, with the mediation of living lab coordinators) via LinkedIn, by phone, or by email. In order to assess whether the collaboration between the company and the living lab was interesting and recently enough for inclusion, an initial phone call with the entrepreneur was made before making an eventual appointment for the interview. Eventually, eight entrepreneurs were selected through snowballing by asking the living lab coordinators. Two additional entrepreneurs were found via the earlier mentioned web search on living labs. The websites of these living labs eventually led to the selection of two additional firms that matched the selection criteria. The entrepreneurs of these two firms were contacted through LinkedIn after which appointments were made for the additional interviews. Table 3 gives an overview of the entrepreneurs and their firms included in this study. The table gives a brief description of the company and the solutions it offers. Furthermore, the table shows the function or position of the interviewee and the affiliated living lab.

### 2.1.2 Interviews with living lab coordinators

The interviews with living lab coordinators were conducted on the basis of a pre-determined interview guide, which can be found in Appendix 1 The interviews commenced with the researcher

providing an introduction about himself and the study which interview concerned. In order to start the conversation introducing question were asked. The first interview topic mainly focused on the background of the initiatives. To this end questions were asked about the reason, purpose, and effects of the living labs. These questions about the reason, purpose and effects of the living labs where asked to be able to determine the type of living lab (i.e. to determine which of the two dimensions, co-creation or learning, predominates within the initiative). To this end, the first topic within these interviews were designed to be able to find and answer on the first research question. The second topic related to the collaboration or participation of entrepreneurs or firms within the initiatives. Here, a question was posed as to what the involvement entrepreneurs meant and what the returns of entrepreneurial involvement were for the living labs and vice versa. Subsequently, questions were asked on factors that what could motivate entrepreneurs to participate in living labs. This second topic was designed to gain insights into the nature of the collaboration between entrepreneurs and the living lab. Furthermore, this topic also served to gain an idea on the benefits that entrepreneurs can experience when they participate in a living lab. In addition to get an idea of the nature of the living labs and the involvement of entrepreneurs in these, the interviews with the living lab coordinators also played an important role in the snowball sampling strategy (i.e. the living lab coordinators served as important channels for contacting the entrepreneurs who participated in this study). To this end, the interviews were concluded with the question whether the interviewee could bring the researcher in contact with entrepreneurs participating in the living lab. Table 2 gives an overview of the living labs and their respective coordinators that were interviewed for this study. Within Table 7, a brief description about the initiative is given, together with the position of the interviewee within the initiative, the initiators and the status of the initiative. Furthermore, the table gives an abbreviation that is used in the results section of this thesis to refer to quotes of these living lab coordinators.

<i>Organization</i>	<i>Position interviewee</i>	<i>Initiators of living lab</i>	<i>Status at time of this study</i>	<i>abbreviation for reference</i>
<i>Medical Delta Living Lab Care Robotics</i>	Founder and Coordinator	The Hague University of Applied Sciences (Knowledge institute)	Operational	<b>C1</b>
<i>Technologie Zorg Academie Living Lab</i>	Coordinator	ROC van Twente (knowledge institute); Municipality of Enschede.		<b>C2</b>
<i>IZi Gezond langer thuis</i>	Manager technology in public domain The Hague municipality & coordinator living lab	Municipality The Hague	Operational	<b>C3</b>
<i>Verpleeghuis/appartement van de toekomst</i>	Consultant healthcare technology	Vitalis group (Healthcare organization)	Finished, but plans exist to restart	<b>C4</b>
<i>Care Innovation Centre West-Brabant</i>	Projectleader	TanteLouise (healthcare organisation), Groenhuysen (homecare organization), Bravis Hospital	Operational	<b>C5</b>

<i>Innovate Dementia Living Lab</i>	Coordinator	GGZ Eindhoven; Technical University Eindhoven, SlimmerLeven2020	Operational	<b>C6</b>
<i>Huis van Morgen</i>	Innovation Consultant	Initiative of municipalities of: Bergen op Zoom; Roosendaal; Steenbergen; Woensdrecht	Operational	<b>C7</b>
<i>Zorg in Oktober Living Lab</i>	Innovation Manager	Zorg in Oktober (healthcare organisation)	Operational	<b>CE1*</b>

Table 7: Overview of interviewed living lab coordinators

### 2.1.3 Interviews with entrepreneurs

The interviews with entrepreneurs were also structured following a pre-defined interview guide. This interview guide can be found in appendix 2. The interviews commenced with the interviewer providing an introduction about himself and the study which the interview concerned. The first set of interview questions functioned to further introduce the interview and asked about the entrepreneur him or herself, his or her firm, and a global description about the affiliated living lab project or collaboration. The second set of questions were aimed at gaining a better understanding about the collaboration of the entrepreneur within the living lab project and the motives of the entrepreneur to participate within the initiative. Furthermore, the questions of this second topic, were aimed at creating a better understanding about the entrepreneurs' perceived benefits of participation in these initiatives. This topic was designed with the purpose to collect data that could lead to an answer on the second research question. During this topic, the benefits of participation in living labs that were identified in the literature before, acted as a frame of reference to be able to steer the conversation if needed. To this end, this reference frame enabled the researcher to probe or steer the conversation if needed. For example, probing questions like: "Could you tell something more about user involvement during the pilot studies of your product in the living lab?" were asked to invite the interviewee to tell more about this topic. The third interview topic was targeted at future trends and technologies for home care and elderly care. With this set of questions, the interviewee was asked about his vision on the future of home care and elderly care, the position of the entrepreneurs' technology in these, barriers for acceptance and adoption of technology within these, and the role of living labs in lowering these barriers. The questions in the third interview topic were designed to identify the vision of the entrepreneur about the future position of his or her technology within the age friendly housing domain and how living labs might support the process in reaching this position. To this end, the information gathered through the questions in the third topic contributed to finding an answer on the third research question. In case the interviewer noticed during the interview that the answers of the interviewee deviated too much from the intended questions, he made an effort to direct the conversation back to the focus of the interview through probing and prompting questions. After the initial interviews, the interview guide was adapted as it seemed that some questions in the original interview guide were experienced as too difficult or confusing. Table 8 gives an overview of the entrepreneurs and their firms included in this study. The table shows the function or position of the interviewee and the affiliated living lab. Furthermore, the table shows the actual status of the participation and gives an



abbreviation that is used in the results section of this thesis to refer to quotes of these entrepreneur.

<i>Organization</i>	<i>Position interviewee</i>	<i>Involved with project/initiative</i>	<i>Status</i>	<i>abbreviation for reference</i>
<i>Kepler Vision Technologies</i>	Innovation Manager	Active participation in Zorg in Oktober living lab	Active participation	CE1*
<i>YourMeds</i>	Director European partnerships	Active participation in CIC living lab West Brabant	Active participation	E1
<i>SmartFloor</i>	CEO and founder	Active participation in Empathische Woning living lab	Active participation	E2
<i>InCompanyMedia</i>	Managing Director	Active participation in Zorg in Oktober living lab	Active participation	E3
<i>MemoryLane</i>	Managing partner	Participated in Huis van Morgen	Participation ended; intentions for future cooperation	E4
<i>Anne4Care</i>	International project manager	Health and Wellbeing living lab Saxion; IHomeLab Luzern (Switzerland);	Active participation;	E5
<i>Admiror (care)</i>	Business Developer Healthcare; Self-employed	Technologie Zorg Academie Living lab; Living lab Roermond	Active participation;	E6
<i>Digitale Stamtafel</i>	CEO and founder	Zorg(t)huis Noorderpoort	Active participation	E7
<i>Tinybots (Tessa zorgrobot)</i>	COO & partner	Living lab Amersfoort; Living lab Roermond; Technologie Zorg Academie Arnhem; Zorg Innovatie Huis Baarn	Participation ended	E8
<i>Qvita/Wuzzi</i>	Founder	IZI living lab	Participation ended	E10

Table 8: Overview of interviewed entrepreneurs

This study was conducted during times of the global COVID-19 pandemic. As a result, all interviews, with the exception of one (which was conducted face-to-face), were conducted online using Microsoft Teams video conferencing or through telephone. The interviews lasted between 25 and 75 minutes, with an average length of 45 minutes. Sixteen interviews were recorded using an audio recording device or via the Microsoft Teams recording functionality. The remaining two interviewees did not give permission to record the interview. For these particular interviews, extensive notes were made to be used for further analysis. All interview recordings were transcribed for analysis within three days after the interviews had taken place.

## 2.2 Data analysis

As the aim of this study is to gain deeper insights into path creation processes rather than testing the existing body of literature, inductive data analysis was performed. The data of this study consisted of a large body with approximately over 180 pages of textual documents. By conducting thematic analysis, it was possible to extract viable new insights from these tis large textual documents. All interviews were analyzed through several phases of thematic analysis (approach adopted from Braun & Clarke (2012) with the help of computer software (NVIVO).

During all these data analysis phases, the concepts from the theories identified earlier were used as guidelines for finding answers to the formulated research questions. Tables 1, 2, 3, and 4, give an indication about how these concepts are operationalized into points of analysis that formed a the guideline for the collection and analysis of data.

During the first phase, the entire collection of data was coded by highlighting and labeling relevant and interesting phrases and textual segments (E.g. Were living lab coordinators talk about the goals and functions of their living labs, or where the entrepreneurs speak of the motivations and benefits of participation in living labs). The coding phase of the data analysis initially resulted in 50 different codes. During the second phase, patterns (recurring and relating codes) in the 50 found codes became observable. These patterns enabled the researcher to distinguish overarching and broader themes in the collected data. For example: the theme “access to, and probing of markets” was given to codes that refer to phrases or textual segments where possibilities for entrepreneurs to access and probe markets through living lab initiatives were expressed. Codes that did not fit within these themes could either be dropped or could, on closer inspection, be placed under previously found themes. In the third coding phase, the found themes were compared for differences and similarities. Where possible or needed, themes were merged or split up into overarching themes and underlying subthemes. For example: the themes “access to, and probing of markets” and “access to resources” were merged into the overarching theme “benefits of entrepreneurs participating in living labs”. In appendix 1, an overview of the eventual coding structure with themes and textual examples is given. Data analysis was done simultaneously with the majority of the data collection in order to make iterative adjustments to the subsequent interviews. After the analysis of the first initial interviews with living lab coordinators and entrepreneurs, it was possible to assess whether and which themes and subthemes needed further investigation in the remaining interviews. Through this it was possible to focus on those themes that needed more attention. After every interview was analyzed, and after every found code was divided into themes and subthemes, all themes were then compared on similarities and differences to identify pattern and relationships that eventually formed the foundation to answer the first and second research questions. To summarize and present the research findings, noteworthy quotations from the interview transcripts were used to indicate the most important findings. The next chapter will discuss the research findings.

## 4. Findings

This chapter presents the results that were found in this study. The chapter builds on the interviews conducted with living lab coordinators and entrepreneurs and starts with explaining the goals and functions of the living labs studied. The remainder of this chapter is structured following the order of the previously formulated research questions. The second section aims to describe the perceived benefits of entrepreneurs when participating in living lab projects.

### 4.1. Different types of Living Labs

The interviews with living lab coordinators show that there are differences and similarities between the living labs themselves in terms of their goals and functionality. Within this chapter, the main differences in goals and functions of these living labs are described. See Table for an overview of the interviewed living lab coordinators.

#### 4.1.1. Co-creation

The main goal all living labs have in common is that they facilitate co-creation between the developers and the users of technology. All coordinators indicate that one of the main goals of their living lab is to involve users in the development and validation of new technology to gain insight into user needs. Involving multiple actors within the design and valuation processes of new technologies is a recurring theme within the interviews with the coordinators.

