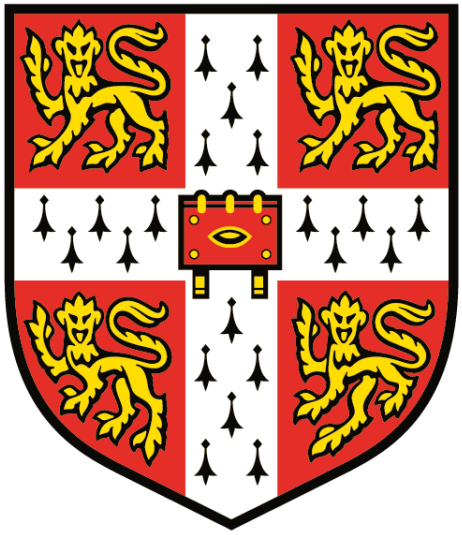
Facilitating Co-creation in Living Labs



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Abstract

Facilitating Co-creation in Living Labs

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Companies increasingly turn towards users for inspiration to develop innovative products and services. Living labs (LLs) represent a new way for companies to engage in co-creation and to better understand user needs. LLs interact with a wide set of stakeholders, such as customers, companies and universities. Therefore, coordinating co-creation is particularly complex, as it requires the inclusion of more activities and actors than those of traditional closed innovation models. It is thus crucial to identify how co-creation can be facilitated in LLs. In spite of a growing body of literature, an understanding of those factors facilitating co-creation in LLs is still lacking. To fill this gap, the perspectives of three key stakeholders, the LL facilitators, companies and co-creators, are considered. This study employs a qualitative explorative approach in the form of a holistic single-case study. A bottom-up theory building approach based on rich qualitative data, collected through interviews, focus groups, observations, questionnaires, and documentary information, is chosen, and grounded theory identified as a suitable approach. Contributions from this thesis are captured in 'The Five Ps for Co-creation Facilitation in Living Labs' framework which presents the conditions to allow for systematic and tailored facilitation services. The five Ps - Purpose, Principles, People, Place, and Prize – build the cornerstones of this framework. This thesis suggests that it is important to understand the purpose behind a company's co-creation project to tailor the facilitation service to its needs. Indeed, seven distinct categories of project objectives are reported. Furthermore, this study identifies seven principles influencing the interaction of People and Place of the LL. Finally, eight categories of project outcomes are recognised, referred to as Prize. This study contributes to the research on co-creation in LLs and provides guidelines for practitioners that would like to engage in such open innovation activities.

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1 Introduction

This chapter highlights the importance of co-creation in living labs as an emerging research area. It also presents the research motivation, as well as research questions and objectives of this study. Finally, the structure of this thesis is presented.

1.1 Background

Innovation is the basis of competitive advantage (Porter, 1990; Chesbrough, Vanhaverbeke and West, 2014). Innovative firms outclass their competitors with regards to their market share, profits and growth (Tidd, Bessant and Pavitt, 2005). Therefore, if firms fail to continuously innovate then their chances of survival are extremely threatened. Traitler, Watzke and Saguy (2011) complement *"innovate or die"* with the new mantra *"partner or perish"* (p. 66). For this reason, companies increasingly reach outside their own organisational boundaries, as a mode of innovation, in which they use external knowledge sources, as well as markets, to accelerate their own internal innovation (Enkel, Gassmann and Chesbrough, 2009; Gassmann, Enkel and Chesbrough, 2010; West and Bogers, 2014; Bogers, Chesbrough and Moedas, 2018). To innovate, companies partner with a variety of stakeholders, such as universities, suppliers, and even competitors. However, a recent study by Brunswicker and Chesbrough (2018) highlights the predominant involvement of customers as a key partner in the open innovation (OI) process. Companies turn towards customers for inspiration to develop innovative products and services that better align with customers' expectations (Gutu, Manuwa and Mbuya, 2018).

The traditional perspective on innovation sees customers as the passive recipients of innovation outcomes, suggesting that most information is flowing one way from the company to its customers (Prahalad and Ramaswamy, 2004b). Both managerial practice and academic research, however, identify the need to review traditional innovation models, and to position customers at the heart of the innovation process when appropriate. Businesses are realising that traditional approaches to innovation — developing new products and services in-house, running focus groups and customer research, in order to assess feasibility and market potential — do not always echo customers' actual needs and desires. Therefore, a growing number of firms pay close attention to their customers and their opinions as a source of vital ideas, useful feedback, valuable use experiences, and new information. Companies involve their customers and users in many ways, by co-creating with them brands, experiences, marketing strategies, designs, and products as well as services (Jeppesen and Måns, 2003; Zwick, Bonsu and Darmody, 2008). Across all industries, firms agree that involving users in the innovation process – to learn from them

and work with them – is vital (Westerlund and Leminen, 2011).

Empowered by the internet and the associated information technologies, customers also want to take a more active role in producing marketable value (Zwass, 2010). Customers are no longer passive adopters of innovations, they are taking instead an active role as innovators by interacting with companies (see also Geoffrey *et al.*, 1993; Barczak, 1995; Storey and Easingwood, 1996; Kelly and Storey, 2000). By allowing customers to become idea generators and co-creators, it is possible to comprehend their latent or unvoiced needs (Kristensson, Matthing and Johansson, 2008). Humphreys *et al.* (2009) find that co-creation increases the number of sources for new ideas in innovation, and facilitates idea generation through experience, as well as knowledge sharing between companies and customers. By embracing co-creation, companies reduce their market risk in the launch of new products and services, and improve their return on investment and time to market (Westerlund and Leminen, 2011). Apart from direct innovation outcomes, such as growth, productivity and profits (Ramaswamy and Gouillart, 2010), co-creation also produces indirect or intangible outcomes, such as an increased perceived value of, and the likelihood of participation in future co-creation opportunities, as well as the increased likelihood of positive word-of-mouth (European Commission, 2014). Indeed, Chesbrough and Brunswicker (2013) identify that businesses consider customer and consumer co-creation as the most important inbound OI practices. Engaging in value co-creation is a source of competitive advantage, as it allows "*turning just-in-time knowledge from customers into just-in-time learning for their organisation"* (Humphreys *et al.*, 2009, p. 13). Co-creation capabilities are thus critical to the growth and profitability of a company (Prahalad and Ramaswamy, 2000, 2004a, 2004c; Von Hippel, 2005; Bhalla, 2010; Ramaswamy and Gouillart, 2010; Ramaswamy and Ozcan, 2013).

One prominent approach to foster co-creation that is becoming increasingly popular are the so-called Living Labs (LLs) (e.g., Schuurman *et al.*, 2015; Leminen *et al.*, 2016). In spite of the lack of a common and coherent definition (Mulder, Velthausz and Kriens, 2008; Bergvall-Kåreborn *et al.*, 2009; Kviselius *et al.*, 2009; Tang *et al.*, 2012; Grotenhuis, 2017), LLs can be seen as settings for OI, which provide a collaborative platform for research, development, and experimentation in real-life contexts, on the basis of particular methodologies and tools (Schaffers and Turkama, 2012). LLs are driven by two focal philosophies. Firstly, LLs involve users as co-creators of innovation outcomes on an equal basis with the other stakeholders, and secondly, LLs focus on experimentation in real-world contexts (Almirall *et al.*, 2012). Through the use of LLs, firms are able to reach beyond their own company boundaries following an open-innovation model (Westerlund and Leminen, 2011) and integrate outsiders in the co-creation of brands (Payne *et al.*, 2009), experiences (Prahalad and Ramaswamy, 2004b), design (Sanders and Stappers,

2008), marketing strategies, and product or service development (Westerlund and Leminen, 2011). LLs offer an environment that closely resembles the context of the product or service in real-life by providing an authentic use situation as much as possible (Bergvall-Kåreborn, Holst and Ståhlbröst, 2009; Leminen, Westerlund and Nyström, 2012).

Westerlund and Leminen (2011) describe the use of LLs as a new way to build competences and sustain competitive advantage by using real-life settings and a multi-stakeholder approach. As part of the co-creation process, LLs often act as an intermediary (Almirall and Wareham, 2011; Cleland *et al.*, 2012) or innovation facilitator (Mulvenna *et al.*, 2010), by providing structure and governance to the co-creation process (Almirall and Wareham, 2008). In LLs, it is assumed that participation in the co-creation process is open to all relevant and interested stakeholders (Ståhlbröst and Bergvall-Kåreborn, 2008), such as customers, businesses, suppliers, universities, and governmental organisations (Ståhlbröst and Bergvall-Kåreborn, 2008; Bergvall-Kåreborn *et al.*, 2009; Ståhlbröst, 2012). These stakeholders not only participate in innovation activities, but also have the power to influence the process (Prahalad and Ramaswamy, 2004b). This power permits them to be active partners in the innovation and development process, rather than just be passive receivers and subjects of internal R&D activities (Higgins and Klein, 2011; Almirall *et al.*, 2012; Leminen and Westerlund, 2012).

To study co-creation in LLs in this thesis, JOSEPHS® - a physical living laboratory – is explored. Located in the city centre of Nuremberg in Germany, JOSEPHS® is open to the public and enables the active involvement of users in the development, introduction and commercialisation of new services and products. The rotating themes in the LL allow for a variety of innovation projects to be carried out. This LL has received multiple awards for its innovation, as well as its research activities, and represents an interesting and multifaceted case that is studied in this thesis.

1.2 Research Motivation

LLs are complex multi-stakeholder constellations where a lot of activities and interactions take place (Garcia Robles *et al.*, 2016; Evans *et al.*, 2017). *"Understanding the key to co-creation success must draw on the motivations of the relevant stakeholders to engage in the process"* (Rudmark, Arnestrand and Avital, 2012, p. 2). While practitioners and academics have discussed the benefits gained from co-creation, little is known about what motivates the different stakeholders to participate in the co-creation of innovations (Pedrosa, 2009). Extant literature focuses on the drivers that encourage customers and users to participate in co-creation activities (e.g. Roberts, Hughes and Kertbo, 2014), yet fails to shed light on the perspective of businesses. The creation, prototyping, validating

and testing of new technologies, services, products, and systems present opportunities for companies to engage in LLs (Westerlund and Leminen, 2011). However, absent in the literature are the specific motivations that companies articulate as their project objective when utilising LLs. In order to guide firms and facilitators on how to utilise LLs, more knowledge is needed regarding companies' motivational drivers for participating in a co-creation process. Furthermore, such motivations need to be compared against the results of engaging in a LL, in order to understand how far the co-creation project has achieved its purpose. Veeckman *et al.* (2013, p. 9) suggest, indeed, that *"the innovation outcome must be considered"*. Yet, *"the emerging LLs research fails to highlight innovation outcomes"* (Leminen and Westerlund, 2015, p. 448). As *"value is always uniquely and phenomenologically determined by the beneficiary"* (Vargo and Lusch, 2008, p. 9), companies utilising the facilitation service of LLs, therefore, determine the value derived from it. While, the success of co-creation projects in LLs can be based on the congruence or discrepancy between planned objectives and outcomes (Gardner, 1977), the literature does not offer such insights.

Despite the numerous advantages of integrating a diverse set of stakeholders in LLs, coordinating co-creation, in such an environment, is complex because it requires the inclusion of more activities and actors than those of traditional innovation models (van de Vrande *et al.*, 2009). As the core service of a LL is to facilitate co-creation by acting as an interface between multiple actors (Mulder and Stappers, 2009), it is important for the LL to understand the factors that play a role in facilitating co-creation in LLs. However, a comprehensive understanding of how multiple stakeholder interaction can be facilitated in LLs is still lacking as *"previously identified capabilities are tailored towards co-creation with one type of stakeholder"* (Kazadi, Lievens and Mahr, 2016). Extant research studies a company's ability to manage co-creation with one type of stakeholder group, such as customers (Coviello and Joseph, 2012), competitors (Amaldoss and Rapoport, 2005) and suppliers (Song and Thieme, 2009). Rosado *et al.* (2015, p. 81) stress, indeed, that there is "*the need for more specific descriptions of the practice of running a LL, i.e. how to organize a LL's activities, how to involve different stakeholders, ways of collaboration, co-ordination etc., combined with a more conceptual concern with the possibility of reconciling the interest of these different stakeholders".* While, studies attempt to describe the characteristics and principles of LLs (Følstad, 2008a; Ståhlbröst, 2012; Veeckman *et al.*, 2013), scholars state that the *"execution of such collaborative innovation processes is conceptually and practically underdeveloped"* (Katzy *et al.*, 2013, p. 296). Researchers call for an in-depth understanding of the characteristics, processes, and tools that are employed in LLs (Ståhlbröst, 2008; Niitamo, Westerlund and Leminen, 2012; Leminen and

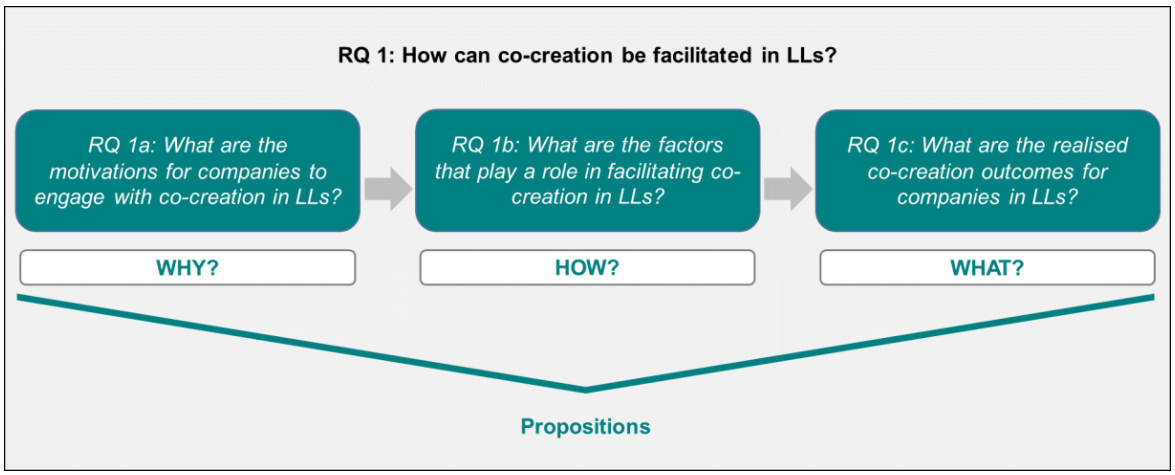
Westerlund, 2013; Sauer, 2013; Tang, 2014; Schuurman, 2015), so that to better understand how to design a LL based on the desired principles.

To conclude, LLs are complex undertakings, demanding not just physical facilities but also careful management of key relationships and networks. Currently, there is no model for developing or managing LLs (Guzmán *et al.*, 2013). Organisations that are considering developing a LL will find little practical guidance and no consensus on the best practices for managing it. Guzmán *et al. (*2013, p. 30) call for a reference model *"to provide LL managers and practitioners [with] the tools to create and evolve a LL following a continuous improvement and evolution approach*". To address this gap in the literature, a holistic framework, explaining how co-creation can be facilitated in LLs, is developed through this study. The following section presents the research questions that build the foundation for this framework.

