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The Key Principles of Living Labs

The practice of key principles in living labs in dementia care

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Extended Master Organization Studies

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Abstract

In academic literature, the concept of innovating through living labs has been gaining more attention for over a decade. Of course, this rise in interest is preceded by the growing number of actual living labs that are established all over Europe and worldwide. Though, because of the relative novelty of this topic a large diversity between living labs is displayed, both in theory and in practice. Thus far, no common denominators for living labs have been defined, despite the fact that several scholars have argued for the necessity of a categorization of living labs. However, research has identified five characteristics that are shared among living labs, called the key principles. Not only are these principles presented as the characteristics of living labs, they also provide guidelines to living lab on how they should organize their innovation processes.

As living labs practice the key principles, and thus follow these guidelines, they are expected to improve the outcomes of their innovation processes. And, as the common characteristics of living labs, these principles might present the opportunity to categorize the population of living labs. However, as the key principles are only defined in general terms, it is not yet possible to make such a statement. This research is aimed at the development of a better understanding of the key principles and the guidelines that they prescribe. Through both a theoretical search and a comparative case study of four living labs, this thesis explores and elaborates on the available knowledge of the key principles. The practice of the key principles is researched in four living labs, which are all active in the development of innovations for dementia care.

The key principles and their practice have been elaborated, based on various other methodologies and theories of innovations. Found is that the practice of each principle consists of one or more aspects, through which living labs should reach certain targets. Subsequently, by reaching those targets, living labs are expected to improve the outcomes of their innovation processes. Empirically, it is found that while there are quite a few similarities in how these key principles are practiced among the cases, some differences stand out as well. Overall it can be stated that, even though the living labs in dementia care are engaged in a variety of projects and are organized in different ways, their practice of the key principles is often comparable.

Key words: *living labs, (practice of) key principles, innovation*

Preface

Before you lies one of the toughest assignments that I have faced in my academic career. Never has a research or project caused me this much effort and stress to complete. This thesis has been written as conclusion to the Extended Master Organization Studies, at Tilburg University. Part of this master is a yearlong traineeship which, in my case, was situated with GGzE, in Eindhoven. While this year has offered to me numerous new experiences and has introduced me to a lot of wonderful people, I am afraid that my struggles with this thesis may cloud my judgment of this year.

While the subject of my research, the concept of innovating through living lab, still appeals to me, it has proven to be a very difficult topic to study. As this subject is relatively novel in academic writing, many concepts and theories related to living labs are yet to be substantiated. However, not only the theory of living labs turned out to be difficult to comprehend. The diversity and variety that exists in literature, also exists in practice, making it even a more challenging task to adequately research and describe living labs.

To my best ability, I have tried to unravel and subsequently describe a small part of this dynamic and complex topic. And while, unfortunately, the completion of this research has taken me more time and effort as was originally planned, I am proud to present my thesis to you. However, before I do, I would express my gratitude to all those who supported me in this research, especially all my colleagues at GGzE and the participants for this research. From GGzE, I especially want to thank Diana, Liselore, Inge, Kees and Joyce for their support and guidance over the past year.

But most of all, I want to express my appreciation for the support given to me by Rob and Marjolein. First, Rob, as my first supervisor, for all his time and effort, for commenting on enormous loads of text and questions that I sent to him, and for sitting down with me to discuss and brainstorming about this topic. And Marjolein, whose patient support has helped me tremendously throughout this entire process. It is safe to say that, without their energy, I would not have been able to complete this task, and therefore I hope that I am able to reward their support and effort with this thesis.

Daan Humblé, March 2014

Table of Contents

1 Introduction

1.1 Research problem

Since its emergence in the beginning of the 21st century a new concept managing innovation, called living labs (for 'living laboratories'), has been gaining increasingly more attention. Today, the number of active living labs is still growing, as is evidenced by the growth of the 'European Network Of Living Labs' (ENOLL). This international network of living labs currently has over 300 members in more than 45 countries worldwide. Academically, the concept of innovating through living labs has been defined in many different ways. For example, some scholars are referring to living labs as a specific methodology for innovation (e.g. Eriksson, Niitamo & Kulkki, 2005), while others regard a living lab to be an environment in which innovations are developed (e.g. Ballon, Pierson & Delaere, 2005). Still, while descriptions may be diverse, commonly shared is that living labs represent a novel approach to innovation in which a wide diversity of stakeholders and users collaborate in the development of new products and processes (Bergvall-Kåreborn & Ståhlbröst, 2009).

When considering living labs from a more practical perspective, the term 'living lab' is used to cover a large variety of initiatives and approaches for innovation (Bergvall-Kåreborn & Ståhlbröst, 2009). That diversity is presented in many ways, as some living labs might develop innovations for people with specific demographic characteristics (e.g. 'young' or 'elderly' people) or rather focus on geographical aspects (like 'rural' or 'urban'). In contrast, other living labs are closely related to certain branches, such as automotive or healthcare (CoreLabs, 2007). Additionally, the variation in living labs is not only limited to their context or target population, as living labs are also found to be organized in different ways (Eriksson, Niitamo & Kulkki, 2005), applying contrasting methods (Feurstein, Hesmer, Hribernik, Thoben & Schumacher, 2008), or even striving for divergent goals (Leminen, Westerlund & Nyström, 2012). Scholars, therefore, have for argued the necessity to structure and categorize the diversity between living labs, their organization, and the methods they apply (i.e., CoreLabs, 2007; Feurstein et al., 2008).

Despite the differences between living labs, there also are a "few common denominators pulling them together" (Bergvall-Kåreborn & Ståhlbröst, 2009, p.357). As mentioned, living labs enable a wide diversity of stakeholders, such as developers and researchers, to collaborate with users in innovation processes (i.e., Almiral, 2008). Also shared among living labs is that their innovation processes are situated in real-life environments (i.e., Svensson & Ihlström Eriksson, 2012). The generation of ideas and the testing of concepts with consideration to the 'real world' is believed to create better insights into the practical suitability and application of innovations. In a study performed by CoreLabs (2007), five aspects have been identified that represent the shared mindset behind living labs: openness, continuity, empowerment of users, realism, and spontaneity.

When considering living labs, these five aspects, referred to as the 'key principles' of living labs (Bergvall-Kåreborn & Ståhlbröst, 2009), are relevant in two ways. On the one hand, the key principles are seen as the characteristics of living labs; their combination represents the way in which living labs organize their innovation processes (Bergvall-Kåreborn & Ståhlbröst, 2009). On the other hand, the key principles are regarded as guidelines that are "crucial in living lab operations" (Ståhlbröst, 2008, p.36). Each key principle prescribes specific goals to living labs that can be of relevance for the success of innovation processes, such as creativity, efficiency, or validity (Bergvall-Kåreborn & Ståhlbröst, 2009). As guidelines, the key principles propose certain approaches that, if practiced correctly, should help living labs to attain to those goals.

While the key principles prescribe living labs with guidelines to reach specific goals, their instructions are only described in general terms, hereby leaving room for interpretation. For example, the key principle of realism is concerned with the external validity of the innovations that are developed in a living lab. By involving real users and incorporating settings and situations that reflect real-life as close as possible, living labs should reach that goal of external validity (Bergvall-Kåreborn & Ståhlbröst, 2009). However, as is evidenced in academic writing, there are many ways in which this key principle of realism is actually brought into practice. Some living labs may actually situate their innovation processes in and around the daily lives of their users (Almiral & Wareham, 2011), while others try to re-create or simulate the real-world (Bergvall-Kåreborn & Ståhlbröst, 2009). In fact, in one of the first living labs an actual laboratory was designed to re-create a home environment with the purpose of observing participants (who lived in the laboratory for an extended time) in their daily life (Markopoulos & Rauterberg, 2000).

In the example described above, the approach that is most appropriate may depend on the situation of the specific individual living lab. And as there are many differences found between individual living labs, there might thus be multiple ways in which the guidelines of each key principle are brought into practice. So far, however, the practice of those key principles has only been studied empirically in a limited number of cases (Bergvall-Kåreborn and Ståhlbröst, 2009; Bergvall-Kåreborn, Holst and Ståhlbröst, 2009), and neither have the key principles been discussed extensively in theoretical writing. Therefore, it is not clear how, or even to what extent, these guidelines are practiced in living labs. While the number of living labs continues to increase, so does the diversity in the ways in which they are organized. Considering that various authors have called for the necessity to categorize the population of living labs, the key principles provide the opportunity to do that: to structure and categorize the ways in which living labs operate through their practice of the key principles.

1.2 Research goal and question

Aiming to build on the available knowledge of living labs, the goal of this research is to explore the ways in which living labs bring the key principles into practice. Through a multiple case study, this study focusses on four living labs that develop innovations for the same context, namely that of dementia care. Together, the four living labs participating in this study collaborate in an international project aiming to improve the care for people living with dementia through the development of innovative technologies and concepts. Among these four cases, this research investigates how the key principles are practiced and by that presents a starting point for potential future studies. Therefore, the central question of this research is: '*How are the key principles practiced in living labs in dementia care?*'

Even living labs that are active in the same context may present differences between them. For example, it is possible that they not only develop completely different innovations, but also target different users with those innovations. In order to account for such differences, the first sub question is: '*What kinds of innovations are developed in the living labs and for whom?*' Then, as little has been written about their practice, a deeper understanding of the key principles is created by incorporating theories and methodologies for innovation that describe approaches similar to those of the key principles. Complemented with the knowledge from other theories, the practice of the key principles can be examined in the way in which the living labs are organized. So, the second sub question reads: '*How are the key principles brought into practice in each of the cases?*' In order to answer the question how living labs in dementia care practice the key principles, the four cases are compared. That comparison is aided by the third and final sub question: '*What similarities and differences in the practice of the key principles are found between the cases?*'

1.3 Relevance

1.3.1 Scientific relevance

In the growing population of living labs, several studies mention the large variety between living labs in focus, methods or approaches (i.e., CoreLabs, 2007; Bergvall-Kareborn & Stahlbrost, 2009). In addition to these scholars, other authors have called for of a categorization of the many types of living labs (Feurstein et al., 2008), but no attempts to make such a classification have been made thus far. The key principles, as they represent the characteristics that are shared among living lab (Stahlbrost, 2008), provide the opportunity to construct such a categorization. However, little has been written on these key principles. To that end, this study builds on the current knowledge of the living labs in two ways. First, by incorporating other theories and methodologies of innovation, a better understanding of the goals and guidelines proposed by the key principles can be created. Secondly, through a comparative

case study among four living labs in dementia care, a better insight is generated in the way in which the key principles are practiced in living labs.

1.3.2 Practical relevance

While the key principles provide guidelines to living labs on how they should develop innovations, they are described only in broad and general terms, leaving plenty of room for different interpretations. By practicing the key principles, living labs are expected to improve their innovative performance. Therefore, by clarifying and expanding on the goals and approaches proposed by the key principles, this study is more able than previous studies to provide actual living labs with relevant and detailed information regarding the guidelines prescribed by these key principles.

The practical relevance of this research also extents to the context in which it is situated. The cases of this study are all part of an international collaboration of living labs, called the 'Innovate Dementia' project. While the main goal of this collaboration is to develop innovation to improve the care for people living with dementia, another aim of this project is to create a sustainable living lab architecture that supports the exploration, evaluation and validation of new innovative concepts. In order to do so, the four living labs share in the responsibility to create a 'protocol' for the set-up of living labs. Through exploration of the similarities and differences in the practices of the four living labs, this research can provide valuable input for that protocol. Additionally, from the Innovate Dementia project it is requested to investigate the facilitators and barriers that are encountered in the operations of living labs. In the practical recommendations of this research will be answered to that request. Here, it will be discussed what common facilitators and barriers are experienced by the participating living labs in their practice of the key principles.

2 Theory

In this chapter, first the theoretical background of living labs will be presented. While many differences between living labs are present in practice as well as in academic writing, a similar mindset is shared among all. From this mindset five key principles are derived that represent both the characteristics that define living labs and also guidelines for innovating through living labs. What guidelines are prescribed by the key principles and how they are expected to affect living labs is discussed throughout this section.

2.1 Living labs

Living labs are considered a novel approach for creating competitive advantage, as they enable organizations to develop innovation more successfully (Leminen, Westerlund & Nyström, 2012). This approach of living labs is supposed to offer various benefits to organizations trying to develop innovations by reducing business risks, encouraging organizations to share knowledge and resources, generating a greater diversity of ideas, and enabling validation of concepts and innovations by users (Pallot, Trousse, Senach & Scapin, 2010). Therefore, it is expected that, by innovating through living labs, organizations can improve the quality and efficiency of their innovation processes, while simultaneously lowering the costs.

Academic writing on living labs can be divided into two complementary streams. The first stream is mainly theoretical, and considers 'Living Lab' to be a methodology for innovation, referring to living labs as a model or methodology (i.e., Eriksson, Niitamo & Kulkki, 2005; Bergvall-Kåreborn, Howcroft, Ståhlbröst & Wikman, 2010) for innovation. The actual execution of this methodology is considered by the second stream of literature, which concerns the organization of the innovation through living labs. This second stream defines living labs, among other things, as environments (Ballon, Pierson & Delaere, 2005), milieus (Bergvall-Kåreborn, Ihlström Eriksson, Ståhlbröst & Svenson, 2009), or systems (CoreLabs, 2007) in which innovations are developed. As there are many ways in which living labs actually organize their innovation processes, the term living lab has become an 'umbrella concept' that covers a diversity of innovative initiatives emerging globally (Bergvall-Kåreborn & Ståhlbröst, 2009).

Those innovative initiatives are diverse in several aspects, such as the type of innovations that are designed, the scope of those innovations, or even the focus of the design process. Living labs are engaged in developing actual products as well as processes or services, for domains such as healthcare, agriculture or media (Ståhlbröst, 2008). Living labs may be focused on the development of very specific innovations either for very specific populations or even individual users, such as the living labs described by Almiral and Wareham (2009a; 2011), where IT solutions are designed only for specific users or

organizations. Then again, other living labs are found to be engaged in the development of innovations that are marketable to a larger populations (Bergvall-Kåreborn, Holst & Ståhlbröst, 2009).

In living labs, usually, innovations are developed from the moment a problem or need arises, up to the point where a marketable prototype has been created (Almiral, 2008). Generally, innovation processes are thought to consist of several phases, from the generation of ideas, to the development of concepts, and the creation and validation of prototypes (Følstad, 2008). But, in order to give direction to the generation of ideas, specific problems or needs of users have to be identified. Therefore, in living labs, these phases are preceded with an extra step, the identification of needs (Mulvenna, Galbraith & Martin, 2009). While the concept of living labs is designed to incorporate all four of these steps, not each living lab necessarily addresses all phases. Some living labs might primarily and even exclusively focus on activities such as the generation of needs and ideas (i.e., Pallot, Trouse, Senach, & Scapin, 2010). In other instances, living labs may be more engaged in the further development and testing of concepts and prototypes that have already been designed elsewhere (Ballon, Pierson & Delaere, 2005).

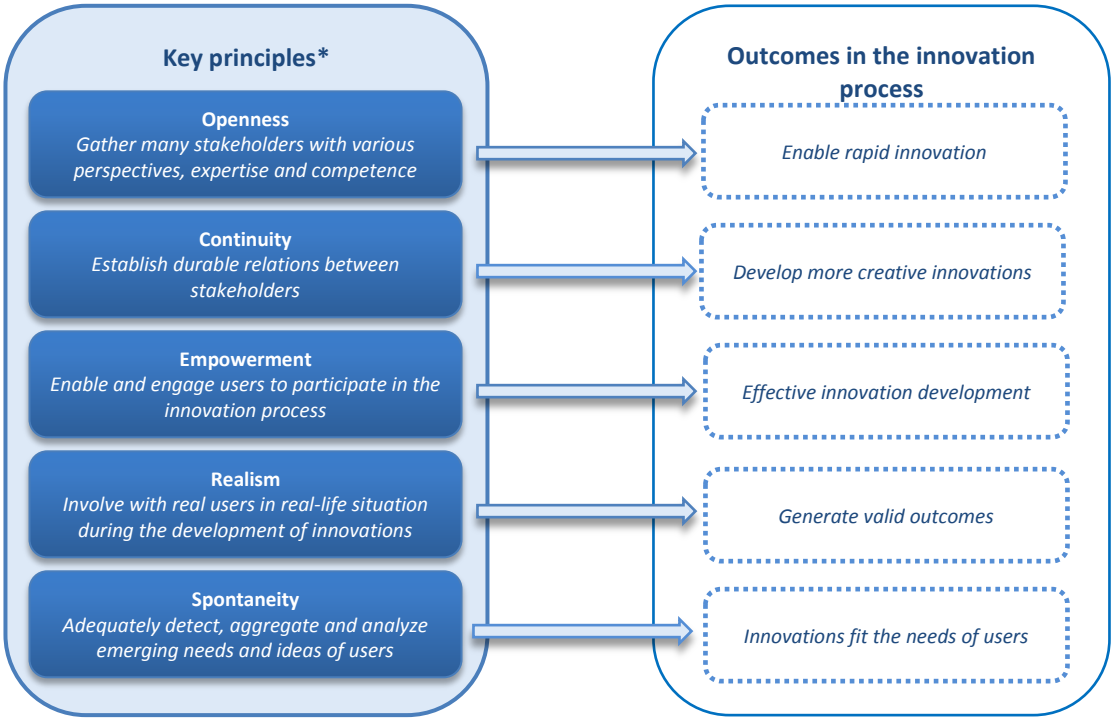
Still, while there may be many differences between living labs, shared among them is the rationale behind this emerging approach to innovation (Bergvall-Kåreborn & Ståhlbröst, 2009). This common rationale, or 'mindset', is based on several methodological streams that, among others, highlight the opportunities for innovation in collaborating between different organizations (for example, Open Innovation) or with the involvement of users (i.e., Lead-user innovation, Web 2.0) (Svensson & Ihlström Eriksson, 2009). Also shared among living labs is that the development of innovations is situated in settings that approximate real-life situations as close as possible (i.e., Eriksson, Niitamo & Kulkki, 2005; Almiral, 2008). This shared mindset of living labs has been highlighted through several aspects that are commonly found among living labs, called the key principles (Bergvall-Kåreborn & Ståhlbröst, 2009).

2.2 Key principles

Originally identified in a study by CoreLabs (2007), the five key principles, are considered to characterize living labs (Bergvall-Kåreborn, Holst & Ståhlbröst, 2009). These five key principles are openness, continuity, empowerment of users (from here on referred to as 'empowerment'), realism, and spontaneity. Each of the principles is related to a specific aspect of the way in which living labs and their innovation processes are organized. Taken together, these key principles represent the crucial aspects that separate living labs from other methodologies for innovation. However, not only do the key principles describe how living labs commonly approach innovation development, they also refer to why living labs are expected to do so. Therefore, from that perspective, the key principles are not only considered to be the shared characteristics of living labs, but also as guidelines that should "permeate throughout all living labs' activities" (Ståhlbröst, 2008, p.36).