Two frequent recurring concepts that indicate the importance of the involvement of multiple actors within the living labs are user-centered design and cocreation. Within the context of these two concepts, coordinators frequently mention the involvement of startups, SMEs, users (referring to seniors or clients), informal caregivers, formal caregivers, care organizations, and students. The most important reason to include these types of actors is that there is often a mismatch between the needs of users (seniors, clients, and informal and formal caregivers) and the development of new technologies. One coordinator gave an example of this form of misalignment:

*“The device was so advanced and state-of-the-art that many functionalities were not required at all for the primarily intended users. This made the device large, and in some cases a bit clumsy. And certainly way too expensive, because the device was offered at a price that actually did not outweigh the support that the device offered” – C3.*

The mismatch between the demands of users and the development of new technologies by entrepreneurs is presumably the result of a misalignment between the visions of technology developers and the actual practices, settings, behavior and lives of seniors and caregivers. One coordinator made the following statement about differences between the types of users and the types of technology developers:

*"You can see that a lot of technologies are made but eventually not used at all. Or that products do not match with practice. So, there is our main challenge: How do you ensure that technologies really match the needs that exist in practice. There is often a gap between user needs and the technologies developed. You often see that technology is developed by completely different types of people with completely different ideas than the types of end-users and care workers and their ideas"- C4 .*

To bridge the gap between user demand and the actual features of technology designs, several coordinators mentioned the concept of demand- or needs- driven development. According to coordinator C1, the spearhead of a living lab should therefore be the facilitation of "demand or needs-driven development":

*"Direct involvement of the user in design processes, ensures efficient development. And that is the promise we make within our living lab, to prevent that products are developed that do not fully meet the needs of either the client or the care professional. We also work a lot within extramural situations, so we are also talking about informal caregivers or family "- C1.*

In addition to these observations, the majority of the living labs were found to fulfill a function within the development of technology by organizing sessions for demand articulation and needs assessment though for example user panel discussions and focus groups.

The degree of user involvement within the development and validation of new technologies also appears to differ per living lab. On the one hand, it seems that there are living labs where the degree of cocreation is high and users are actively involved within all phases of product design. On the other hand, it appears that there are living labs where user involvement is limited to asking for user opinions. One coordinator stated that user involvement and technology creation and validation is of the utmost importance within his initiative:

*"The starting point is really to give that nurse and client a voice in the development process. Whether it is making something new, or adapting something existing and understanding what it does in practice. How you involve people in an innovation process is actually of the utmost importance here" - C1.*

When looking at another living lab, user involvement and the development and validation of technology seem to play a less important role. This initiative seems more like a demonstration space where users act as a sounding board for the developers of technology:

*"For the entrepreneurs, we are a display cabinet where they can show their products to many professionals, students, and citizens. These users are asked about their opinion about the products and how they like it "- C2.*

The function of this initiative seems to be more of a place for demonstration than that of a development site for technologies for healthy aging. The following section will dive deeper into the function of living labs as a place for demonstration and learning.

In sum, the main goal and function of the living labs that were included in this study, seem to be to involve multiple actors or stakeholders within the design phases of new technologies. Observed was that living labs aim to involve users and other actors to co-create and to prevent a mismatch between user demand and development or design of technology. Living labs do this by means of demand articulation and needs assessments through user panels and focus group sessions.

#### 4.1.2. Learning and demonstrating

Gaining and spreading knowledge and experience with technology by municipalities, healthcare organizations and educational institutions is a second identified goal of the living labs that I have studied. The interviews with living lab coordinators show that learning within living labs plays an important role. This way, the living lab is not only a place for work and learning for researchers and developers, but also offers a learning environment for all parties involved in the innovation process. Learning processes take place around several key issues such as: How do we use technology within the home environments of seniors and? And how do we implement these technologies in existing (care)processes?

The question of how to implement technologies within real life, in an extramural setting, is seen as an important issue among healthcare organizations and municipalities. Ideas on how to get from prototype development towards a working product within daily practice are important for the acceptance and adoption of technology.

*“The reason for this [the launch of a living lab] was that the municipality wanted to experiment with living at home longer in practice. They wanted to explore what the possibilities of these technologies were, which technologies were available, what their effects would be, and to what extent they could actually be rolled out and used by people. This living lab is much more about implementation and about how you can implement a technology that is ready for use in practice, how can you ensure that it is actually used and continues to be used?” – C3.*

In addition to learning and acquiring knowledge about using technology within practice, some living labs seem to have a role in inspiring and informing users about existing technologies. By hand of this functionality, care organizations and municipalities attempt to introduce seniors, informal and formal caregivers to technologies for healthy aging. In this way, people can experience and get used to technologies such as these. In addition, living labs seem to create public understanding of technology and improve the attitude of others towards technology. The role for inspiring and informing users about the capabilities of existing technologies is expressed in the following quote:

*“It is partly intended as inspiration for clients, informal caregivers and care providers. And offers a peek into the future. The purpose of this is to inspire and inform this group of people about the possibilities of existing technology within elderly and home care” – C4.*

Inspiring and informing users was a frequently recurring theme within the interviews. Living labs seem to offer a space where users, students and caregivers can learn about, from and with technology. Within these spaces, users, students and caregivers are stimulated to think about the possibilities of the technologies in supporting their daily tasks.

*“Within the lab, we receive products on loan from companies and startups with which we can test and experiment. Sometimes a researcher walks along who asks for feedback and input. But what we are actually trying to do within this lab is that we share knowledge about the possibilities of these technologies and give demonstrations about these technologies. And in this way we want to inform care providers and broaden their knowledge” – C7.*

Inspiring and informing users about technologies within living labs may also play a role in the acceptance and adoption of technology. Following, living labs might play a role in solving organizational issues regarding the acceptance of technologies within healthcare environments. This becomes clear from the statement of coordinator C2, who acknowledged that acceptance of technology is crucial for effective implementation of innovations:

*“I think there is a very important success factor that has very little to do with technological design. That is the acceptance of technology by our employees and that is an organizational issue that we will have to solve ourselves. So, besides the development of new technologies, we try to create awareness, acceptance and adoption of technology among healthcare professionals, students, and citizens through education about innovations and a trial service to test products” – C2.*

In sum, this study found that living labs have a second important function in gaining and spreading knowledge and experience with healthy ageing technologies. By enabling seniors, students, informal and formal caregivers to experience and test innovations, care organizations attempt to make stakeholders become aware of the possibilities and opportunities of technologies for healthy aging. Living Labs might also play a role in the creation of awareness, acceptance, and adoption of technologies. This additional role of living labs is experienced by the entrepreneurs interviewed within this study as well and will be further explained in chapter 4.2 of this thesis.

By taking this last and the former mentioned functionalities into consideration, living labs can be perceived as places for co-creation and social technological innovation. There appear to be several different functions and goals between the living labs that were included within this study. Characterizing for these living labs is that they offer space for multiple stakeholders to test, validate, co-create and learn with and from technological solutions for healthy aging. In the next paragraph, further attention will be paid with regards to the participation of entrepreneurs as important actors within living lab initiatives.

## 4.2. Entrepreneurs participating in living labs

Within this section, the results of the interviews with entrepreneurs are presented. This paragraph focuses on the experiences of entrepreneurs when participating in living lab projects. All entrepreneurs recognize more or less the same societal problem: There is insufficient or no capacity for the intramural housing of Dutch senior citizens. The capacity that remains is only accessible for patients with an acute demand for healthcare services and support. As a result, senior citizens have to live independent in their own home environments for a longer time.

Insufficient capacity within homecare services brings all sorts of problems. Problems such as loneliness and dementia in particular are frequently mentioned by the entrepreneurs. What all entrepreneurs have in common is that they work on solutions either aimed to improve the wellbeing of senior citizens or with the goal to relieve caregivers from high work pressure. All entrepreneurs agree that technology will play a crucial role within the future of senior citizens' lives and home care practices. On the one hand, technologies like care domotica will enable senior citizens to continue to live independently in their own environments for as long as possible. On the other hand, smart patient monitoring systems can help in relieving the burden and workload on healthcare providers. Innovations that are developed by the entrepreneurs are aimed at reducing loneliness and other social cognitive problems or at maintaining independence and self-sustainability. All interviewed entrepreneurs actively participate in a Living Lab pilot project or have done this recently. Table 8 gives an overview of interviewed entrepreneurs or firm representatives and their affiliated living lab participations. In addition, Table 9 gives a more detailed description about the firms and technologies the entrepreneurs work on.

<i>Name of firm</i>	<i>Description of firm and technology</i>
<i>Qvita</i>	Qvita develops mobile personal alarm systems for seniors. It offers a small device that enables seniors to safely enjoy their freedom. The mobile device can be worn and activated when the senior needs help in case of emergency. It offers communication functionalities that establish a connection with relatives or an emergency center. Qvita participated in the past within the Izl living lab to evaluate and test functionalities with users and care providers. It also participated intending to increase visibility and brand awareness through demonstrating the possibilities of the solutions in the living labs to users and caregivers.
<i>Tinybots</i>	Tinybots develops the Tessa Zorgrobot. A small social robot aimed at supporting people suffering from dementia and other cognitive disorders. Tessa can help people with problems like forgetfulness, malnutrition, restlessness, apathy. With Tessa, seniors can continue to live independently in their environments.
<i>Digitale Stamtafel</i>	Digitale Stamtafel develops a social (care)network platform primarily for seniors to get them into contact with friends and family through a safe and easy environment. reduce loneliness. It also offers reliable information regarding healthy aging, aging at home, and informal care. The platform also supports communication services through video calling.
<i>Admirror care</i>	Admirror is a company that produces smart mirrors for advertisement in the retail, restaurant, and hospitality business. It integrates a digital tablet within an ordinary mirror for flexible advertisement display. Recently, Admirror started a spinoff firm, Admirror care with the idea of developing and commercializing a smart mirror solution for seniors in both care facilities as for seniors at home to remind and support those seniors with services for the support of daily tasks, medication adherence, agenda functionalities, and revalidation programs. Admirror care participates in several living labs in the east of the Netherlands to probe user demand and do initial tests with users.

<i>Anne4Care</i>	Anne4Care is a Developer of a virtual assistant, or avatar with a speech function designed to help people affected by loneliness to stay in touch with friends, relatives, and caregivers. Furthermore, the application features a video calling platform, a medication adherence service, and an agenda functionality to support the provision of daily structure using audiovisual instructions for seniors with dementia.
<i>MemoryLane</i>	Memorylane develops a tablet for seniors that offers care services, like medication alarms and an alarm system in case of emergency. It also offers features like video calling and communication with care providers. The product connects formal and informal caregivers with seniors. Also, it helps to target loneliness problems and increases experienced care quality, and reduces the workload for caregivers. The system helps to monitor seniors, supports in their daily tasks and offers connection to an emergency response center. Memorylane participated in het Huis van Morgen living lab to involve users and caregivers to improve the product and further develop its features.
<i>InCompanyMedia</i>	InCompanyMedia is a business to business TV provider and also specializes in internet streaming video services. In addition to the usual regional, national, and international TV channel offerings, it also develops care support services such as drug reminders, meal ordering services, support services for dementia patients, and rehabilitation programs. InCompanyMedia participates in the Care In October living lab intending to further develop and commercialize its care support services for both inpatient patients and seniors living independently at home.
<i>SmartFloor</i>	Smartfloor produces thin sensor film that can be placed under the floor surfaces of all kinds of healthcare organizations. In combination with a portable sensor, this sensor floor can generate accurate data with which, among other things, fall movements can be predicted and detected. The system also offers the possibility to monitor lifestyle. The SmartFloor systems can be used to monitor the lifestyle and activity of seniors in an intramural setting. SmartFloor is working on a pilot within the empathetic home living lab to test the possibilities for deployment within an extramural setting.
<i>YourMeds</i>	YourMeds develops smart blister packaging for medication. In combination with a smart digital device, this product can help seniors living at home, in sheltered housing, or in intramural settings with the prescription and intake of medication. The product makes it easy to understand what medications are to be taken, and when they need to be taken. YourMeds is a British firm which develops its products since 2013 for the British market. By participating in the CIC West Brabant living labs, it wants to explore the potential a product for the Dutch market.
<i>Kepler Vision Technologies</i>	Kepler Vision develops artificial intelligence applications that can look after the wellbeing of seniors in intramural and extramural care settings. Cameras allow the system to detect when a senior falls or when he is not moving for a longer period. This lifestyle monitor software reduces the workload for caregivers as they do not need to walk into the senior's room unnecessarily to check.