1.3 Research Questions and Objectives

In line with the research motivation discussed in section 1.2, this research explores how co-creation can be facilitated in LLs. An overarching research question, filling the research limitations discussed above, is formulated. The research question is: *How can co-creation be facilitated in LLs?* The research question is then articulated in three sub-questions (Figure 1). The sub-questions of this thesis enquire about the specifics of how co-creation can be facilitated in LLs.

Figure 1 Research Approach



As the motivation of companies is an important prerequisite for them to engage in a creative process, it is important to first understand what motivates them to engage in co-creation. Co-creation success is based on the motivations of the relevant stakeholders participating

in the process (Rudmark, Arnestrand and Avital, 2012). As a key stakeholder in the process, it is therefore important to understand what motivates companies to engage in co-creation. For this reason, research question 1a is defined as *"What are the motivations for companies to engage with co-creation in LLs?".*

Despite the numerous advantages of integrating a diverse set of stakeholders, coordinating co-creation in such an environment is more complex than pursuing innovation through traditional innovation models (van de Vrande *et al.*, 2009). It is critical to understand what conditions have to be created to facilitate the co-creation process between companies and co-creators in LLs. Thus, research question 1b is "*What are the factors that play a role in facilitating co-creation in LLs?"*.

Considering the novelty of LLs as an innovation platform, it is important to assess their success. To do so, Veeckman *et al.* (2013) recommends considering the innovation outcome. Also, Gascó (2017, p. 97) stresses that *"specifically, qualitative research should aim at obtaining the insights of […] innovation outcomes".* Therefore, research question 1c poses the question: "*What are the realised co-creation outcomes for companies?"*

Drawing on these three sub-research questions, the overarching question *"How can co-creation be facilitated in LLs?"* is addressed. This thesis introduces *'The Five Ps for Co-creation Facilitation in Living Labs'* framework, which presents the conditions that allow for systematic and tailored facilitation services. Finally, three propositions for successful co-creation facilitation in LLs are presented.

1.4 Thesis Structure

This thesis consists of seven chapters and is structured as follows:

In chapter two, the literature is reviewed. First, the foundations of co-creation and LLs, their definitions and conceptual boundaries are discussed to clarify the theoretical positioning of the study. Second, a systematic literature review on the current state-of-the-art of co-creation in LLs is conducted analysing articles, thematically, to identify, analyse and report patterns within the selected body of literature.

Chapter three presents the methodology used in the research that is reported in this thesis. The philosophical position of this research is described before providing the rationale for a qualitative, single case study. Then, the research design with regards to the data collection methods and sources is discussed. Grounded theory is discussed as the method for data analysis and interpretation, and finally, research quality is verified by reference to internal validity, construct validity, external validity, and reliability.

In chapter four, the case of JOSEPHS® - a physical living laboratory – is presented. In the case description, attention is drawn to the physical layout of the LL, and

the key stakeholders that are involved in the co-creation process, and any other aspects that define JOSEPHS'® concept. One longitudinal example is presented to show how a company engaged in the co-creation process and the lessons they learnt from using JOSEPHS®. Three key challenges that JOSEPHS® encounters are discussed. Further, JOSEPHS'® co-creation process is described. Finally, the changes that have been introduced since its launch in 2014 are analysed. The findings from the pilot study reveal that there is not only a theoretical gap but also a practical need that requires a structured approach to identify what facilitates co-creation in LLs.

In chapter five, the findings are discussed, and organised according to the different research questions of the study. Firstly, the motivations why stakeholders engage in co-creation are presented. Secondly, factors facilitating co-creation in LLs are studied and organised in three categories: principles, people, and place. Finally, planned and unplanned co-creation outcomes are examined.

Chapter six discusses the findings and places them within the existing literature, showing how research gaps in several areas are filled. The chapter highlights the contributions of this study with regards to the companies' motivations to engage with co-creation, the factors that play a role in facilitating the co-creative process, and the outcomes that can be achieved through co-creation in LLs. Moreover, the chapter puts forward three propositions derived from this study and discusses the innovation potential of LLs with regards to three particularly interesting areas that require further investigation.

Chapter seven concludes the work by presenting the conclusions, contributions to theory and practice, and their implications for future theoretical development. Also, the study's limitations are discussed. Moreover, a number of future research opportunities to validate the framework, explain and further explore findings are proposed. The chapter shows that the research questions posed are successfully addressed by the study.

2 Literature Review

This chapter offers a review of the literature on co-creation in LLs. In the first part, co-creation and LLs are introduced to familiarise the reader with these two concepts. Secondly, a systematic review of articles at the intersection of these two fields is presented. A descriptive and thematic analysis of studies is carried out to position this study in the wider academic debate. Finally, a summary is presented highlighting important gaps in the literature.

2.1 Introduction to Co-creation and Living Labs

This thesis investigates the co-creation of innovations through the use of LLs. Co-creation is an important part of LLs (Følstad, 2008a; Almirall *et al.*, 2012), and therefore, these two concepts are strongly interconnected. Indeed, many definitions of LLs, which will be presented in section 2.1.2.2, emphasise how LLs help to stimulate a collaborative innovation process between multiple stakeholders, which is oriented towards the generation of an innovative output and the support of a creative processes. Before analysing the extant literature on co-creation in LLs, the two notions are introduced separately in the following sections.

2.1.1 What is Co-creation?

Although the expression co-creation is now widely recognised, several concepts have been used in the past to describe comparable phenomena. Several disciplines and streams of research, often at the same time, developed concepts which are partially overlapping, contributing to the emergence of the idea of co-creation. To clarify the foundation of this thesis, this section provides the reader with an introduction to one of the main concepts at the base of this study and presents an overview of the evolution of the co-creation notion. Finally, this section defines customer co-creation.

2.1.1.1 A Brief History of Co-Creation

The idea of co-creation became prominent at the beginning of the 21st century, as a result of the mutated role of customers, who became, from isolated, unaware and passive to connected, informed and active (Terblanche, 2005), which was thanks to a wide array of technological advancements (Zwass, 2010; Saarijärvi, 2012; Malthouse *et al.*, 2013). With access to unprecedented volumes of information (Prahalad and Ramaswamy, 2004a), consumers are now able to take better informed decisions. A key implication of people becoming more informed about offerings and comparable products and services from competitors, is that their knowledge provides them with more negotiation power (Kirah,

2009), which is revolutionising markets: *"Companies must escape the firm-centric view of the past and seek to co-create value with customers through an obsessive focus on personalized interactions between the consumer and the company"* (Prahalad and Ramaswamy, 2004, p. 7). As a result, customers increasingly engage in an active dialogue with companies and exercise their influence in every area of the business (Prahalad and Ramaswamy, 2000, 2004a). Such increased attention towards intangible assets, such as relationships, interactivity and mutual creation, led to the shift from a firm and goods-dominant (G-D) marketing perspective to a perspective that focuses on relationship marketing, and on customers as co-producers of value (Vargo and Lusch, 2004; Grönroos, 2008; Gummesson, 2008).

Indeed, the service-dominant (S-D) logic opened a new era of marketing thought, highlighting the transitioning from a *goods-dominant* to a *service-dominant perspective* of value creation (Vargo and Lusch, 2004). The S-D logic, as introduced by Vargo and Lusch (2004, p. 9), is *"a mindset, a lens through which to look at social and economic exchange phenomena so they can potentially be seen more clearly".* The S-D logic contrasts with the traditional, foundational goods-dominant logic (G-D logic) which considers goods as the unit of exchange and the focus of value creation. Instead, the S-D logic is focusing on the primacy of intangibles, such as knowledge and skills, in the creation of value. The perspective suggests that the service, rather than the products, is basis of all exchanges, whereby goods only serve as transmitters of services and act as a way for customers to take advantage of firm competences (e.g. Vargo and Lusch, 2004; Vargo et al., 2008). A major difference between the S-D and G-D logic lies in the basis of exchange (Vargo and Lusch, 2004): the G-D logic suggests that value is created in exchange (value-in-exchange), while the S-D logic suggests that value is created in use (value-in-use). This new view fundamentally alters the relationship between providers and customers (Ng et al., 2012). Following the S-D logic, the firm cannot produce value by itself, but it can offer a value proposition and together, the customer and firm create value. Indeed, Vargo and Lusch (2008, p. 7) state that the customer is always *"a co-creator of value"* (Vargo and Lusch 2008, p. 7). Thus, the notion of co-creation represents an essential part of the S-D logic. In other words, the S-D logic suggests that firms do not provide value, but they offer value propositions (Vargo and Lusch, 2004) and it is the customer that determines the value and co-creates it together with the firm. While acknowledging the importance of the S-D logic, which has significantly contributed to the understanding of how value is co-created, this thesis, however, focuses on the facilitation process of co-creation in LLs. Therefore, the S-D logic does not provide a suitable theoretical lens to fully understand the facilitation process of co-creation nor the context in which it takes place. Indeed, Grönroos and Voima

(2013, p. 134) point out that the *"roles of the service provider and the customer or the nature, scope, and locus of this value co-creation process"* have not been defined.

The roots of a shift from passive to active customer, however, were already present well before the beginning of 21st Century. The marketing literature, for example, tried to capture the shift taking place from being a passive customer to an active innovator by introducing the idea of customer participation; firstly, this was used in a paper by Lovelock and Young (1979). Since then, a substantial body of literature has emerged, studying both the productivity gains as well as the challenges that occur from turning customers into quasi-employees (Firat, Dholakia and Venkatesh, 1995; Edvardsson *et al.*, 2000; Bendapudi and Leone, 2003; Namasivayam, 2003).

Another important contribution in this area is the one from Toffler (1981), who introduces the idea of the prosumer; a customer who produces some of the goods and services they consume. Scholars (Toffler, 1981; Kotler, 1986; Ritzer and Jurgenson, 2010) argue that consumers replace employees for some of the tasks in the production process. Building on these contributions, Prahalad and Ramaswamy (2000, 2002, 2004a, 2004b) coined the term co-creation. Several scholars (Ramirez, 1999; Prahalad and Ramaswamy, 2004c, 2004a; Lusch, Vargo and Brien, 2007, among others), argue that companies have to acknowledge the fact that customers are becoming partners in creating value. More recent literature (Protogerou, Caloghirou and Lioukas, 2005; Payne *et al.*, 2008; Zwick, Bonsu and Darmody, 2008; Skaržauskaitė, 2013) emphasises collaboration with the customers based on their free will and employing different platforms and social technologies.

Since Prahalad and Ramaswamy's influential articles (2000, 2002, 2004b, 2004a), the notion of co-creation has gained worldwide attention, as the study of value creation has moved away from a focus on the role of the firm to one that incorporates the customer (Lusch and Webster, 2011). The growing attention toward the phenomena is also echoed in the professional magazines, news aggregators and online blogs, where co-creation of value appears like a buzz-word. While the literature offered over the years has used a diverse set of definitions to describe what is conceptualised in this work as co-creation, still recently, scholars (Galvagno and Dalli, 2014; Buhalis and Foerste, 2015; Kushwah, Shree and Sagar, 2017; Huo, Gu and Wang, 2018) describe co-creation as a new paradigm. Such a paradigmatic shift requires a change in how to view innovation in organisations and society.

Schuurman *et al.* (2013) consider co-creation as a link between the perspectives of OI and user innovation. Although, conceptually, co-creation processes are discussed across disciplines including marketing and management theory, as well as psychology, all co-creation approaches share two key features: firstly, an expansion of organisational

boundaries, and secondly, the involvement of co-creators (Roser, DeFillippi and Samson, 2013). This study focuses on co-creation in the context of innovation studies.

2.1.1.2 Customer Co-creation of Innovations

Co-creation does not necessarily take place involving customers: it can also rely on engagement with, for example, other firms, dealers, employees, and suppliers. Furthermore, co-creation can be aimed at different objectives. This thesis, however, specifically examines co-creation involving customers and users for the purpose of innovating new technologies, services, products, and systems. Customer co-creation refers to current as well as prospective customers. To ensure clarity, the expression 'co-creator' is used throughout this thesis when referring to co-creation with customers and users, which is consistent with the usage by Leminen, Nyström and Westerlund (2015, p. 8) who define co-creators as any individual who *"seeks and solves problems, ideates and innovates, and develops the solutions together with the companies' R&D teams and other LL actors on an equal basis"*.

Ideas from customers are critical to innovation because they may generate more effective problem identification and solutions (Von Hippel, 2005; Poetz and Schreier, 2012) when compared to conventional market research methods (Franke and Piller, 2004; Von Hippel, 2005; Ogawa and Piller, 2006). Research (e.g. Kristensson, Matthing and Magnusson, 2002; Magnusson, 2003, 2009; Kristensson, Gustafsson and Archer, 2004; Poetz and Schreier, 2012; Nishikawa, Schreier and Ogawa, 2013) compares the quality and commercial success of customer versus professionally-ideated products and services in order to learn that customers can surpass the company's professionals. Customer co-creation can produce radical innovations (Dahl and Moreau, 2002; Kristensson, Gustafsson and Archer, 2004; Magnusson, 2009) and has been studied with regard to different contexts, such as, for example, computer gaming (Prügl and Schreier, 2006), and sport kiting (Rowley, Kupiec-Teahan and Leeming, 2007).

2.1.2 What is a Living Lab?

In this section, the concept of LLs is introduced. The first subsection discusses the emergence of the concept. Several definitions are presented to demonstrate the lack of a common understanding of the notion. Finally, the LL definition that is employed in this study is discussed.

2.1.2.1 The Emergence of Living Labs

The term 'Living Lab' was first introduced by William J. Mitchell and was used in the context of a real home where the activities and interactions of ordinary home life can be observed, documented for later investigation, and experimentally manipulated (Mitchell, 2003). More specifically, a LL is seen as an extension of laboratory experiments with the objective to receive more accurate and naturalistic user information by collecting more long-term data and carrying out observations of day-to-day activities. Schuurman *et al.* (2011) define this as the American or original version of LLs. In American LLs, users are not actively involved in the development of products or services, yet their role is closer to that of being passive test subjects or research subjects.

In comparison, European LLs are often short-term and small-scale co-creation projects that take place in real-life environments. Ballon and Schuurman (2015) argue that European LLs are characterised by five basic elements that reflect several goals and characteristics. These elements include active user involvement, a real-life setting, multiple stakeholder participation, a multi-method approach, and co-creation. In 2006, the European LL movement attracted more attention through a number of European Union (EU) policy measures (Dutilleul, Birrer and Mensink, 2010). As a result, initiatives such as the European Network of Living Labs (ENoLL) were founded.