As living labs aim to efficiently develop and create high quality and creative innovations that fit the needs of projected end-users (Bergvall-Kåreborn & Ståhlbröst, 2009), the key principles provide them with guidelines to improve the outcomes of their innovation development processes. Derived from the description of the key principles can be specific goals. Reaching such goals, living labs are, for example, expected to develop more creative innovations, or develop new innovations more effectively. When regarded as guidelines, the key principles suggest what approaches living labs should use to reach such goals (*see figure 2.1*). For example, the key principle empowerment states that, in order to innovate more effectively, living labs should enable and engage users to participate in the development of innovations (Bergvall-Kåreborn & Ståhlbröst, 2009). In this example, the goal represented by empowerment is that of an effective innovation development process. Living labs should attain to this goal through the facilitation of user involvement in the innovation process. When living labs bring the key principles into practice, they are expected to reach those goals like efficiency and creativity. Additionally, as living labs approach their innovation processes in line with these guidelines, they should also reflect the characteristics that define living labs.

Figure 2.1: Key principles



**) Based on the descriptions given by CoreLabs (2007); Ståhlbröst (2008); and Bergvall-Kåreborn & Ståhlbröst (2009)*

The current literature on living labs only provides general descriptions of the key principles and the approaches they propose. As a result, both from a theoretical and from an empirical perspective, many things about the key principles remain unclear. For example, through what mechanisms does the engagement of users enhance the efficiency of the innovation process? In which ways can, and should, living labs involve users in innovation development? What kind of stakeholders should be gathered and what competences should they possess? Therefore, in the following sections the knowledge on the key principles is expanded and elaborated. In the first sections will be discussed in what way, or through which mechanism, the guidelines of the key principles are expected to lead to their respective goals. After that the key principles are each discussed into more detail.

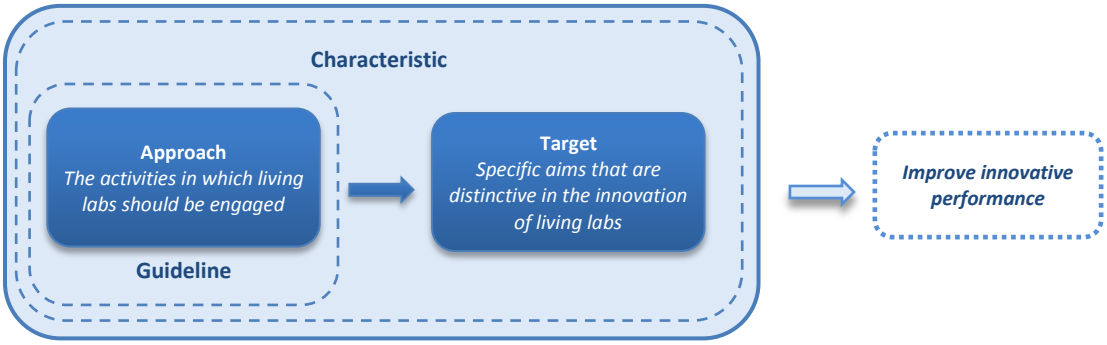
2.3 Mechanism of the key principles

As mentioned, each of the key principles prescribes the approaches living labs should take to reach to goals such as developing innovations creatively and generating valid results. However, often a direct relation between the prescribed approach and its goals is not present. In the case of empowerment, for example, it might be true that the engagement of users in the innovation process could enhance the efficiency of the innovation process, but that relation is far from causal. As a matter of fact, user engagement itself does not lead to efficiency; it rather is "user-driven innovation" that enables the efficient development of innovations (Bergvall-Kåreborn & Ståhlbröst, 2009, p.4). While the example concerns the key principle empowerment, that similar mechanism can be recognized among all key principles.

Thus, the theoretical mechanism behind the key principles can be divided into three steps. First, the key principles propose to living labs how they should approach the innovation process. Each of the guidelines prescribed by the key principles considers specific activities that a living lab should undertake, such as the engagement of users or to detect and analyze the needs and ideas of users (Ståhlbröst, 2008). Second, when living labs practice the guidelines correctly, they are supposed to reach specific targets. For example, by facilitating and engaging in user participation, living labs could stimulate user-driven innovation. The combination of these first two steps is also what characterizes living labs. For instance, living labs typically engage in "user-driven innovation, including users wherever they are and whoever they are" (Bergvall-Kåreborn, Holst & Ståhlbröst, 2009, p.2). The third and final step, considers the goals of the key principles. These goals should not be considered as an integral part of the key principles, but instead should be regarded as outcomes of the practice of the key principles. When living labs practice the key principles correctly, they are expected to improve their innovative performance by enhancing the creativity, efficiency or validity (*see figure 2.2*). This research focusses on the practice of the key principles, which relates to the 'approach'. And while in some cases the relation between a key

principle and its ultimate goal may be debatable, this research focuses the practice of the key principles, and not their supposed outcomes.

Figure 2.2: Mechanism of the key principles



As mentioned before, between living labs a large diversity in the organization of the innovation process can be found (Feurstein et al., 2008). That variety is mainly observed in the activities in which living labs engage, as they apply different methods (Feurstein et al., 2008), involve different kinds of stakeholders (Leminen, Westerlund & Nyström), or use different settings (Bergvall-Kåreborn, Holst & Ståhlbröst, 2009). Those variations are possible as their guidelines are only described in more general terms, rather than detailed instructions. However, it is therefore difficult to observe the ways in which living labs can attain to their targets. For example, again with regard to the principle of empowerment, if a living lab enables its users to choose the color for a newly developed innovation, but does not involve them any further, does that living lab empower its users? Following the prescribed approach, it is difficult to state that the living lab does not practice empowerment appropriately, as it enables and engages users to participate in the innovation process. However, in this example, is it still possible for an innovator to claim to be facilitating user-driven innovation? And to what extent should this particular practice help to reach the key principles' ultimate goal of efficiency?

In order to answer those questions, it is important to take a closer look at the guidelines that the key principles propose. Based on the approaches they prescribe, it is possible to relate and compare each key principle to other methodologies and theories that propose similar guidelines (such as Participatory Design, Soft Systems Methodology, or Open Innovation). These methodologies provide the ability to expand and elaborate the knowledge on each of the key principles. Also it is possible to describe more concrete aspects of the practice of each key principle. For example, when considering the key principle empowerment, it is not only necessary that users participate in the innovation process, just as important

is the way in which they are enabled to do so (Kensing & Blomberg, 1998). In the following subsections each key principle will be discussed separately to expand on the available knowledge.

2.3.1 Openness

The key principle of openness regards the involvement of stakeholders that possess varying perspectives, knowledge and expertise. Partners bringing different skills and competences are expected to strengthen the knowledge base of the living lab, hereby enabling rapid progress in the innovation process (Bergvall-Kåreborn, Holst & Ståhlbröst, 2009). The principle of openness is founded in the idea that collaboration "makes possible the achievement of ends that would be impossible without it or that could be achieved only at extra cost" (Nahapiet & Ghoshal, 1998, p.245). Through networking and collaborations with different stakeholders, many different perspectives and competences are gathered that enable living labs to innovate at high speeds (Pallot, Trousse, Senach & Scapin, 2010).

The theory of Open Innovation stimulates individual organizations to engage in collaboration with other actors, as it argues that organizations neither need nor should exclusively rely on their own R&D (Gassmann & Enkel, 2004). According to Open Innovations theory, organizations can and should improve their innovative performance by focusing on their strengths, while seeking externally for knowledge or competences they lack. Organizations can practice this theory individually, either by outsourcing or selling their own knowledge or, conversely, by infusing their internal knowledge base with externally gathered ideas and expertise (Enkel, Gassmann & Chesbrough, 2009).

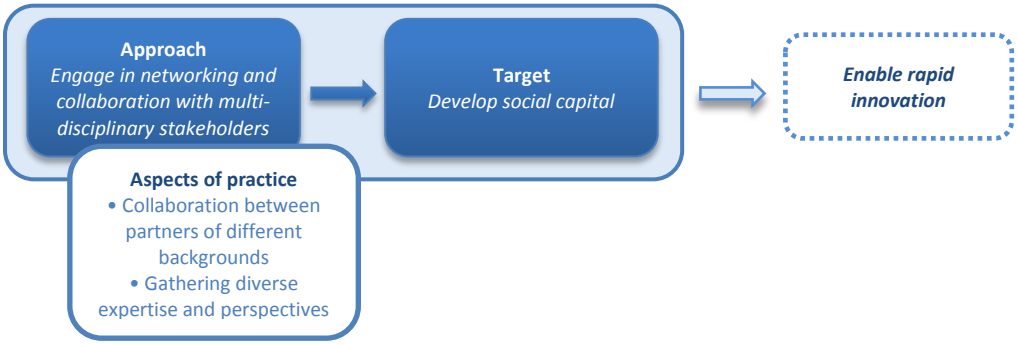
When organizations structurally collaborate in innovation, this is often facilitated by so-called 'intermediaries' that broker or facilitate cooperation (Gassmann & Enkel, 2004). As they enable the innovation among multiple partners and users, living labs are also considered to be intermediaries of Open Innovation (Almirall, 2008). However, contrasting with the intermediaries described by Chesbrough which consist of globally operating firms, living labs are commonly "public-private partnerships" (Almirall, 2008, p.22). In these public-private-partnerships, collaborations usually consist of businesses and developers, governmental representatives, academic researchers, and users; otherwise known as the "quadruple helix" (Cleland, Mulvenna, Galbraith, Wallace and Martin, 2012, p.129).

In networks and collaboration, such as Open Innovation intermediaries, social capital is created. Social capital is created by the shared knowledge and capabilities in relations between actors (Nahapiet & Ghoshal, 1998). Like other forms of capital (e.g., financial or human capital), social capital is considered a valuable organizational resource, and in its absence reaching specific achievements would not be

possible (Coleman, 1988). In collaborations, the creation of social capital increases productivity as partners develop "reliable and effective communication channels across organizational boundaries" (Landry, Amara & Lamari, 2000, p.7). In contrast to other forms of capital, social capital can only be owned between partners in a relationship, and no single actor is capable of having exclusive ownership (Nahapiet & Ghoshal, 1998).

Practicing openness, living labs try to enhance the speed of the innovation process. Therefore, the collaborations in living labs should represent stakeholders that have diverse perspectives and expertise. Rapid innovation is enabled as in living labs develop social capital that is relevant for their innovation processes. What exactly is considered as relevant knowledge and competences can be expected to vary between living labs. However, as public-private partnerships, living labs are expected to at least have access to stakeholders from each party in the quadruple helix. Therefore, when observing the practice of openness in living labs, one must regard the background of participating stakeholders and the diversity in perspectives and expertise that they bring.

Figure 2.3: Openness



2.3.2 Continuity

While the key principle of openness considers the benefits of collaborating in innovation, continuity regards the positive influence of relational stability and durability on the creativity and innovation in living labs (Ståhlbröst, 2008). To promote learning, creativity and innovation in organizational networks, high-trust relationships are considered to be necessary to facilitate the required levels of communication between parties. Many different definitions of trust can found in the literature, though "two issues seem central: first that trust is about dealing with risk and uncertainty, second that trust is about accepting vulnerability" (Newel & Swan, 2000, p.1293). In inter-organizational relationships, trust

between partners is not only an enhancer of innovative performance; it is in fact a fundamental trait that has to be developed to even enable collaborative innovation (Dyer & Chu, 2000).

For the effective exchange of knowledge and resources, partners have to develop the trust in each other to be "honest, capable and committed to joint aims" (Dodgson, 1994, p.291). Therefore, when engaging in inter-organizational collaboration, one of the most important aspects is to create and sustain inter-personal relationships (Dodgson, 1994). In network theories, a relationship between two actors is referred to as a 'tie'. The higher the strength of a specific tie, the closer the bond between two actors is considered to be. The strength of (personal) ties, according to Granovetter (1973, p. 1361), entails a combination of the "amount of time, emotional intensity, intimacy (mutual confiding) and the reciprocal services" that characterizes the tie. Strong ties facilitate good (cross-border) collaboration, and as such, allow for complex knowledge to be produced and transferred in networks involving close relationships among the partners (Alter & Hage, 1993; Uzzi, 1997).

In the definition given by Granovetter, both trust (in the form of intimacy) and continuity (amount of time) are aspects that contribute to the strength of ties. However, the relation between continuity and trust is more complex, as continuity can be seen as both an antecedent and a consequence of trust (and vice versa) (Seppänen, Blomqvist & Sundqvist, 2005). Over the course of a relationship trust develops when partners prove that they are predictable and do not act opportunistically. However, if there is no trust between two actors, a relationship is not likely to be durable. As in living labs often multiple organizations collaborate, it is more relevant to look at the stability of the entire partnership. As the composition of partners in networks changes over time, new relations have to be formed, while others expire, impairing the possible build-up of strong ties within the alliance.

In stable relations, trust develops over time, as partners are willing to be more susceptible to the risks of collaborating with other organizations, as they are ensured that their counterparts will not take advantage of their vulnerabilities. Besides stability, the strength of ties is also dependent on the intensity of interactions between actors (Gilsing & Nooteboom, 2004). For instance, in the workplace, stronger ties are more likely to develop between colleagues that work together daily, than between two co-workers that only meet every six months. When they interact regularly, actors are presumed to be more involved in a relationship, which strengthens their mutual trust. Therefore, when regarding the continuity of a partnership, not only is it important to regard the stability of that relation, but also to take the frequency of interactions between actors in consideration. A substitute for trust is the use of control mechanisms, such as written agreements and contracts. By formally agreeing over issues such as

confidentiality, the sharing of resources and intellectual property, the need for trust is limited while still enabling collaboration (Gilsing & Nooteboom, 2004).

So, as durable relations between stakeholders are established, trust develops in the partnership. And, subsequently the living lab is able to generate more creativity from their collaboration. Over time, as actors become more familiar with each other, that trust develops. Therefore, in living labs, more stable partnerships are expected to better facilitate the development of trust. However, not only the stability of networks enhances trust. The more frequent actors interact, the more familiar they will get. Therefore, it is also important to regard the intensity of the relationships. Finally, when considering the development of trust, it is also beneficial to consider the formal and legal agreements that bind partners, since such as contractual agreements can (partially) substitute the effects of trust.

Figure 2.4: Continuity

2.3.3 Empowerment

An innovation process is effective if little time and effort is lost in the creation of ideas or concepts that will not be developed further as they do not meet the needs and desires of the targeted users. The key principle of user empowerment is concerned with this efficiency (Bergvall-Kåreborn & Ståhlbröst, 2009). Users are those individuals that are expected to benefit directly from using a product or a service (von Hippel, 2009). By enabling these users to be active and empowered participants, they can steer and direct the innovation process in a desired direction, also known as user-driven innovation (Leminen, Westerlund and Nyström, 2012). As the final product or service should also reflect the wishes of users, the earlier in the process users are involved, the better, as that can prevent unproductive design decisions that may also be costly, time-consuming and even irreversible (Wright & McCarthy, 2010).

In order to innovate successfully, two types of information are required. The first type, which considers "generic solution information" (von Hippel, 2009, p.33), is the knowledge of technological capabilities,

production processes or material specifics. Designers and manufacturers are the ones that possess and are able to apply this expertise in a large variety of context. For instance, when a couple is privately building a house, the contractor (the manufacturer) usually has a better knowledge of what combination of materials and techniques is best suited to build the walls. However, what the contractor does not know is what the design of the house should look like or if there are specific preferences or desires that should be incorporated in the construction. That type of knowledge, the "need and context-of-use information" (von Hippel, 2009, p.33), can only be supplied by the eventual users of the house.

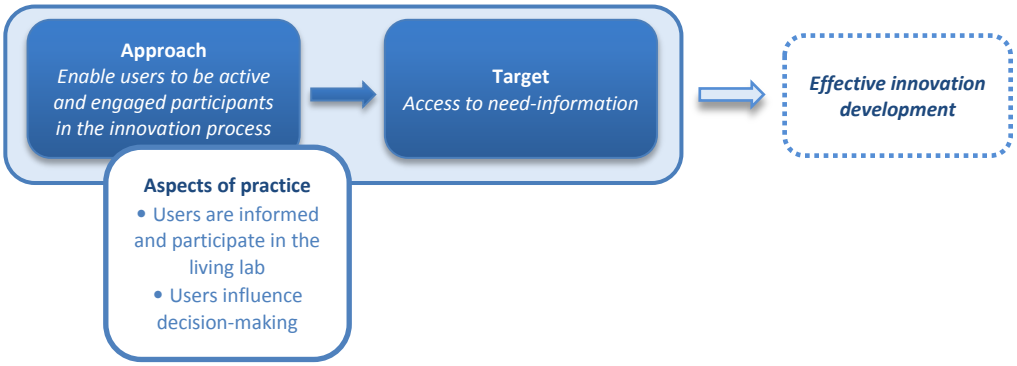
Both solution information and need information is generally very 'sticky', which means that it is difficult and expensive to transfer the information from the site where it is generated (von Hippel, 2009). The owners of the example above would probably have to spend a lot of effort and money to acquire the same extensive knowledge of building materials and techniques possessed by the contractor. Vice versa, while the contractor may eventually learn the needs and desires of these owners, that knowledge will probably not be applicable when building a house for another couple as it is to specific. By involving the users in the construction of the house, the manufacturer can prevent that decisions are made with which the users do not agree (and are thus inefficient or do not meet the desires of the owners). As users can best provide that need-information, they are considered a valuable resource in development processes (Rasoulifar, Thomann & Villeneuve, 2010).

However, while user involvement is valuable in innovation development, users usually lack the required knowledge or competences to participate independently (Clement & van den Besselaar, 1993). Therefore, users have to be enabled to be engaged and participating in the development of innovations. Participatory Design is such an approach that facilitates the active involvement of non-designers in innovation processes (Kensing & Blomberg, 1998). In Participatory Design, the experiences, interests and skills of users and designers are integrated in the design process. The goal of Participatory Design is to improve the likelihood that developments will be well suited for the environments and routines of users. Non-designers are enabled to contribute to the innovation process, as they are provided with techniques or toolkits to support them in modifying and appropriating concepts or technologies designed by others (Sanders, Brandt & Binder, 2010).