*Table 9: Detailed description of firms and affiliated technologies*

#### 4.2.1. Access to knowledge and competences

The most frequently mentioned benefit of participation within a living lab project was that participating within a living lab project provides the entrepreneur access to knowledge and competencies that the companies themselves did not have access to. All interviewed entrepreneurs indicated that access to complementary knowledge and skills and the exchange of information were important reasons to participate in one or more living lab pilots.



One company was relatively new within the (home)care industry. With a background in the media and advertising industry, this company participated in two living lab pilots to explore a potential product portfolio expanding within the healthcare setting. The entrepreneur coming from this company, which develops smart mirrors for advertising within restaurants and cafés, mentioned the following:

*"And actually that [participating in living lab projects] is the only possibility for us to enter the healthcare market. Because it is difficult for us to empathize with the healthcare practice. You can come a long way with logical reasoning, but the healthcare practice is something that doesn't flow in our firms' veins. We are a media company, we only have advertising and media knowledge and expertise" – E7.*

This indicates that living lab initiatives are beneficial for entrepreneurs to acquire new know-how on practices within the healthcare sector. This observation is further illustrated within the following quote from the same entrepreneur:

*"Advertisement sales is just skill number one here. Skill number two is building robust mirrors that will last above the urinals in pubs, so to speak. And now, as we are going digital, a lot of new possibilities open up that are not directly within our set of skills" – E7.*

Another entrepreneur indicated that one of the reasons to participate in a Living Lab project is to make use of the interdisciplinary nature of the living lab projects. He indicated that he wants to benefit from the knowledge and skills of other participants and thought that participating in a living lab project could inspire him or his company for new business ideas. This point of view is expressed in the following quote:

*"Well, two parties know more than one. We want to connect, or stack - however you may call it - several disciplines together. So, make use of each other strengths and help and inspire each other" – E5.*

A third entrepreneur stated that participating in living lab projects might lead to interesting insights from the visions of different entrepreneurs:

*"Another interesting thing is that you are constantly confronted with several fellow entrepreneurs who in turn have all kinds of other products and visions on solutions. Sometimes this leads to all kinds of collaborations" E3.*

This entrepreneur viewed the living lab project as a space where several actors were brought together to search for solutions to existing problems together. This is further illustrated within the following quote where the same entrepreneur indicated that participating in a living lab project enabled his business to cooperate with a party with specific competencies in IT network structures to roll out a jointly designed product:

*“This also meant that other parties were added that we could eventually use to further roll out the product. So, parties who, for example, could install a fiber-optic network because everything went via fiber, just to name a few” – E3.*

In sum, living labs are expected to gain access to complementary knowledge and competences that entrepreneurs need for the development, the adoption and the commercialization of their innovations. Entrepreneurs participate in living lab projects to gain access to knowledge about market specific practices and routines, and knowledge about specific technologies. Furthermore, entrepreneurs seem to participate in living lab projects to complement their existing knowledge and competence base with new skills and competencies that are not available within the focal firm itself. In addition, the interviews have shown that entrepreneurs seek for interdisciplinary knowledge and competences within these living lab projects. Three of the interviewed entrepreneurs seem to participate with the idea to come to new valuable business propositions through cross-fertilization of between two or more different disciplines, technologies and markets. As such, it seems cooperating within a living lab project provides the entrepreneur with new and interesting insights, which may in turn lead to new collaborations or business cases.

### 4.2.2. User involvement

The second observed benefit of participation within living lab for entrepreneurs is that these environments offer the entrepreneur a platform to involve users within the development and commercialization of their innovations. Through user involvement, entrepreneurs can collect useful feedback from users about the usability of their products. In addition, these initiatives enable entrepreneurs to evaluate the receipt and the attitude of the end users towards the entrepreneurs and help develop ideas on socio technological configurations. All the interviewed entrepreneurs indicated that involving users within innovation processes was an important benefit of participation within a living lab. The idea that entrepreneurs participate to collect user feedback within living labs becomes evident through the following quotes:

*“We participate in the assumption that we can receive feedback from those living labs and the healthcare professionals and students working there, on what they see. We want to know what they think that could be better. That kind of feedback is very important to us” - E7.*

And:

*“Yes, because that [collecting feedback from users and healthcare providers on solutions] is of course the hardest thing for start-ups. Of course, we cannot just ring the doorbell and investigate user experiences right away. Via this way we can gain entrance to care institutions and their clients and test their innovations in practice” – CE1.*

A different entrepreneur acknowledges the usefulness of living labs in the collection of user feedback on the usability of innovations. This entrepreneur, however, is also skeptical about the usefulness of living labs for the scaling up of innovations towards a larger mass:

*You can ask your target audience whether the product works, and then you might receive feedback to improve the product. If that is what you are looking for, then a living lab is a very good option. There are a lot of studies with students and end-users which can provide you with a full list of possible product improvements ... In the beginning that [collecting user feedback] is very important. Later on, this remains important, but then you especially must look for large scale evaluations or proof points that your product works in terms of efficiency and effectiveness. What we then want to hear is that clients do become more self-reliant and that it saves time and money” – E9*

Living labs offer the entrepreneurs the possibility to test and experiment with the ideas they have about socio-technological configurations. By conducting tests and experiments within these environments, entrepreneurs can validate new technology applications in real life environments with the involvement of end-users. Through this, entrepreneurs can develop and test practical features of new technologies with the involvement of users within the design and evaluation processes of innovations. This is observed within the following expressions:

*“In these projects we sit down with seniors and caregivers to gain insights into user needs and to create a thorough understanding of care processes. We show them our products and the possibilities of it and say we can do it like this and like that. In this way we ensure that it is not the technology that is leading, but that the care process and user inputs are leading in our designs. We explain that we want to start a conversation with them based on their needs” - CE1.*

And:

*“What we validate here focuses on three levels. Does the product work. What are the clients wishes? And what does it do for their quality of life?” - E4.*

And

*“It always offers insights into how we can improve the product. Because there is always new feedback. Feedback that you think about, ‘hey, we didn’t look at it that way’. And that can be a simple adjustment, but it can also be an entirely new functionality” – E8.*

All interviewed entrepreneurs indicate that they participate within living lab projects to involve users within the need assessment and product design stages of their innovation development processes. For nine entrepreneurs, this is mainly done with the argument of gaining a better understanding of user’s needs. Five entrepreneurs argue that they involve users in the process in order to gain insights into the perceptions of users on their products and services. For these entrepreneurs, user feedback for product and service improvement seems to be an important benefit.

### 4.2.3. Accessing and probing markets

Next to gaining access to new knowledge and competences and the involvement of users in assessment and development processes, entrepreneurs expressed a third benefit of participating in living labs. Five out of ten entrepreneurs indicated that they collaborate within living lab projects with the idea of gaining access to markets that were not within reach without participating in these living labs. Entrepreneur E7 mentioned that his firm decided to join living lab projects with the idea of using the living lab as its initial market entry. He stated the following:

*“Actually, these living labs are our first” markets”. We can place our products here, and through this we can reach our initial customers so that they can give their feedback based on their experiences within the market. They can give us input about what could be smarter, and what could be better. Or that we might need to integrate our product with another product so that we can turn it into something really valuable. Sometimes things are very flat. If we want to sell mirrors, there are only a few customers who want to use them at this stage and these might be reached through these living labs or their networks”.*

With this statement, it seems that living labs are seen as opportunities to enter new markets or market segment that previously has not been targeted by the company before. The idea of reaching markets that were previously out of reach through participating in living labs is also supported by the following expression of entrepreneur E5:

*“By participating within these projects, we connect with parties who otherwise would not have been within our reach. And that is the idea of it: Making connections with parties with whom you can reach target groups or customers that you otherwise cannot reach”.*

The same entrepreneur also mentioned that the network around the living lab is an important access point towards new (international) sales markets:

*“The network is also very important for your sales. So, for example, we are currently setting up a branch in Switzerland. That would not have been possible without this project. Through these projects we have gained all those contacts and it is therefore possible for us to open a door to a market that is new to us”.*

A third entrepreneur stated that he perceives living labs as a possibility to develop new applications to address new market segments. This was expressed in the following way:

*“I see it mainly as an opportunity to develop a new application. And often a new application means that you can claim a new market segment. So to give you an idea: At the moment, we are mainly working in care- and nursing homes. That's a huge market. But if I want to make a business proposition to a physiotherapist or to an extramural setting, for example, I have to give my product a whole new look and offer a whole new application. I can then experiment within a living lab project to see how the market reacts to it” – E2.*

Furthermore, it seems that living lab environments are a place where entrepreneurs can search for, and learn about optimal configurations of business models. Therefore, it appears that living labs offer possibilities for entrepreneurs to learn about and probe markets that are new for the entrepreneur of firm. For example, two entrepreneurs indicate that living labs offer a good opportunity to test and find out whether specific configurations of a certain technology and a certain revenue model are suitable within specific market segments. This becomes clear from the following quote:

*“I see it mainly as an opportunity to develop a new application. And often a new application means that you can claim a new market segment. So, to give you an idea, at the moment we are mainly working in care and nursing homes. Well that's already a huge market. But if, for example, I want to make a proposition to a physiotherapist or to an [living lab X], I have to give my product a whole new look and offer a whole new application with an underlying revenue model. You are stimulated from all sides, both by science and other entrepreneurs, to take a critical look at whether there is a potential market for me there or not” – E2.*

Living lab environments further offer the entrepreneur possibilities to explore new business models and the fit of new technologies within market practice. For example, one entrepreneur stated that participation offered him a possibility to test the users “willingness-to-pay” to gain insights about product pricing and business model fit. This is expressed in the following quote:

*“What we also do is that we test the willingness-to-pay. So, we ask our potential customers that, if we bring this product to market, what are you prepared to pay for it? Although we mainly do R&D in these projects, we also can validate the commercial aspects of our business ideas. Maybe this is a shift that we [the company] are undergoing as we want these products to enter the market more and more now”- E5.*

Access to, probing of, and learning about markets is a third found advantage of living labs for entrepreneurs. Potential access to a new group of customers in an extramural (home) setting was seen as an important advantage perceived by the entrepreneurs. Especially the presence of local (home)care providers as partners within living lab projects where perceived as important entrances to large groups of seniors with a potential need for the products and services the entrepreneur offers. One of the entrepreneurs even mentioned these living labs as a strategy for his initial entry within the healthcare market.