2.1.2.2 Defining Living Labs

Although there is now a certain body of literature that attempts to elucidate and analyse the phenomenon (Følstad, 2008a; Almirall *et al.*, 2012; Leminen, Westerlund and Nyström, 2012) LL practices are still under-researched, and a theoretical as well as a methodological gap exists (Ballon and Schuurman, 2015). A lot of different definitions have been proposed to explain what a LL is (Garcia Robles *et al.*, 2016), and the absence of a widely recognised definition (Mulder, Velthausz and Kriens, 2008; Kviselius *et al.*, 2009; Tang *et al.*, 2012; Grotenhuis, 2017) indicates the lack of a common understanding of the concept and its underlying mechanisms (Bergvall-Kåreborn and Ståhlbröst, 2009). A report for the European Commission (Santonen *et al.*, 2017) highlights that several reviews on existing LL concepts and definitions exist (Følstad, 2008a; Dutilleul, Birrer and Mensink, 2010; Schuurman *et al.*, 2012). A recent review by Leminen (2015) identifies 70 different LL definitions, some of which are reported in Table 1. In spite of the lack of a widely accepted definition, LL definitions commonly share the following two key elements: a real-life test and experimentation environment, and stakeholders that are external to the company who are co-involved in the innovation process.

Table 1 Living Lab Definitions

Author	Definition
Eriksson *et al.*, 2005	*"A user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts"* p. 4.
Ballon, Pierson and Delaere, 2005	*"An experimentation environment in which technology is given shape in real-life contexts and in which (end) users are considered co-producers"* p. 3.
Ponce De Leon *et al.*, 2006	*"An R&D methodology where innovations, such as new services, products, or applications enhancements, are created and validated in collaborative, multi-contextual, empirical, real-world environments within individual regions"* p. 1.
Schaffers and Kulkki, 2007	*"As experimentation and validation environments characterized by early involvement of user communities, closely working together with developers and other stakeholders, and driving rapid cycles of ICT-based innovations"* p. 31.
Feuerstein *et al.*, 2008	*"Systemic innovation approach in which all stakeholders in a product, service or application participate directly in the development process"* p. 1.
Bergvall-Kåreborn *et al.*, 2009	*"A user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values"* p. 3.
European Commission, 2009	*"A user-driven open innovation ecosystem based on a business–citizens– government partnership which enables users to take an active part in the research, development and innovation process"* p. 7.
Almirall and Wareham, 2011	*"Open innovation intermediaries that seek to mediate between users, research, and public and private organizations, [and to] advance our concept of technology transfer by incorporating not only the user-based experimentation, but also by engaging firms and public organizations in a process of learning and the creation of pre-commercial demand"* p. 100.
Westerlund and Leminen, 2011	*"Physical regions or virtual realities in which stakeholders form public-private-people partnerships (4Ps) of firms, public agencies, universities, institutes, and users all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts"* p. 20.
Konsti-Laakso, Pihkala and Kraus, 2012	*"An R&D concept which aims to create innovations in a multi-contextual, real-world setting"* p. 97.
Fulgenico, Le Fever and Katzy, 2012	*"A human-technology interaction innovation entity utilizing a mix of methods, tools and principles drawn from known disciplines (design, science, ICT, etc.) and set in a real environment and on a local/societal scale"* p. 6.
ENoLL, 2018	*"User-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings."*

In line with Westerlund and Leminen (2011, p. 20), this thesis defines LLs as *"physical regions or virtual realities in which stakeholders form public-private-people partnerships*

(4Ps) of firms, public agencies, universities, institutes, and users all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts." This comprehensive definition is chosen because it underpins the multifaceted nature of the phenomena by stressing the multi-stakeholder involvement, the real-life context in which authentic use situations are captured, and the variety of contributions that stakeholders can make in the innovation process of technologies, services, products and systems.

2.2 Evidence from the Systematic Literature Review

Due to the presence in the literature of a multitude of overlapping concepts, it is important to map the intellectual territory that revolves around co-creative innovation activities in LLs. An integrative literature review is considered a suitable approach to address emerging topics which would benefit from a holistic synthesis of the literature to date (Torraco, 2005). A comprehensive unbiased search is one of the key differences between a traditional narrative literature review and a systematic one (Tranfield, Denyer and Smart, 2003). Indeed, systematic reviews deliver the most efficient as well as a high-quality method for identifying and assessing extensive literatures (Mulrow, 1994).

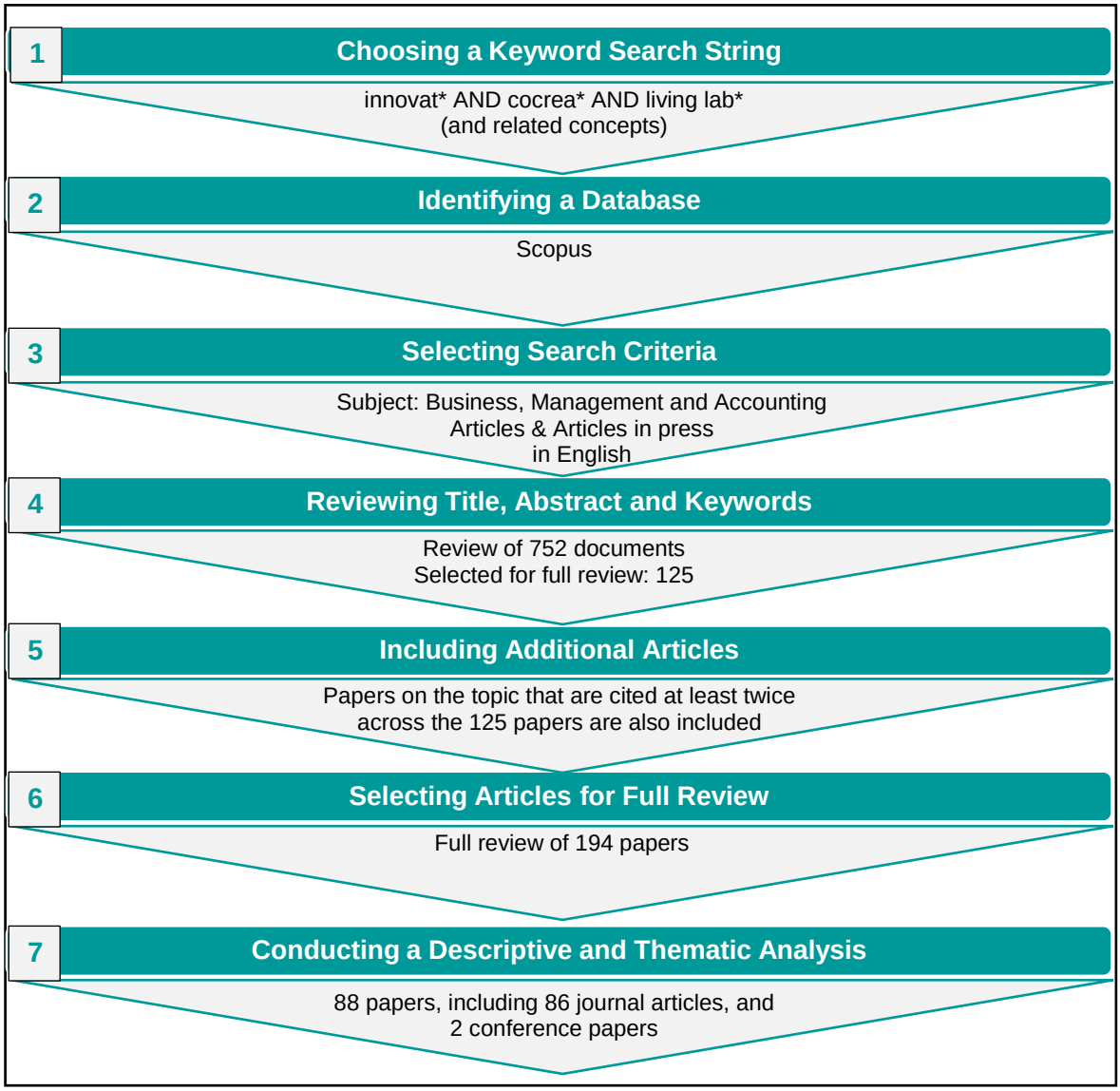
2.2.1 Identifying the Need for a Review

To carry out a systematic literature review, it is essential to assess if a review with an identical focus has been done before. A search of peer-reviewed journal articles across five major academic databases, including ABI (ProQuest), ISI Web of Science, Science Direct, Emerald, and Scopus, is carried out. For this purpose, the search string *cocrea** AND *living lab** AND *systematic literature review* OR *systematic review* OR *systematic analysis* is used. No entries are found across these five databases, suggesting that carrying out a systematic literature review is required to provide an overview of the state of the research on this topic.

2.2.2 Conducting a Systematic Literature Review

This literature review incorporates the principles and generic framework of the orthodox systematic review process as articulated for the management science field (Tranfield, Denyer and Smart, 2003). The review procedure carried out is summarised in Figure 2.

Figure 2 Systematic Literature Review in 7 Steps



2.2.2.1 Step 1: Choosing a Keyword Search String

In order to systematically search for relevant articles, it is necessary to identify keywords and keyword search strings (Tranfield, Denyer and Smart, 2003). Keyword search strings combine keywords, employing Boolean Logic (e.g., OR, *, AND, NOT), to find the most effective combination of keywords that will deliver relevant studies. An initial set of keywords is generated through reading journal articles. Running searches using those keywords across several databases helps to further refine the search string (see Pittaway et al., 2004 for a similar approach).

As co-creation and LLs have been associated with different concepts, and are often used interchangeably, such terms are included as part of the search strategy (Schibrowsky, Peltier and Nill, 2007). To ensure that the search results address the topic in the context of innovation, the term is coupled with cocrea* (and related concepts) and living

lab* (and related concepts). The goal is to achieve a more focused search by connecting generic search strings with more specific keywords (Leseure et al., 1991). Reviewing the search results confirmed that a high level of keyword saturation is achieved, and no additional keywords are identified by reading titles, keywords and abstracts. An overview of keywords included in the search is presented in Table 2.

Table 2 Keyword Selection

Keyword	AND	Keyword	AND	Keyword
innovat*		co-crea*/ cocreat*/ co creat*		living lab*
		co-prod*/ coprod*/ co prod*		open innovation space*
		co-innovat*/ coinnovat*/ co innovat*		open innovation lab*
		collaborat* product development		innovation lab*
		consumer design		open innovation ecosystem*
		crowdsourc*		cooperation lab*
		customer empowerment		innovation hub*
		customer integration		
		customer involvement		
		customer participation		
		customized product*		
		early customer input		
		external sources of innovation		
		lead users		
		mass customization		
		multi-stakeholder collaboration/ multistakeholder collaboration		
		open innovation		
		user communities		
		user innovat*		
		user involvement		

Source: Keyword selection partially based on Gemser and Perks (2015)

2.2.2.2 Step 2: Identifying a Database

Consistently with Randhawa, Wilden and Hohberger (2016), Scopus is selected as the most suitable scholarly database due to the quality and focus of the search results. As the largest abstract and citation database of peer-reviewed literature, Scopus is one of the most widespread databases on different scientific fields and covers a wide range of journals (Guz and Rushchitsky, 2009). Also, Scopus allows for the easy construction of complex searches and permits advanced searching by the use of filters (Kitchenham et al., 2010).

2.2.2.3 Step 3: Selecting Search Criteria

In order to achieve focused search results, only documents published in English, belonging to the Business, Management and Accounting subject area, are included (see Degnegaard, 2012 for a similar approach). In line with Galvagno and Dalli (2014), the selection of the subject area is to avoid a large number of irrelevant results that discuss co-creation in other contexts.

Similar to David and Han (2004), Newbert (2007) and Mustak, Jaakkola and Halinen (2013, p. 343), peer-reviewed journal articles, and articles in press at this stage of the review, are selected as they are considered to *"represent the most advanced level of research".* David and Han (2004, p. 42) point out that *"journal articles have been through a review process that acts as a screen for quality, allowing us to distil studies meeting a certain level of conceptual and methodological rigor."* According to Light and Pillemer (1984, p. 35), the rigorous peer review process that articles must undergo prior to publication usually lead to a better *"technical product".*

2.2.2.4 Step 4: Reviewing Title, Abstract and Keywords

The review of article titles, abstracts and keywords served to eliminate duplicates, non-English results and substantively irrelevant articles in the context of the specified criteria. This process reduced the pool from 752 to 125 articles that are seemingly relevant to co-creation in LLs. While the selection of keywords ensures maximal inclusivity, this step in the selection process demonstrates the wide use of co-creation and related concepts in a variety of contexts.

2.2.2.5 Step 5: Including Additional Articles

To ensure that the described keyword search does not exclude some relevant articles, simply because some scholars use different terminology or the database does not list them, the reference lists of the selected articles are cross checked (Mustak, Jaakkola and Halinen, 2013). Additional articles that are cited in more than one of the 125 publications, and that address co-creative phenomena or LLs are identified, irrespective of their publication status (two conference papers are included) and the disciplinary focus of the journals.

2.2.2.6 Step 6: Selecting Articles for Full Review

The steps described so far led to the creation of a list of 194 individual papers, which then became the object of a full-text review. The papers were scrutinised to ensure their content was relevant with respect to the objectives of this literature review. From these, 88 articles are chosen for the descriptive and thematic analysis (highlighted with an asterisk (*) in the

reference list). These articles are considered to be representative of the current body of knowledge related to co-creation in LLs in an innovation context.

2.2.2.7 Step 7: Conducting a Descriptive and Thematic Analysis

In line with Mustak, Jaakkola and Halinen (2013), the analysis started by organising the articles in chronological order and reading them from oldest to newest. This helped the researcher to become familiar with the subject, and to understand how ideas on co-creation in LLs have developed over time (Gabbott, 2004). This thesis includes articles that have been made available on Scopus until 20 May 2018, which are finally thematically analysed. This method is used for identifying, analysing and reporting patterns and themes within data across all of the chosen articles (Braun and Clarke, 2006).

2.2.3 Descriptive Analysis of the Literature

The 88 papers, consisting of 86 journal articles and two conference papers, selected for the systematic literature, have been published between 2002 and 20th May 2018. More than half of these are published in the last five years, demonstrating the growing relevance of the topic investigated in this study.

The journal articles have been published in 53 different journals. As displayed in Table 3, five journals published almost a third of the selected papers, whereas the remaining articles are issued across 48 journals. This indicates that a variety of journals address the topic around co-creation in LLs, but also that some journals are particularly influential in shaping the academic debate in this field.

Table 3 Top Five Journals by Number of Articles selected in this Study

#	Journal	Number of articles
1	Technology Innovation Management Review	10
2	International Journal of Product Development	5
3	Info[1]	5
4	Creativity and Innovation Management	4
5	The Electronic Journal for Virtual Organizations and Networks	4

The most influential papers, as measured by number of citations, are listed in Table 4. In total, six papers, each, have above 1000 citations on Google Scholar. All of these papers discuss general topics associated with co-creation and user engagement. When specifically

[1] According to Scopus: Digital Policy, Regulation and Governance (formerly info: The journal of policy, regulation and strategy for telecommunications, information and media)

focusing on those papers that are explicitly discussing LLs, the top six articles have between 127 and 364 citations (see Table 5).