While there are many different tools, techniques or infrastructures in Participatory Design, three basic requirements are necessary to enable the participation of non-designers in innovation processes (Kensing & Blomberg, 1998). These requirements should also be considered in living labs, when practicing the principle of empowerment. First, participants should have access to information that is relevant for the innovation process. What is considered relevant information can be different for each

process, but could consist of (but is not restricted to) the technological possibilities, possible positive and negative consequences, and also the costs of certain options or choices. Secondly, as such information might be difficult to comprehend for persons with limited expertise in innovation development. Users need to be able to make sense of that information. Participatory Design strives to make design ideas as concrete as possible for participations in order to enable them to formulate their personal opinion on problems. That leads to the third and final requirement for successful participation, which states that users should be able to influence the decision-making processes. Both in Participatory Design as in user-driven innovation should the participants have an important vote in directing the innovation process (Wright & McCarthy, 2010).

Figure 2.5: Empowerment



2.3.4 Realism

The fourth principle, realism, is concerned with the results that are generated in living labs. The results of living labs are not only developed innovations, but also the identification of users' needs, design ideas, or the outcomes of prototype testing. By practicing the key principle of realism, these results should be valid for the 'real' market (Bergvall-Kåreborn & Ståhlbröst, 2009). To enhance that validity in the design process, living labs try to involve actual users from their 'target population', the group of people for which innovations are developed (Ballon, Pierson & Delaere, 2005). Additionally, in contrast with other methodologies of user involvement, much of the innovation process is situated in the natural environments of those users. In living labs, concepts and prototypes are tested by users in situations that reflect their daily life as accurately as possible (Eriksson, Niitamo & Kulkki, 2005).

This type of testing can be called "ecological validity" (Markopoulos & Rauterberg, 2000, p.35), which regards if a result or effect is representative of what happens in everyday life. It differs from external validity, which considers whether an effect can occur across different people and settings. Ecological validity should not be confused with, but can be a prerequisite or cause of, external validity (Brewer,

2000). When outcomes are regarded ecological valid, they may only be representative for those users that are involved and their individual situations, but do not necessarily apply to others not involved in the study. Thus, living labs that strive to attain external validity in their outcomes, should consider the notion that ecological validity in the innovation process alone may not suffice.

Each project or innovation process starts with a specific goal. That goal might be to improve a current process or technology, to find (answers to) specific needs, or to solve a problem situation. Subsequently, each goal has a scope, which refers to the project group of people that should benefit from a successful project. The innovation project is considered ecologically valid if the methods and settings realistically reflect the environment in which problems occur or arise (Brewer, 2000). Thus, an accurate representation of the environment is required. However, the external validity of a project is dependent on the extent to which the outcomes are applicable to the targeted population. Therefore, for external validity, it is important that not only the methods and settings represent reality, but the users that are involved should realistically reflect the targeted population.

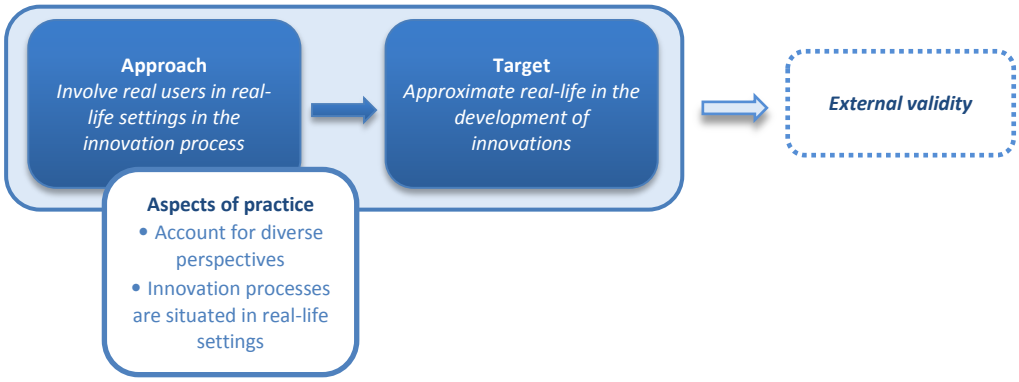
In addition, reality is a very complex concept, as each individual may answer the question of 'what is real' differently. As reality depends on perspective, what one person considers real does not necessarily hold the same meaning for another; what one might regard a 'freedom fighter' is considered a 'terrorist' by others (Lane & Oliva, 1998). As the needs or problem situations addressed by living labs are commonly shared among many individuals, it is important to take note and act on that complexity. Soft Systems Methodology (SSM) provides living labs with an approach to do so. Central in SSM is the notion that social reality is complex, and therefore cannot be "assumed to have systemic properties" (Lane & Oliva, 1998, p.215). Originally designed to support in the interpretation and definition of problem situations in organizations, the primary concern of SSM is not to study issues objectively in order to create an optimal solution. Instead, the methodology is intended to create the richest possible picture of a problem with the intent to gradually and iteratively improve on that situation (Checkland & Holwell, 1998).

In order to deal with the complexity of reality, Soft Systems Methodology consists of three main steps (Lane & Oliva, 1998). While theoretically these steps follow each other in consecutive order, it is important to notice that Soft Systems Methodology considers innovation as an iterative process. Therefore, both in SSM as in living labs, the sequence of steps may and sometimes even should vary (Checkland & Holwell, 1998). The first step considers the conceptual exploration of a problem situation. By involving both the problem owners (users in living labs) and other stakeholders, the "richest possible picture" of a problem situation should be created (Lane & Oliva, 1998, p. 217). Different stakeholders often have different feelings and opinions about a situation and in this conceptual exploration, all

opinions are equally relevant. As it is often too complex to express problems or needs in text, that richest possible picture is often represented visually (Checkland, 1981).

Thereafter, in the second step, ideas and concepts are created to address at least part of the problem situation (Lane & Oliva, 1998). Rarely will it be possible to completely solve a need for all those who experience it, as each individual may expect or require a different solution. Therefore, possible solutions should try to answer part of a need, in order to enable further improvements down the road. In Soft Systems Methodology, to solve problem situations often the goal is to make incremental rather than radical improvements (Checkland & Holwell, 1998). Therefore, after developing solutions, the third step addresses the way in which potential solutions are tested. As is also the case in living labs, the suitability of solutions in SSM is examined in the actual problem situations, with the involvement of the problem owners (Lane & Oliva, 1998).

Figure 2.6: Realism



2.3.5 Spontaneity

The final key principle, which is that of spontaneity, regards how living labs should try to successfully develop innovations. As stated by Bergvall-Kåreborn and Ståhlbröst (2009), in order to succeed with new innovations "it is important to inspire usage, meet personal desires, and fit and contribute to societal and social needs". Spontaneity states that innovations should answer the needs and desires of user, and therefore the goals of this key principle are similar to that of empowerment. However, where empowerment regards the ability for users to be engaged in the innovation process, the principle of spontaneity is more focused on identifying and analyzing the needs and ideas of the users. More than empowerment, spontaneity considers the generation, collection and analysis of data in living labs that, if performed objectively and unbiased, can greatly enhance the creativity and quality of innovations developed (Bergvall-Kåreborn & Ståhlbröst, 2009). Therefore, the key principle of spontaneity much more resembles that of realism. However, where realism is concerned with the extent to which the

setting of the innovation process approximates reality, the key principle of spontaneity regards the quality and value of the information taken from that setting.

While user participation is a very valuable asset for innovation development, the capability of users to guide the development of new products and services is limited by their experience and their ability to imagine and describe possible innovations (Leonard & Rayport, 1997). That limitation does not hold that users cannot actively participate in innovation developments; however, it does imply that living labs should not solely depend on these people to guide the innovation process. The possible contributions of users are restricted for two reasons (Leonard & Rayport, 1997). First, users cannot desire for what they do not know is (technically) possible. For example, while technically possible, practically nobody could even imagine a smartphone with touchscreen only a few years ago. The second limitation for users to contribute in innovation processes is that they may be incapable of articulating their needs. People create 'work-arounds' for situations that are inconvenient yet become habitual, so that users are not even conscious of those inconveniences (Slater & Mohr, 2006).

Empathic design is based on those ideas that users are limited in their ability to clearly share their needs and desires (Slater & Mohr, 2006). This approach focuses on identifying and understanding the needs of users rather than from the direct articulation of those needs. From the viewpoint of empathic design, the greatest potential benefit for innovators is to identify and answer those needs that users are not able to articulate (Heilman, Nadeau & Beversdorf, 2003). By creating innovations that fit in their daily lives, developers promote themselves and their products by showing their customers to be able to understand and empathize with them (Leonard & Rayport, 1997).

In empathic design the importance to collect data not only through focus groups and interviews, but to concentrate on visual information as well is stressed (Slater & Mohr, 2006). Therefore, observation is a main method of data collection in empathic design. In close relation to the key principle of realism, observations should preferably be undertaken in the daily life of the users, there where they actually use experience their needs or use the developed innovations (Leonard & Rayport, 1997). By incorporating observation next to the collection of text and numbers, several types of valuable and additional information can be generated, such as patterns in usage (under what circumstances do people use a specific product or concept), users customization (does a product have certain flaws or are there other (unexpected) applications), and unarticulated needs (do users encounter problems of which they are unaware or do not know they can be addressed) (Leonard & Rayport, 1997).

Following the key principle spontaneity, living labs have to fit the needs of their users and society. From empathic design a few guidelines can be derived to effectively do so. The first guideline regards the methods through which data is collected. While participants in focus groups or interviews will provide valuable inputs for the innovation process, it is also important to recognize the limitations of these participants. Empathic design therefor proposes also to collect data through observation, preferably in real life (Slater & Mohr, 2006). Secondly, to optimize data collection, a multi-disciplinary team of researchers and innovators should be involved in the process. When collecting data through observation, it is impossible to record all available information. By combining the knowledge of a diversity of disciplines, each team member recognizes different cues that might lead to different information. The third and final guideline is, after data is collected, to "de-bias" the data, by confirming and analyzing the data (Leonard & Rayport, 1997). In living labs, the users should be participants in this third step, as they can help to confirm and further analyze the data that is collected.

Figure 2.7: Spontaneity

3 Methods

After expanding the knowledge on the key principles and deducing how their practice can be observed in living labs, this chapter describes the methods that are used to answer the main question of this research. By examining the activities and actors of a living lab, an elaborate overview of that living lab is created. Based on various indicators, the practice of the key principles is derived from that overview.

3.1 Research design

In the previous chapter, the key principles have been discussed into detail, and the core aspects of their practice have been identified. The central question of this research is concerned with the way in which living labs practice the key principles. However, while the aspects of the key principles' practice have been identified, it is still not know where or how to observe their practice. To explore the practice of the key principles a comparative case study is performed among four living labs in dementia care. Through document studies and in-depth interviews with informants data is collected to answer the research question. The living labs are the units of analysis in this research. The units of observation are the members of the project teams in each case. As is usual in exploratory research, this study is based on qualitative data, which is collected through interviews with the project members, document studies and observations. Data collection is aimed to create a rich description of each case, from which the practice of the key principles can be deduced, observed or interpreted.

The participating living labs, and therefore also this research, are situated in an international collaboration of four living labs that develop innovations for dementia care, called 'Innovate Dementia'. This research is conducted on behalf of one of the partners in that collaboration, namely 'Stichting Geïntegreerde Geestelijke Gezondheidszorg Eindhoven en de Kempen' (GGzE).

3.2 Sampling

Multiple cases are examined in this research. The sampling of cases is aimed at enhancing the informational value of the observations that are made (Lincoln & Guba, 1985). More specifically, in this research theoretical sampling is applied, to "facilitate the development of theoretical insights" (Straits & Singleton, 2011, p.298). This study does not aim to develop statistically generalizable outcomes; rather it tries to establish a starting point for future research. Four living labs, operating in the same context, are investigated in this research. The cases that are included in this research are all partners in the Innovate Dementia project. In addition to GGzE, located in Eindhoven (Netherlands), the other living labs are situated in Krefeld (Germany), Liverpool (United Kingdom), and Turnhout and Geel (Belgium). In each of the cases in this research, a project team that leads and organizes the living labs is present. These teams

are fairly small in size, as only a couple of individuals take part in the 'daily' operations of the living labs. Together, these individuals are involved in most, if not all, activities in which the living lab engages. These people, whom this research considers as the 'core' members of the living labs, represent the informants of this study. In each case, the number of people that are considered core members ranges between two and five people.

3.3 Data collection

An appropriate way of examining this practice would be through observations. However, as multiple cases across different countries are examined in this study, it is not possible to conduct proper and intensive observations across all cases. Additionally, none of the involved living labs have a single setting in which they operate, on the contrary, in most cases various team members work in different organizations and situations. Therefore, the data for this research is collected through document studies and in-depth interviews with the core members in every living lab. When studying phenomena that "transcend particular settings" or are geographically diffused, in-depth interviewing is considered an appropriate method (Straits & Singleton, 2011, p.304). For the interviews with the core members of each living lab formal appointments have been made. Most, but not all, interviews are conducted face-to-face, at the actual locations where the informants are situated. The interviews with the members of the English living lab have not been conducted on site, but through online teleconferencing. Additionally, due to scheduling difficulties, one interview in Eindhoven is conducted by phone.

Through the interviews with multiple informants, the aim is to create a complete overview of the living labs and their operations. In studies with an exploratory nature, Straits and Singleton (2011) suggest that 'open' interviews, more resembling a conversation, are often best suited to gather relevant and elaborate information on a particular subject. Therefore, it is chosen to conduct semi-structured interviews, and to that end an interview guide is developed, providing only a rough structure to the interviews. For two reasons is chosen to avoid direct questions with regard to the key principles. The first reason is that, as living labs are expected to be aware of the key principles and their message, it is possible that interviewees will provide socially desirable answers to direct questions of their practice. Secondly, as the key principles are only defined in abstract and general terms, they leave a lot of room for interpretation. Because of the complexity of these concepts, chosen is to discuss the 'daily' operations of the living labs, and to analyze these discussions in order to derive the practice of the key principles. The interview guide presents the general course of an interview. To ensure that all key principles are discussed, an overview of the aspects of the practice of each key principle is included, with some topics for the interviewer to discuss (*see appendix I*). However, no concrete questions or order of

topics is determined before the interviews, as their formulation is dependent on the course of the conversation (Straits & Singleton, 2011).

The nature of the data collected through the document studies is such that it is more appropriate to be used as enrichment of the data from the interviews, as it only provides sparse information on the operations of the living labs. The documents that are studied have been made available from the Innovate Dementia project. Mostly, these documents describe the actions and goals of the individual living labs in Eindhoven, Liverpool and Krefeld. The fourth living lab, in Belgium, only joined the Innovate Dementia project at a later time, and is therefore not described in these documents. As for this fourth case no comparable documents were available, this case is therefore primarily investigated through the interviews with the informants.

During the course of this researcher, several meetings, both physical and virtual have been attended by the researcher. However, during these meetings, in which the research took both the role of participant and of observer, no data has been collected. Therefore, these observations are mainly used as background information for the researcher, in order to create a better understanding of the living labs and the projects that they are working on.

3.4 Measurement

In the theoretical chapter of this thesis the key principles have been described by means of one or more aspects per key principle, in which their practice can be observed. In order to subsequently enable comparisons to be made between the cases, indicators have been derived based on these aspects of practice. An overview of the key principles and their indicators is given in the operationalization table, presented in the appendix (*see appendix II*). In each case is observed how the indicators are realized. To compare the cases, each indicator will be scored on an ordinal scale. That is to say, for each indicator a scale of five 'ranks' is devised, ranging from '++' to '−−'. If not mentioned otherwise, '++' indicators 'large' or 'more', while '−−' refers to 'small' or 'less'. It should be mentioned that these scales are not intended to rank the cases in order of their performance in the key principles, but only to compare their practice of the key principles. Only for the purpose of visualization is chosen to use a scale of plusses and minuses.

3.5 Data analysis and interpretation

Although data is collected through various sources, the primary source for analysis is the data collected through the in depth interviews with the core members of each living lab. The data from these interviews provides this study with the most elaborate and detailed description of the 'make-up' of each living lab. Therefore, the first part of the analysis is based on the information derived from the

interviews. The data from the documents studied is incorporated later on in the analysis, where their information is used to expand on the outcomes of the interviews. However, first the available data has to be processed to enable their analysis. The examined documents already represent written data ready to be analyzed, the interviews do not. Therefore, the interviews with informants are recorded on audiotape and subsequently transcribed.

In order to answer the research question of this thesis, the data is analyzed through various steps. The first step is to structure and reduce the large 'bulk' of available data. For each case, the data is structure along two 'labels': 1) which actors are present in the living lab, and 2) what activities are undertaken in the living lab. The transcriptions of the interviews, along with the documents and field jottings are read, and relevant sections are highlighted in three colors: blue (actors), red (activities), and purple (both) (*for an example, see appendix III*). These highlighted sections, which range from only a few words to multiple sentences at once, are gathered in two separate tables: one for the present actors, and the other for the activities. Sections that consider both actors and activities are copied in both tables. In each table the copied sections are immediately gathered along their 'topic', which is usually a specific actor or activity. For example, all data mentioning the actor 'government' are collected under the heading labelled government. This is done separately for each case.

After structuring the data, the second step is considered with a categorization of the available data. Categorization is also done according to the previously mentioned labels: the actors and the activities. In both tables is searched for commonalities between the labels. With regard to the activities, two general types of activities are identified in the data: activities that are directly considered with the development of innovations, and 'other', more organizational activities (such as meetings or promotional activities). Each single activity is categorized with a summary of the data. To structure that information, two separate tables are created: 'innovation projects', and 'other activities'. For each activity is described which actors are involved, and what is done. The tables for each case are provided in the appendix (*see appendix IV*). Based on the innovations table, sub question one can be answered. For each project an elaboration of the innovation is made and who the users are of that innovation.

The table outlining the actors present in the data is also categorized. In this case categorization leads to the identification of different backgrounds of stakeholders that are present in the data, such as academics or (mental) healthcare providers. In most cases multiple actors can be found sharing the same background. Each individual actor is subsequently identified, with consideration to their involvement in the living lab, and what role or tasks they perform. In order to represent that information a table is made, consisting of four columns: background, who the stakeholder is, how the

stakeholder is involved in the living lab (in what kind of activities), and a further elaboration describing the tasks and role of the stakeholders.

The information presented in these tables is then applied to answer the second and third sub questions. To answer the second sub question, which considers the practice of the key principles in each of the individual cases, the indicators from the operationalization table are used. For each living lab is described how the indicators are represented in the living lab. Those descriptions are presented in the results table in the appendix (*see appendix IV*). In order to answer the third and final sub question, comparisons are made between the living labs. As described in the previous section, all cases are scored comparatively on each of the indicators, on a scale from '++' to '– –'. In some instances a score cannot be determined on a specific indicator. If a score could not be determined because it is not relevant or applicable to a certain case, it is denoted with an 'X'. If it is not possible to score an indicator because of mixed results or a lack of information, it is indicated with '…'. These scores are also presented in the results tables (*see appendix V*). The answers to the sub questions will be used in answering the research question of this thesis.