#### 4.2.4. Collection of proof for feasibility, viability and effectiveness of solutions

The fourth identified advantage of participating within living labs for entrepreneurs is that these initiatives enable the entrepreneur to collect evidence or proof for the viability, feasibility and effectiveness of his or her innovations and business ideas. One entrepreneur indicated that participating in living labs has helped the entrepreneur to collect valuable information about the acceptability of his product:

*“By participating in living labs, you will receive your first proof of concept. You then know that you are on the right track. It is about that signal. Does our product work? May it continue to exist? Does the user accept it? Those are very fundamental questions that are answered there. This is quite exciting because in our case we are going to place a robot with the elderly. Will it be thrown out of the window, or can it stay? Well, guess what: It can stay” – E9.*

The idea of the advantage of living labs in the collecting of proof for viability is further supported by entrepreneur E3, who states that the living lab project also offered him insights into whether or not his prototype was worth further development:

*“Participating in living labs also enables us to test whether your perceived value propositions are successful or not. You can learn for a specific application about what features are necessary to adapt your technology to. Then you can consider whether it is worth it or not and whether that’s interesting or not” – E3.*

In addition to proof for the viability and feasibility of technologies, it seems that living labs also gain entrepreneurs some sort of credibility for their technologies by offering proof that technologies have the expected effect and impact on practices. By carrying out successful evaluation studies, a living lab or its affiliated research partners might offer evidence that the technologies do actually work and have positive effects on, for example, the lives of seniors or work load for care givers. Support for this was also found within the case of E3, who found positive evidence for its technology through the living lab research. The entrepreneur further mentioned that this evidence in turn might help him convince healthcare providers and other potential customers of the potential of his solutions:

*“The great advantage of participating in these types of initiatives is that a scientific basis is often found for it [the new technology] in the beginning. So, disrespectfully said, this means that you have less trouble to be able to sell such a product. We participate because we simply receive proof. That [the product] just sells itself more easily. Look if I can demonstrably say to a healthcare institution that if you pay me thirty thousand euros per year in licenses for those sensors and I save you five hundred thousand euros by demonstrably, well that's a pretty good proposition. So yes, to personnel costs and related costs in healthcare. And that has all been shown by studies, so the great thing about it is that I don't have to say. Then I can just give them those papers” – E3.*

That living labs might offer scientific proof that helps convincing other parties of the effectiveness and impact of new technological solutions is further supported by the remarks made by entrepreneur E8, which indicate key numbers and figures that prove efficiency and effectivity of innovations towards health care insurers are needed:

*“Unfortunately, there is another reason why you really have to do it. And that is that health insurers cut everything short with money. We simply have to demonstrate to health insurers and also to policymakers in this country that what we do is scientifically substantiated with figures and numbers” – E8.*

The idea that testing and validating technologies through participation in living lab initiatives produces key numbers and figures about the effectiveness and efficiency of technologies is supported in the following quote of the same entrepreneur:

*And secondly, it always yields key figures for us. So, evidence, burden of proof. And that burden of proof, in turn, is important towards healthcare insurers or the municipality. That depends about who should pay for it these products or services. There are two funding methods in the Netherlands. One via the healthcare insurer and one via the municipality. And in both cases, we can use it [burden of proof]” – E8.*

Another entrepreneur supported these statements by expressing that credibility for an innovation might positively be influenced if it is recognized as useful and effective by a neutral and knowledgeable actor such as a university or other credible research institute:

*“The moment an independent expert organization is involved in the process and confirms that you are a reliable party, you have nice stuff and that offers significantly good results. If you can refer to that and it is also published somewhere. Then that is true. Instead of relying on word of mouth, you suddenly have hard evidence. If you have this, then you have already overcome five barriers, so to speak”- E10.*

In sum, the fourth frequently mentioned advantage of participation within living labs, is that through these research projects evidence can be gathered to prove the viability, feasibility and efficiency of innovations. It is remarkable that there seem to be two different underlying motives for the collection of evidence or proof for viability and feasibility. On the one hand, it seems that entrepreneurs working innovations that are in an early stage of development especially seek for a so-called proof of concept (POC) for their innovations. Some entrepreneurs indicated that finding such a POC was a motive to participate within living lab projects. On the other hand, it seems that entrepreneurs working on innovations that are in a further stage of development seek for evidence in particular in order to convince powerful actors such as health care insurers and healthcare decision makers of the effectiveness and efficiency of their innovations. Furthermore some of the interviewed entrepreneurs indicate that they participate with the motive of collecting evidence of effectivity and efficiency. In addition, it has to be noted that two of the entrepreneurs indicate that living lab projects might not be the right places to collect evidence for the effectivity and efficiency of innovations because of the small and local character of these initiatives. Within these last observations, it seems that the motives of participation depend on the phase in which the company or the product currently is situated. Entrepreneurs of firms that are in an early phase of development seem eager to participate in projects or initiatives that enable them to find a POC for their prototypes' right to exist. These projects or initiatives focus on feedback from users and test whether the prototypes work in practice and how the product is received by its end users. Entrepreneurs of these types of firms seem to benefit of small-scale initiatives to test innovations in practice in co-creation with end users. Companies that are further down the line with the development of their product may have other motives for participating in living labs. A motive to participate for entrepreneurs of these firms is market entry by, for example, gaining access to contracts with larger health care organizations. Entrepreneurs of these types of firms seem to benefit from projects or initiatives aimed at testing the effectivity and efficiency of innovations on a larger scale.

#### 4.2.5. Visibility and brand awareness

A second frequently mentioned benefit within this study is that participation in living lab projects offers the entrepreneur some sort of visibility in a way that it attracts the attention of healthcare organizations. One entrepreneur stated that through his participation within a living lab, he managed to reach the attention of other healthcare organizations that possibly were interested in adopting his technology:

*“We asked ourselves: What is the best way for us to help these people in the best and smartest way possible? This goes faster, better and more broadly by*



*offering our services through the large client bases of healthcare organizations than through one by one business to consumer sales. This living lab offers us some kind of platform to validate our solutions at a number of home care organizations. The results of those tests also arouse the interest of other care organizations of course” – E7.*

This statement resembles the experiences of entrepreneur FL, who also stated that it was the platform or network around the living lab that offered him additional access to the attention of twenty healthcare organizations:

*“By joining this project, we suddenly gained access to a platform to which twenty healthcare organizations are affiliated. That does offer us the opportunity to scale up within those twenty organizations. Than you suddenly become visible throughout Brabant. And a part of the central Netherlands and Zeeland. And then you can continue from there” – E2.*

The idea that living labs might play an important role in gaining visibility for an entrepreneur’s technology among certain markets is also supported by entrepreneurs E8 and CE1, who expressed the following:

*“What it does bring us is a certain interest from the market. We saw, for example, that during our pilot at the living lab we aroused the interest of other organizations. Those were then invited to the living lab where we gave demonstrations and courses. It could be that organizations say "ohh we want to try that at our place too" – E8.*

And:

*“And in this way, you can also create support by showing it to such a care worker who then wants to get [the system] started with a client. So, it often provides visibility to other healthcare institutions. That is actually the most important thing. Because if you can do business with a leader, others will also look at you” - CE1.*

One entrepreneur even seemed to indicate to perceive the living lab he was participating in as some sort of showroom to display his products to potential customers:

*“We can use such a project as a showcase anyway. And of course, we could also just profit from the commerce that played a role in that project”- E10.*

Entrepreneur E2 made it seem that living lab environments offer entrepreneurs a stage through which they are able to attract the attention of important stakeholders.

*“For small players or startups, the living lab has a huge value in connecting parties. We don't have such a big network yet. We cannot just call a healthcare organization to ask if we can pilot. And well that is of course a mega value of*

*the CIC living lab that they can give you a stage through which we can attract other healthcare organizations' attention" – E2.*

It seems that living labs offer the entrepreneurs stages through which they are able to display solutions, which offers the entrepreneur visibility and brand awareness with regards to potential customers and other important stakeholders.

Furthermore, increased visibility and awareness of technology might benefit the entrepreneur or firm as this might contribute to the acceptance and support of new technologies by seniors and caregivers. This is expressed by entrepreneur CE1:

*You can test extensively in such a living lab. We make agreements with the care providers and then we can try it in practice. That is often difficult, that you have to go straight to a practical situation, which immediately puts pressure on the care provider. Because, in addition to his much too busy schedule, he has to think again about how to get started with that new system. And in this way, you can also create support by showing it to such a care worker, letting him play with it and then he wants to get [the system] started with a client. That is actually the most important thing. Because if you can do business with a leader, others will also look at you. So, in this way we create a lot of support and we also try to allay the fear that you are working with smart sensors with cameras" – CE1.*

The provision of visibility of new technologies by living labs might also play a role in reducing a stakeholder's resistance to change. This is supported by the following statements of entrepreneurs E6 and E4:

*And if you can play with that that way, there's a chance that the staff would say, "well this is interesting" and: "ohh I get it, use a mirror for that, yes I get that now" – E6.*

And:

*The caregiver can really take the product away from the client. Because they say that is not good for my client. And that also has to do with a bit of fear of becoming redundant perhaps. Healthcare professionals often feel that they know best for the client. And if you tell them that, they get angry about it and say that it is not true. But yes, we experience it that way. Well and by participating in these kinds of living labs, we also want to partly show that our technology can really support and relieve those care providers. And usually you see that the attitude of those care providers towards our technology changes slightly"- E4.*

In sum, the interviews with entrepreneurs indicate that living labs also might play a role in the acceptance of new technology and in the creation of a support base for these technologies. Within the interviews, there are several arguments provided for this. The first argument found is that participation in living lab might lead to acceptance of technology because these initiatives

enable the intended users of technology to experience these technologies before the actual adoption of these technologies takes place. Five entrepreneurs support this proposition by stating that living labs can fulfill a function in demonstrating solutions and by indicating that living labs might help in getting end users used to new technologies.

### 4.3. Scaling up beyond living labs

All entrepreneurs recognize that living labs can be of use in the early stages of product development and during the start-up phases of companies. However, what entrepreneurs representing companies who are already a bit further with their product development do say, is that there is a moment after which living labs are no longer relevant and lose their added value. It is expected that the character of living labs is too local and small-scale to actually lead to the upscaling of products. If an entrepreneur has the intention of scaling up and creating more support, he or she will have to look beyond living labs and take his or her efforts to a higher level. A coordinator indicated that scale-ups are often no longer interested in the services and facilities of the living lab. He said that:

*“As soon as companies move to a larger scale, it will be a lot more challenging to keep the cooperation with them going. It also depends a bit on what the goal and the idea of the collaboration is, but most companies that have experienced strong growth do not find us that interesting anymore. Especially because there are of course a large number of these types of houses and living labs. In this sense, these companies are mainly interested in truly structural, fundamental collaborations on a larger scale. And that is not what our living lab can provide”*  
– C3.

Entrepreneur E9 recognizes the added value of living labs in the development and validation of new products in co-creation with clients and healthcare workers. He sees that these living labs are mainly engaged in small-scale innovations that focus on a specific target group and sees that products and companies that are in the initial phase benefit greatly from living labs. However, this entrepreneur does not see the added value of living labs when entrepreneurs have a working and tested product and want to scale up. He sees no immediate solution in living labs for the larger issues facing healthcare. Furthermore, he says the following:

*“A living lab, in my experience, is less effective once you have a product and you want to scale it up or really improve it. Products that benefit from a living lab are often very small specific niche products that are not necessarily a solution to the larger questions that healthcare has. The challenges that healthcare has are often about the upscaling of solutions and the development of it in larger complex systems. And those are completely different challenges that require completely different capabilities of the stakeholders. Because then we are talking about how do you do this process, how do you organize the education of your staff, how do you do adoption on a scale. And then it is not just about the two percent of your innovators who take everything innovations*

*because it is new. Because as soon as it is no longer new, their enthusiasm is gone” – E9.*

The interview with the same entrepreneur shows that there may be a tipping point in the innovation or development process of products, after which a living lab loses its added value regarding the entrepreneur or his firm. The entrepreneur specified that participation in a living lab for his product was probably not much more useful after the effectiveness and usability of his solution had been proven. This entrepreneur further indicated that the tipping point probably lies at the point the product has proven itself and is ready for large-scale adoption within the healthcare sector. This becomes evident from the following statement:

*“Those living labs generally don't do that [supporting the scale up of innovations]. And so that is the tipping point. You then have a working product. Until now, our product has been helped by the living lab. Because it appears that the product works. People listen to her. We know what features work and which don't. Whether the design is understood or not. That kind of feedback is very helpful. And then at some point you switch to scaling up, what do we need in terms of adoption. What should care providers do with it and how does it fit into the care process. All that kind of things. And it is in my experience that living labs are less focused on this” – E9.*