Table 4 Most influential Papers

#	Number of Citations[2]	Reference
1	2064	Sanders, E.B.N. and Stappers, P.J., 2008. Co-creation and the new landscapes of design. *Co-design*, *4*(1), pp.5-18.
2	1662	Prahalad, C.K. and Ramaswamy, V., 2004. Co-creating unique value with customers. *Strategy & leadership*, *32*(3), pp.4-9.
3	1573	Howells, J., 2006. Intermediation and the role of intermediaries in innovation. *Research policy*, *35*(5), pp.715-728.
4	1543	Franke, N. and Shah, S., 2003. How communities support innovative activities: an exploration of assistance and sharing among end-users. *Research policy*, *32*(1), pp.157-178.
5	1195	Sawhney, M., Verona, G. and Prandelli, E., 2005. Collaborating to create: The Internet as a platform for customer engagement in product innovation. *Journal of interactive marketing*, *19*(4), pp.4-17.
6	1066	Nambisan, S., 2002. Designing virtual customer environments for new product development: Toward a theory. *Academy of Management Review*, *27*(3), pp.392-413.

Table 5 Top Six Publications about Living Labs

#	Number of Citations[2]	Reference
1	364	Følstad, A., 2008. Living labs for innovation and development of information and communication technology: a literature review.
2	239	Almirall, E. and Wareham, J., 2008. Living labs and open innovation: Roles and applicability. *eJOV: The Electronic Journal for Virtual Organization & Networks*, *10*.
3	185	Leminen, S., Westerlund, M. and Nyström, A.G., 2012. Living Labs as open-innovation networks. *Technology Innovation Management Review*, *2*(9).
4	178	Bergvall-Kareborn, B. and Stahlbrost, A., 2009. Living Lab: an open and citizen-centric approach for innovation. *International Journal of Innovation and Regional Development*, *1*(4), pp.356-370.
5	128	Almirall, E., Lee, M. and Wareham, J., 2012. Mapping living labs in the landscape of innovation methodologies. *Technology innovation management review*, *2*(9).
6	127	Dutilleul, B., Birrer, F.A. and Mensink, W., 2010. Unpacking European living labs: analysing innovation's social dimensions. *Central European journal of public policy*, *4*(1), pp.60-85.

2.2.4 Thematic Analysis of the Literature

The papers identified through the systematic process, described earlier, are discussed in the following four thematic subsections. The first part presents those papers which compare

[2] According to Google Scholar

LLs to other innovation approaches, as well as papers that highlight LL characteristics and principles (section 2.2.4.1). The remaining papers are discussed in four further subsections, mirroring the definition employed in this research. This study adopts the definition of LLs put forward by Westerlund and Leminen (2011), which describes them as "*Physical regions or virtual realities in which stakeholders form public-private-people partnerships (4Ps) of firms, public agencies, universities, institutes, and users all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts.".* Building on this definition, the section is structured around four different areas. Firstly, a LL is a "place", which can be virtual or physical, and thus it represents where co-creative activities take place (see section 2.2.4.2). Secondly, a multiplicity of stakeholders engages in LLs which is referred to as public-private-people partnerships (PPPP) (see section 2.2.4.3). Thirdly, the practices to support the collaboration for creation, prototyping, validating, and testing activities are discussed in section 2.2.4.4. Finally, the definition emphasises the objective of a LL as being related to the contribution to the innovation process (see section 2.2.4.5).

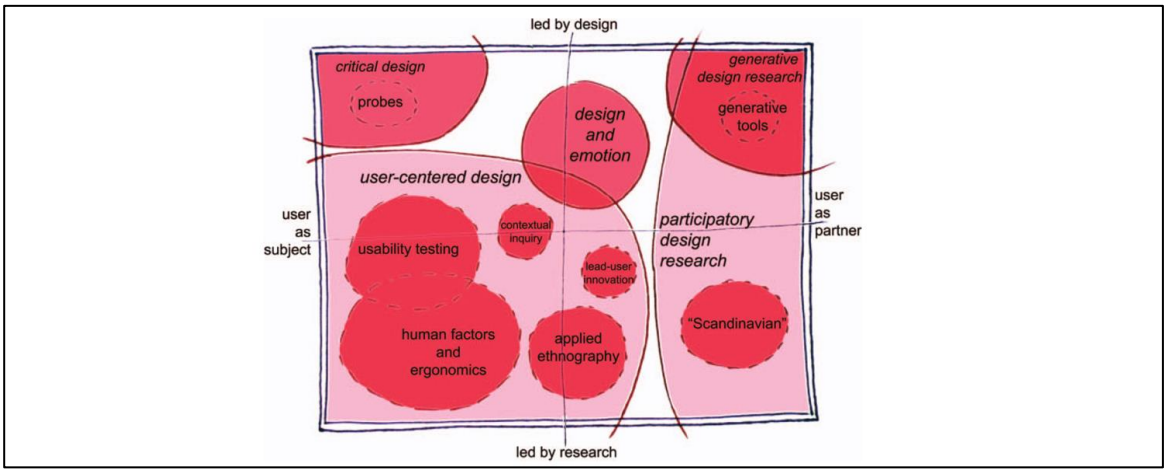
2.2.4.1 Conceptualising Living Labs

This section presents the studies that are concerned with the conceptualisation of LLs. Firstly, the concept is positioned in the wider innovation literature comparing similar approaches to LLs. Secondly, the role of LLs is presented, and finally studies are discussed that outline specific characteristics of the phenomena.

2.2.4.1.1 Positioning Living Labs in the Innovation Literature

LLs, according to Sanders and Stappers (2008), are part of the human-centred innovation approach.

Figure 3 The landscape of human-centred design research

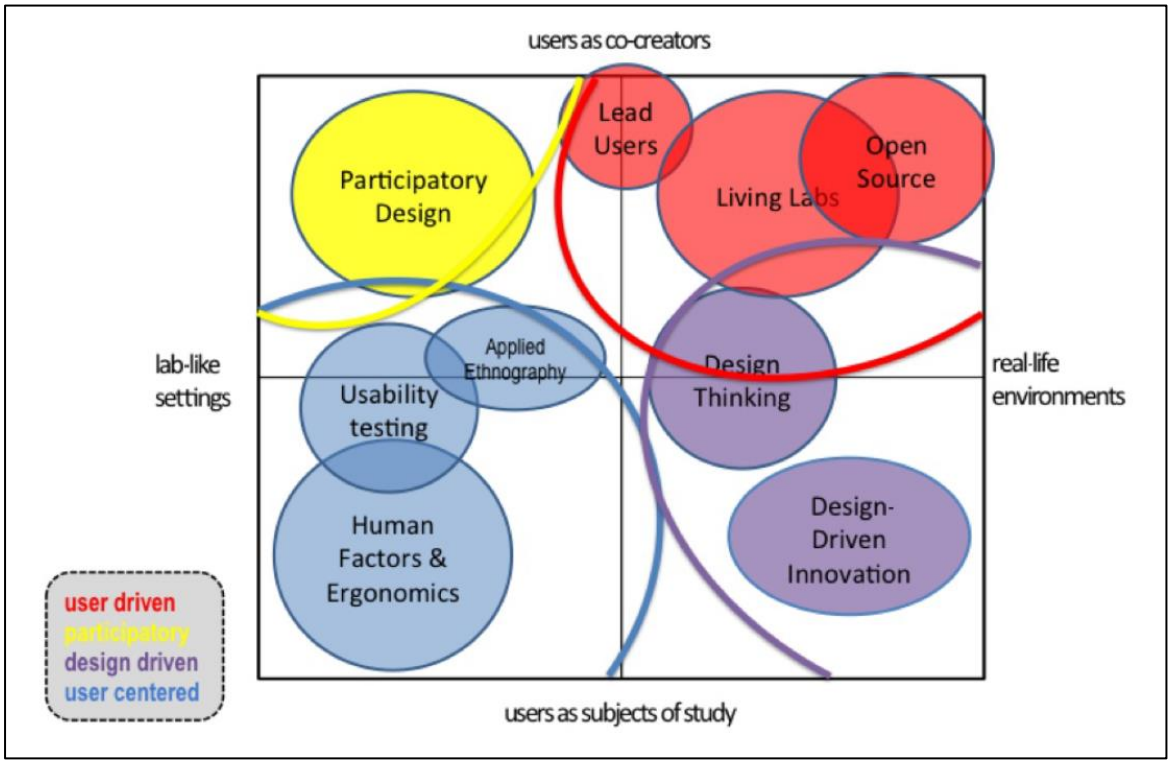


Source: Sanders and Stappers (2008)

In the field of participatory design, displayed in Figure 3, the notions of co-creation and co-design have been growing. The terminology of these two concepts is often confused and/or treated interchangeably with one another. However, Sanders and Stappers (2008) consider co-design as a particular instance of co-creation. More specifically, they use the term co-design to refer to the creativity of designers, and to people not qualified in design, who are working together in the design development process.

Differently, Almirall *et al.* (2012) provide insights into the most common European LL approaches and they place them in the landscape of user-contributed innovation methodologies (see Figure 4). Their study puts forward four propositions. Findings reveal that users are involved early on in the innovation process to obtain either market knowledge, or more focused domain-based knowledge. Secondly, the importance of real-life environments as the locus of research is stressed. Thirdly, another distinctive characteristic of LL methodologies is associated with the presence of public-private-partnerships (PPPs). Fourthly, the authors suggest that LLs benefit from PPPs for creating an initial demand, and also regularly involve other stakeholders, such as small and medium-sized businesses, in order to lower the barriers of entry in multi-stakeholder or very regulated environments.

Figure 4 Mapping user-innovation methodologies



Source: Almirall *et al.* (2012)

Figure 4 compares LLs with other user-innovation methodologies by classifying them according to two relevant dimensions (Almirall *et al.*, 2012). The first dimension considers one of the key characteristics of LLs: the participation of users in the co-creation process. The study recognises a variety of practices along that dimension. On one end of the spectrum, users are viewed as subjects of observation, for example, in human factors, ergonomics, or applied ethnography. On the other end of the spectrum, users are co-creators, including, for instance, lead users or open source communities. The second dimension of interest takes into account the setting of user participation, having lab-like environments at one extreme and real-life settings at the other. Based on the degree of user involvement in the innovation process, Almirall *et al.* (2012) divided the illustrated methodologies into four categories. LLs belong to user driven methodologies together with open source and lead users; in this grouping, users are the ones that drive the innovation process.

Pascu and van Lieshout (2009) compare, instead, LLs with OI and social computing, highlighting that they all emphasise the role of the user in the innovation process. The study recognises that user-centric services can help in promoting future service ecosystems. In particular, the LL perspective presents the opportunity to open new geographical markets where new products and services can be studied. The study also suggests that LLs can be employed to go beyond the present “launch-and-learn” approach in online social communities, and empower active end-user engagement in the online communities' development process (Pascu and van Lieshout, 2009).

Instead, Schmidt and Brinks (2017) position open creative labs in a broader discourse on knowledge communities in relation to organisations. Based on the insights that are derived from the innovation and creativity labs in Berlin, a taxonomy of four lab types is proposed: experimentation labs, working labs, OI labs, and investor-driven labs. Experimentation and working labs offer both spatial and social structures to promote creativity with the goal of creating new and strong social communities. On the other hand, OI labs and investor-driven labs are more focused on profiting from the diverse knowledge resources that are rooted in different knowledge communities and external to the hosting organisation (Schmidt and Brinks, 2017).

2.2.4.1.2 Roles of Living Labs

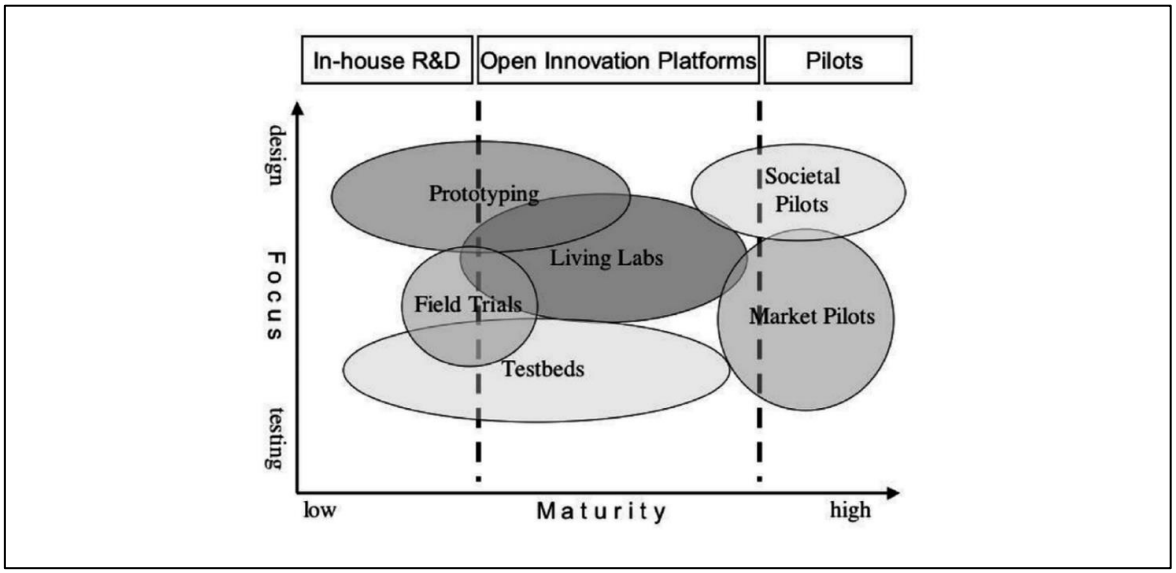
LLs are discussed in the literature as performing multiple roles, while also being described as intermediary, platforms and networks.