4 Results

Presented in this chapter are the results of empirical investigation of the practice of the key principles in living labs in dementia care. A comparative case study of four living labs is performed. All four cases are part of an international collaboration, namely the Innovate Dementia project. First a description of this project is given. That description is followed by a short introduction of each case, with regard to the innovations that they develop. After that the practice of the key principles in each living lab is discussed more elaborately. In conclusion of this chapter the practice of each separate key principle is discussed.

4.1 Context: the Innovate Dementia project

The living labs described in this thesis are all partners in the Innovate Dementia project, which started in 2012 as transnational program, designed to accelerate and enhance North-Western Europe's capacity to "innovate, through facilitating the development and sharing of knowledge based approaches and best practices for people living with dementia" (Woods, Smith, Pendleton & Parker, 2013, p.6). The project is situated in four countries, in each of which living labs have been established that are engaged in the development of innovations for dementia care. The participating living labs of the Innovate Dementia project are located in the United Kingdom (Liverpool), Germany (Krefeld), the Netherlands (Eindhoven), and Belgium (Tongelre and Geel). In this project, there are four main themes in which innovations to improve the care for people living with dementia are developed: intelligent lighting, environment, exercise and nutrition, and models of assistance. In all living labs these themes are addressed, however each of the living labs is expected to lead the creation and sharing of expertise on one of the themes.

The Innovate Dementia project has stated three main goals: first (I), to create innovative concepts for people living with dementia based on their own needs. By improving the independence of dementing individuals, they can live longer at home. Subsequently, through such innovations, their presumed quality of live will improve, while simultaneously reducing, and hopefully even avoiding, the additional discomfort and costs of moving people living with dementia from their trusted environments into, for example, a nursing home. By experimenting and learning from the process of setting up these living lab projects, the second (II) goal of this project is to create a sustainable living lab architecture that supports exploration, evaluation and validation of new innovative concepts. During the project, the processes, as well as the problems that the organizations face are documented in order to create a 'protocol' of living labs. This experience-based protocol can subsequently be used for other projects as a guideline while setting up a living lab. Thirdly (III), Innovate Dementia aims to generate economic activity in the North-West European region through strong collaboration between stakeholders.

In this project, the four participating living labs communicate and collaborate on a regular basis through both physical and virtual conferences. During these meetings experiences and expertise are shared, and the partners are informed of the progress in all living labs. As the project is still in its relatively early stages, few actual exchanges of innovations or expertise have been made, but that remains a goal for the near future. Through such exchanges the living labs aim to improve their collective learning and progress into developing sustainable living lab architectures. Additionally, the partners also intend to exchange their projects and concepts so that these can be tested and validated with different users in various environments.

4.2 The innovations

As explained before, living labs can be expected to develop different innovations and target different users, even if they are active in the same context. The first sub question of this research is concerned with those potential differences. Through the interviews and document studies, the innovations developed by the living labs in Innovate Dementia are investigated. In this section, an overview will be given of the projects and innovations in which each case is engaged. Also is described who can be identified as the users and what the scope of those innovations is.

4.2.1 Liverpool, United Kingdom

The main theme for the English living lab is that of exercise and nutrition, and several projects addressing that theme are currently running in Liverpool. Common in those projects is that they target persons living with dementia as their users. The scope of these projects is very wide, as they include people in all stages of dementia, that can still be living at home, but also in nursing homes or on (geriatric) hospital wards. The living lab is also exploring types of innovations or projects, such as lighting and memory enabling technologies. Especially in these instances it is not suffice to say that dementing individuals are the only users, as both informal and professional care givers also make use of such innovations.

4.2.2 Eindhoven, Netherlands

While strides are made to integrate the entire innovation process, currently the projects in Eindhoven revolve around already existing products or technologies. As the Dutch case is the 'youngest' of the four living labs, the projects are ran not only to test and evaluate prototypes, but also to learn and improve on the actual process of running a living lab. In Eindhoven, the innovations developed and tested are intended to be used by dementing individuals and their informal caregivers (usually a spouse) in their own homes. The main theme in this living lab is that of lighting technologies, but innovations such as an activity planner, or a smartphone for elderly people, are also included in the living lab.

4.2.3 Krefeld, Germany

Distinct from the other cases is the German living lab. 'Models of assistance' is the central theme in Krefeld, and to that end a different scope is applied. In Krefeld, an established network of care providers is considered as the living lab. In this network, that comprises the entire city, new models and work processes are introduced in order to improve the regulation and coordination of the necessary care for people living with dementia. Concepts such as an independent case manager or a database that is shared among care providers are initiated in this network. While dementing people as well as healthcare professionals are identified as the users of the living lab in Krefeld, it is arguable that only the professionals are the actual users of the processes developed. No doubt, persons living with dementia are the main beneficiaries of these projects, but the healthcare professional are working with, and thus using, the new care models. These professional can thus be considered the users in the German living lab.

4.2.4 Turnhout and Geel, Belgium

As the final partner to join the Innovate Dementia project, the Belgian case has not yet engaged in projects focused solely on people living with dementia. It is does not yet known whether their central theme 'Environment', will be adopted. Despite their late entry, this living lab is also the only of the four cases to be part of an already established living lab. That living lab, called 'LiCaLab' (Living and Care Lab), is aimed at the development of innovations for elderly people with limited mobility. Their target population thus also includes people living with dementia. Two projects including dementing people are currently running in Belgium. The targeted population in both projects is that of limited mobile elderly people and their informal caregivers. The first regards the development of a breakfast for individuals that have difficulties swallowing, and is developed internally in the living lab. Also developed internally is the second project, which is a novel service where the Belgian postal services deliver the personal groceries at the home of the users. As in Liverpool, the scope of the innovations entails the entire local community, where people may be living in their own homes, but also in nursing homes or even hospitals.

Table 4.1: The innovations and their users

Living labs	Theme	Kind of innovations*	Users
Liverpool, United Kingdom	Exercise and nutrition	• Technology (Memory Enabling)	• People living with dementia • Care providers
		• Support Program (Exercise)	• People living with dementia
		• Technology (Lighting)	• People living with dementia
Eindhoven, Netherlands	Intelligent lightning	• Technology (Activity Manager)	• People living with dementia • Care providers
		• Technology (Intelligent Lighting)	• People living with dementia
Krefeld, Germany	Models of assistance	• Service Network	• Health and social care professionals
		• Technology (Supporting database)	• Health and social care professionals
Turnhout & Geel, Belgium	Environment**	• Support Service (home-delivered groceries)	• Elderly people with limited mobility
		• Nutrition	• Persons with difficulty swallowing

*) This column provides a sample representative of the projects in the living labs, but does not necessarily encompass all innovation projects.
**) As the Belgian partners joined the Innovate Dementia project at a later stage, it has not been confirmed that they have adopted this theme.

4.3 Practice of the key principles

Below, a more elaborate description of each of the cases will be given, with regard to how they practice the key principles. While theory behind the key principles and their practice is described in more detail in the second chapter of this thesis, a short description of each principle is presented in the following table (*see table 4.2*). After the discussion of each case, a similar table is presented highlighting the practice of the key principles in that case.

Table 4.2: Practice of the key principles

Key principles	Elaboration
Openness	• According to the principle of openness, living labs harbor a collaboration of stakeholders from various backgrounds. As partners possess different perspectives and expertise, the creation of social capital enables living labs to develop innovations more rapidly.
Continuity	• In order to be creative and collaborate effectively, relationships between stakeholders should be based on trust. Trust is developed through long-term and continuous relationships between partners.
Empowerment	• By enabling users to actively participate in the innovation process, living labs create access to so-called need information. As users provide feedback and direction to the living lab, they are able to innovation more effective and efficient.
Realism	• To generate results valid for 'real' markets living labs try to approximate the real world in their innovation process. They do so by incorporating users representative of the target population, and by accurately simulating realistic situation in which innovations are tested.
Spontaneity	• By incorporating various methods of data collection, living labs are able to develop innovations that better fit the needs of users.

4.3.1 Liverpool

The living lab situated in Liverpool is headed by a collaboration of two organizations: Liverpool John Moore's University and Mersey Care NHS Trust. As already implied by their names, these organizations stem from backgrounds in academics and healthcare. Together the two partners assume the leading role in the entire living lab, both in its organization and in the innovation projects. The three informants

interviewed for this case come from those organizations. Every three months the living lab organizes a meeting in which (practically) all involved stakeholders come together, called the 'regional stakeholder platform', or 'RSP'. In the organization of the living lab, this RSP is the most central aspect, as many partners and stakeholders are represented. According to an interviewee, invited to the RSP are: "*government, businesses, the third sector, such as the Dementia Society UK, etcetera, and people living with dementia"*. The participants in these meetings not only represent a mixture in backgrounds, but also in involvement in the living lab. Some may only attend the RSP once or twice, while others are permanently present.

It is interesting for a lot of stakeholders to participate in these meetings, as variety of topics is discussed. The RSP acts as a kind of steering committee as so "*that everybody is being involved in terms of decision making*". Decisions are made not only regarding the direction of the living lab overall, but single innovation projects are discussed as well. In those meetings the users, the people living with dementia, are considered as crucial contributors to the discussions, and are even being paid for their participation. This prominent role is given to the people living with dementia as they are considered as the experts "*because they are the ones who are living with the problems*". No decisions are made without the feedback of the RSP. As all activities in the living lab are discussed during the RSP, there is little room for detailed discussions. Therefore, work groups are organized, for smaller groups of stakeholders to collaborate on specific topics and projects.

As mentioned before, there are many different innovation projects currently running in the living lab in Liverpool. Many of these projects are inspired by discussions in the regional stakeholder platform. Especially in the early phases of the living lab, the RSP is not only used as the governing body of the living lab, but also as focus group. Through broad discussions with all participating stakeholders the living labs aims to create an insight and "*think about what it is like living with dementia. And within that we started with the everyday challenges of living with dementia*". Those discussions were recorded and analyzed, and from that analysis several topics were raised. And at each RSP these topics will return, enabling the living lab to further elaborate on certain subjects. For example, one of the topics was the need of people living with dementia for "*remembering to remember*". Through multiple iterations in the RSP, the living lab has gone from an elaboration on that need, to the creation of ideas or technologies that might solve that need. Here the living lab takes two different paths. On the one hand the living lab went out and researched available memory enabling technologies that might solve those needs. This led to several technologies that are currently tested in the living lab, such as MyLife and TellJoan.

The living lab is, on the other hand, also investigating and even partly developing such a technology itself. As the main partners of the living lab in Liverpool have no background in technology development, they

are not able to completely develop a new technology. Therefore the living lab has chosen to explore the concept of memory enabling technologies in collaboration with the users. In the RSP the participants started thinking about how to "*work with technologies and some of the priorities around technologies. And in the next RSP we started to bring products on the table that people could play with*". The users are introduced to various products in order to give them an idea of what a technology might look like. That led to discussion about what a technology should look like. "*One thing we looked at was developing a brief* [list of requirements]*, which is really about what should the qualities be of a good memory enabling product. And through the RSP we went back again, to verify these qualities, without knowing which product or what they looked like. So we now have those priorities. The next stage is to take that brief and bring it out to a number of SME's [small and medium enterprises] to make a prototype*".

In Liverpool, the development of innovations is thus a very collaborative process, in which users and many different stakeholders discuss and share their ideas. So far this has not led to the actual creation of a prototype, as the living is in search for a developer to assist them. However, the living lab has also engaged in other projects. Some projects stem from discussion in the RSP, such as the exercise program. Others might be inspired by technologies that are readily available, but have not been applied in the setting of dementia care. Additionally the living is also open for businesses to introduce their products or ideas in the RSP, so that they can receive feedback or even test the product among people living with dementia.

Prototypes or concepts are tested in many different ways and settings in Liverpool, as the living lab includes people in various stages of dementia. Some of them still live in their own homes, while others may live in nursing homes or in geriatric hospitals. Depending on the innovation, tests can be situated in one or more of these settings. In the case of MyLife, that product is tested among various settings for a period of several months. During testing, usually little data is collected other than the feedback given by users in interviews or focus groups.

Table 4.3: Practice of the key principles in Liverpool

Key principles	Elaboration
Openness	• In Liverpool partners come from diverse backgrounds and expertise. However, while there are businesses among the partners of the living lab, the living lab is searching externally for partners capable to further develop their ideas.
Continuity	• Two main partners are identified (Liverpool John Moore's University and Mersey Care NHS Trust) with many other stakeholders participating more distantly. The RSP is open to all interested parties, but contracts are made when partners participate in innovation projects. Businesses also attend the RSP, but are reluctant to discuss their ideas with potential competitors.
Empowerment	• A stable group of users attends the RSP, where they are considered as partners and experts on the topic of living with dementia. Through various ways users are kept up to date and involved in the living lab, and they have an important voice in decision making processes.
Realism	• Users are heavily involved in the exploration of needs and prototypes are tested by these users in their daily lives. Other relevant stakeholders, such as family members and healthcare professionals also participate in those sessions.
Spontaneity	• The living lab mostly uses inquiry methods, such as interviews and focus groups. Those meetings are recorded for later analysis, by researchers from the main partners.

4.3.2 Netherlands

In the Dutch living lab four main partners are identified, each with a different background: GGzE (a mental care provider), the Technical University of Eindhoven 'Tu/e' (academic), the municipality of Eindhoven (government), and Brainport (a network organization for local technology businesses). However, while there are four main partners, a distinction between their roles and tasks has to be made, as both the municipality as Brainport are only sparsely involved in the innovation processes of the local living lab. Both these partners are more dedicated to the transnational Innovate Dementia project as they perform important roles there (Brainport is the overall lead partner of the Innovate Dementia project, while the municipality is responsible for the project-wide communication). As stated by one of the interviewees: "*GGzE and the technical university are really the frontrunners in the local living lab*". The informants in this case, four in total, are also employed by GGzE (three informants) or by Tu/e (one informant). As the interviews were conducted in Dutch, the quotes presented in this section are translated to English.

The difference in tasks can also be seen in the collaboration between the partners. While GGzE and Tu/e meet at least weekly, the only regular meeting between all four partners is scheduled monthly. Both Brainport and the municipality of Eindhoven are also sparsely involved in the innovation projects of the living lab, as these are usually initiated and led by GGzE and Tu/e. Therefore, the monthly meetings are mostly used to discuss the overall progress of the living lab, while more in depth discussions regarding the innovations are held at other times. Between the GGzE and Tu/e clear roles are devided. As a technical university, Tu/e has a large expertise on the development of innovations. Moreover, Tu/e also has the most experience with regard to innovating through living labs. On the other hand, as a mental

institution, GGzE has access to a large population of people living with dementia, and features a large body of expertise in mental healthcare.

From the Innovate Dementia project, the living lab in Eindhoven is given the task to develop a protocol for setting up a living lab. However, as the 'youngest' of the four living labs, the Dutch living lab is also concerned with developing their own expertise at operating a living lab. To build and improve their own expertise the partners in the living lab are also 'experimenting' with innovation projects, for instance by attracting businesses that already have (relevant) innovations or products available to be tested. Such collaborations lead to benefits for all parties as a project is empirically tested, while the living lab is able to develop its own processes further, as put by one informant: "*so their product is empirically tested by us, or they are supported in further developing their product, while we are able to develop our processes further by testing that* product".

Thus far, all innovation projects in Eindhoven originated in other organizations or before the institution of the living lab. However, that does not mean that the living lab is only focused on testing existing products. The living lab is also engaging in the generation and exploration of needs for people living with dementia. Each new client of GGzE (diagnosed with dementia) is issued a questionnaire regarding their daily life. From the data generated through these questionnaires, topics are analyzed and used as input for focus groups. "*The questionnaires are issued to a large share of the 800 new patients that are enlisted with GGzE each year. And we also distribute those questionnaires outside of GGzE, because it is an easy and short screening. From that screening we want to select people that share the same needs, and invite them to participate in our focus groups*". "*That way, we can improve and enrich our focus groups, and can explore specific subject more elaborately. Then, we are also able to connect the discomfort of people to actual needs. For example, someone may not be able to walk the stairs, but is not required to do so, in his or her daily life. Then there is no actual need*".

Those focus groups are organized for different groups of stakeholders. Several focus groups have been held involving dementing persons and their informal caregivers (usually a spouse). However, other focus groups have involved healthcare professionals or user representatives. Those focus groups involving stakeholders other than the actual users are not only used to enrich the exploration of needs but also to gain support for the living lab from important actors in the mental health sector. "*So, we want to organize multiple focus groups, including patients, practitioners, to let people close to the field judge the available concepts, to get to know what they like and don't like*". These focus groups are also applied to allow users and other stakeholders to be informed and provide input on the progress of the living lab and its innovation projects.

Table 4.4: Practice of the key principles in Eindhoven

Key principles	Elaboration
Openness	• The collaboration consists of a mental healthcare provider, an academic institution, local government and a network organization for technology businesses. Actual businesses are not (structurally) part in the living lab, and therefore the living lab has to source that expertise externally.
Continuity	• Together, the four partners form a stable coalition, but mostly GGzE and Tu/e are involved in the innovation projects, while Brainport and the municipalities are more focused on the Innovate Dementia project entirely. Short term partnerships mostly involve innovation projects.
Empowerment	• Mostly through focus or discussion groups users are involved in the living lab. Many topics can be discussed in those meetings, such as the progress of the living lab overall, or specific innovation projects. While users are enabled to provide feedback in those meetings, their influence on decision making is limited.
Realism	• The users involved in the living lab display a preference for technically interested persons of higher education. However, through questionnaires, needs exploration reaches a much larger share of the target population. Tests commonly involve actual people living with dementia, within their home environment.
Spontaneity	• Almost exclusively inquiry methods are applied, as data is collected through questionnaires, interviews and focus groups. It is not known to what extent that data is analyzed, but involved in data analysis are researchers with a background either in healthcare or (industrial design) academics.

4.3.3 Germany

Led by the Alexian Dementia Research Center, the German living lab is integrated in an existing network of local care providers. In this case, two interviews are held with the project leaders at Alexian. The partnership of the living lab is constituted of these care providers, either from Krefeld or the neighboring regions. Together they form a steering committee called the PSAG ("Psychosoziale Arbeitsgemeinschaft"), which meets every month. Said by one interviewee: "*there are hospitals, partners from the community, not only from Krefeld, from Viersen, Düsseldorf, and we talk about our project and at the moment we make agreements, so they work also in this network*".