The assumption that living labs only offer limited value for companies and products that are already further in their development and are moving towards scaling up their company becomes also apparent from the interview with entrepreneur E3. He states that his product has also been developed and tested within living lab-like projects for a few years and that this product is now also ready for upscaling and adoption within the market. Just like entrepreneur E9 this entrepreneur says that his product and company have passed the phases where living labs are of most value. When companies want to scale up their products, there are other avenues to be followed. It is important to look beyond the local health care institutions and their affiliated living labs and specifically to find support from important players such as health insurers or national decision-makers within health care. This is evident from the following quote:

*“Once a technology has been proven in a living lab, where they have measured and evaluated extensively for years, then you should not start a pilot again in a living lab in Groningen or in South Limburg. No, then you should indeed embrace what you say and then you have to scale it up. Because otherwise you keep piloting and testing in living labs, and if something is terrible, it is all those loose pilots. You have to set up a pilot properly and you have a few years to do that. But if it is in the right place, then you should also embrace it as a promising technology. In that respect, that game is played on a completely different level and we have already recognized that level and we are in line, so that is not a reason for us to participate in a living lab. For example, you have to make sure that you are properly registered with CZ [health insurer] or an important decision-maker within the healthcare sector or government. And they must give*

*signals from dude, these are the promising innovations that we must all support in order to get them further” – E3.*

In sum, it appears that all entrepreneurs see the added value of living labs for the early stages of development and commercialization of innovations. However, a number of entrepreneurs indicate that Living Labs have less value for large-scale adoption of technologies and the upscaling of firms. It becomes clear that there is a tipping point with regards to the phases of development and commercialization of innovations, after which living labs lose their added value. It is therefore expected that start-ups will benefit most and scale-ups will benefit less from participation in living labs.

#### 4.4. Conclusion

Entrepreneurs participate in LLs for several reasons. Within this study, five themes have been identified through interviews with entrepreneurs. First, participation in living lab initiative might enable the entrepreneurs to access additional resources like knowledge and competencies entrepreneurs did not have access to in advance. All interviewed entrepreneurs indicated that access to complementary knowledge and skills and the exchange of information needed for the development, the adoption and the commercialization of their innovations were important benefits of participation in living lab initiatives.

Second, participation in living labs offers entrepreneurs the possibility to involve users within the design and evaluation of new technology and business models. Involving these users, who can both be seniors and care providers, enables companies to test and validate their innovations in practice. The interviewed entrepreneurs indicated that participating in living labs offered them a better understanding about the needs and everyday life of users. Through user involvement, the entrepreneurs were able to improve products by hand of practical user feedback on the usability of technology at an early stage of innovation development. In addition, participation also offered four entrepreneurs the ability to improve their business models, through testing willingness-to-pay and value proposition fit.

Third, living labs offer the entrepreneur to learn from, probe and access markets. Participation within living labs may provide the entrepreneur with valuable insights into the commercial potential of technologies. These insights offer the entrepreneurs an opportunity to find a suitable business model for their solutions. In addition, the entrepreneurs viewed the presence of local (home)care providers as partners within living lab initiatives as important entrances to large groups of seniors with a potential need for or interest in the products and services of the entrepreneurs.

Fourth, participation in living labs enable the entrepreneur to collection proof for the viability, feasibility and effectiveness of their technologies. On the one hand, it seems that in particular entrepreneurs working on innovations that are in an early stage of development seek for a so-called proof of concept (POC) for their innovations. On the other hand, it seems that entrepreneurs working on innovations that are in a further stage of development especially seek for evidence to convince powerful actors such as health care insurers and healthcare decision makers of the effectiveness and efficiency of their innovations. Furthermore, it seems that living labs gain

entrepreneurs some sort of credibility for their technologies by offering proof that they work and are wanted within practice. Three entrepreneur support this by stating that living labs projects help in finding key numbers and figures about the effectivity of technologies. In one case, the living lab even helped in finding scientific proof for the effectivity of the entrepreneur's technology.

Fifth, participation in living labs may increase visibility and awareness of the technologies and cause of the entrepreneur and his or her firm. The idea here is that living labs offer a stage where entrepreneurs can use the living lab facilities to reach intended users. In line with this idea, it also seems that the strong networks of which Living Labs are often part play a major role in gaining brand awareness for many innovations. For a number of entrepreneurs, these strong networks provide visibility to larger healthcare organizations that represent potential customers.

It becomes clear that all entrepreneurs see the added value of living labs for the early stages of development and commercialization of innovations. However, a number of entrepreneurs indicate that Living Labs have less value for large-scale adoption of technologies and the upscaling of firms. This indicates that there might be a tipping point with regards to the phases of development and commercialization of innovations, after which living labs lose their added value. It is therefore expected that start-ups will benefit most and scale-ups will benefit less from participation in living labs.

In general, there can be concluded that living labs contribute to involved end users at an early stage of innovation development. Involving these users, who can be seniors but also care providers, enables companies to test and validate their innovations in practice. In many cases, this provides the entrepreneur with insights into user needs and wishes regarding the design of their technologies. In addition, these test and validation projects provide insights into the commercial potential of technologies. These insights offer the entrepreneurs an opportunity to find a suitable business model for their offered solutions. In addition to user feedback on design and the provided opportunity to find a suitable business model, it seems that user involvement within living labs contributes to the acceptance and accelerated adoption of new technology by users as well. Entrepreneurs owe this in particular to the environments and opportunities that living labs offer for experimentation and discovery of technology by the intended users and their environments. The idea here is that living labs offer a stage where entrepreneurs can use the living lab facilities to reach intended users. In line with this idea, it also seems that the strong networks of which Living Labs are often part play a major role in gaining brand awareness for many innovations. For a number of entrepreneurs, these strong networks provide visibility to larger healthcare organizations that represent potential customers. Lastly, although all entrepreneurs acknowledge the added value of living labs for innovations and firms in their startup phases, a number of entrepreneurs indicate that Living Labs are of less value for large-scale adoption of technologies and when firms have the goal to scale-up. It seems that there is a tipping point in the phases of development and commercialization of innovations after which living labs lose their added value. It is therefore expected that mainly start-ups with innovations in early phases of development will benefit from participation in living labs and scale-ups will benefit less from participation in living labs.

## 5. Discussion

After presenting the benefits of LLs to entrepreneurs, this section will further discuss what the found results imply in the light of the earlier formulated theoretical background. This section aims to answer the third and fourth research questions by discussing how living labs support the entrepreneurs in mobilizing minds and in the creation of legitimacy for new technologies. The sections commence with a reflection on the concepts used in the data collection and analysis. Following, the empirically found benefits will be used as examples to formulate several propositions on how participation in different types of living labs support entrepreneurs in shaping and steering socio-technological pathways. The remainder of this discussion will be devoted to recommendations for further research, implications and the limitations of this study.

### 5.1. Mobilizing minds

Path creation literature and theories on institutional entrepreneurship globally describe the entrepreneurial cycle in terms of disembedding from existing institutions, translating opportunities for change into understandable ideas for others, and the mobilization of resources and allies behind these ideas. Central to these strands of literature are the challenges that entrepreneurs face when introducing change or new technologies. The path creation theory starts with describing the major challenge for an entrepreneur to disembed from existing ways of doing “things” as he might be imprisoned within an iron cage of history (Garud and Karnoe, 2001). Furthermore, the theory describes that deviations from existing institutions are met with apathy at best and resistance at worst (Garud and Karnoe, 2001). Within this study, it is assumed that entrepreneurs participate in living labs after they have disembedded from existing practices, and created an idea for institutional change or a new technology. It is widely acknowledged that entrepreneurs face resistance and indifference when disembedding from previous practices while pursuing new ideas and technologies (Aldrich & Fiol, 1994; Garud & Karnøe, 2001; Lawrence, 1968; Maurer, 1996). How entrepreneurs deal with this resistance and apathy will determine whether social change or new technologies will be successful. As mentioned earlier in the theoretical framework, entrepreneurs have to remain persistent with flexibility and need to act as boundary spanners in order to deal with potential resistance and apathy voiced by their contexts. They have to translate and transform their ideas in such ways that they are understandable by others.

So, how does this translate to the empirical findings in this study? The boundary spanning role of entrepreneurs and their persistence with flexibility can be recognized within the motives of entrepreneurs to participate in living labs. The interviewed entrepreneurs acknowledge that acceptance and support of new ideas and technologies within their contexts is generally low. Some entrepreneurs even argue that the resistance to change and new technology in the healthcare sector is higher than in other sectors. An important condition for path creation is flexibility in the entrepreneurial cycle: Entrepreneurs need to stay flexible in their ideas about solutions (flexibility of minds) in order to create legitimacy and find support for their ideas (Garud and Karnoe, 2001). Moreover, they have to be open to receiving feedback on their ideas from stakeholders and span boundaries.

Living labs enable the entrepreneurs to probe markets, to involve (end)users, and to access and mobilize resources such as knowledge and competencies. Especially the first two advantages seem important in the light of the entrepreneurial boundary spanners' role, as these advantages indicate that the entrepreneurs in this study are aware of the fact that their perceptions of business models and ideas for new technologies might not be perfect in the perception of other individuals within the context or market. Moreover, the advantages experienced by entrepreneurs of involving users in the design of new technology and the advantages experienced when probing markets indicate that the entrepreneurs in this study remain persistent with flexibility. In this particular case, this implies that entrepreneurs are prepared to transform and translate their ideas so that they do fit with the perception of other individuals such as seniors, formal and informal care providers.

The first observed advantage, that living labs enable entrepreneurs to involve users in the design of new technologies, can be seen as an attempt of the entrepreneur to translate and transform his or her idea in ways that are understandable by others. By collecting user feedback and gaining insights into user demands and lives, entrepreneurs can better understand how they must translate their idea into ways that are understandable by others. Moreover, by involving others within the design processes of innovations, entrepreneurs tend to transform their ideas through interaction with their context in order to overcome resistance and indifferences with the status quo. In this sense, living labs can be seen as environments that offer the entrepreneur opportunities to translate and present deviations (technological change) in ways that are understandable by others. This provides a link to the second observed advantage, namely that an entrepreneur's attempt to probe markets can be seen as attempts of the entrepreneur to gain understanding of how actors within the market might receive his or her product design or business model. To this end, the probing of markets within living lab environments offers the entrepreneur an opportunity to figure out how business ideas might be sold and how the business ideas must be presented to the public to do so. One of the observed benefits of participation within a living lab is that entrepreneurs can use the feedback they receive from the validation of their products as well as business ideas from these living lab environments to further transform ideas and designs that help overcome resistance and indifferences. Furthermore, the living lab environment offers the entrepreneur opportunities to experiment with the translation and presentation of his or her technology and ideas in such a way that it becomes understandable by others. In this particular case, this applies to seniors, informal and formal caregivers, but on decision makers at care organizations, local government and care insurers as well. Taking the first two motives and corresponding benefit of participation in mind, this study proposes that:

- *P1: Entrepreneurs use living labs to translate and present their ideas into understandable concepts for others by validating and adapting their ideas with users and within markets.*

It is possible to illustrate this proposition by taking the case of entrepreneur E7 as an example. Entrepreneur E7 stated in the interview that he participates in a living lab with the assumption that this enables him to receive valuable information about how the product is perceived by potential consumers, healthcare organizations, insurers or government. With this information, it was possible for the entrepreneur to decide whether his ideas for social change correspond with the experiences and wishes of the context. When it turned out not to be the case, the entrepreneur



did use the feedback that he collected through the living lab environment to adjust his initial idea and position and in the future will communicate the idea in a different way so that the context responds to the idea more positively.