Almirall and Wareham (2011) claim that LLs function as an intermediary between various stakeholders. LLs can perform a variety of activities in the innovation process in their intermediary capacity (e.g. Howells, 2006) and thus can also be labelled as agents,

brokers or marketplaces. Katzy *et al.* (2013) suggest a strategic position for these innovation intermediaries as facilitators with strategic innovation capabilities. The study recognises matchmaking and innovation process design, management of collaborative projects, project valuation and portfolio management as such strategic capabilities. For such an intermediary role to be performed effectively, Lapointe and Guimont (2015) remark on the need for an organisational culture of openness and permeability, in regard to the external environment of companies. They also confirm that stakeholders utilising LLs identify the need to be sensitised and supported in the development of OI know-how through intermediaries. Agogué, Yström and Le Masson (2013) suggest that innovation intermediaries, such as LLs, can play a valuable role, even when the technologies, markets and stakeholders are unidentified, and where there is a need for communal action beyond the sole company to discover new opportunities. The kind of intermediary studied reveals that an innovation intermediary can be an initiator, co-creator, manager and stakeholder simultaneously in processes concerned with complex issues. Agogué, Yström and Le Masson (2013) suggest that for innovation intermediaries that want to expand their role and be more participative, it is essential to recognise the need for specific capabilities, such as a creative, open-minded leadership. Ståhlbröst and Bergvall-Kåreborn (2011) explored the intermediation role of an online LL in which users can contribute to the innovation process by taking an active role in the development and testing of ideas, services, and products. The study reveals that users' motivation to participate in innovation activities is influenced by situational factors, confirming the findings of the study by Antikainen, Mäkipää, and Ahonen (2010). The most important motivators for users' contribution are intrinsic motivations, for example, learning, stimulating curiosity and being entertained. Ståhlbröst and Bergvall-Kåreborn (2011) conclude that in order to fully exploit the potential of a community, it is vital to understand what is important for the users in that particular context and make sure that this is satisfied.

Ballon, Pierson and Delaere (2005) identify LLs as *platforms* and emphasise that LLs are different than test beds. The authors suggest that LLs recreate a natural user environment and are therefore different from in-house R&D, OI platforms and pilots. Ballon, Pierson and Delaere (2005) view LLs as a special case of Test and Experimentation Platforms (TEPs) (see Figure 5). A key difference is that the commercial maturity of what is tested is usually higher in societal and market pilots when compared to LLs. Also, the focus on design, instead of testing a finished product, is greater in LLs in comparison to testbeds and field trials. Moreover, the open nature of LLs, as opposed to purely in-house activities, plays a more significant role. As it is shown in Figure 5, these different TEPs can in practice partly overlap with each other. For instance, a testbed and/or field trial can be integrated in a LL setting. As a result, a vast variety of diverse LL settings as well as configurations exist.

Figure 5 Conceptual Framework of Test and Experimentation Platforms



Source: Ballon, Pierson and Delaere (2005)

Other studies conceive LLs as *networks* (Nyström *et al.*, 2014; Vecchio *et al.*, 2017). For example, Westerlund and Leminen (2011) consider LLs as networks, acknowledging their multi-actor nature. Leminen, Westerlund and Nyström (2012) emphasise that the type of actor that is involved in the innovation and the mechanisms by which the actors' objectives are realised characterise LL networks. In spite of the rising interest and efforts to differentiate the numerous types of LLs, their underlying innovation mechanisms, and their relationship with the stakeholder driving the innovation in LL networks, it requires further research (Følstad, 2008a; Dutilleul, Birrer and Mensink, 2010). For this reason, Leminen (2013) studies the different coordination and participation approaches in LL networks. The author categorises LLs into four types based on their coordination approach (i.e., bottom-up versus top-down) and participation approach (exhalation-dominated versus inhalation-dominated). A top-down approach is directed or coordinated in line with centralised and official targets, while a bottom-up approach addresses local needs and functions at the grassroots level. On the other hand, the inhalation-dominated innovation approach tries to satisfy the needs of the driving party of the LL, whereas the objective of the exhalation-dominated innovation approach is to address the requirements of other stakeholders. Also, Leminen, Westerlund and Nyström (2012) consider LLs as networks that integrate both user-centred research and OI. They characterise LLs by their purpose, organisation, action, outcomes, and lifespan. As a result, four types of LLs were identified. Firstly, in a utiliser-driven LL the focus lies on developing and testing company products and services. Companies are utilisers who use LLs as a strategic tool to gather user data to support the company’s business development. Secondly, enabler-driven LLs are usually public-sector

projects which pursue societal goals. Often, universities carry out the development work close to the users and their everyday lives. In enabler-driven LLs, company participation has usually been minimal. Leminen, Westerlund and Nyström (2012) suggest that the low level of participation means that businesses fail to see the value of participating in those types of LLs that address mainly enabler's objectives. Thirdly, developer organisations, such as universities or consultants, can launch provider-driven LLs. The objective of provider-driven LLs is to endorse advances in research and theory, increasing knowledge creation, and finding solutions to particular issues. For example, universities may use LLs for educational reasons, creating new research and teaching approaches. Fourthly, user-driven LLs are introduced by user communities to address users' daily life problems. The objective of such LLs is to solve particular issues in a manner that is aligned with the values and requirements of users and their communities. Value is co-created primarily for the user community; however, businesses and society at large also benefit indirectly (Leminen, Westerlund and Nyström, 2012). Based on this categorisation, in a later paper, Leminen *et al.* (2016) suggest that the driving actors in LLs influence the novelty of the innovation and conclude that provider-driven and utiliser-driven LL networks offer opportunities for radical innovation. Lettl, Herstatt and Gemuenden (2006) show that the profile of users, who can contribute significantly to the early phases of radical innovations projects, varies greatly from those users who are typically engaged in traditional marketing research.

2.2.4.1.3 Characteristics of Living Labs

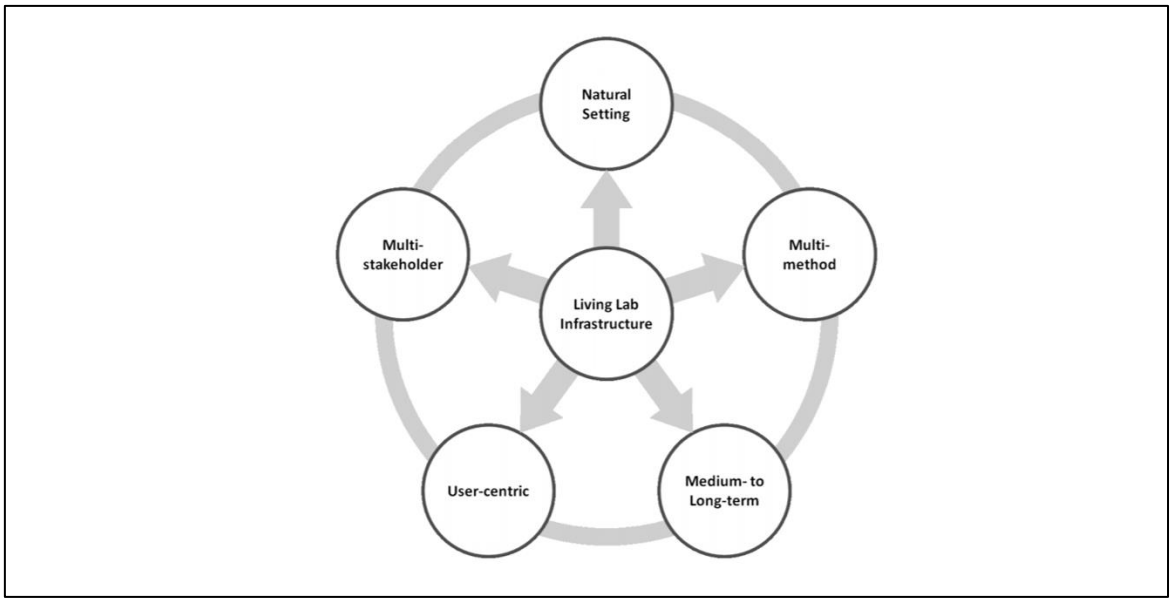
While the studies, discussed so far, focus on the conceptualisation of LLs, often in comparative terms to other concepts existing in the innovation literature, other studies offer a description of the main characteristics of LLs and the conditions required for their success.

Ståhlbröst (2012) identifies five key principles characterising LLs: Value, sustainability, influence, realism, and openness. In LLs, the aim is to generate value for all stakeholders and the processes in place support this in two different ways. Firstly, value is created for the LL partners, for example, in companies with respect to business value. Ståhlbröst (2012, p. 4) explains that *"business value is a somewhat intangible term that includes all forms of value that determine the health and well-being of an organisation in the long-run".* Secondly, value is produced for the presumptive customer or user in terms of user value. Sustainability relates to the sustainability of the LL and its obligation to the wider society. Furthermore, consistent with the general sustainability and environmental trends in society, it is also imperative that LLs assume responsibility for their ecological, social, and economic impact. The third principle that the author proposes is influence. Ståhlbröst (2012) argues that users should be active participants and have an influence on the innovation process. The author describes realism as another cornerstone of the LL

approach. The principle refers to the realistic, natural, real-life setting in which the innovation activities should be conducted. Finally, openness is considered to be an essential principle that can strengthen innovation capacity through cross-fertilisation and open collaboration between different stakeholders. Openness is vital for innovation processes in LLs, as it helps in understanding the different stakeholder perspectives to develop an innovation.

Schuurman *et al.*, (2013) characterise LLs by six defining elements: a natural setting, multiple stakeholders, multiple methods, a medium- to long-term perspective, user centricity, and some form of LL infrastructure (see Figure 6). These elements are proposed as a set of guidelines for innovating in LLs and for setting them up.

Figure 6 Defining Elements of a Living Lab



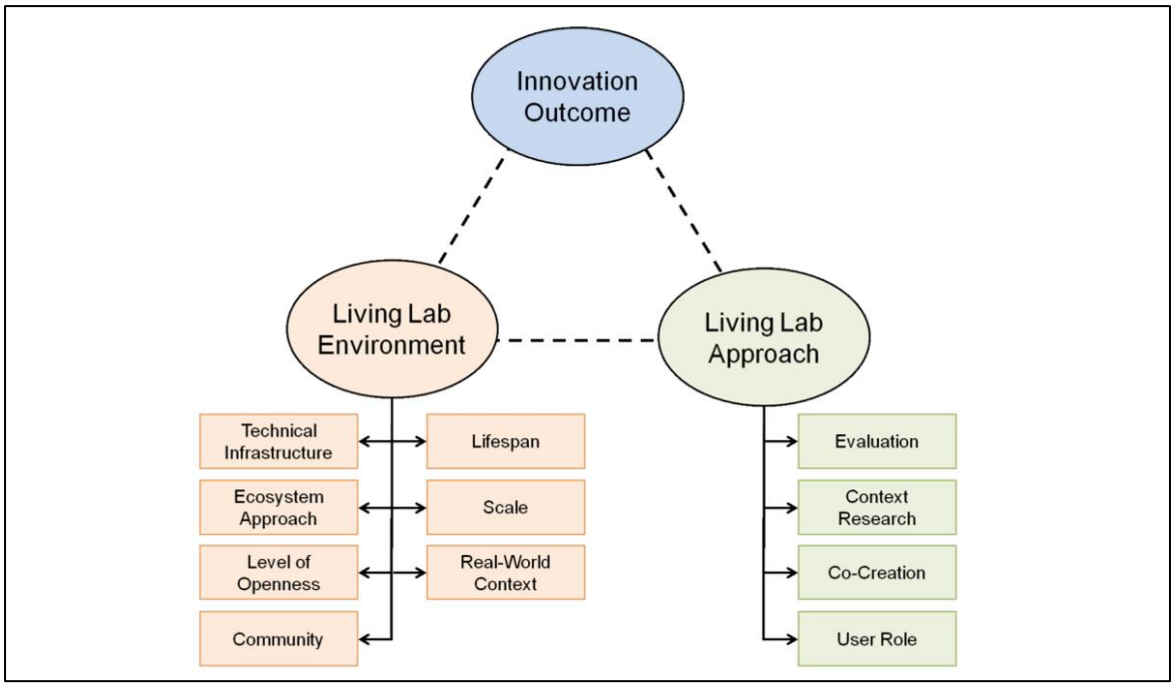
Source: Schuurman *et al.* (2013)

In his effort to further conceptualise LLs, Følstad (2008a) employed a bottom-up approach and carried out a wide literature review of ICT LLs, recognising nine distinct characteristics: context research, discovery, co-creation, evaluation, technical testing, familiar context, real-world context, medium- or long-term, and large scale. Firstly, context research refers to the investigating of the context of use. Secondly, discovery relates to the provision of insights into unexpected ICT uses and new service opportunities. Thirdly, co-creation refers to the involvement of users as co-creators. Fourthly, evaluation echoes the purpose to evaluate or validate new ICT solutions with users. Fifthly, technical testing takes the (semi) realistic context of use into account. Følstad (2008a) summarises these five characterising purposes as LL contributions to the innovation and development process. In addition to

those five, two characterising purposes are related to the LL context. Familiar context is seen as the experience and experiment with ICT solutions in contexts that are familiar to users. Next, the real-world context describes the experience and experiment with ICT solutions in real-world contexts. The fourth category of characterising purposes that Følstad (2008a) describes link to the specific characteristics of LL studies. He distinguishes between medium and long-term studies involving users. Finally, large scale refers to trying out ICT solutions with large numbers of users.

Veeckman *et al.* (2013) propose a framework defining LL characteristics and outcomes. The study considers the link between the three building blocks of LLs and analyses their impact on the LL outcomes. The 'Living Lab Triangle' framework (Figure 7) consists of three pillars and includes 11 key characteristics. The framework is based on the characterising purposes identified by Følstad (2008a).

Figure 7 The Living Lab Triangle



Source: Veeckman *et al.* (2013)

2.2.4.2 Virtual and Physical Living Labs

LLs are a "place" where co-creation takes place. Such an environment for co-creation can be in physical spaces or in virtual realities (Westerlund and Leminen, 2011). This section presents the studies retrieved in the systematic literature review, accordingly.

2.2.4.2.1 Physical Innovation Spaces

Oksanen and Ståhle (2013) investigate the physical environment as a source for innovation. The study proposes five characteristics that are important elements to consider in a physical space for innovation. The first characteristic identified is communicativeness: innovation is viewed as a social process taking place through the collaborative work that is carried out. An ideal working environment encourages and empowers interaction between different stakeholders. Secondly, modifiability is needed to carry out innovative work. The innovation spaces under investigation were built to support a wide range of activities and new collaborative approaches of studying and working. Thirdly, the study identifies intellectuality as a characteristic of a space that is naturally linked to certain key technologies, such as wireless communication and numerous sensors. The often-employed term 'smart space' relates to environments that are qualified for co-operation with smart objects as well as systems and for interaction with different users. Fourthly, the space has to be attractive. This can include, for example, interior design, ergonomics, and art. The attractiveness of a space also consists of elements such as location, architecture, or services. Finally, the space should reflect the values and meanings as a continuation of a company's identity. Oksanen and Ståhle (2013) identify that, in practice, innovative spaces involve a combination of these five attributes, and are conditional to each case, where some elements are more important than others. Also, Lewis and Moultrie (2005) analyse the physical environment of innovation labs, and highlight that the physical design of the space is vital to its functionality by endorsing the out-of-the-box thinking of the participants and thus enhancing the novelty of the ideas. Thereby, the dislocation from daily activities, removing hierarchy, and inspiring participation all play an important role. The direct facilitation is critical to successful LL operations.