The network in Krefeld has already been established in 2006, as to improve the help and service structures in Germany. "*So I think we started, seven years ago, to build a network here in Krefeld and it increased step by step.*" This collaboration aimed to improve the local care systems, and develop a method of collaboration for care providers. As the living lab is integrated in this network, its aims are the same. Therefore, the concepts and innovations that are developed here are intended to improve on the cooperation between the partners and the care they provide to people living with dementia. "*One thing is to improve the work with the people, to improve the help system, and to build up new service structures that are missing in some of the regions of Krefeld*."

In Krefeld, the innovations that are developed in the living lab are often based on research of different care models around the world. Rather than developing concepts 'from scratch', the project team from Alexian, consisting of around 30 coworkers with a variety of expertise in healthcare, travels around the world to visit other organizations. They then look for concepts or initiatives that would fit in their local

environment or that would solve challenges with which they cope. These challenges, or needs, are identified mostly by the partners in PSAG. For example, after noticing that dementing patients attend to different hospitals without those care providers being aware of it, it was decided to institute independent case managers. A group of case managers was established, and each of those represents a group of patients for which they are responsible. This new concept is then embedded in the partnership, in order to better coordinate the care for individual patients.

Other concepts are also developed, aimed at providing better care to people living with dementia, and putting them in charge of their own care program. Both people living with dementia and their family members are invited to workgroups that discuss their situation in the care system. However, it is not entirely clear how much influence they can exert in those meetings. Neither is known to what extent the actual users, such as the case managers, are involved in the development and evaluation of the concepts that are introduced. It also seems that new concepts aren't really tested, but rather are implemented to be gradually improved. Of course, in the steering committee, the PSAG, health care providers are involved, however, there is no mention of a group of 'users' or professional that participate in this meetings.

Table 4.5: Practice of the key principles in Krefeld

Key principles	Elaboration
Openness	• Large collaboration of local care providers, headed by Alexian Dementia Research Center. At Alexian a team of (healthcare) academics supports the living lab, however, no businesses or developers take (active) part in the living lab.
Continuity	• All collaborations are formalized, and especially the collaboration in the network is very stable. Very few stakeholders participate only temporarily in the living lab, and if so, they mostly do on a project or contract basis.
Empowerment	• Professional caregivers, which are the users of the innovations, and also the people living with dementia are included in the living lab, but only to a limited extent. It appears that, as the scope of the innovations covers the entire network, most influence lies with the network partners rather than the users.
Realism	• Users are involved in the living lab, but only to a limited extent. Next to that are prototypes implemented permanently in the network, rather than tested over a certain period of time.
Spontaneity	• Data is collected through various measures, both inquiry (group discussions and questionnaires) and non-inquiry (observations). It is unclear how that data is processed and analyzed.

4.3.4 Belgium

In Belgium, the living lab, LiCaLab, is part of the research department of a local university college, called Thomas More De Kempen. Four interviews were held with co-workers at LiCaLab. LiCaLab has been established as a living lab before they became partners in Innovate Dementia, and is originally focused on developing innovations that enable elderly people to live longer in their own homes. At the time of this research LiCaLab had only been part of Innovate Dementia for a few months, and has yet to engage

in projects aimed solely at developing innovations for people living with dementia. However, the living lab, already, has two projects running that also include people living with dementia.

While LiCaLab has longstanding partnerships with local governments and a large pharmaceutical company, other than Thomas More, there are no main stakeholders that are permanently involved throughout the living lab. LiCaLab acts as a facilitator or broker for developers or academics that are willing to empirically test their developments or innovations. "*We function as organizer and coordinator of entire projects, and try to act as connector between projects*." At Thomas More, LiCaLab is embedded in a multi-disciplinary department, where people of wide diversity of professional and academic backgrounds collaborate. That diversity ranges from economics, to healthcare specialists and from engineers to chemists, and if necessary, all different coworkers participate in projects.

Those projects come from a variety of sources. While LiCaLab may only facilitate projects or prototypes to be tested, they are also involved in the development of new products and processes. Their project with the national postal services is one such example. In that case, LiCaLab (or actually Thomas More), was approach by Bpost (the postal services) with a request to support and participate them in exploring new business opportunities. That has led to the concept of the post carriers to not only deliver the mail, but also daily groceries to people at home. "*That kind of came from a collaborative brainstorm with them [Bpost], as we defined the strengths of the mail delivery, that are their logistics and organization processes, which enables them to deliver not only mail, but also other goods, at home*." This project is currently being run in the city of Turnhout, were for over half a year 100 users (among which are people living with dementia) get their groceries delivered at home.

The living lab also engages in the generation and exploration of needs, and does so in a variety of ways. One of those approaches is the analysis of available and relevant data, subtracted from a large international database. From this database input is drawn and similar questionnaires are issued to the users of the living labs. The living lab also organizes focus groups to identify needs, inviting both care providers and people living with dementia to discuss predefined topics. Those topics not only concern the needs of elderly people, but also those of their care givers, both professional and informal. Each focus group is recorded and analyzed in various ways as "*the outcomes of each focus group were discussed plenary with all participants, and a mind map was made*". Also a "*kind of semantic analysis is performed, as we counted specific topics that were discussed to identify central topics*". The outcomes of these focus groups are subsequently shared with businesses and developers, to inspire them to develop new innovations.

Table 4.6: Practice of the key principles in Turnhout & Geel

Key principles	Elaboration
Openness	• The living lab is embedded in Thomas More De Kempen, a university college that provides a multi-disciplinary team of academics. What partners are involved differs in each project, depending on the requirements of that project.
Continuity	• Central in the living lab is Thomas More, and other stable (but more distant) partners are the city of Turnhout and Janssen Pharmaceuticals. The living lab engages in temporary collaborations frequently, and in most, if not all projects temporary partners participate.
Empowerment	• User involvement may vary between projects, but through focus groups and co-creation sessions users are able to participate and influence most aspects of the living lab. Additionally an online communication platform is developed to better enable interactions between users and other stakeholders.
Realism	• Many stakeholders, such as care providers and informal care givers are involved in needs explorations, along with users. That exploration is enriched through the use of questionnaires and an (existing) international database.
Spontaneity	• Focus groups are recorded and along with data from the questionnaires are analyzed extensively, by researchers from various expertise and backgrounds.

4.4 Comparing the practice of the key principles

For each key principle, several indicators have been derived that enable a comparison of their practice. These are described in the theoretical sections of this research. All cases are compared on the separate indicators and accordingly scored, ranging from '++' to '--'. As explained in the methodology, in most cases '++' will refer to 'large' or 'more', while '--' refers to 'small' or 'less'. In those instances where a score has a different meaning it is mentioned in the footnote. In this section the similarities and differences in those scores and in the actual practice are discussed. Therefore, at the start of each section a table presents the scores of each case, and the similarities and differences between the cases. A further substantiation for those scores is given in the appendix (*see Appendix V*). It should be noted that this study is not intended, nor does it have the ability, to judge the participating living labs whether the key principles are practiced in the 'right way', as the most appropriate practice of the key principles can be different for every case. The scores displayed below are thus only intended to enable this comparison between the cases.

4.4.1 Openness

Common among the cases is that the main partners stem from backgrounds either in mental healthcare and academics, or both. But, when regarding the available expertise in the living labs, two different approaches stand out. In the Belgian and German cases, those main partners (Alexian and Thomas More, respectively) internally employ multi-disciplinary teams of academics and healthcare professionals to support the living labs operations. In Liverpool and Eindhoven such teams are not present, or at least to a much lesser extent. It is in those cases that it is rather the entire collaboration of stakeholders that harbors the necessary expertise. Usually, in all cases, expertise in business or innovation development is sparse, as most living labs often engage in external searches for business partners to support or facilitate

innovation development. Additionally it should be mentioned that only in the United Kingdom 'users' are not only participating, but are effectively partners in the living lab.

Table 4.7: Practice of Openness

Score					
Indicators		**UK**	**NL**	**GE**	**BE**
• diversity in backgrounds		++	+/-	-	+/-
• diversity in available expertise		+	+/-	+/-	++
• reported lack in competences or expertise		+	+/-	+	+/-
Comparison					
Similarities	• In all cases the main partners stem from either academic or (mental) healthcare backgrounds (or both).				
	• All cases either express or demonstrate a lack of 'in-house' business expertise				
Differences	• In Germany and Belgium the lead partners occupy a multi-disciplinary team supporting their living lab with a wide diversity in expertise. In the United Kingdom and the Netherlands, that expertise is found in the entire collaboration.				
	• Only in the UK are users not only participants but can also be considered as partners in the living lab.				

4.4.2 Continuity

The key principle of continuity regards the stability of the partnerships in living labs. As partners engage in long term relations with another, and interact frequently, they are expected to innovate more effective and creatively. In all cases one or two 'main' partners are identified, which are those partners that are engaged in organizing the living lab and its innovation projects. Collaboration between the main partners is high in frequency and intensity in all cases. Differences occur when considering partners that are involved in the living lab on a temporary or more 'distant' basis. In all living labs temporary collaborations with external partners are forged, but where the German living lab rarely collaborates with external partners, are the majority of partners in Belgium and the UK there for the short term. However, where in Liverpool a large part of the entire partnership convenes in their regular regional stakeholder platform, the collaboration in Turnhout is much more segregated, as each project may involve different stakeholders. In each living lab it is mentioned that businesses are reluctant or even unwilling to collaborate (much less share ideas) with other developers and businesses.

Table 4.8: Practice of Continuity

Score					
Indicators		**UK**	**NL**	**GE**	**BE**
• size of permanent partnership		+/-	+/-	++	+/-
• presence of temporary partners		++	+/-	-	++
• change in partnership over time		+	-	--	+
• frequency of interactions between permanent partners		++	++	+	X
• reported quality of collaboration with temporary partners		+/-	-	…	+
• contractual agreements		+/-	+	++	+
Comparison					
Similarities	• Close collaboration between one or two main partners				
	• Businesses are often reluctant to share their ideas, especially with other businesses				
Differences	• Presence of temporary partners: both in Belgium and in the UK there are many temporary partners present, while there are relatively few temporary partners in the Netherlands and Germany. • Only in Germany there is a (very) large permanent partnership, while the other living labs consist of only a single (in Belgium) to a few permanent partners.				

4.4.3 Empowerment

Most diversity between the living labs is found in the practice of user empowerment. As can be seen in the scores on the indicators, each separate case scores consistently throughout the key principles. In the English case, people living with dementia, are considered as partners equal to the other stakeholders in the living lab. Subsequently they are involved more and given more influence in the living lab. Especially in Krefeld a different example is found. Here, users are still involved, but much more at a distance, as their role is much more that of participant than partners. Where the users in Liverpool are enabled to participate in decision-making processes, it is not clear if, or to what extent, the users in Krefeld are able to influence choices that are made. When comparing all four cases, both the Dutch and the Belgian living labs appear to be somewhere in the middle between the living labs in the United Kingdom and Germany.

Table 4.9: Practice of Empowerment

Score					
Indicators		**UK**	**NL**	**GE**	**BE**
• user involvement (information)		++	+/-	-	+
• user participation (understanding and feedback)		++	+	-	+
• user influence ('weight of voice')		++	+/-	…	+
Comparison					
Similarities	• Users are invited to, and participate in, meetings or discussion groups				
Differences	• Only in the UK users are not only participants, but also considered partners. Therefore, they are more involved and given more influence in this case as compared to the other cases.				

4.4.4 Realism

With regard to the key principle realism, the living labs in the United Kingdom, the Netherlands and Belgium present very similar practices. In all cases the users, along with family members and healthcare professionals take part in the exploration of needs. In some instances other stakeholders or partners are also involved, such as businesses, but in each of these living labs, it is the people living with dementia that are considered the most important contributors. Also in testing their innovations, these living labs are largely comparable, as the biggest difference between these cases may be the actual length of test periods, which ranges from a couple of weeks in Eindhoven, to over half a year in Belgium. An entirely different approach is taken in Krefeld. Here, as the living lab is developing processes to be applied in the whole network, the care providers in that network are already involved in the exploration of their needs. However, these care providers are not necessarily the actual users of the innovations developed (though, as the local care providers, they are the employers of the actual users). Next to that, in Germany, innovations appear to be implemented in the network, rather than that they are tested. Therefore this German case cannot be scored on the final three indicators.

Table 4.10: Practice of Realism

Score				
Indicators	**UK**	**NL**	**GE**	**BE**
• user participation in needs exploration	++	++	-	+
• diversity of perspectives	++	+	+/-	+
• situation of prototype tests*	++	+	X	+
• participation of users representative of the targeted population	+/-	+/-	X	+
• realism of tests	+	+	X	++
Comparison				
Similarities	• Very similar approaches in UK, Netherlands and Belgium			
Differences	• More implementing rather than testing in Germany			
	• Needs are explored on a 'different' level in Germany (that of the network), where the other cases take a more individual approach			
	• Differences in duration of testing between UK, Netherlands and Belgium			

**) '++' = real-life situations, '--' = laboratory setting*

4.4.5 Spontaneity

When considering the types of methodologies used by the living labs to collect their data, it occurs that all living labs rely mostly on methods of inquiry. Especially through group interviews, such as focus groups, the living labs involve many different stakeholders to explore a variety of topics. That data is then often complemented with those of individual interviews or questionnaires. Non-inquiry methods, such as observations, are used far less often, or not even at all. While all living labs record such meetings and collect data through questionnaires, in some cases that data is analyzed more extensively compared

to the others. Particularly in the Belgian (and to a lesser extent the English) living lab the data from focus groups is analyzed, even semantically analyzing discussions to identify the most relevant topics. The Belgian case also stands out as there is much more diversity in the (academic) backgrounds of the researchers that they employ.

Table 4.11: Practice of Spontaneity

Score				
Indicators	**UK**	**NL**	**GE**	**BE**
• use of inquiry vs non-inquiry methods of data collection*	+/-	-	+	+/-
• 'richness' of data collection and analysis	+	+/-	…	++
• diversity in backgrounds of researchers	+/-	+/-	+	++
Comparison				
Similarities	• All cases rely mostly on inquiry methods, and particularly group discussion for their data collection			
	• Often complemented with data from questionnaires			
	• Not often observational methods are used			
	• Most researchers stem from background in (mental) health or social sciences, rather than other backgrounds			
Differences	• In Belgium and (to a lesser extent) the United Kingdom, data and recordings from focus groups are analyzed extensively			
	• In Belgium a multi-disciplinary team of researcher from a variety of backgrounds works in the living lab			

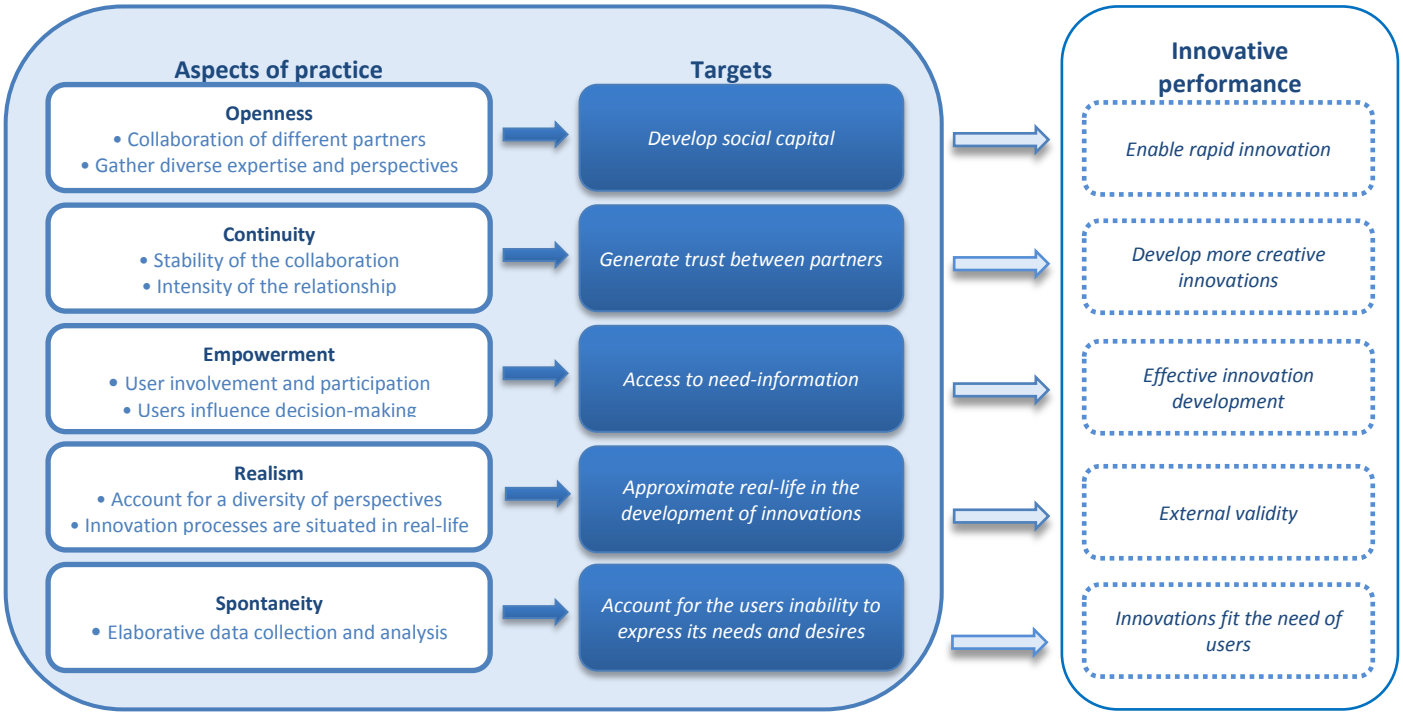
*) '++' = equal use of both inquiry and non-inquiry methods, '--' = exclusive use of one of the two kinds

5 Conclusion

The goal of this research is to elaborate on the available knowledge of living labs in general, and their key principles in particular. This chapter provides the conclusions derived from this research. First, a conclusion of the theoretical elaboration of the key principles is discussed, which is followed by the conclusions from the comparative study of four living labs in dementia care. There, an answer to the research question of this thesis is presented, which reads: 'How are the key principles practiced in living labs in dementia care?'

The key principles: openness, continuity, empowerment, realism, and spontaneity; present living labs with a set of guidelines. Practice of the key principles provides the opportunity to living labs to reach specific goals that, in turn, enable to improve the outcomes of their innovation processes. In earlier research, the principles are described in rather general and abstract terms, leaving their message open to various interpretations. Therefore, this research relates each key principle to existing methodologies and theories for innovation. By elaborating the knowledge of the key principles through these theories aspects of the practice of the key principles are identified. These aspects represent a more clear description of the guidelines of the key principles. Following these guidelines lead living labs to certain targets. Subsequently, through these targets living labs are able to reach the originally described goals (*see figure 5.1*).