As found earlier, user involvement and access to and probing of markets is mainly supported by living labs that focus on co-creation and R&D. As a result, there can be determined that the mobilization of minds and the creation of a shared space mainly takes place in those living labs that focus on R&D and cocreation.

- *P2: living labs that focus on co-creation and R&D with the end users will provide more support to the entrepreneur in presenting and translating ideas in understandable concepts for others than living labs that focus on Learning and Demonstrating.*

To conclude, the first two motives for entrepreneurs to participate in living lab projects seem to relate to the statement of Garrud and Karnoe (2001), as “entrepreneurs cannot do what they choose in pursuing their narrow self-interests. Rather, entrepreneurship is a collective enterprise where a shared space is created and nurtured by members of a community who derive different meanings from their involvement.” The authors also propose that the creation of a shared space sets the basis for generating buy-in required to mobilize a critical mass around an idea. In addition to the creation of this shared space as a basis for generation buy-in required to mobilize a critical mass around an idea, other authors found that the creation of legitimacy for institutional change and new technology is an essential factor for the mobilization of resources and actions for the successful implementation of new practices as well (Aldrich & Fiol, 1994; Battilana et al., 2009; Maguire et al., 2004).

## 5.2. Creation of legitimacy and support

Institutional change is a process of mobilizing campaigns in order to legitimate a social or technological innovation. According to Aldrich and Fiol (2006), legitimacy has two dimensions. The first dimension, cognitive legitimacy, refers to the taken-for-granted assumption that an institutional change is desirable, proper, and appropriate within a widely shared system of norms and values. In addition, this dimension can be described as to how knowledgeable people are of the emerging technology and how likely new entrants are to copy the existing organizational form rather than that they experiment with new ones. The second dimension, sociopolitical legitimacy, consists of endorsements and the support of key constituents, such as financial investors, government officials, consumers, and others who play key roles in developing and implementing an innovation. Furthermore, socio-political legitimacy can be described as a process by which the key constituents accept the technology as appropriate and right, giving existing norms and values. Aldrich and Fiol also identified several legitimization strategies. They describe that cognitive legitimacy strategies encompass the development of a knowledge base by using symbolic language and behaviors, encouraging convergence around a dominant design, promoting activity through third party actors, and creating linkages with established educational curricula. Socio-

political strategies encompass the development of trust, perception and reputation (Aldrich and Fiol, 1994).

## 5.2.1. Legitimization processes

### 5.2.1.1. Cognitive legitimacy through increased visibility and brand awareness

Cognitive legitimacy strategies encompass the development of a knowledge base by making use of symbolic language and behaviors, encouraging convergence around a dominant design, promoting activity through third party actors, and creating linkages with established educational curricula. From the cognitive perspective of legitimacy, organizations are legitimate when they are understandable (that is, when there is greater awareness and therefore less uncertainty involved with the organization). In this sense, knowledge and awareness of an organization's existence provides cognitive legitimacy (Aldrich & Fiol, 1994; Jepperson, 1991; Suchman, 1995).

The entrepreneurs interviewed within this study expressed that living labs support the development and commercialization of their technology by offering visibility and brand awareness. In this sense, it seems that, within the professional context, living lab projects play a role in displaying technologies and innovations to stakeholders such as users and healthcare organizations. Furthermore, the results show that positive results within living lab pilot projects might reward the entrepreneur with attention of important and large healthcare organizations.

So, how exactly do visibility and brand awareness support cognitive legitimacy? Visibility and brand awareness support the recognizability of products among the public including potential users. In this sense, the spread of knowledge about an innovation or a venture may be a function of marketing efforts, directed searches on the part of a potential customer to fulfill a need, or occurrence due to word-of-mouth communication between parties. In other words, the spread of knowledge is not necessarily exclusively the creation of new information, but may be a function of increased awareness as well (Shepherd & Zacharakis, 2003). To this end, cognitive legitimacy of new technologies and ventures can be increased through participation, as living labs create visibility for technologies and ventures to the public. This will mainly apply to living labs where the demonstration function plays an important role. In addition, success stories can be used by living labs as a showpiece and can be demonstrated to affiliated parties. This makes the innovation visible to the public, which in turn might perceive the new technology and venture as useful and desirable. Finally, word-of-mouth advertising allows care organizations in the context of the living lab to see that other care organizations successfully use innovations and that these offer tangible benefits. In particular, care providers and other end users can be enthused about testing the innovation themselves and potentially adopt it as a result. The large network of care organizations affiliated with living labs also contributes to making the new innovation visible at affiliated care organizations. When taking visibility and brand awareness through living lab participation into account, the following proposition is made:

*P3: Entrepreneurs use living labs to create knowledge and awareness about their organizations' or technologies' existence by increasing visibility and brand awareness among the LLs context and network.*

This proposition is clearly supported by looking at the case of entrepreneur E3. Entrepreneur E3 mentioned that participation in a living lab suddenly gained him access to a network of twenty affiliated healthcare organization among which his technologies were displayed and demonstrated. Through this, he managed to raise knowledge and awareness about his technologies' and firms' existence and potential among a large group of care providers and decision-makers within the regional environment.

Visibility and brand awareness are mainly supported by living labs that focus on gaining experience, learning with and demonstrating technology. These living labs are more concerned with experiments with existing technologies and with figuring out how these technologies can be used in practice. Testing and trying in practice with seniors and care providers plays an important role in this. Positive experiences with technology will lead to extra brand awareness and word-of-mouth advertising. It is expected that living labs that specifically focus on co-creation and the development of innovations offer less visibility and brand awareness. Therefore:

*P4: Living labs that focus on Learning and demonstrating within a regional context will provide more support to the entrepreneur in creating knowledge and awareness about their organizations' or technologies' existence than living labs that focus on cocreation.*

#### 5.2.1.2. Socio-political legitimacy through the collection of evidence

As presented earlier, living labs may be beneficiary to the acceptance and support of new technologies. Main arguments for this are that the living labs enable end users and their environment to obtain experience with the technologies. Furthermore, an advantage of participating in a living lab is that entrepreneurs can collect evidence for viability, feasibility but also efficiency and effectivity of their innovations. This evidence or proof may in turn lead to the mobilization of minds, as this evidence may support the entrepreneur in the creation of sociopolitical legitimacy and support for his technology. Finding sociopolitical legitimacy, which is described as the support for the innovation or social change of key constituents, such as financial investors, government officials, consumers and other key figures, is an important aspect of technology entrepreneurship.

This study found that living labs projects enable the entrepreneur to collect evidence in two ways. First, through experimentation, it is possible to collect proof that the innovations may exist. As entrepreneur E9 mentioned, testing in a living lab enables the entrepreneur to collect proof of concept for new technology or business ideas. This proof of concept is defined in the used literature as a method to demonstrate whether an idea, technology or a product feature is feasible, desirable and fits the experiences of the targeted users. Through collecting proof of concept, the entrepreneurs can create cognitive legitimacy, as the proof of concept displays that a technology will be taken-for-granted, desirable and proper and appropriate within the norms and values of the end users. In addition, this study shows that entrepreneurs collect formal, scientific evidence that show the efficiency and effectivity of innovations and technologies. Scientific evidence might eventually enable the entrepreneur to create sociopolitical legitimacy by convincing key constituents, as investors, healthcare and government decision makers, consumer representatives and other key figures to support his business.

*P5: Entrepreneurs use living labs to create support from key constituents by increasing and demonstrating credibility for their ideas for socio-technological configurations.*

This proposition can receive support by taking the case of entrepreneur E3 as an example. This entrepreneur expresses that the advantage of living labs is the creation of credibility that can demonstrate the potential and effectivity of an entrepreneurs technologies to important or key decision makers within large care organizations, health insurance companies, or in some cases (local) governments. Through this, it is shown that entrepreneur can use living labs to create support from key constituents for their innovations.

This study did not find that participating in a particular type of living lab specifically enables entrepreneurs to increase and demonstrate his or her technology nor the firm's credibility. To this end, it is not possible to make any propositions about whether any particular type of living lab is more useful in the creation of support from key constituents, or socio-political legitimacy. On the one hand, one can argue that validation and testing of technologies happens most in living labs that focus on co-creation. On the other hand, one can argue that the interest of key constituents might be attracted more through living labs that focus on learning and demonstrating. However, on the basis of the ten entrepreneurs and eight living labs included in this study, no reliable proposition can be given about these assumptions.

### 5.2.2. Mobilizing structures

Within this study, we found a motive for entrepreneurs to participate in living labs to gain access to and mobilize resources such as knowledge and competencies. Gaining access to resources seems like a straight forwarded motive for entrepreneurs to participate in research collaborations. However, within the light of institutional change, the mobilization of resources and actions are important steps in the creation of legitimacy for the social acceptance and adoption of change (Wang and Swanson, 2007), or in this particular case, age friendly technologies.

In addition to providing an environment for co-creation, R&D, learning, and demonstrating technologies, it also seems that living labs fulfill an intermediary function between stakeholders within the institutional context that might gain entrepreneurs access to complementary knowledge and competencies. According to (Powell, 2016) research breakthroughs demand a range of intellectual and scientific skills that exceeds the capabilities of any single organization. To create new knowledge and learn, companies seek close relationships in order to gain access to specialized capabilities that they can leverage in combination with their own. These include both direct and indirect relationships with competitors and potential competitors, as well as relationships with universities, research labs, suppliers, and customers.

Regarding this study, the search of close relationships is observed in the case of E7, which shows that the entrepreneurs participate with specific reasons to gaining access complementary resources. Entrepreneur E7 participated in the living lab with the motive of gaining access to knowledge that his company needed for the development and commercialization of new technologies: It seems that this company lacks knowledge and competences itself needed for further development and the commercialization of technology. A comparable situation is seen in

the case of E3, who mentioned that the living lab environment enabled his company to partner up with a company which possessed different complementary knowledge and skills required to develop and commercialize a product together.

It seems that entrepreneurs participate in living labs in order to link up with existing formal or informal networks or to create new formal or informal networks. They do this to gain access to and mobilize resources such as knowledge and competencies to further develop and commercialize their technology. In this sense, it seems to be the network advantages that motivate entrepreneurs to participate in living labs. This is in line with the findings of Wang & Swanson (2007), who found that actors channel resources and coordinate actions through relationships with each other. By helping to establish such relationships, entrepreneurs can recruit a necessary mass of actors whose actions and resources could then be mobilized in favor of their technologies.

This access to, and mobilization of resources through the networks where living lab are part of is also observed within the case E4, where the participation within the living lab gained the company access to a state-of-the-art IT infrastructure of a large healthcare organization. This enabled the firm to supply digital services to a large group of extramural customers. In the latter case, the entrepreneur could make use of the resources of the healthcare organization to extend product features and commercialize its business. The same situation applies also to the case E3 and E6, where participation in the living labs enabled the entrepreneur to gain access to a large platform of healthcare organizations that were possibly interested in the new technology. The entrepreneur of this firm indicated that his company's objective was to capture a position within the market of fall prevention. To obtain this position, the entrepreneur managed to gain access to a platform of twenty health care providers.

In general, living labs seem to enable one important condition for entrepreneurship, namely by putting entrepreneurs in positions that offer them access to resources needed for further development and commercialization of technologies. The importance of an entrepreneur's social position as an enabling condition for institutional entrepreneurship has earlier been acknowledged by Battilana et. al. (2009) who argue that "an entrepreneurs' social position might affect his perception of the context and their access to the resources he needs to engage in institutional entrepreneurship". Furthermore, the findings of this study also seem in line with the work of (Maguire et al., 2004) who found that actors that hold certain "subject positions" in an organizational field might receive wide legitimacy from their access to resources as funding, social capital, political power and/or knowledge.