While, Elmquist and Ollila (2016) agree that a physical space is beneficial, as it facilitates interactions with new people, they also highlight that relying only on the physical space is risky. *"It is not enough to attract partner organisations to a location; the manager must initiate the development of relationships"* (Elmquist and Ollila, 2016 p. 290). Similarly, Schuurman *et al.* (2016) argue that the LL infrastructure is a facilitating element which fosters collaboration among all stakeholders, and enables knowledge and technology spill-overs within the innovation ecosystem. Other studies remark how a physical space is important, but also according to its consistency with the firm's overall strategy. While Lewis and Moultrie (2005) focus specifically on innovation labs and the characteristics of the space itself, Moultrie *et al.* (2007), for example, link the environment to the firm's strategic goals. The authors suggest that the environment itself can become part of the company's innovation strategy and can have an impact on innovation performance and as a consequence should be a conscious part of any innovation strategy.

In contrast to earlier studies (Lewis and Moultrie, 2005; Magadley and Birdi, 2009), Memon *et al.* (2018) find that the dedicated physical space that previously has been recognised as a key component of the LL structure is actually not a fundamental part of it. Instead, the study finds that many of the existing LLs under investigation are focused on the groups of people who facilitate the innovation process out of the specific physical boundaries. In other words, *"their activities are not bounded by the lab premises rather the lab personnel carry the necessary equipment along to other sites and facilitate the innovation process therein"* (Memon *et al.*, 2018, p. 9).

2.2.4.2.2 Virtual Innovation Platforms

A number of studies focus on virtual innovation platforms for innovation purposes. For example, Følstad, (2008b) presents the LL approach as a way to address current service development challenges in the area of online communities. Sawhney, Verona and Prandelli (2005) focus on virtual platforms by presenting the distinctive capabilities of the Internet for customer engagement, which includes interactivity, greater reach, persistence, speed, and flexibility. The study highlights that companies can employ these capabilities to involve customers in collaborative product innovation through different Internet-based mechanisms. The authors argue that in virtual environments lead users can be better selected or you can let them self-select. Moreover, companies are neither restricted by geographical borders nor by the boundaries of their served markets in the selection of lead users. Sawhney, Verona and Prandelli (2005) identify three themes in Internet-based collaboration with customers to support New Product Development (NPD), with regards to *"(a) the absorption and integration of complementary forms of knowledge through different mechanisms; (b) organizational transformation as a prerequisite for the success of collaborative innovation and; (c) the emergence of mediators who facilitate collaborative innovation"* (p. 14). Indeed, employing online methods to engage with customers has positive implications for the firm's innovation output (Ryzhkova, 2015).

2.2.4.3 Stakeholder Engagement in Living Labs

LLs offer opportunities for companies to co-create with a variety of stakeholders, but also enable cities to attain innovative services provision for citizens and other local actors. Bifulco, Tregua and Amitrano (2017) emphasise that a variety of actors, including people, private sector actors, universities and research centres, institutions and organisations should be involved in the co-creation of new services. Also in the context of collaborative innovation networks in cities, Leminen, Rajahonka and Westerlund (2017) point out that LLs, typically, include different stakeholders, such as suppliers, customers and users, competitors, universities, and other institutions and organisations. For this reason, this

section discusses first the literature around the different stakeholder roles in the innovation process in LLs. As extant literature focuses on the role of users and how they can be engaged in the co-creation process, the next two subsections specifically address these aspects.

2.2.4.3.1 Stakeholder Roles

Nyström *et al.* (2014) identify 17 different actor roles and defines their particular characteristics (see Table 6).

Table 6 Actor Roles and their Characteristics

#	Roles	Characteristics
1	Webber	Acts as the initiator, decides on potential actors
2	Instigator	Influences actors' decision-making processes
3	Gatekeeper	Possesses resources
4	Advocate	Background role, distributes information externally
5	Producer	Contributes to the development process Participates
6	Planner	Participates in development processes; input in the form of intangible resources
7	Accessory provider	Self-motivated to promote its products, services, and expertise
8	Coordinator	Coordinates a group of participants Establishes
9	Builder	Establishes and promotes the emergence of close relationships between various participants in the living lab
10	Messenger	Forwards and disseminates information in the living lab network
11	Facilitator	Offers resources for the use of the net
12	Orchestrator	Guides and supports the network's activities and continuation; tries to establish trust in the network to boost collaboration which aims at the living lab's goals
13	Integrator	Integrates heterogeneous knowledge, development ideas, technologies, or outputs of different living lab actors into a functional entity
14	Informant	Brings users' knowledge, understanding, and opinions to the living lab
15	Tester	Tests innovation in (customers') real-life environments, e.g. hospitals, student restaurants, and classrooms
16	Contributor	Collaborates intensively with the other actors in the network to develop new products, services, processes, or technologies
17	Co-creator	The user co-designs a service, product, or process together with the company's R&D team and the other living lab actors

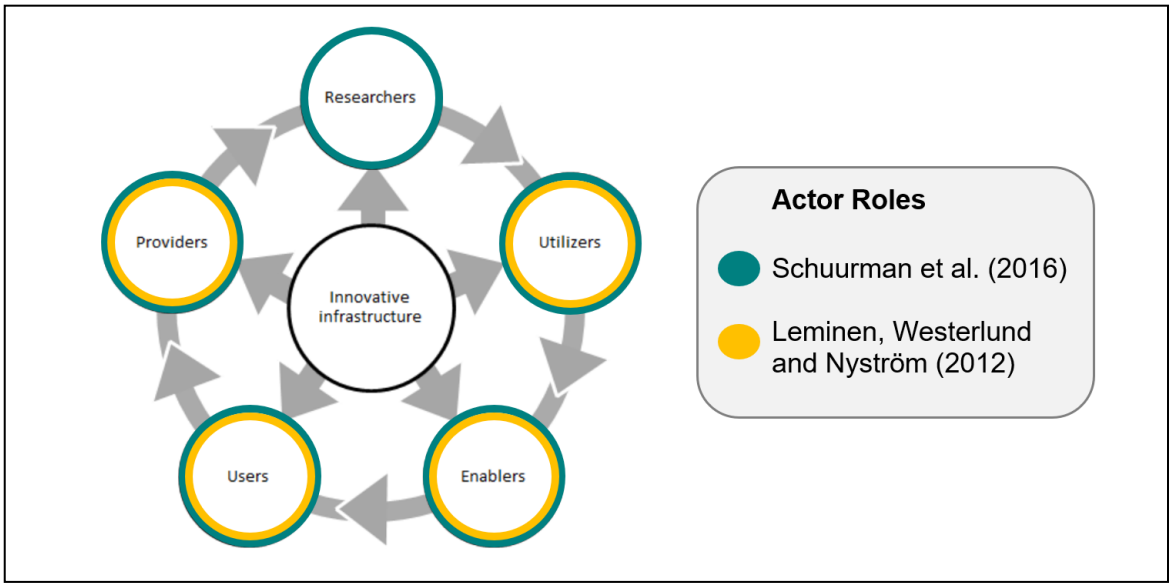
Source: Adapted from Nyström *et al.* (2014)

According to Nyström *et al.* (2014), among the 17 different actor roles, 10 are new actor roles that have not been discussed in previous literature (#8-17). While some of the actor roles are associated with a variety of stakeholders, the new roles are predominantly linked

to the users. In contrast, Leminen, Westerlund and Nyström (2012), through an empirical investigation of multiple LLs, identify four different LL actors: utilisers, enablers, providers and users. Utilisers intend to grow their businesses within the LL ecosystem and concentrate on advancing and testing their new products and services. These utilisers employ LLs as a strategic tool to gather information on the test-users of their products or services and work together with all stakeholders in the LL ecosystem. Enablers, on the other hand, are commonly public-sector actors, non-governmental organisations or investors, such as towns, municipalities, or development organisations. They usually offer (financial) resources or a policy to support the LL operations. Providers make the product or service portfolio available to the other actors in the LL; they are primarily private firms that engage with LLs to co-create new products, services and solutions. Finally, users are the 'end-users' that are participating in the LL operations.

In the categorisation of Leminen, Westerlund and Nyström (2012), academic researchers are viewed as providers because they offer the necessary expertise on user research. However, Schuurman *et al.* (2016) argue that the scholarly contributions are not restricted to user research only and also address research on technical topics with regards to the focus of the LL or policy and business researchers. For this reason, Schuurman *et al.* (2016) differentiate researchers as a separate type of actor within the LL anatomy (Figure 8).

Figure 8 Living Lab Anatomy



Source: Adapted from Schuurman *et al.* (2016)

Besides analysing the roles of different actors, Schuurman *et al.* (2016) also explore their respective motivations to engage in a LL. Schuurman *et al.* (2016) hypothesises that

exploration is the main motive of utilisers to participate in LLs. The role of researchers is seen as intermediaries between utilisers and users. Researchers are motivated by the opportunity to exploit implementable knowledge and explore new knowledge. Instead, the providers are expected to be motivated by technology and/or knowledge exploitation opportunities, whereas users are driven by intrinsic motivations. On the other hand, enablers contribute to the LL with financial support or other assets that allow LL operations to be carried out, and hence, expect the LL to realise some predefined policy objectives.

2.2.4.3.2 User Roles

While multiple stakeholders engage in LLs, numerous scholars highlight the central role of users in the innovation process (Almirall and Wareham, 2008; Følstad, 2008a; Lee, Olson and Trimi, 2012; Leminen, Westerlund and Nyström, 2012). Several studies highlight the different roles users assume in the innovation process (Leminen, Westerlund and Nyström, 2014; Nambisan, 2002). However, Bogers, Afuah and Bastian (2010, p. 865), in spite of the presence of these studies, conclude that *"an important shortcoming of the literature on users as innovators is the lack of theory or theoretical perspectives, in particular those related to theories in the management literature."*

Leminen, Westerlund and Nyström (2014) suggest four different user roles in LLs with regards to the degree of user activity and the company's perspective of co-creation: i) informant, ii) tester, iii) contributor, and iv) co-creator. The informant conveys user knowledge, understanding, and opinions to the LL. By observing the informant or by gathering their knowledge about a user's everyday life, problems and needs, other stakeholders in the LL obtain information. The informant serves as a ''lab rat'' in a real-life setting in which behaviour can be overseen, and information on needs and wants can be obtained. Instead, the tester assesses innovation in the users' actual real-life environments, such as hospitals, and restaurants. Another user role that Leminen, Westerlund and Nyström (2014) identify is the contributor who resembles a user in user-centric design. A contributor engages with others to create new products, services, processes, and technologies to achieve the goals of firms in the LL. Finally, the co-creator seeks and addresses problems, ideates and innovates, and develops the solutions in collaboration with the firms' R&D teams, and other LL actors, on an equal ground.

Based on these user roles, identified by Leminen, Westerlund and Nyström (2014), Leminen, Nyström and Westerlund (2015) examine the roles that users adopt to carry out joint innovation. The study suggests that the user innovator's role impacts innovation and its outcome. Correspondingly, Schuurman and Marez's (2012) study looks at which users engage in a LL project. In the context of a panel-based LL, the authors propose a framework for user selection over a random or general user selection, or recruitment, by means of

practice-based evidence. Schuurman and Marez (2012) conclude that a panel-based LL facilitates the recruitment of users on the basis of particular characteristics associated with the innovation that is created and tested in the LL. In the context of virtual customer communities, Nambisan (2002) identifies three different customer roles that are associated with three NPD phases. Customers are considered, firstly, a resource in the ideation phase, and then co-creators in the design and development phase, and, finally, as users in the product testing and support stage.

2.2.4.3.3 User Engagement

This section discusses studies that are concerned with user engagement. More specifically, scholars focus on context related aspects that play a role when engaging users, and the online interaction of users, their characteristics and motivation; and finally, studies are concerned with how to engage users.

Several studies focus on the motives that influence user engagement in LLs. Indeed, Zwass (2010, p. 32) states that *"the propensity of individuals to contribute is the bedrock of co-creation".* The study identifies a variety of motivators ranging from altruistic to monetary incentives. Roser, DeFillippi and Samson (2013) recognise that the relative importance of different types of motives is context-dependent. In the context of LL field trials, Georges *et al.* (2015) recognise a number of factors that play a role in the participation of users. The study identified the functional maturity of the innovation, and the degree to which a prototype resembles the functionalities and the processes of the final go-to-market product, at the time of the field trial, as influential factors that play a role in the participation of users. The authors propose a 'user engagement model for field trials' to explicate the factors that play a part in the engagement of end-users in LL field trials.

Community affiliation presents a way of forming and maintaining interpersonal relationships that foster user engagement (Pera and Viglia, 2015). For example, Antikainen, Mäkipää and Ahonen (2010) focus on collaboration in OI communities, more generally, and examine how users can be motivated to collaborate and what kind of tools and methods can support such activities. The study identifies nine motivations explaining why users collaborate in OI communities. These factors include, for example, that users like to influence and make better products and services, or it gives them a sense of efficacy. Antikainen, Mäkipää and Ahonen (2010, p. 113) state that *"collective work with others was seen as being enriching, fun, productive, efficient, and even the best way to trigger creative innovations."* In the context of sports-related consumer products, Franke and Shah (2003) study the process by which individuals, who belong to voluntary user-communities, acquire innovation-related resources and assistance. The study recognises that user-innovation is a joint process where innovators receive assistance from other individuals who are creative

and innovative, often possessing skills complementary to their own. Further, findings suggest that innovation-related resources, assistance, and the subsequent innovations are freely and openly shared in the communities.

Instead, Füller (2010) explores what consumers expect from virtual co-creation. The study focuses on how consumers' motivations and personalities affect those expectations. The findings highlight that consumers engage in virtual co-creation for a number of reasons: curiosity, dissatisfaction with existing products, intrinsic interest in innovation, to obtain knowledge, to present ideas, or to receive monetary rewards. Füller (2010) suggests that consumers' motives to actively engage in co-creation projects may be heterogeneous and subject to the consumer's personality. The study identifies four differently motivated consumer types that engage in virtual co-creation. Moreover, differently motivated consumer groups may have different expectations in relation to the co-creation process, the co-creation content, as well as co-creation partners (Füller, 2010).

Füller and Matzler (2007) show how customers can be virtually integrated into a firm's innovation process. In another study, Füller, Matzler and Hoppe (2008) investigate the ability and willingness of brand community members to participate in a firm's innovation process. The authors suggest that consumer creativity, identification with the brand community, and brand-specific emotions and attitudes (passion and trust), as well as brand knowledge, are central factors influencing the willingness of consumers to share their knowledge with producers. The articles also acknowledge two personality traits, extraversion and openness, that have a substantial impact on brand passion, creativity, and identification with the community. Similarly, Wang *et al.* (2016) also report that co-creation activities can significantly boost brand awareness in online communities. Instead, Jeppesen and Frederiksen (2006) examine the key personal attributes of innovative users to understand why such users contribute to firm-hosted user communities. The study concludes that innovative users are likely to be hobbyists; this is a characteristic that can be expected to positively influence an innovators' willingness to share innovations. Jeppesen and Frederiksen (2006) also recognise that innovative users are likely to be lead users.