Figure 5.1: Practice of the key principles



In order to answer the main question of this research, several sub questions have been posed. As the research question of this thesis is concerned with the practice of the key principles in living labs in dementia care it is relevant, to look at the commonalities between the four cases. Therefore, only the results of the third sub question are discussed: '*What similarities and differences in the practice of the key principles are found between the cases?*' The main emphasis of this conclusion lies on the similarities between the four cases, as those can be considered as the 'common' practices in these living labs in dementia care. For each key principle the similarities and notable differences are discussed below.

Openness:

- In living labs in dementia care, partners come from several backgrounds. Most prominent are partners with backgrounds in (mental) healthcare, academics, and government representatives. Partners from different backgrounds, such as businesses, but also users, are also participating in the living labs, though to a lesser extent.
- In all four cases, the main partners stem from academic of (mental) healthcare backgrounds.
- Living labs have to search externally for partners with expertise in business or innovation development.

Continuity:

- The main partners in each living lab collaborate very closely, but in all cases there is much less interaction with temporary or more distant stakeholders.
- Overall, living labs report the collaboration between partners to be good. However, all cases also mention that businesses are reluctant to collaborate among each other.
- A notable difference between the living labs is found in the amount of temporary or more distant partners. While two living labs connect with large numbers of stakeholders, the other two cases present the opposite, as there are only a few, if any, temporary partners outside of the main partners.

Empowerment:

- Users are invited to, and participate in, focus or discussion groups in all living labs. However, most living labs seem to struggle with the actual empowerment of users, as only in one case the users are involved in the development of new ideas and concepts.

Realism:

- In all living labs needs are explored with not only the inclusion of the users, but also with other relevant stakeholders. Usually, those other stakeholders are identified as informal care givers,

such as family members, or (mental) healthcare professionals. Only in the UK are businesses and developers also participants in the exploration of needs.

- All living labs that engage in prototype testing do so in real-life situations, with inclusion of the actual users. However, the duration of those test periods differs between the cases, ranging from a few weeks to over half a year per test.

Spontaneity:

- The living labs in dementia care predominantly rely on the use of methods of inquiry, such as questionnaires, interviews, and group discussions. Non-inquiry methods, such as observations, are much less often applied.
- Researchers involved in the living labs usually come from backgrounds in (mental) healthcare or social sciences. While all living labs also involve (some) researchers from other academic backgrounds, only in Belgium a multi-disciplinary team of academics from various backgrounds structurally works in the living lab.
- While all living labs analyze the data that they collect to some extent, this is done much more extensively in the living labs in Belgium and the UK.

6 Discussion

In this chapter will be reflected on the outcomes of this research. This research has been concerned not only with the empirical examination of the key principles, but has also explored the theoretical backgrounds of this topic. Therefore, the discussion of this research is divided into two parts. First a theoretical discussion is presented, which is concerned with the question how the practice of the key principles affects living labs. As the key principles are considered not only as guidelines, but as characteristics as well, these two perspectives will be discussed in order to answer that question. After that theoretical discussion, notable outcomes in the results and conclusion of this research are debated in the empirical discussion. Here, it is reflected on the differences between the living labs in the composition of their collaboration. Subsequently the potential limitations that have to be considered in this study are presented. Also derived from this study are several recommendations, both for future research and for practice, and these are discussed in the final paragraphs of this chapter.

6.1 Theoretical discussion

While this study has elaborated on the content and expected outcomes of the practice of the key principles, it remains unclear how practicing the key principles actually affects living labs and their success in developing innovations. Conversely, should a living lab elect not to follow the guidelines of the key principles, how does that impact the living lab? None of the key principles presents an 'unbreakable rule', which protects innovators from certain failure. For example, many successful innovations are developed by single organizations, as opposed to collaborations (Tushman, Smith, Wood, Westerman, & O'Reilly, 2010). And while consideration for the users and their real world can support and improve innovation processes, numerous examples can be provided where the involvement of users is not deemed necessary or productive (Alam, 2002). So, the key principles should not, nor can they, be considered as invaluable guidelines for developing innovations. Still, several authors mention the key principles to be essential in living labs (e.g., Corelabs, 2007, Bergvall-Kåreborn and colleagues (2009, 2010). In order to consider their impact on living labs, it is necessary to discuss the key principles both as the characteristics of living labs, and as guidelines for innovative performance.

6.1.1 Key principles as characteristics of living labs

Part of their importance can be found in the notion that the key principles are not only considered to be guidelines for living labs. Much more, the key principles are considered as a combination of characteristics that distinguish living labs from other methodologies of innovation (Bergvall-Kåreborn, Holst & Ståhlbröst, 2009). In other words, in order to innovate as a living lab, one is expected to bring

the key principles into practice. From that perspective, the key principles should be seen as vital conditions for living labs. Then, if the key principles are not practiced, a living lab cannot be considered a living lab, as it does not present (all) the characteristics that are shared by living labs.

However, even before raising the issue of how, or to what extent, a key principle should be practiced, it stands to be argued if all five principles can considered as being equal. Should all key principles be equally practiced by a living lab for it to be considered a living lab? The European Network of Living Labs (ENoLL), in its most recent call for new members, defines a living lab as a "real-life test and experimentation environment where users and producers co-create innovation" (ENoLL 8th Wave Brochure, 2014, p.1). From that definition only three key principles can be derived: realism, empowerment, and openness. And in fact, when considering the definition of living labs in academic writing, only these three aspects stand out: (1) living labs facilitate the collaboration where diverse stakeholders and (2) users participate in innovation processes, which (3) are situated in real-life environments (*see table 6.1*). In contrast to the key principles of openness, realism and empowerment, neither continuity nor spontaneity is referred to in any of the definitions or descriptions given to living labs. It thus appears that these two principles are less 'defining' for living labs as their commonly mentioned counterparts. Accordingly, from a characteristics standpoint, in order to be considered a living lab, innovators should at least bring the principles of openness, realism and empowerment into practice.

Table 6.1: Definitions*

Authors	Description	O	E	R
ENoLL, 2014	*A living lab is a real-life test and experimentation environment where users and producers co-create innovation.*	X	X	X
Bergvall-Kareborn, Holst & Stahlbrost, 2009	*A living lab is a gathering of public-private partnerships in which businesses, researchers, authorities, and citizens work together for the creation, validation, and test of new services, business ideas, markets, and technologies in real-life contexts.*	X	X	X
Bergvall-Kareborn & Stahlbrost, 2009	*A living lab is an open innovation environment in real-life settings in which user-driven innovation is the co-creation process for new services, products and societal infrastructures.*		X	X
Eriksson, Niitamo & Kulkki, 2005	*Living labs represents a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real-life contexts.*		X	X
Almiral, 2008	*Living labs become an innovation area where users co-create with developers and researchers and we postulate that they are the first attempt to structure and provide governance to user involvement in a way that can be addressed by companies, research institutions, public organizations and policy makers. Their goal is no other than the creation of "innovation arena" where multiple actors could experiment in an open, real life environment.*	X	X	X
Pallot, Trousse, Senach & Scapin, 2010	*A living lab is an open research and innovation ecosystem involving user communities, solution developers, research labs, local authorities and policy makers as well as investors.*	X	X	
Svensson & Ihlstrom 2012	*In a living lab, ICT innovations are created and validated in collaborative multi-contextual empirical real-world environments.*	X		X
Leminen 2012	*Living labs offer an R&D methodology through which innovations are created and validated in collaborative real-world environments.*	X		X
Ballon, Pierson & Delaere, 2005	*An experimentation environment in which technology is given shape in real life contexts and in which (end) users are considered co-producers.*		X	X

*) 'O' stands for 'openness', 'E' stands for 'empowerment', and 'R' stands for 'realism'

6.1.2 Key principles as guidelines for innovative performance

When considering the key principles as guidelines, it is relevant to regard to what goal they guide living labs. Then again, a distinction between spontaneity and continuity and the other principles appears. The key principles of openness, empowerment, and realism profess goals as speed, effectiveness and validity. Such goals almost refer to innovation processes as a production process, and by practicing the key principles living labs are able to 'produce' innovations more efficiently. However, such tangible outcomes only refer to the innovation process, and not to the 'quality' of the innovations that are developed. With 'quality' is referred to the "degree of novelty" that an innovation presents (Laursen & Salter, 2006, p.136). By only striving for efficient innovation processes, living labs may be perfectly capable of quickly developing new products that provide an improvement for the user in his or her daily life. While they may be successful, by following the guidelines of openness, empowerment and realism, innovations are more likely to present small and 'incremental' changes to yet existing products, rather than the introduction of 'radical' or revolutionary concepts (Laursen & Salter, 2006, p.136). It cannot be stated that radical innovations are 'better' than incremental ones, however, the expected rewards of radical innovations far outweigh those of incremental innovations (Lettl, 2007).

To some extent, both incremental and radical innovations require creativity (to think of something new) and knowledge (to know what is possible and how to do it) (Laursen & Salter, 2006). However, in order to develop innovations that present a radical change of the status quo, creativity and knowledge are even more important (Enkel, Gassman, & Chesbrough, 2009). This is where the principles of continuity and spontaneity come in, as their guidelines lead to those outcomes. As living labs practice continuity, the development of trust between partners should lead to better and more creative collaboration (Ståhlbröst, 2008). On the other hand, the principle of spontaneity refers to the ability of living labs to "detect, aggregate and analyze users' spontaneous reactions and ideas" (Bergvall-Kåreborn, Holst & Ståhlbröst, 2009) or, in other words, the ability to gather knowledge. Hence, living labs aiming to develop radical innovations, rather than incremental ones, should not neglect to practice the principles of spontaneity and continuity.

6.1.3 Impact of practicing the key principles

Thus, when considering the impact that practicing the key principles has on living labs, different perspectives can be taken. When regarding the key principles as the aspects that characterize living labs, the principles of openness, empowerment and realism stand out. More so than spontaneity and continuity, these three principles seem to define what constitutes of a living lab. However, when the key principles are seen as guidelines for innovative performance, it is continuity and spontaneity that seem

more relevant. A cause for that discrepancy may lie in the descriptions given to each of the key principles.

However, as argued in the theoretical section of this thesis, the notion that each key principle only leads to a singular goal is to narrow. For example, the outcomes of openness and continuity might be reversed. Scholars have argued that not strong and continuous partnerships, but more open and distant relations that strengthen creativity and knowledge creation (e.g. Granovetter, 1973; Uzzi & Spiro, 2005). Conversely, while trust strengthens creativity in collaborations, durability and familiarity might harm that creativity (Uzzi & Spiro, 2005). In fact, continuity in inter-organizational relationships fosters enhances the speed and efficiency of production processes (Gilsing, Cloodt, & Rooijakkers, 2011).

Additionally, while user empowerment makes it possible to develop innovations more effectively, von Hippel (2009) has stated that users are also excellent creators of radical innovations. A study by Riggs and von Hippel (1994) found that innovations (co-)developed by users tended to much more radical and novel in nature. On the contrary, innovations developed by manufacturers "enabled users to do the same things they had been doing, but to do them more conveniently or reliably" (von Hippel, 2009, p.34). The key principles of realism and spontaneity are also intertwined, as spontaneity regards how living labs collect their data with consideration to the real users, in their daily lives.

So, while the initial descriptions of the key principles lead to different conclusions regarding the importance of each key principle, the perspectives of characteristics and innovative performance are in fact compatible. The key principles of openness, empowerment, and realism are those that characterize living labs. The goals proposed by these principles are more concerned with the efficiency of innovations processes, rather than the quality and novelty of innovations developed. However, the when considering the approaches that they propose, rather than their goals, it is possible to incorporate the goals prescribed by the key principles of continuity and spontaneity. While such a theoretical model has to be elaborated further, it seems possible to reduce the number of key principles to three, namely those of openness, empowerment, and realism.

6.2 Empirical discussion

In this study, the practice of the key principles has been investigated empirically in four living labs in dementia care. Each case has been scored in their practice of the key principles, compared to the other cases. Most of these scores represent a scale, and what stands out is the consistency for each case in their scores on a key principle. The living labs are scored on a scale of five points: from '++', to '+/-', to '--', and except for the principle of continuity, the largest disparity for a single case on a key principle is two scales (for example, the highest score the Dutch living lab reached on the principle of

empowerment is '++', while the lowest score on that same principle is '+/-'). Only in the principle of continuity a larger variation can be found, in both the Dutch and the German cases.

That larger variance in scores can be attributed to the combination of indicators that are chosen for this key principle. In the principle of continuity, a distinction is made between partners that are permanently involved, and those that are more distantly or temporarily involved. Both the Dutch as well as the German living lab revolves mostly around their permanent partners, and in comparison to the other two cases, there are much less temporary partners participating in these living labs. A possible explanation for this occurrence can be found in the scale at which the living lab is working. In the Netherlands, the living lab is working on a relatively small scale, where they engage at only one project at a time. On the other hand, both in the UK and in Belgium, a much larger operation is found, as both living labs are working on multiple projects simultaneously. The living lab in Germany is also engaged in more projects at once, but here an already large collaboration of permanent partners can be found, which might lessen the necessity to bring in external expertise.

However, what also stands out is the way in which those collaborations are organized. In all cases the living labs can be considered as broker for innovation (Winch & Courtney, 2007), facilitating the collaboration of various partners in innovation projects. In their study, Winch and Courtney identified two types of innovation brokerage: top-down and bottom-up. A top-down broker acts as a coordinator of research and collaboration (Winch & Courtney, 2007), and is responsible for bringing together the 'right' partners to complete a specific project. On the other hand, a bottom-up broker acts as a facilitator, enabling an already existing collaboration to innovation collaboratively. In the cases examined in this research, a similar distinction can be made, especially between the English living lab and that in Belgium. In the English case, the living lab consists of very large collaboration of many stakeholders, both permanent and temporary, in the Regional Stakeholder Platform. Facilitated by the leading partners (John Moore's University and Mersey Care), from this large group new projects arise. On the other hand, in Belgium, the living lab, LiCaLab, really acts as a broker for organizations, to come into contact and collaborate with other stakeholders and users. Where in the United Kingdom all stakeholders, both permanent and temporary, interact regularly at the RSP, it is likely that they would never meet in the Belgian case.

Such a distinction between living labs can also be seen in the study by Leminen, Westerlund and Nyström (2012). They identified several kinds of different organizations in living labs. The living lab in Liverpool strongly resembles that of an enabler-driven living lab, where a network is formed around a project or an organization. As is the case in the UK, in an enabler-driven living lab, innovation in a collaborative effort of all the partners in the network. On the other hand, the Belgian living lab shows

many similarities with what Leminen and colleagues call a 'utilizer-driven' living lab. Here, a network is formed around a utilizer, in this case LiCaLab. This utilizer acts as the governing body of the network which guides innovation processes.

6.3 Limitations

Not unlike other studies, this research has several limitations that have to be considered. The first limitation regards the complexity of the 'phenomenon' that is living labs. As explained earlier, many different interpretations can be found among living labs, both in theory as well as in practice. While that diversity may already make it difficult to describe a living lab, it is even harder to make comparisons between them. Each living lab in this study is organized differently. On the one hand, there is the English case, where a very large collaboration is considered to be 'the' living lab in which innovations are developed. And on the other end of the spectrum, there is the Belgian living lab, which is factually a small organization, which engages in various projects with external stakeholders. Both the Dutch and German cases lie somewhere in the middle of that spectrum. On several occasions, that diversity made it challenging to make fair and proper comparisons between the living labs. Therefore is chosen to consider each living lab as a whole, as opposed to the separate innovation projects in each of the cases. While this study still provides an accurate comparison of the living labs in their entirety, would the choice have been made to examine the cases (or a single case) at the 'project' level, a more detailed (but less elaborate) description of the practice of the key principles could have been given.

Another limitation regards the generalizability of the empirical findings of this thesis. In this study, a comparative case study has been performed among four living labs in dementia care. These four living labs are related to each, as they are all partners in the same international collaboration: the Innovate Dementia project. As partners in this collaboration, the participating living labs interact and share their experiences while they are in the process of setting up their living labs. Although the results of this study provide no indication to this statement, it is not inconceivable that the partners have influenced each other in their practice of the key principles. Just as living labs in contexts other than that of dementia care may practice the key principles differently, it is possible that even living labs in the same context display a different practice. Therefore, a generalization of the conclusions of this study has to be made with caution.

As this research is conducted by a single researcher, a third limitation of this study is that its objectivity cannot be guaranteed. As discussed by Straits and Singleton (2011), complete objectivity of a research is almost impossible, especially as qualitative findings are subject to the personal interpretations of a single researcher. To support the findings and conclusions of this research, both the analysis tables as the results tables are included in the appendix (*see appendix IV & V*).

6.4 Recommendations

6.4.1 Directions for future research

In this research the practice of the key principles in living labs is examined. The design of this research is that of a comparative case study, as the practice of the key principles is compared between four living labs. Because of the inclusion of multiple cases, this research is considered with the practice of the key principles in entire living labs. However, as living labs engage in multiple innovations projects, often simultaneously, it is not unthinkable that differences in the practice of the key principles can even exist within a single living lab. Additionally, it is interesting for future research to consider the practice of the key principles in a more detailed fashion. Some authors, such as Feurstein and colleagues (2005), have described some of the methods and techniques that are applied in living labs. By examining the practice of the key principles more 'in-depth', future research may be able integrate the practice of the key principles with the methodologies and techniques that are used by living labs.

Secondly, this thesis presents a research on the practice of the key principles in living labs that are active in the context of dementia care. However, living labs are found in many different contexts, such as agriculture, online media, or education (Ståhlbröst, 2012). In order to further develop the knowledge on living labs and the key principles, it is interesting to regard the practice of the key principles in different settings. It can be expected that different practices of the key principles are found between living labs in different contexts. A first, and obvious, difference will be the partners that are involved in living labs. Just as living labs in dementia care present a heavy involvement of mental health care providers, living labs in other settings will also present their own kind of stakeholders. However, when different stakeholders are involved, especially in a leading role, it is not unreasonable to expect different practices.

For each of the key principles this research has described one or more aspects of practice. Subsequently, for each aspect indicators have been defined. However, their description is based on a theoretical research. In such cases, Straits and Singleton (2011) suggest that statistical tests have to be performed in order to confirm the reliability of these models. Therefore, a third recommendation for future research is to statistically test the reliability of this theoretical model, and possibly further elaborate and substantiate the work presented in this thesis.