### 5.3. Future research

This study made a contribution to the literature by studying path creation and institutional entrepreneurship from the perspective of entrepreneurs that participate in living labs. To this end, several propositions were made on the role that living labs might play within path creation an institutional entrepreneurship processes. However, this study did not have an holistic perspective on the development of a specific technology or product category as the creation of a socio-

technological trajectory. Therefore, it seems worthwhile to explore what the roles of living labs are over a longer timeframe in the case of a specific technology or firm. A thorough approach to do so is to conduct a longitudinal study, following multiple living labs in the development and commercialization processes of emerging innovations. A less time-consuming approach might be to do a retrospective study to trace back innovation paths in the past in combination with a prospective study that tries to do a forecast on socio-technological developments in the future. Such an approach has been recommended by the initial authors of the path creation theory (Garrud & Karnoe, 2010) and has been earlier applied by (Boon et al., 2015) for the case of path creation in genomics in healthcare insurance in the Netherlands. Both approaches demand a perspective that takes the innovation itself as the subject of study and investigate how different entrepreneurs work on the same technology rather than studying entrepreneurs that all work on different technologies. Such an approach might also be able to further explore and confirm the role of different types of living labs on different phases and processes of path creation.

A study by Deuten et al. (2017) showed that living labs are promising workplaces for research, development and innovation. It remains however unclear what the effects of living labs are in terms of societal challenges or technological transitions. The Rathenau study and this thesis both agree that there are (not specifically within the health care system) many different small-scale initiatives that call themselves living labs within the Dutch innovation system. As a result, the question that arises is: How can these local, small-scale initiatives contribute to national and perhaps international societal challenges such as, in this case, the aging of populations? An answer could be found by investigating into the positions and contributions of living labs within innovation (eco) systems. In this context, there can be focused mainly on how living labs could strengthen various functions within these innovation systems and an approach could be developed to fill in shortcomings within functions in innovation ecosystems with living labs. Furthermore, by applying a multi-level perspective as proposed by Geels (2002), useful insights may be gained into how living labs can facilitate the transition of technologies from niche level to socio-technological regime levels.

## 5.4. Limitations

While conducting this study, finding a suitable sample proved to be of high difficulty. As a result, few suitable entrepreneurs who could provide useful data could be found. To solve this issue, there was decided to extend the definition of a living labs within the data collection. The living lab initiatives included within this study had different goals and functions. Because of this, the definition of the living labs included should be broadly handled. Some living labs have R&D as their primary function. Other living labs seem to fulfill more of a demonstration and training function. The differences between the living labs pose a challenge when making a well-weighted judgment on the effects of living labs in general without neglecting individual living labs. Deuten et al. (2017) recognizes that there are several different types of living labs. These different types vary in the degree as to which the dimension co-creation and the dimension learning are central. In a follow-up study, it seems useful to zoom in further on the different types of living labs and to discover how these types have different benefits for entrepreneurs.

In addition, there exist substantial differences between the companies included in this study. One of the companies has only just started developing a product specifically for the healthcare sector and has only been participating in a living lab for a number of months. Another company has been operating for ten years and has already participated living lab projects a several times. As a result, the motives and benefits of participation differ among the participants. The inclusion of very different companies and the phases they are in with their product development is expected to have resulted in a greater diversity of insights. In addition, this research was explorative by nature, so that these differences between companies / cases were able to provide interesting insights. For example, it is interesting to further investigate into the extent of influence of the product development phase on the motives of entrepreneurs to participate in living labs. In addition, the phase of product development can determine the benefits that participation brings to entrepreneurs. Although this study showed how entrepreneurs try to mobilize structures in order to gain support for their technologies and businesses, it might have fell short in gaining insights into how living labs enable the formation of networks that support collective action. Specifically, this study may not have found sufficient useful insight into entrepreneurial processes or interactions that might indicate the generation of momentum as processes where entrepreneurs try to leverage a critical mass of support behind an idea.

One explanation for this lack of insight into the generation of momentum might be that living labs are not suitable environments for entrepreneurs to seek for a critical mass that supports their ideas for changes in socio-technological configurations. Moreover, living labs seem to be suitable for startups to validate and test initial technological designs, and possibly, for scaleups to find credibility for solutions. On the other hand, it could be that creating and mobilizing support of mass populations is not within the strengths and core tasks of living labs, and that these processes happen at stages or in places outside those of living labs. In this sense, it is likely that entrepreneurs create and mobilize mass support for their technologies in phases where their technologies no longer benefit from living labs. It is therefore plausible that for studying the generation of momentum one should not look for entrepreneurs who currently participate in living labs, but for entrepreneurs who left these early phases of startups and scaleups a number of years ago. Nevertheless, the above statements are based only on assumptions. However, by looking at the cases of E3 and E10, it is possible to explain these assumptions to some extent. Moreover, both cases are firms that are past their startup phases and have participated in living labs during their startups phases some years ago. Both entrepreneurs have indicated that their firms especially benefited specifically from participation in living labs during initial phases of technology development and validation. They also both indicated that they do not participate in living labs at present times anymore as those initiatives are no longer important or useful for the phases of development where their firms are now. This shows that there may be a tipping point in the development or growth stages of firms, after which living labs probably no longer offer benefits for these companies.

An alternative explanation for the lack of insights into the generation of momentum might be the result of a shortcoming in either the sampling strategy or the operationalization of the concept of generation of momentum within the used interview-guide. Within this study, an attempt was made to translate the generating of momentum by entrepreneurs into situations where the scale of a

technology or firm seemed to change from initial development and validation towards a scale-up and implementation phase where the large-scale adoption of the innovation takes place and where the firms seemed to capture a notable place in the market. To this end, it would perhaps have been better to include more companies in the sample that have passed the startup phase and have already achieved a significant position in the market, in addition to startups and a single larger company. Furthermore, the interviews might have yielded more or different insights by using different questions with regard to the concept of generation of momentum.

Because this study has found few indications for the occurrence and generation of momentum (or the emergence of widespread support for new technologies), it is impossible to make statements on how the different types of living labs can benefit different phases of technology development and commercialization. To test what these effects are and whether these effects are present at all, a study among several living labs and entrepreneurs should take place.

## 5.5. Implications

This study found that living labs are useful for entrepreneurs during the early stages of their product development. In addition, living labs are also useful for finding and testing solutions to problems within the Dutch healthcare system. This study shows that the initiatives that call themselves living labs within this care system differ greatly in terms of design and objectives. Living labs are mainly useful for small-scale development and testing of solutions for startups, and it was found that the usefulness of living labs in scaling up products and companies is limited. In order to increase the contribution of living labs to system transitions, it is necessary to strengthen the functionality of living labs to support the growth of startups when scaling up innovations. Policy should focus on better coordination and collaboration between the living labs. Currently, a European platform or network of benchmarked living labs (ENOLL) already exists. In The Netherlands, there are four living labs connected to this platform ((ENOLL, 2020)). To improve the positions and contributions of living labs within system transitions, it is recommended to connect more living labs to this network to facilitate and coordinate regional, national and international cooperation on development and to steer the proliferation of small local living lab-like initiatives so that these initiatives also contribute effectively to solving social problems.

For entrepreneurs and firms that work on early prototypes of innovations or are in early stages of innovation commercialization, living labs offer suitable grounds to develop and test products and services within actual practices, including all relevant stakeholders. To this end, living labs offer the entrepreneur decent opportunities for improving initial product designs and business model configurations. In addition to practical benefits, living labs also provide support in creating legitimacy for new technologies and solutions. Firstly, the living lab can provide visibility and brand awareness of technologies, which may ultimately contribute to accelerated adoption and acceptance of technology. Furthermore, living labs also offer opportunities for the entrepreneur to gather scientific evidence of the usefulness of his technologies. If the entrepreneur's technology has been legitimated and its usefulness has already been demonstrated, participation in further living lab initiatives will probably not yield any additional benefits. These entrepreneurs are



therefore advised to look elsewhere for large-scale support and additional resources are needed to scale up technologies.

## 6. Conclusion

The introduction of this thesis commenced by describing the challenges of an aging society increasing the societal need for innovative solutions that can help solving scarcity problems in the Dutch healthcare and housing system for senior citizens. Technologies that support seniors to maintain an active, healthy, and independent life within their own environments are expected to offer a solution to this societal challenge. In this thesis, the emerging Dutch sector for technologies that support active and assisted living of seniors in their own environments was taken as a case to explore how living labs as experimentation environments for co-creation and mutual learning support entrepreneurs in their attempts to create and steering of socio-technological pathways.

This study first examined which different types of living labs exist within the Dutch elderly care sector. It found that there are two distinctive types of living labs. The first dimension entails the co-creative nature of living labs, which entails not only the active participation of public and private actors but also the active involvement of users within the design processes of new technology. The second dimension entails the learning and demonstration character of the living labs, which describes the functionalities that living labs offer for stakeholders to learn about the practical consequences of technologies and to demonstrate the potential and possibilities of their technologies to older adults, potential investors, healthcare professionals, and sometimes informal caregivers.

This study also found that participating in living lab initiatives offer several benefits for entrepreneurs. First, living lab environments gain the entrepreneur access to valuable resources such as complementing knowledge and competencies that are needed for the development and commercialization of new technologies. Second, living lab initiatives offer the entrepreneur the possibility to design and validate their technologies and business models through user involvement within the early phases of product and service development. Third, living labs seem to be suitable places for the entrepreneur to probe and learn about market characteristics, consumer preferences, and business model fit. In addition, living lab environments might gain the entrepreneur access to markets or market segments that were previously not reachable before. Fourth, living labs enable entrepreneurs to gain credibility for their innovations by collecting proof for the viability, feasibility, effectivity, and efficiency. Fifth, living labs offer the entrepreneur visibility for their products, firms, or brands by demonstrating the potential and possibilities of the entrepreneurs' technologies to key constituents such as potential investors, healthcare organizations, and insurers.

This thesis furthermore explained how living labs support entrepreneurs in the creation of socio-technological paths. First, it is proposed that living labs support the entrepreneur in his or her creation of a shared space by enabling the entrepreneur to involve users and probe markets in order to maintain "persistence with flexibility". This indicates that entrepreneurs know that their initial ideas for technological or social innovation may not be perceived as perfect by his or her

context and that living labs help the entrepreneur with insights on how to transform and translate ideas into products or services that are understandable by others. Furthermore, it is proposed that living labs might support the entrepreneur in creating legitimacy for his or her ideas about future socio-technological configurations by increasing visibility and brand awareness of technologies and by increasing and demonstrating the credibility of these technologies.

At last, this thesis explored how different types of living labs support entrepreneurs in their attempts to shape and steer future socio-technical pathways. For living labs of the co-creation type, it is proposed that the focus on co-creation and development in collaboration with other stakeholders and users will mainly support entrepreneurs within path creation processes such as mobilizing minds and a shared space. It is also suspected that this type of living lab is particularly useful for companies or technologies that are in the early stages of development. For living labs of the learning and demonstrating type, it is argued that the focus on learning and demonstrating will mainly support entrepreneurs in their creation of legitimacy. It is also suspected that these types of living labs are specifically useful for entrepreneurs of companies or technologies that are ready for adoption.

In conclusion, there are many different living labs-like initiatives found within the Dutch landscape that focus on improving the care system for the elderly by looking for solutions that enable elderly people to grow old independently for longer in a dignified and healthy way. Although these living labs offer various advantages for entrepreneurs, there are still improvements to be made in various areas. Many living labs operate in isolation from each other, which means that the potential of the living labs in accelerating transitions seems largely unused. Amongst other things, explicit investigations could be done into how living labs contribute to transitions within the Dutch healthcare system and how their contribution to innovation ecosystems could be improved.