Edvardsson *et al.* (2012) studies how to integrate customers within a service development by evaluating the different methods of gaining use information. The article proposes four modes of customer integration in which data is classified either as insitu (data captured in a customer's use situation) or exsitu (data captured outside the use situation). Moreover, the authors differentiate between incontext and excontext. Incontext relates to methods in which the customer is in the actual use context and has access to different resources; whereas, excontext relates to a situation in which the customer is outside the use context and, hence, has no direct access to the resources. In a similar vein, Tekic and

Willoughby (2017) argue that a co-creation strategy should be adapted to the specific context in which it is to be realised. Similarly, Franz (2015) also argues that a locally contextualised design, with regards to the space and methods, is needed in order to create an environment of trust and collaboration.

2.2.4.4 Managing Co-creation

A number of studies present challenges, success factors, and approaches to manage and facilitate the co-creation process. One of the first environmental factors, identified in the literature, concerns the legal environment. Legal aspects surrounding the operations of a LL are particularly important when engaging with users. User communities are commonly not legal persons, and therefore, this has legal implications for LLs in relation to copyright and other Intellectual Property Rights (IPR). Pitkänen and Lehto (2012) analyse such legal issues in the context of LLs, user-driven product development, and OI processes. The study points towards privacy protection issues in user communities and discusses the collection and sharing of user data with other organisations. Similarly, Hienerth, Keinz and Lettl (2011) identify a transparent IP policy, rooted in openness and a fair distribution of the output of co-creation, as key in creating a sense of community and is also represented as an incentive to participate. The study also reveals several dimensions associated with user involvement. For example, none of the firms participating in the research offer financial incentives to users. Instead, they are relying on their willingness to co-create in return for being valued as a partner on equal grounds, as well as having the possibility to improve new or existing products and services, being recognised by peers, and being empowered to take up ideas produced during the ideation phase. Another success factor relates to firms inviting users to participate in exploiting co-created business opportunities through, for example, user entrepreneurship programs. Also, companies are increasingly devoting attention to guiding the contributors' activities in pre-determined directions. Finally, to guarantee continuous and long-standing user involvement and participation, companies focus on continuous communication and feedback loops (Hienerth, Keinz and Lettl, 2011).

Bosch-Sijtsema and Bosch (2015) recognise that user feedback is not only appropriate in particular phases of the innovation cycle but can also be useful throughout the whole duration of the innovation cycle. This means user's feedback is useful in the predevelopment, during development, as well as at the commercial deployment stage. Magnusson (2003) even finds that users produce service innovations that are more creative and useful than those proposed by professionals. Matthing, Sandén and Edvardsson (2004) confirm these findings and highlight that consumers' service ideas are more innovative, with regards to originality and user value, when compared to those of professional service developers. However, whether or not an organisation decides to adopt a user innovation is

based on the company's capacity to understand the technical requirements and respond to community concerns in relation to the innovation (Di Gangi and Wasko, 2009).

Specifically, in the context of LLs, Leminen, Westerlund and Kortelainen (2012) explain that the innovation outcome is dependent on five components: i) strategic intention; ii) passion; iii) knowledge and skills; iv) other resources; and v) partners in the LL network. Kanstrup, Bjerge and Kristensen (2010) examine how LLs support interactive learning among participants on technological innovations. The study shows how designers can work with and benefit from people as co-creators in design projects. Also, Zimmerling, Purtik and Welpe (2017) stress the opportunity for stakeholders to engage in social learning processes through LLs, which, in turn, will also increase the acceptance of the developed product service systems. In line with Leminen, Westerlund and Nyström (2012), Juujärvi and Pesso (2013) reports proactive networking among LL stakeholders as an important success factor of an urban LL. Other aspects that contribute to the success were experimenting as a bottom-up process, using student innovators as resources, as well as a focus on long-term development work. Almirall, Lee and Majchrzak (2014) highlight that OI is likely to succeed only when the needs of the whole ecosystem of sources and supporters are arranged in ways that promote both competition and collaboration.

Kusiak (2007) stresses the importance of understanding the breadth, content, and structure of customer requirements to enable innovation. Commonly used attributes to attract customers, and simultaneously improve business performance, relate to the product's function and form, as well as quality, reliability and costs. Kusiak (2007, p. 867) expands on the categories of requirements and argues that *"a customer of today purchases a product that meets her/his functional requirements (product personalization), but also seriously considers additional attributes such as surprise (e.g., unexpected product function), pleasure (e.g., driving a car), emotion, customer experience, and so on."* Instead, Katzy, Baltes and Gard (2012) offer insights on how to direct the entire NPD process in LLs around latent user needs. The study offers a framework presenting organisational capabilities for innovation intermediaries in networks. Möller, Rajala and Westerlund (2008) also focus on the relationship with customers as a fundamental factor to promote co-creation in LLs. However, rather than focusing on firms' capabilities, the authors stress the importance of the customers' competences and activities in realising value that is embodied in a service provider's value proposition. The scholars emphasise that the most successful service providers do not focus on their own capabilities, or on their customers' current needs. Instead, providers incorporate customers' experiences as well as capabilities into service co-creation processes.

The relationship with a broader range of stakeholders, is discussed by Budweg *et al.* (2011) who analyses the success factors and challenges that have to be taken into

account for the LL approach to be able to facilitate innovation in collaborative work environments. The study concludes that it is complex to generate successful innovations in an open community, due to the need for a careful coordination of the numerous stakeholders and roles across the innovation lifecycle. Clear responsibilities and ownership are the key success factors, and the level of ambition should be aligned with the existing resources in order to circumvent fragmentation and situations where initiated activities are not accomplished. Without leadership and proper clarification of ownership of the required support activities, there is a danger that valuable initiatives fail.

Schaffers and Turkama (2012) study how LLs can form collaboration networks to accelerate the development and acceptance of innovations. They identify that they require in-depth understanding of each of the stakeholders' objectives and drivers. Moreover, the alignment of operational processes, the creation of an open and collaborative culture, as well as competences, methods, and tools, aimed at supporting collaboration, are important. Romero and Molina (2011) suggest that the power of co-creation arises from the ability of companies to access new skills thereby, integrating complementary competencies. Their study stresses that the capacity to select, and invest, as well as exploit co-creation opportunities, are seen as critical factors in order to improve customer satisfaction, business revenue streams and create a new foundation for achieving competitive advantage in experience environments. Focusing on citizens' involvement, Mulder (2012) studies how living methodologies that capture social and dynamic aspects can be embedded in LL practices. Based on three LL cases, the study concludes that existing LLs do not benefit from their full potential. Most LL activities focus on conventional user-centric lab methodologies, though it is the living aspect that makes a LL an exceptional methodology for user-driven and co-creative innovation.

To facilitate co-creation in LLs, a number of methods and tools are utilised. Mulder (2012) finds that the living methods and tools in common use are heterogeneous and differ between different LLs; they can even differ across the services within one LL. Bridging these methods and tools from one LL to another becomes significantly easier if a common model is shared across these LLs (Mulder, Velthausz and Kriens, 2008). For this reason, Mulder, Velthausz and Kriens (2008) propose the 'Living Labs Harmonization Cube' which enables the harmonisation of methods and tools to be employed in various areas and across numerous LLs. The Living Labs Harmonization Cube, hence, wisely facilitates a common basis for sharing. The cube model not only embodies the most significant elements of a LL, it also helps by specifying the links between existing LLs, for example, to learn from each other, share best practices, and connect different LLs. Additionally, the cube also helps in identifying the level of harmonisation of employed methods and tools in LLs. Based

on the Harmonization Cube, Kovács (2016) presents the added value of interactive value production through LLs in the renewable energy industry.

Other studies have tried to develop normative models to manage LLs. For example, Guzmán *et al.* (2013) propose the Process Reference Model (PRM) for efficient practices to manage a LL. The PRM they developed uses processes and practices to manage the LL and facilitate the involvement of users in the technical development process. It offers a formalised method to guide user communities, research organisations, and technology providers in the multifaceted process of creating a self-sustaining LL. Moreover, the PRM also enables benchmarking experiences among different LLs.

Prahalad and Ramaswamy (2004) propose the DART model, as an effort to specify the range of capabilities necessary for firms to effectively co-create with customers. The model comprises four main building blocks of competencies that firms should develop to effectively participate in value co-creation with customers. Those building blocks consist of Dialog, Access, Risk Assessment and Transparency. Dialogue refers to the interactivity between two equal problem solvers, who are keen to act and to learn. Access relates to the facilitation of co-creation by offering the right tools for communication between customers and suppliers. Risk assessment implies that the customers have the right to be fully informed about the risks they may encounter from accepting the value proposition. Finally, transparency relates to the practicing of an openness of information across stakeholders.

2.2.4.5 Co-creation Outcomes and Living Lab Assessments

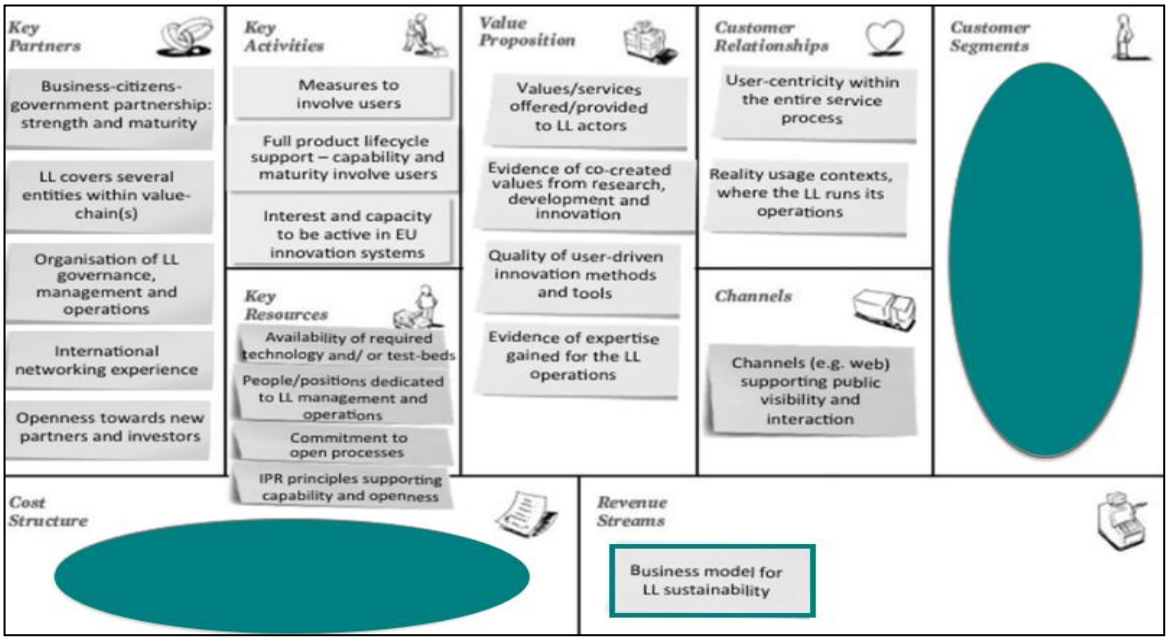
Companies engage in co-creation projects in order to understand their customers better and as a consequence, they can turn the insights they derive from this into innovation and a competitive advantage. The process begins with setting the project objectives and Bhalla (2014) identifies three categories that classify such objectives. Firstly, ‘Generation’ refers to cases where the company’s objective is to obtain ideas, suggestions or designs from customers and other stakeholders. Secondly, ‘Refinement’ includes cases where collaborators work with the firm’s representatives in order to refine the features of a product or service. Thirdly, ‘Creation’ refers to the situation where both collaborators and a company’s professionals work together to develop a completely new product or service (Bhalla, 2014). Leminen and Westerlund (2012) point out that a LL serves as a platform for addressing both the shared goals of LLs and the goals of individual stakeholders.

Hoyer *et al.* (2010) recognise a number of positive co-creation outcomes, such as increased productivity and efficiency gains through cost-minimisation. Furthermore, a faster speed to market (Alam, 2002) and a closer fit with customer needs (Fang, 2008) can be achieved through co-creation. However, Hoyer *et al.* (2010) also acknowledges the costs and risks associated with co-creation. For example, companies experience diminished

control with regards to strategic management and planning of the business. In addition to decreasing control, the empowerment of consumers leads to a greater complexity of managing the company's objectives, and the interests of diverse stakeholders involved in the co-creation process (Hoyer *et al.*, 2010). Edwards-Schachter, Matti and Alcántara (2012) suggest LLs help to recognise people's needs, their preferences, as well as expectations for innovation opportunities using a LL methodology. Aside from identifying community needs, the findings also show that LLs are a beneficial instrument in order to improve local development and support, as well as integrate technological and social innovations in policies and local governance processes. In LLs, the knowledge emerging in the experimentation phases is often delivering unexpected insights, whereas more predictable knowledge is produced in the co-creation and exploration phases (Lehmann *et al.*, 2015). The same study also suggests that emerging knowledge might increase in complexity along the phase progression of a LL project, as stakeholders and users are becoming more informed and experienced about the services they develop (Lehmann *et al.*, 2015). Magadley and Birdi (2009) offer more insights into micro issues, such as the creative outcomes, human–technology interaction, group dynamics and facilitators. The findings suggest that the innovation lab positively influences creativity. This positive impact is credited to the main conceptual ingredients of the facility, such as a time and place to participate in creative thinking and the technology needed to facilitate such a process. Yet, the study stresses another important characteristic, which is human facilitation or people. In spite of the potential positive outcomes associated with LLs, Grotenhuis (2017) highlight that some LLs remain underutilised. To fully make use of their potential, better coordination between LLs and the companies that they serve is required. The scholars provide insights into the experiences of various LLs, and highlight how they can facilitate the provision of a wide variety of services, ranging from new R&D projects to a joint business development.

Mastelic, Sahakian and Bonazzi (2015) investigate the evaluation criteria of LLs and how such an assessment contributes to the LL performance. Building on efforts by the European Network of Living Lab (ENoLL), the study complements existing criteria with elements from business model development strategies – particularly the Business Model Canvas. Figure 9 presents the ENoLL evaluation criteria and three additional (turquoise colour coded) elements as identified by Mastelic, Sahakian and Bonazzi (2015). As indicated through the turquoise colour coding in Figure 9, the authors claim that three critical elements are missing from the current ENoLL evaluation criteria of LLs: identification of the cost structure, customer segments and the revenue stream.

Figure 9 ENoLL Criteria Applied to the Business Model Canvas



Source: Adapted from Mastelic, Sahakian and Bonazzi (2015)

Lewis and Moultrie (2005) propose a framework as the foundation for analysing the structure, infrastructure, benefits and dis-benefits of innovation labs. Similarly, Magadley and Birdi (2009) assess the effectiveness of an innovation lab as a new approach for endorsing creativity in companies. The study expands on the research of Lewis and Moultrie (2005), not only by assessing an innovation lab by means of different research approaches, but also by viewing the phenomenon entirely from the users' perspective.