6.4.2 Practical recommendations

As mentioned in the introduction, from the Innovate Dementia project it is requested that the facilitators and barriers experience by the living labs are investigated. This section is used to discuss a few of the most notable facilitators and barriers and, if possible, practical recommendations are derived from them.

It must be noted that, during the interviews, participants often found it difficult to describe any facilitators or barriers that they experienced in the practice of the key principles. Some commonly mentioned barriers, such as a lack of resources or a limited experience with this kind innovation, can be expected in a project that has started recently, and is largely dependent on public funding. Additionally, during the interviews, it occurred that very few interviewees are able to identify their barriers. It is thinkable that, as the living labs are still experimenting and trying out new things, they have yet to experience structural facilitators and barriers that influence their performance. As one interviewee described, they do not think in terms of barriers, but rather in the challenges that they experience and have to overcome. Still, a few barriers can be identified among the living labs.

The first barrier experienced by the living labs is considered with the collaboration with other (external) stakeholders. In most cases, that challenge even starts with finding business partners willing to collaborate in the living lab. For the large majority of stakeholders, innovating through a living lab represents a novel and unknown concept, making many of them reluctant to participate. As stated in an interview: "*We told all organizations about this kind of service, but it needs very many times to drive to every organization and explain what we mean and how it works. It is much work.*" Additionally, it is experienced that many stakeholders are unwilling to collaborate with each other. That does not only regard businesses that are not willing to share their ideas, but also other stakeholders. For example, in one case local health care providers are very protective of their own work, and are afraid that participating in the living lab will lead them to lose control or have to change their routines.

While this barrier of the reluctance of external stakeholders to participate or collaborate in the living lab is found to some extent in all cases, positive developments can be seen, especially in Liverpool. In the United Kingdom, nationally a lot of attention is paid to the 'threat' of dementia. Therefore, the public awareness for this disease is a lot higher. "*Dementia is really big within Liverpool at the moment, in terms of the priority. So a lot of people are keen to be involved*." All living labs are engaged in promotional activities to raise the awareness for the disease dementia. However, as that awareness in the UK is already high, the English living lab has been able to promote itself, rather than its cause. What also facilitates the participation of external stakeholders in Liverpool is the 'open' nature of their living lab. In all other living labs, participants are often expected to contribute in innovation project. On the other hand, through their Regional Stakeholder Platform, the English living labs provides interested stakeholders with a platform to participate in the living lab without the necessity to commit to a project. Both the national awareness of the living lab, as well as the open platform can be considered as facilitators for the participation in the living lab in Liverpool. It can therefore be recommended to other living labs, in order to more easily raise the participation of external stakeholders, to create a sort of 'meeting point'. Such a 'meeting point', as the RSP in Liverpool, will allow living labs draw the interest of

more potential stakeholders, by enabling them to get familiar with the living lab and its operations before they have to commit in any projects.

A second and final barrier that is observed in the living labs can be related to the practice of realism. Those living labs that are developing innovations for people living with dementia experience difficulties in trying to make a correct representation of their target population. In the living lab in the UK, very few users from other ethnic backgrounds take part. "*We don't know whether we're representing the population of Liverpool, because people are still saying that some people are very isolated and not receiving support.*" On the other hand, in the Netherlands, it is noted that those users that are willing to participate, usually come from higher educational and professional backgrounds, and are more technologically interested (than average persons). However, while both living labs are aware of a potential bias in their user population, neither mentions this to be a barrier. As one participant noticed: "*The problem with that thinking is that people with dementia, it's a static group anyway. When you're diagnosed, you're diagnosed."* From the viewpoint of the living labs, regardless of their background, many people living with dementia face the same challenges. And while the living labs strive to get a better representation of their target population, the current (potential) bias in their user group does not have to affect their outcomes in a negative way.

7 Literature

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Appendix

Appendix I: Interview Guide

Appendix I: Interview Guide

Interview part	Example questions	
Introduction	Who are you?	
	What is your role in the living lab?	
Projects	In what projects are you engaged?	
	What kind of projects are those?	
	How are the projects organized?	
	How is this project related to other projects?	
Key principles	*Aspects*	*Topics for discussion/example questions*
Openness	• Collaboration between partners of different backgrounds	• Involved partners • Roles and responsibilities of partners
	• Gathering diverse expertise and perspectives	• Input of partners
Continuity	• Stability of the collaboration	• Kind of involvement • Duration of involvement • Contractual agreements
	• Intensity of the relationship	• What kind of interactions, between which partners • How organized
Empowerment	• Users are informed and participate in the living lab	• User involvement in projects • For whom innovations are developed • Communication with users (and other stakeholders)
	• Users influence decision-making	• Participation of users • Input and feedback of users • Influence of users in the living lab
Realism	• Account for diverse perspectives	• Needs exploration • What is the targeted population? Which users are involved
	• Innovation processes are situated in real-life settings	• Prototype testing • Methods of testing and evaluation • Location of testing
Spontaneity	• Elaborative data collection and analysis	• Methods of data collection • Methods of data analysis • Background of researchers involved

Appendix II: Operationalization

Appendix II: Operationalization table

Key principles	Aspects of practice	Indicators	Scoring
Openness	• Collaboration of different partners • Gather diverse expertise and perspectives	• diversity in backgrounds	++ = 'more' or 'large', -- = 'less' or 'small'
		• diversity in available expertise	++ = 'more' or 'large', -- = 'less' or 'small'
		• reported lack in competences or expertise	++ = 'more' or 'large', -- = 'less' or 'small'
Continuity	• Stability of the collaboration	• size of permanent partnership	++ = 'more' or 'large', -- = 'less' or 'small'
		• presence of temporary partners	++ = 'more' or 'large', -- = 'less' or 'small'
		• change in partnership over time	++ = 'more' or 'large', -- = 'less' or 'small'
		• contractual agreements	++ = 'more' or 'large', -- = 'less' or 'small'
	• Intensity of the relationship	• frequency of interactions between permanent partners	++ = 'more' or 'large', -- = 'less' or 'small'
		• reported quality of collaboration with temporary partners	++ = 'more' or 'large', -- = 'less' or 'small'
Empowerment	• Users are informed and participate in the living lab	• user involvement (information)	++ = 'more' or 'large', -- = 'less' or 'small'
		• user participation (understanding and feedback)	++ = 'more' or 'large', -- = 'less' or 'small'
	• Users influence decision-making	• user influence ('weight of voice')	++ = 'more' or 'large', -- = 'less' or 'small'
Realism	• Account for a diversity of perspectives	• user participation in needs exploration	++ = 'more' or 'large', -- = 'less' or 'small'
		• diversity of perspectives	++ = 'more' or 'large', -- = 'less' or 'small'
	• Innovation processes are situated in real-life settings	• situation of prototype tests	'++' = real-life situations, '--' = laboratory setting
		• Participation of users representative of the targeted population	++ = 'more' or 'large', -- = 'less' or 'small'
		• realism of tests	++ = 'more' or 'large', -- = 'less' or 'small'
Spontaneity	• Elaborative data collection and analysis	• use of both inquiry and non-inquiry methods of data collection	'++' = equal use of both inquiry and non-inquiry methods, '--' = exclusive use of one of the two kinds
		• 'richness' of data collection and analysis	++ = 'more' or 'large', -- = 'less' or 'small'
		• diversity in backgrounds of researchers	++ = 'more' or 'large', -- = 'less' or 'small'

Appendix III: Structuring the data

Appendix III (a): labeling

Labels	Coloring
Actors	These are marked blue
Activities	These are marked red
Both	These are marked purple

Appendix III (b): an example of labeling

G: We're involved in a number of projects, in different types of ways. But I think from start to finish, a kind of usefull project, is what we call memory enabling projects. The first thing we did is when we had our first RSP, is to start with wanting to engage with everybody outthere. So government, business, the third sector, such as the Dementia Society UK, etc; and people living with dementia.

Appendix III (c): an example of structuring table

Actors	Activities
Government	But I think from start to finish, a kind of usefull project, is what we call memory enabling projects
Business,	The first thing we did is when we had our first RSP, is to start with wanting to engage with everybody outthere. So government, business, the third sector, such as the Dementia Society UK, etc; and people living with dementia.
The third sector, such as the Dementia Society UK,	
People living with dementia.	

Appendix IV: Analysis Tables

Appendix IV (a): Liverpool

Appendix IV (a): Liverpool Actors

Background	Who	Involvement		Elaboration
		Stability	*Nature*	
Academic	• Liverpool John Moore's University (LJMU)	Permanent (leading)	Entire living lab	• Leading and organizing partner (shared with Mersey Care) • Provides access to a business development unit to coach participating businesses
	• Other academic institutions	Temporary participation	In the RSP	• Representatives from other universities attend the RSP to share knowledge and ideas about living labs and innovation
Context-specific	• Mersey Care NHS Trust	Permanent (leading)	Entire living lab	• Leading and organizing partner (shared with LJMU) • As a mental hospital provides access to people living with dementia (users)
	• Local care providers	Permanent or temporary	In the RSP, sometimes in innovation projects	• Provide access to people living with dementia to participate in testing • Represent their patients/clients
	• NHS Trust – Clinical Commissioning Counsel	Permanent	In the project board	• Represent the National Health service in the project board
Government	• City of Liverpool	Permanent	In the RSP	• Participate in the RSP • Are consulted with new projects
Businesses	• Phillips	Temporary (project based)	In an innovation project	• Large producer of technology (for people living with dementia) • Have products available that are not yet tested for people living with dementia
	• Tom Stalls	discussion ongoing		• Large technology producer
	• Tell Joan	Temporary	In an innovation project	• Upstart developer that has developed a memory enabling technology
	• Other developers	Permanent	Some developers consistently attend the RSP	• Developers that are interested in developing innovations for people living with dementia. • Regularly attend the RSP
		Temporary	In an innovation project	• Developers that have or can develop innovations for people living with dementia

				• Occasionally developers attend the RSP
	• Local SME Cluster	Permanent	Access to SMEs	• Network partner that provides the living lab with access to a large number of local technology businesses
Third Sector	• Dementia Society UK			
	• other third sector representatives			
Users	• User group	Permanent	Attend RSP, participate in work groups	• Stable group (+/- 20 persons) of dementing people that attend every RSP.

Appendix IV (a): Liverpool Activities

Type	Subtype	What	Involved Actors	Elaboration
Organizational	Meetings	• RSP)	• LJMU • Mersey Care • Users • Care providers • Various businesses	• 'Heart' of the living lab. Every three months all participants gather in this meeting. • The RSP has various roles. It acts as a focus group to generate needs or create ideas. But also acts as the governing body of the living lab: all vital decisions are made here. • In the RSP users have a prominent role, as they are considered as the 'experts' in their field, which is living with dementia.
		• Workgroups	*Varies*	• Workgroups to elaborate more on specific topics. People that are interested are asked to participate.
		• Project Board	• LJMU • Mersey Care • NHS Trust	• Steering committee of the living lab, in which LJMU and Mersey Care collaborate. NHS Trust joined the project board as they are responsible for financing healthcare in the UK.
	(Internal) communication	• Mailing list	• Mersey Care • LJMU	• Regular newsletter to all participants and other affiliates of the living lab. This newsletter provides both information on dementia in general, and the progress of the living lab itself.
Other	Promotion	• Workshops	• Mersey Care • LJMU • Users	• Workshops in the community (for example on high schools) to raise awareness on dementia. People living with dementia participate actively in these workshops.
		• Roadshows	• LJMU • Mersey Care	• Five 'roadshows' throughout Liverpool in order to gain an insight in the total population of people living with dementia.

Appendix IV (a): Liverpool innovations

	What	Why	Users	How	Involved actors
General	• Needs generation		• People living with dementia and/or their representatives. Only people in the early stages of dementia are able to participate in this exercise. However, they are asked to envision their needs and preferences for when they reach the later stages of dementia.	• At the RSP group discussions are held with people living with dementia and other stakeholders to gain an insight in the 'daily struggles of living with dementia'. These discussions are recorded and their content is analyzed to uncover central themes and topics. In later RSPs these themes are verified and further elaborated.	• People living with dementia • Professional caregivers • Informal caregivers • LJMU • Mersey Care • Businesses
Projects	• Lighting Technologies	• During an information meeting it was recognized that existing lighting technologies were used for elderly people in nursing homes. These technologies had yet to be tested for people living with dementia.	• People suffering from severe forms of dementia, living in nursing homes or in mental hospitals.	• Lighting technologies have been installed in hospital wards. People living on the wards are tested on objective measures of (physical) well-being.	• LJMU • Mersey Care • Phillips
	• Memory Enabling	• From the needs generation in the RSP the topic of 'remembering to remember' was most prominent. Therefore the living lab engaged in the development of memory enabling.	• People living with dementia (all stages) and their care givers.	• Exploration of existing technologies led the living lab to a local developer, called Tell Joan. Tell Joan was originally developed for personal use by a daughter whose mother suffers from dementia, and the living lab is researching whether it can be distributed on a larger scale.	• LJMU • Mersey Care • TellJoan
				• Internal development of a memory enabling technology. Through the RSP and other workgroups discussion are held on the requirements and priorities for memory enabling technologies. From these discussions a 'brief' is developed for which developers are sought.	• LJMU • Mersey Care • Other SMEs
	• Exercise	• Discussion in the RSP regarding exercise showed that people living with dementia do not engage in exercise much as they don't know how or where to.	• People in all stages of dementia.	• In Liverpool there is an existing exercise project that tries to encourage people over the age of 55 to exercise. The living lab has engaged in discussions to open up the program for people living with dementia. Over a period of	• LJMU • Mersey Care • Other care providers • Liveability project

				6 months 20 dementing persons living in their own homes will participate in the program. Additionally is exercise programs organized in nursing homes and on hospital wards.	
	• Reminiscence	• Opportunity to test an already developed technology.	• People in all stages of dementia.	• Testing of an existing reminiscence technology called MyLife. This technology is subsequently tested in various settings (at home, nursing home, and hospital wards), for three months per setting.	• LJMU • Mersey Care • Other care providers • MyLife

Appendix IV (b): Eindhoven

Appendix IV (b): Eindhoven Actors

Background	Who	Involvement		Elaboration
		Stability	*Nature*	
Academic	• Technical University Eindhoven (Tu/e)	Permanent	Both in living lab and in innovation projects	• Lead partner in the innovation projects (shared with GGzE) • Expertise in developing and marketing innovations • Access to upstart developers and businesses • Access to students
Context-specific	• GGzE	Permanent	Both in living lab and in innovation projects	• Lead partner in the innovation projects (shared with Tu/e) • Access to users (both for tests and other activities)
Government	• City of Eindhoven	Permanent	In the living lab overall	• Responsible for the communication of the entire Innovate Dementia project • Networking with care providers and developers in the region of Eindhoven • Promotional activities
	• Province of Noord Brabant	Permanent	In the living lab overall	• Representatives of a regional project • Networking partner
Businesses	• Brainport	Permanent	In the living lab overall	• Lead partner of the entire Innovate Dementia project • Network organization of local technology businesses and developers • Access to upstart developers and businesses
	• Vitaallicht	Project basis	In an innovation project	• Developer of a product tested in the living lab
	• FamilyLifePhone	Project basis	In an innovation project	• Developer of a product tested in the living lab

Appendix IV (b): Eindhoven Activities

Type	Subtype	What	Involved Actors	Elaboration
Organizational	Meetings	• Steering committee	• GGzE • Tu/e • Brainport • Municipality of Eindhoven • Province of Noord Brabant	• Monthly meeting between the permanent partners of the living lab. Mainly discussed is the direction of the living lab and promotion.
		• Weekly meetings	• GGzE • Tu/e	• Weekly meeting between the two partners that are mainly involved in the innovation projects.
		• Focus groups	• People living with dementia • Informal caregivers • Professional caregivers • Tu/e • GGzE	• Focus groups with various participants, which may be health care professionals, informal caregivers or people living with dementia. • Different kinds of topics may be discussed, from the generation or elaboration of needs, to evaluation of projects. Also discussed are the activities of the living lab, to gain feedback on the progress of the living lab from the 'other side'.
		• KBA	• Tu/e	• Meetings to come into contact with

			• GGzE • Brainport	developers.
	Communication	-	-	• Newsletters, a public website
Other	Promotion	• Memory Week	All	• Large event in Eindhoven to raise awareness on dementia and dementia care.

Appendix IV (b): Eindhoven Innovations

	What	Why	Users	How	Involved actors
General	• Needs generation		• People in the early stages of dementia • Informal caregivers • Professional caregivers	• Each new patient of GGzE is requested to fill in several questionnaires, including a needs assessment. That assessment covers many different aspects of daily life, and patients are asked how they are able to cope with that. The outcomes of these questionnaires serve as input for focus groups, with users or care givers. Based on the answers given in the questionnaires dementing people are invited to the focus groups.	• GGzE • Tu/e
	• Developing of innovations by students at Tu/e		• Elderly people	• During a course of the study 'Industrial Design' students engage in the development of concepts and innovations. This course is designed for students to intensively interact with users in order to develop innovation that address their needs. • As most projects end after a student has presented a concept or early prototype, this course has only led to one project in the living lab (PhysiCal). However, the aim is to engage in long-term projects in order to actually develop viable innovations to be tested in the living lab.	• Tu/e
Projects	• PhysiCal	• An activity planner for people living with dementia, developed by one of the partners of the living lab, but prior to the institution of the living lab. First project in the living lab.	• People with the early stages of dementia and their (informal) caregivers.	• One of the participants from Tu/e had developed this product before the institution of the living lab. As the product had yet to be tested and the living lab had to start testing products this was the first project in Eindhoven. Testing occurred in the homes of people living with dementia, for a few weeks per test.	• Tu/e • GGzE
	• Vitaallicht	• Developed by an external business that was looking to test the lamp. Via the Tu/e a connection with the living lab was made.	• ? Tested for people living with dementia, but applicable in many settings.	• Introduced as a product ready to be marketed, Vitaallicht has been tested at the homes of people living with dementia for a few weeks at a time. Not only was the product evaluated, but a new way of evaluating products with people living with dementia was tested. Few modifications to the eventual product have been made based on the tests.	• Tu/e • GGzE • Vitaallicht
	• FamilyLifePhone	• Developed by former students of Tu/e	• People living with dementia	• People living with dementia will be given a smartphone with a 'user-friendly' design. People will test the smartphone for a few weeks at a time.	• Tu/e • GGzE • FamilyLifePhone
	• Other projects	• Address found	-	• In Eindhoven is actively searched for	• Tu/e

		needs or desires • Further develop the protocol of the living lab	businesses or developers willing to introduce their products in the living lab for testing. This way the living lab is able to further develop living lab protocols. Prototype tests are not necessarily applied to further develop product, but might also be used for academic valorization tests.	• GGzE • other developers

Appendix IV (c): Krefeld

Appendix IV (c): Krefeld Actors

Background	Who	Involvement		Elaboration
		Stability	*Nature*	
Academic	• Alexian Dementia Research Center	Permanent	Entire living lab and innovation projects	• Leading partner in the entire living lab. Responsible for governing the network, connecting with partners and initiating projects. • Alexian has an internal multi-disciplinary team of care professionals that support the living lab and its projects.
	• Aktion Psychisch Kranken	?	Specific cases	• A national (?) body that supports in the evaluation of the healthcare provided to people living with dementia through longitudinal case studies.
Context-specific	• Alexian Dementia Research Center	-	-	-
	• Local care providers	Permanent	In the living lab overall	• Partners in the living lab. • Wide range of care providers (mental, social, generic healthcare)
Government	• City of Krefeld	Permanent	Distant	• Involved in discussions with the living lab around the organization of the local care system.
	• National Government bodies	?	Distant	• Originally, the idea to form a network stems from discussions with the national government.
Businesses	• IT developers	Contract-based	Hired	• A business is hired to develop the IT structure that supports the network and the living lab.