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## Appendix 1: Interview guide master thesis research: Living lab coordinators

<b>Introductie</b>	Stel jezelf voor en vertel dat je dankbaar bent dat de deelnemer interesse toont en tijd wil vrijmaken voor een interview.
<b>Doel van het onderzoek</b>	Vertel over het doel van het onderzoek en hoe je bij dit living lab initiatief terecht bent gekomen.
<b>Anonimiteit en vertrouwelijkheid</b>	Interview data zal worden geanonimiseerd en de informatie die de deelnemer geeft zal alleen voor dit onderzoek worden gebruikt.
<b>Opnemen</b>	Volgens de wet is het verplicht om toestemming te hebben om gebruik te maken van opnameapparatuur. Daarom dient toestemming gevraagd te worden voor opname.  De interview data zal worden geanonimiseerd en de informatie die de deelnemer geeft zal alleen voor dit onderzoek worden gebruikt.
<b>Onderwerpen:</b>	<ul style="list-style-type: none"> <li>- Introducerend (over achtergrond living lab);</li> <li>- Type living lab;</li> <li>- Participatie van ondernemers en bedrijven;</li> <li>- Path creation (Ideeën over de plaats van technologie in toekomst van wonen en zorg voor ouderen);</li> </ul>
<b>Introducerende onderwerpen</b> - Achtergrond living lab	<ol style="list-style-type: none"> <li>1. Doel van het living lab?</li> <li>2. Hoe is het idee ontstaan om dit initiatief te starten?</li> <li>3. Hoe gaat het initiatief te werk, hoe zien de projecten hierbinnen eruit?</li> </ol>
<b>Type living lab</b>	<p><b>Vertel dat er verschillende typen living labs te identificeren zijn. Living labs die zich meer richten op cocreatie en living labs die zich meer richten op leren en demonstreren.</b></p> <ol style="list-style-type: none"> <li>4. Valt uw living lab dan meer onder het eerste type, of onder het tweede type?</li> <li>5. Kunt u vertellen waarom dit is?</li> </ol>

	6. Welke functie vervult uw living lab hierbij hoofdzakelijk?
<b>Ondernemers en bedrijven die participeren binnen het living lab</b>	<p>7. Kunt u iets vertellen over de binnen dit living lab deelnemende bedrijven of ondernemers?</p> <p>8. Wat betekenen deze bedrijven of ondernemers voor het living lab? Wat levert dit het living lab op?</p> <p>9. Wat zou de motivatie van deze bedrijven of ondernemers kunnen zijn om mee te doen?</p> <p>10. Wat zou deelname aan living labs voor bedrijven of ondernemers kunnen opleveren?</p>
<b>Ideeën over de plaats van technologie in toekomst van wonen en zorg voor ouderen</b>	<p><b>Visie:</b></p> <p>11. Wat is uw visie de op de toekomst van zorg en huisvesting voor ouderen?</p> <p>12. Welke positie heeft technologie binnen deze toekomst?</p> <p><b>Barrières</b></p> <p>13. Welke barrières verhinderen grootschalig gebruik van deze technologieën?</p> <p>14. Wat is er nodig om deze barrières te verlagen/te verwijderen?</p> <p>15. Wat is de toegevoegde waarde van living labs binnen grootschalige adoptie van deze technologieën?</p>
<b>Afsluiting van het interview</b>	<p>16. Wie zou ik nog meer moeten spreken mbt dit onderwerp/onderzoek?</p> <p>17. Kunt u mij in contact brengen met bedrijven of ondernemers die participeren in uw living lab?</p> <p>18. Heeft u nog vragen of toevoegingen?</p> <p>19. Wenst u de onderzoeksresultaten te ontvangen?</p>
<b>Bedank voor het interview</b>	Stop opname
<b>Contactgegevens uitwisselen</b>	Geef contactgegevens van projectgroep/interviewer

## Appendix 2: Interview guide master thesis research: Entrepreneurs

<b>Introductie</b>	Stel jezelf voor en vertel dat je dankbaar bent dat de deelnemer interesse toont en tijd wil vrijmaken voor een interview.
<b>Doel van het onderzoek</b>	Vertel over het doel van het onderzoek en hoe je bij deze ondernemer en dit living lab initiatief terecht bent gekomen.
<b>Opnemen</b>	Volgens de wet is het verplicht om toestemming te hebben om gebruik te maken van opnameapparatuur. Daarom dient toestemming gevraagd te worden voor opname.  De interview data zal worden geanonimiseerd en de informatie die de deelnemer geeft zal alleen voor dit onderzoek worden gebruikt.
<b>Onderwerpen:</b>	<ul style="list-style-type: none"> <li>- Introducerend (over bedrijf en ondernemer);</li> <li>- Participatie binnen living lab;</li> <li>- Path creation (Ideeën over de plaats van technologie in toekomst);</li> </ul>
<b>Introducerende onderwerpen</b> <ul style="list-style-type: none"> <li>- Achtergrond bedrijf en technologie/oplossing</li> <li>- Achtergrond van ondernemer</li> </ul>	<ol style="list-style-type: none"> <li>1. Kunt u iets meer over uw bedrijf vertellen?</li> <li>2. Kunt u iets meer vertellen over de technologie die u ontwikkelt/jullie ontwikkelen?</li> <li>3. Kunt u vertellen over hoe u/jullie op het idee bent/zijn gekomen om te beginnen met dit product/deze service?</li> </ol>
<b>Participatie aan living lab</b> <ul style="list-style-type: none"> <li>- Motivatie om te participeren</li> <li>- Voordelen van participatie</li> </ul>	<ol style="list-style-type: none"> <li>4. Kunt u wat meer vertellen over uw/jullie participatie in, of samenwerking met living lab X?</li> <li>5. Wat is uw/jullie reden om te participeren aan living lab X?</li> <li>6. Wat levert participatie aan living lab X u/jullie op?</li> <li>7. Bent u van plan om in de toekomst nogmaals te participeren in living labs of dergelijke initiatieven?</li> </ol>



<p><b>Ideeën over de plaats van technologie in toekomst van wonen en zorg voor ouderen</b></p>	<p><b>Visie:</b></p> <p>8. Wat is uw/jullie visie de op de toekomst van zorg en huisvesting voor ouderen?</p> <p>9. Welke positie heeft uw/jullie technologie binnen deze toekomst?</p> <p>10. Hoe denkt u dat te kunnen bereiken?</p> <p><b>Barrières:</b></p> <p>11. Wat houdt u tegen hierin/ zijn er hindernissen/barrières te overkomen?</p> <p>12. Hoe ondersteunen samenwerkingen als het living lab X hierin?</p>
<p><b>Afsluiting van het interview</b></p>	<p>Vermeld dat je aan het einde bent gekomen van het interview.</p> <p>13. Heeft u nog vragen of toevoegingen?</p> <p>14. Wenst u de onderzoeksresultaten te ontvangen?</p>
<p><b>Bedank voor het interview</b></p>	<p>Stop opname</p>
<p><b>Contactgegevens uitwisselen</b></p>	<p>Geef contactgegevens van projectgroep/interviewer</p>

## Appendix 3: Overview of coding structure with textual examples

THEME	SUBTHEME	TEXTUAL EXAMPLE
<b>TYPES OF LLS</b>		
MAIN GOAL OR FUNCTION OF LLS	Cocreation	Interviewee CE1: “Zijn we dus nu begonnen met ook Living Labs en bij cliënten en mantelzorgers te vragen van ja "wat vinden jullie heirvan, wat vind je daarvan en kom zelf eens met ideeën. En op die manier eigenlijk bedrijven prikkelen om te zeggen van "bied je product nou eens aan, en dan gaan wij kijken of we daar dan in 2023 ook echt een certificaat hebben als je deze spullen gebruikt, dan weet je in ieder geval dat het geschikt is voor de doelgroep waarvoor je het wilt inzetten”.
	Learning and demonstrating	Interviewee C3: “En de aanleiding daarvoor [het LL] was dat de gemeente graag wilde gaan experimenteren met langer thuiswonen. Om daar de rol van te verkennen en wat de mogelijkheden waren welke technologieën er beschikbaar waren en in hoeverre die ook daadwerkelijk konden worden uitgerold en door mensen gebruikt worden en effecten zouden hebben op de zorg vanuit de WMO”.
<b>ENTREPRENEURS PARTICIPATING IN LLS</b>		
MOTIVATIONS PARTICIPATE	Access to resources	Interviewee E6: “En eigenlijk is dat voor ons de enige mogelijkheid want wij kunnen moeilijk ons inleven in de zorg. Je kan een heel eind meedenken maar de praktijk is iets dat niet in de aderen stroomt van bedrijf X. Wij zijn een [ ] bedrijf, wij hebben een [ ]. Dus [ ] verkoop is hier gewoon skill nummer één. Skill nummer twee is het bouwen van [ ] om zo maar eens te zeggen en ja nu, omdat we digitaal gaan openen zich heel veel mogelijkheden”.
	Accessing and probing markets	Interviewee E2: “En daar kwamen ook steeds andere partijen bij die we uiteindelijk nodig hadden om het product wereldwijd uit te rollen. Dus partijen die bijvoorbeeld een glasvezel wereldwijd konden installeren omdat alles via glasvezel ging om maar iets te noemen”.
		Interviewee E2: “Ja ik zie het voornamelijk als een mogelijkheid om een nieuwe applicatie te ontwikkelen. En vaak betekend een nieuwe applicatie zeg maar dat

je een nieuw marktsegment kunt claimen. Dus om je een idee te geven nu zijn we met name bezig in zorg en verpleeghuizen. Nou dat is een gigantische markt. Maar als ik bijvoorbeeld naar een fysiotherapeut of naar een empathische woning een propositie wil doen dan moet ik mijn product in een heel nieuw jasje gieten en een hele nieuwe applicatie aanbieden”.

User involvement

Interviewee E6: “vanuit de aanname dat we vanuit die living labs feedback kunnen krijgen, zowel vanuit zorgmedewerkers die hun commentaar geven op wat ze daar zien. Als vanuit studenten die denken hé, maar dat kan nog veel beter. En dat soort feedback is voor ons heel belangrijk”.

Interviewee E8: “Je kan zeggen werkt het product, en dan krijg je feedback om het product beter te maken. Als je daarnaar opzoek bent, in mijn ervaring met een living lab is dat heel goed. Er zijn dan veel onderzoeken met studenten en je krijgt dan een lijstje met productverbeteringen. En in het begin is dat heel belangrijk. Ja het was dus voornamelijk die feedback van cliënten en gebruikers op [ ], op de product functionaliteit. He dus ik heb wel die outputs gezien. En dat was dan een lijst met verbeterpunten voor het product. Je krijgt dan user feedback”.

Collection of proof for feasibility, viability and effectivity

Interviewee E2: “Nou het grote voordeel vind ik om mee te doen aan dit soort initiatieven dat er dan vaak ook in het begin een wetenschappelijke basis voor gevonden wordt. Dus dat betekend dat je als bedrijf minder moeite heb om zo'n product te kunnen verkopen, oneerbiedig gezegd. Of er aan mee te doen want er is gewoon een bewijs voor geleverd. Ja dus inderdaad die credibility dat eigen wil ik daar ook mee zeggen dat vaak geeft dat wetenschappelijk onderzoek mij ook handvatten om beter te kunnen nagaan hoe ik mijn product kan positioneren in zo'n totale compositie.”

Interviewee E7: “We hebben nou eenmaal te maken dat we moeten aantonen richting zorgverzekeraars en ook richting de beleidsmakers in dit land dat wat wij doen dat dat wetenschappelijk onderbouwd wordt met cijfers en met getallen”.

Visibility

Interviewee E2: “Nou wij krijgen nu de mogelijkheid om binnen die twintig organisatie op te schalen. Ja dan wordt je ineens zichtbaar in heel Brabant. En een stuk van midden Nederland en Zeeland. En dan kun je van daaruit weer verder.... ...Ja goed dus de stap waar ze opschalen en je blijven focussen op een ding op valpreventie en daar heel zichtbaar op worden”.