Appendix IV (c): Krefeld Activities

Type	Subtype	What	Involved Actors	Elaboration
Organizational	Meetings	• Steering Committee (PSAG)	• Alexian • Local care providers	• The PSAG acts as the steering committee of the German living lab. In the PSAG all local care providers are invited, to discuss the direction and activities of the living lab. The PSAG is organized each month by Alexian, and all participants in the PSAG are partners in the network.
		• Workgroups with family members & patients	• Alexian • Family members	• Next to the PSAG work groups are also organized for family members of people living with dementia. In these workgroups is discussed what support they require in giving care to their dementing family members.

				These meetings are also used to evaluate the proceedings of the living lab and the local care system.
		• Careplan meetings	• ICCM • Patient • Family members	• Careplan meetings are organized by the ICCM for each individual patient. Mostly, this meeting can be considered as the 'normal' routines of healthcare. However, also discussed are the patients desires and experiences of the care that is provided to them. These meetings thus provide the ability to gain feedback from people living with dementia themselves.
	(Internal) communication	• Knowledge and communication platform		• An online platform or database is constructed to support the local network. This database is applied for two causes: 1) it is used as a sort of communication platform between local healthcare providers (that are partners in the living lab), and 2) it is used as an elaborate knowledge tool, containing a lot of information on the living lab, the disease dementia, and the care for people living with dementia.
Other	Promotion	• Yearly conference	• Alexian • Care providers • Government	• A yearly conference on dementia is organized by Alexian and other local partners to raise awareness on this disease.

Appendix IV (c): Krefeld Innovations

	What	Why	Users	How	Involved actors
General	• Needs generation		• Professional caregivers • People living with dementia	• In group discussions with care providers, (and sometimes people living with dementia or their family members) the performance of the local care system is discussed and flaws or needs are identified.	• Alexian • Care providers
	• Idea development	• Identify chances for improvement or solve needs.		• Through field research of 'best practices' in other places ideas are generated.	• Alexian
Projects	• Independent Case Manager (ICCM)	• As the care system in Krefeld is fragmented, an overarching concept was installed to monitor the care of individuals between different care providers.	• Care professionals • People living with dementia (?)	• Case managers are trained and appointed in the network. These case managers then	• Alexian • Care providers

	• Connecting point	• Derived from an example in a different German town, where a connecting point was established in the city center.	• Elderly people • People living with dementia	• Thus far, this project is only a concept on which the living lab is working.	• Alexian • Care providers • City of Krefeld
	• IT structure	• An IT structure and knowledge tool is developed to support the network and living lab operations.	• Care providers and professionals	• A server is installed on which all information of both the network and the living lab are available to the partners of the living lab. The platform will also be used for communication between the ICCM and care providers.	• Alexian • Technology business

Appendix IV (d): Turnhout & Geel

Appendix IV (d): Turnhout & Geel Actors

Background	Who	Involvement		Elaboration
		Stability	*Nature*	
Academic	• Thomas More De Kempen (LiCaLab)	Permanent	Entire living lab	• Organizing 'party'. LiCaLab is embedded in Thomas More De Kempen, a university college in Belgium. LiCaLab is situated in a multi-disciplinary department with academics from a wide variety of backgrounds. • LiCaLab acts as the organizer of the living lab, engaging projects (both internally and externally), and connecting relevant partners to each other.
	• Academics	Project based	In projects	• As Thomas More is a university college, rather than an academic university, other academics are involved in case that projects have to be academically tested.
Context-specific	• Sint Annadael (Diest)	Permanent	In projects	• A nursing home in Diest in Belgium, which is connected to the living lab. Here several small projects are ran with the inhabitants of the nursing home. LiCaLab support Sint Annadael in their projects.
	• Care providers	Permanent (distant)	Living lab overall	• Local care providers are involved in a 'users committee', which acts as a steering committee in each project. (The composition of this committee may change for each project).
Government	• City of Turnhout	Permanent (distant)	Living lab overall	• LiCaLab has a long-term agreement with the city of Turnhout to collaborate in developing new care concepts for people living with dementia.
Businesses	• Janssen Pharmaceutica	Permanent (distant)	Living lab overall	• Permanent partner of LiCaLab
	• Bpost	Temporary	In a project	• National postal services. Engaged LiCaLab to explore new business opportunities, which led to the 'bpost' project.
	• TopFoods	Temporary	In a project	• Developer of food supplements, involved in the 'topshake' project.
	• Agoria	Permanent (distant)	Living lab overall	• Network organization of local technology businesses. Provides LiCaLab with access to potential business partners.
	• Cubigo	Temporary	Living lab overall	• Developer of software solutions, engaged with living lab to develop a communication platform.
Third Sector	• National Elderly	Occasionally	Living lab overall	• The living lab is trying to reach elderly and

	Councils			dementing people through national councils
	• Dementie expertise centrum Vlaanderen	Occasionally	Living lab overall	• Partner in the Innovate Dementia collaboration. Provides training and engages in raising the national awareness for dementia.

Appendix IV (d): Turnhout & Geel Activities

Type	Subtype	What	Involved Actors	Elaboration
Organizational	Meetings	• Workshops	• LiCaLab • Care providers • Users	• Workshops and focus groups are organized to explore specific topics. These work groups are organized by LiCaLab and invited are stakeholders from healthcare and potential users.
		• Business event	• Agoria • Technology businesses • LiCaLab • Care providers	• Ideas or needs coming from the workgroups are presented at a business event with technology businesses, to inspire potential new innovations
		• Recruiting users	• LiCaLab	• LiCaLab is trying to recruit a permanent user pool. To this end they attend local markets and other gatherings, in order to meet with users and invite them to take part.
	(Internal) communication	• Communication platform	• LiCaLab • Cubigo	• A 'facebook-like' communication platform is designed to support the living lab processes
Other	Promotion	• 'Te gek' tour	• LiCaLab • National and European government	• A promotional activity in which young dementing people have cycled a small 'tour de France. Many prominent Belgian persons were involved in order to raise awareness on dementia.

Appendix IV (d): Turnhout & Geel Innovations

	What	Why	Users	How	Involved actors
General	• Needs generation	• Identify the needs of elderly people, but also their family members and care providers.		• Work- and focus groups are organized in which care providers, users and family members participate and discuss predefined topics. These discussion groups are recorded and later analyzed. • A large international database is used to provide input on a variety of topics and needs. • Based on the topic in the database questionnaires are issued among users.	• LiCaLab • Care providers • People living with dementia & caregivers
	• Co-creation sessions		• Elderly people with limited mobility.	• During project co-creation sessions may be organized (*though they have not yet been organized for innovations in dementia care*). In these sessions, users are invited to express their opinions around specific products or concepts, and discuss what they would change to a concept, or for example, what they would pay for it.	• LiCaLab • Care providers • Developers • Users
Projects	• Bpost	• Bpost had approached LiCaLab to explore potential new business opportunities.	• Elderly people with limited mobility.	• In collaboration with local businesses in the city of Turnhout, Bpost and LiCaLab have engaged in a project to deliver peoples' groceries at their home. Over the course of half a year is experimented with this new concept.	• LiCaLab • City of Turnhout • Bpost
	• Topshake	• An attempt to make a nutritional breakfast for people with difficulties swallowing	• People with difficulties swallowing	• At Thomas More it is examined if it is possible to industrially make a nutritional and tasteful liquid breakfast. This will then be tested in nursing homes and may also be tested with people at home.	• LiCaLab • Topfoods
	• Interaction with the community	• Improve interactions between the population of the nursing home and the surrounding society.		• By engaging in diverse projects, the nursing home is trying to stimulate interactions between its population and the surrounding society. An example is a church choir of elderly people.	• LiCaLab • Sint Annadael

Appendix V: Results Tables

Appendix V (a): Results table Liverpool

Appendix V (a): Results table Liverpool

Key principles	Indicators	Realization	Score
Openness	• diversity in backgrounds	• The partnership in Liverpool displays a wide variety in backgrounds. Among them are academics, government and third sector representatives, businesses, care providers and users.	++
	• diversity in available expertise	• The diversity in the partnership also represents a variety in expertise	+
	• reported lack in competences or expertise	• The living lab has to search outside of its partnership for businesses or developers able (and willing) to further develop their ideas.	+
Continuity	• size of permanent partners	• Liverpool John Moore's University and Mersey Care are identified as the most permanent partners	+/-
	• presence of temporary partners	• While there are two main partners, many different stakeholders collaborate in the living lab, either on short term or contract basis, or for extended periods of time.	++
	• change in partnership over time	• While there are many (fairly) stable partners, the composition of the RSP fluctuates every time.	+
	• frequency of interactions between permanent partners	• Very close collaboration between John Moore's University and Mersey Care	++
	• reported quality of collaboration with temporary partners	• While most partners collaborate in the RSP, businesses are not willing to discuss their ideas or concepts with each other.	+/-
	• contractual agreements	• Stakeholders are free to attend the RSP, but contractual agreements are made in projects.	+/-
Empowerment	• user involvement (information)	• Users are informed on the progress of the living lab through various ways, such as regular newsletters and of course the RSP.	++
	• user participation (understanding and feedback)	• A stable group of 20 to 30 users attends the RSP regularly. Additionally work groups are organized to work further on specific topics or projects.	++
	• user influence ('weight of voice')	• Users are considered the experts of living with dementia, and no decisions are made without consulting the RSP. In the development of innovations users are given the final vote in decisions.	++
Realism	• user participation in needs exploration	• Users are considered the experts of living with dementia, and as such are the main participants in focus groups exploring their needs.	++
	• diversity of perspectives	• In focus groups many different stakeholders participate, such as care providers and businesses.	++
	• situation of prototype tests	• Prototypes are tested by users in their daily life, whether that is in their own home, in nursing homes or on hospital wards.	++
	• participation of users representative of the targeted population	• Actual users participate in tests, however, the living lab is not sure if their user population accurately represents the target population.	+/-
	• realism of tests	• Products are tested over multiple months, in the daily life of users.	+
Spontaneity	• use of inquiry vs non-inquiry methods of data collection	• Mostly inquiry methods are used, such as interviews and focus groups. In some test settings observations are made by professional care givers.	+/-
	• 'richness' or data collection and analysis	• Focus groups are recorded on video and later analyzed. The outcomes of those analyses are then verified in the RSP.	+
	• diversity in backgrounds of researchers	• All involved researchers share a similar background (in healthcare).	+/-

Appendix V (b): Results table Eindhoven

Appendix V (b): Results table Eindhoven

Key principles	Indicators	Elaboration	Score
Openness	• diversity in backgrounds	• Involved partners stem from academics, government, business, mental care. Users are also involved, but not as partners.	+/-
	• diversity in available expertise	• The partnership is limited in size and directly available expertise.	+/-
	• reported lack in competences or expertise	• In many operations and projects external partners are sought to support the partnership.	+/-
Continuity	• size of permanent partners	• Four main partners are identified, of which GGzE and Tu/e are most involved in innovation projects.	+/-
	• presence of temporary partners	• The living lab engages with temporary partners on a project basis.	+/-
	• change in partnership over time	• The only changes in the partnership are the temporary partners, which are only involved in projects.	-
	• frequency of interactions between permanent partners	• GGzE and Tu/e collaborate intensively for innovation projects. The entire partnership (including Brainport and the municipality of Eindhoven) meets every month.	++
	• reported quality of collaboration with temporary partners	• Businesses are reluctant to participate in the living lab, and even more reluctant to collaborate with potential competitors.	-
	• contractual agreements	• Contracts are made between all involved partners.	+
Empowerment	• user involvement (information)	• Users are invited to meetings or focus groups to discuss the progress of the living lab and its projects. A regular newsletter is sent to all participants.	+/-
	• user participation (understanding and feedback)	• In focus groups users are able to ask questions and express their opinions.	+
	• user influence ('weight of voice')	• Users are able to advise on the direction of the living lab or what projects to engage in. However, thus far users have not really been able to affect innovations tested in the living lab.**	+/-
Realism	• user participation in needs exploration	• Input for needs exploration is gathered from questionnaires which are provided to all new patients at GGzE (800 per year). The outcomes of the questionnaires provide input for focus groups with users.	++
	• diversity of perspectives	• Focus groups on needs are also organized for professional care givers and family members of users.	+
	• situation of prototype tests	• In the homes of people living with dementia.	+
	• participation of users representative of the targeted population	• The user population shows a bias to higher educated and technological interested people.	+/-
	• realism of tests	• Tests last for a few weeks, in which users can 'freely' experiment and use the prototypes.	+
Spontaneity	• use of inquiry vs non-inquiry methods of data collection	• Mostly inquiry methods such as questionnaires, interviews and focus groups are used to collect data.	-
	• 'richness' or data collection and analysis	• Focus groups are recorded, but it is not known to what extent those recordings are further analyzed. All questionnaires are statistically analyzed	+/-
	• diversity in backgrounds of researchers	• Most researcher stem from backgrounds in healthcare, either as care giver or as academic.	+/-

*) While Tu/e is one of the main partners, the involvement of other departments or students of Tu/e are considered as external partners.

**) Users were involved in the development of the PhysiCal. But the Physical in large part was developed before it was formally introduced in the living lab.

Appendix V (c): Results table Krefeld

Appendix V (c): Results table Krefeld

Key principles	Indicators	Elaboration	Score
Openness	• diversity in backgrounds	• The collaboration consists mainly of care providers.	-
	• diversity in available expertise	• At Alexian a multi-disciplinary team works in the living lab. The members of this team are mostly academics in (mental) healthcare	+/-
	• reported lack in competences or expertise	• There are no IT or technology developers in the collaboration.	+
Continuity	• size of permanent partners	• The collaboration in the living lab consists of over 20 organizations, of which Alexian can be considered as the leading partner.	++
	• presence of temporary partners	• Very few, if any, temporary partners.	-
	• change in partnership over time	• The network already exists for a few years and is steadily growing.	--
	• frequency of interactions between permanent partners	• Monthly meetings between the partners.	+
	• reported quality of collaboration with temporary partners	• Unknown/not relevant	…
	• contractual agreements	• Most or even all collaborations are formalized.	++
Empowerment	• user involvement (information)	• Users are invited to meetings in which they are informed	-
	• user participation (understanding and feedback)	• Workgroups are organized in which users and other stakeholders can express their experiences and opinions.	-
	• user influence ('weight of voice')	• Unknown, but appears limited	…
Realism	• user participation in needs exploration	• Work groups are organized in which patients, family members, or care professionals can express their needs.	-
	• diversity of perspectives	• Most participants have the perspective of care providers.	+/-
	• situation of prototype tests	•	X*
	• participation of users representative of the targeted population	•	X*
	• realism of tests	•	X*
Spontaneity	• use of inquiry vs non-inquiry methods of data collection	• Data is collected through work and focus groups with care providers and professionals, but also by observing the entire local care system.	+
	• 'richness' or data collection and analysis	• Unknown	…
	• diversity in backgrounds of researchers	• A large team of (healthcare) academics collaborates in the living lab.	+

*) Innovations are implemented and gradually developed further, rather than tested.

Appendix V (d): Results table Turnhout & Geel

Appendix V (d): Results table Turnhout & Geel

Key principles	Indicators	Elaboration	Score
Openness	• diversity in backgrounds	• In essence LiCaLab is embedded in a university college, Thomas More De Kempen, with a background in academics.	+/-
	• diversity in available expertise	• LiCaLab is embedded in a multi-disciplinary department of Thomas More, with co-workers from a wide variety of academic backgrounds.	++
	• reported lack in competences or expertise	• In the future LiCaLab is planning to attract co-workers with more expertise in business development and coaching.	+/-
Continuity	• size of permanent partners	• Thomas More is the main partner in LiCaLab, which has long term collaboration agreements with the city of Turnhout and Janssen Pharmaceutica.	+/-
	• presence of temporary partners	• Many. In each project LiCaLab may collaborate with multiple different partners, including businesses, care providers, users, government, third sector representatives, etc.	++
	• change in partnership over time	• In each project the involved partners may (and will) change	+
	• frequency of interactions between permanent partners	• Irrelevant, as LiCaLab is the single main partner	X
	• reported quality of collaboration with temporary partners	• Temporary partners collaborate to a certain extent in innovation projects.	+
	• contractual agreements	• Contractual agreements are made in projects between partners.	+
Empowerment	• user involvement (information)	• Information is accessible via newsletters and a website.	+
	• user participation (understanding and feedback)	• A communication and information platform is developed for all stakeholders to communicate and collaborate. • Focus groups are organized for users and care givers, but only a few users participated.	+
	• user influence ('weight of voice')	• Users' feedback is used as input in decision-making	+
Realism	• user participation in needs exploration	• Users are invited to focus groups, and questionnaires are issued to all involved users. Additionally an international database is used to enrich the data collected.	+
	• diversity of perspectives	• Next to users are care givers, both professional and informal, also invited in the focus groups.	+
	• situation of prototype tests	• In real-life, at the homes of people living with dementia, in nursing homes or in hospitals.	+
	• participation of users representative of the targeted population	• Elderly people, often with limited mobility or that are recovering from other health problems.	+
	• realism of tests	• Tests usually last for over 6 months, in which the concepts or innovations really become part of users' daily lives.	++
Spontaneity	• use of inquiry vs non-inquiry methods of data collection	• Mostly use of inquiry methods, such as (group) interviews or questionnaires. However, during those interviews observations can be made (either during or based on recordings)	+/-
	• 'richness' or data collection and analysis	• All collected data is analyzed, often in multiple ways	++
	• diversity in backgrounds of researchers	• At LiCaLab a variety of academics collaborates.	++