Veeckman *et al.* (2013) put forward five recommendations to achieve a successful implementation of projects. They suggest that a LL should establish: (i) a clear strategic intention, (ii) a minimum of shared value creation and sharing among all stakeholders, (iii) a minimum level of openness, (iv) a minimum set of users and establish a strong communication, and (v) a mixed set of LL tools to discover new opportunities.

2.2.5 Gaps in the Literature

Five main themes are identified by analysing the literature. Firstly, scholars have made an effort to conceptualise LLs and to understand their positioning in the wider innovation literature. Secondly, studies pay attention to the virtual and physical environment of LLs in which multiple stakeholders contribute to the innovation process. Thirdly, a vast amount of studies focus on stakeholder engagement in LLs. While research acknowledges the presence of multiple stakeholders, the roles and engagement of users emerged as the primary area of interest across the field. Fourthly, research discusses how co-creation

should be managed in order to achieve the desired outcomes, and finally, studies highlight the challenges and success factors of co-creation in LLs and describe the benefits that can be achieved by employing such an approach. The analysis of these themes reveals three particularly interesting insights that this thesis aims to address.

Firstly, the literature widely acknowledges the participation of multiple stakeholders in the co-creation process; however, the vast majority of studies focus on the engagement of users, leaving a considerable gap in the literature. While substantial efforts have been made to understand the motivation of users to engage in co-creative activities in LLs, the literature is lacking specific motivations and the project objectives that companies wish to address. Although, Bhalla (2014) identifies three broad categories of objectives for companies to engage with LLs, which are referring to the generation, refinement or joint creation of ideas, the study does not provide a list of specific and measurable objectives that companies would like to address. In order to guide firms and facilitators on how to fully utilise LLs, more knowledge is needed regarding the companies' specific motivational drivers for participating in a co-creation process. In order to address this gap in the literature, this study aims to understand what motivates companies to engage with co-creation in LLs.

Secondly, numerous studies focus on the conceptualisation of LLs by identifying different characteristics associated with the phenomenon. Extant literature describes characteristics (Schuurman *et al.*, 2013), characterising purposes (Følstad, 2008a) and principles (Ståhlbröst, 2012), which are used to evaluate and guide LL operations; however, the interplay of such elements is not sufficiently explored. More specifically, studies fail to explain how such characteristics affect LL operations with respect to the people and the environment in which they interact. Considering the multi-stakeholder nature of LLs, this study incorporates the views from companies, co-creators and a LL facilitator to understand the co-creation process in LLs, and explores the factors that play a role in facilitating it.

Thirdly, while it is important to understand what drives companies to engage in co-creative activities in LLs, the literature on co-creation outcomes is rather vague and refers to the general benefits, such as a faster speed to market (Alam, 2002) and a closer fit with customer needs (Fang, 2008) that companies may strive for. However, the realised outcomes in comparison to their project objectives are not discussed. Indeed, Veeckman et al. (2013, p. 9) suggest that *"the innovation outcome must be considered"*. Yet, studies on LLs fail to highlight innovation outcomes (Leminen and Westerlund, 2015). To understand and assess the effectiveness of LL operations, this study not only aims to explore companies' motivation to utilise LLs, but also identifies realised co-creation outcomes.

2.3 Summary

This chapter discusses extant literature on the co-creation of innovations in LLs. Firstly, an introduction to co-creation and LLs is presented and a LL definition, as a basis for this thesis, is presented. Secondly, a systematic approach to reviewing the existing literature on the topic is described, which is followed by a descriptive and thematic analysis of 88 selected studies. Five main themes are identified by analysing the literature which are discussed under the following sections: (i) conceptualising LLs, (ii) virtual and physical LLs, (iii) stakeholder engagement in LLs, (iv) managing co-creation, and (v) co-creation outcomes and LL assessments. Based on these five themes, three research gaps could be identified which this study aims to address through the following research questions:

RQ 1: How can co-creation be facilitated in LLs?

RQ 1a: What are the motivations for companies to engage with co-creation in LLs?

RQ 1b: What are the factors that play a role in facilitating co-creation in LLs?

RQ 1c: What are the realised co-creation outcomes for companies in LLs?

3 Methodology

In this chapter, the research and philosophical approach is presented. Additionally, the criteria used to select the case study are defined. This chapter also describes the research design and the method employed for analysing the data. Validity and reliability aspects of the study are also presented.

3.1 Qualitative Method

The aim of any research is to make contributions to existing theory. For example, Campbell (1990, p. 65) defines a theory as a *"collection of assertions, both verbal and symbolic, that identifies what variables are important and for what reasons, specifies how they are interrelated and why, and identifies the conditions under which they should be related or not related"*. There are two ways that empirical articles can make theoretical contributions: theory testing and theory building (Colquitt and Zapata-Phelan, 2007). While theory testing requires scholars to formulate hypotheses prior to testing those hypotheses with observations deductively, in theory building, researchers begin with observations to generate theory through inductive reasoning (Colquitt and Zapata-Phelan, 2007).

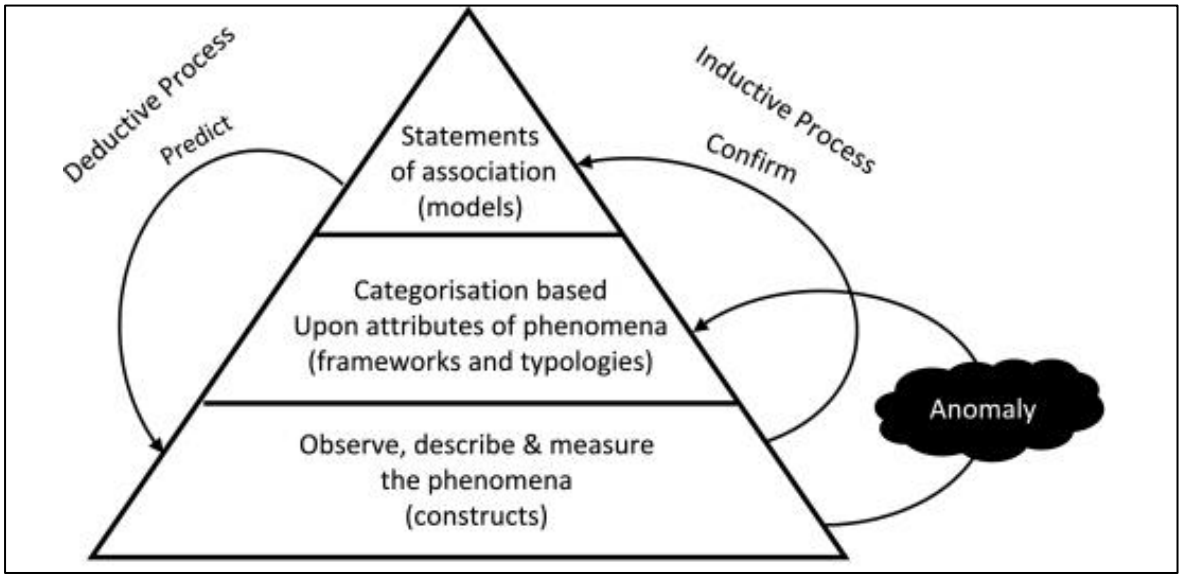
Deduction is based on logical reasoning and moves towards hypothesis testing, after which the principle is confirmed, disproved or revised (Gray, 2013). Following this deductive process, hypotheses are constructed based on existing theory and then data is gathered to test the theory. On the other hand, the inductive approach takes empirical data as a starting point. The data are analysed to understand if any patterns arise that suggest relationships between variables. Based on these observations it may be possible to derive generalisations, relationships and even theories (Gray, 2013). A third approach, called abduction, seems to be positioned between the extremes of the other two approaches (Dubois and Gadde, 2002; Kovács and Spens, 2005; Saunders, Lewis and Thornhill, 2009; Creswell, 2014).

Qualitative methods are mostly inductive and play a vital role *"to achieve understanding of a particular situation, or individuals, or groups of individual, or (sub)cultures, etc., rather than to explain and predict future behaviours*" (Bendassolli, 2013, p. 2). Employing qualitative research is suitable in emerging fields where little or no knowledge at all has yet been produced. Also, if intricate details, such as feelings and thought processes about a phenomenon, have to be obtained, qualitative methods are more appropriate, as more conventional research methods will have difficulty in extracting information or learning about the same issues (Strauss and Corbin, 1990).

This research analyses how co-creation can be facilitated in LLs. There are several reasons why a qualitative research approach is suitable for this study. Firstly, although co-

creation and LLs are receiving growing attention in the literature, both notions are still in their infancy (Akaka, Vargo and Wieland, 2017; Santonen *et al.*, 2017), and only a limited amount of studies exist that are discussing the facilitation of co-creation in LLs. To study this new phenomenon, where little knowledge so far has been accumulated, qualitative research is, hence, very suitable. Secondly, studying how co-creation can be facilitated in LLs requires a close investigation of the enablers and barriers associated with the concept, and involves the examining of the subjective experiences of companies, co-creators and LL facilitators. Thirdly, this study aims to create a framework outlining the motivations of companies wanting to engage in co-creation, and the factors that play a role in the facilitation process, as well as the outcomes of co-creation projects, which have a theory building purpose. Theory building relates to the advancement of inductive theories that form *"bridges from rich qualitative evidence to mainstream deductive research"* (Eisenhardt and Graebner, 2007, p. 25). Eisenhardt and Graebner (2007, p. 25) state that inductive theory building from cases creates a means to an end, generating new theory, which can then be deductively tested, therefore, *"completing the cycle"*. The theory-building process is depicted in Figure 10, which offers guidance on the inductive approach of this study.

Figure 10 The Process of Building Theory



Source: Christensen (2006)

3.2 Philosophical Positioning

All research is built on some underlying assumptions (Myers and Avison, 1997). The research philosophy that is adopted contains these important assumptions and specifies the way the researcher views the world. Thus, it is imperative to know what these

assumptions are as they underpin the research strategy and the methods to be adopted as part of that strategy (Saunders, Lewis and Thornhill, 2009). Although, the research philosophy is mainly determined by the researcher's particular view of the relationship between knowledge and the process by which it is established, it is also influenced by practical considerations (Saunders, Lewis and Thornhill, 2009).

Easterby-Smith, Thorpe and Jackson (2012) describe the relationship between four important terms that define the philosophical debate: Ontology, Epistemology, Methodology, Methods and Techniques. Methods and techniques employed in a study comprise of, for example, interviews and questionnaires. These are considered to be the most apparent characteristics of a research project; however, they are subject to the decisions and assumptions made about the methodology, epistemology and ontology, which lie behind the scene, and which are gradually less noticeable. Table 7 offers definitions of ontology, epistemology, methodology and their methods and techniques (Easterby-Smith, Thorpe and Jackson, 2012).

Table 7 Ontology, Epistemology, Methodology, Methods and Techniques

Ontology	Philosophical assumptions about the nature of reality.
Epistemology	A general set of assumptions about ways of inquiring into the nature of the world.
Methodology	A combination of techniques used to inquire into a specific situation.
Methods and Techniques	Individual techniques for data collection, analysis, etc.

Source: Easterby-Smith, Thorpe and Jackson (2012)

Bryman (2012) states that epistemological considerations are focused on what is regarded as acceptable knowledge within a field, which is resting upon two contradicting disciplines: interpretivism and positivism. Positivism considers reality to be guided by immutable natural laws and mechanisms. In the positivistic approach, Arbnor and Bjerke (2009) suggest that the accumulated knowledge is not subject to time and context and can be directly generalised. Hence, the researcher takes on a detached and non-interactive position in relation to the research field. Unlike positivism, which is an approach used within the natural sciences, interpretivism, highlights the importance of understanding human behaviour, and thus involves the researcher to take into account the subjective meaning of a social action. Therefore, interpretivism considers social science as being principally different from natural sciences (Saunders, Lewis and Thornhill, 2009); it is not about explaining but about understanding.

This study is adopting an interpretivism epistemological stance, as *"empathetic understanding of human behaviour*" (Bryman and Bell, 2015, p. 28) is important, as co-

creation is a notion that focuses on the human attitude and participation. Interpretivism also specifies *"the subjective meaning of social action"* (Bryman and Bell, 2015, p. 724). In other words, interpretivism allows the researcher to study the subjective meaning of an action, and while doing so in an objective manner (Schwandt, 2000). Moreover, co-creation, as an object of study, is a social phenomenon which cannot be detached from its reality. This type of research would be difficult to realise by adopting a natural science/positivist approach that suggests being logical and value-independent. Therefore, this study is based on the ontological assumption that research into social actions occurs in authentic situations. This means that reality and research cannot be separated and is, therefore, inevitably subjective (Creswell, 1994; Saunders, Lewis and Thornhill, 2007). Consequently, the epistemology behind this study is interpretivism, and therefore, situations as well as social roles are interpreted by the researcher's own interpretation of the world (Creswell, 1994; Saunders, Lewis and Thornhill, 2007). Table 8 provides a comparison between positivism, and interpretivism.

Table 8 Comparison between Positivism and Interpretivism

	Positivism	Interpretivism
Ontology		
Nature of 'being'/ nature of the world	Have direct access to the real world	No direct access to the real world
Reality	Single external reality	No single external reality
Epistemology		
'Grounds' of knowledge/ relationship between reality and research	Possible to obtain hard, and secure objective knowledge	Understood through 'perceived' knowledge
	Research focuses on generalisation	Research focuses on the specific and concrete
	Thought governed by hypotheses and stated theories	Seeking to understand a specific context
Methodology		
Focus of research	Concentrates on description and explanation	Concentrates on understanding and interpretation
Role of researcher	Detached, external observer	Researchers want to experience what they are studying
	Clear distinction between reason and feeling	Allow feelings and reason to govern actions
	Aim to discover external reality rather than creating the object of study	Partially create what is studied, the meaning of the phenomena.
	Strive to use a rational, consistent, verbal, logical approach	Use of pre-understanding is important
	Seek to maintain a clear distinction between facts and value judgements	Distinction between facts and value judgements is less clear
	Distinction between science and personal experience	Accept influence from both science and personal experience
Techniques used by researcher	Formalised statistical and mathematical methods predominant	Primarily non-quantitative

Source: Carson *et al.* (2001)

3.3 Method Selection

This study aims to build theory by employing a qualitative approach, and it has the philosophical position of interpretivism. In order to select a suitable method to conduct this research, Yin (2008) suggests examining three conditions which consists of (i) the kind of research question posed, (ii) the degree of control a researcher has over actual behavioural events, and (iii) the extent of the focus on contemporary instead of historical events. Table 9 presents these conditions and depicts how each one is linked to five major research methods: experiments, surveys, archival analyses, histories, and case studies.

Table 9 Relevant Situations for Different Research Methods

Method	(i) Form of Research Question	(ii) Requires Control of Behavioural Events?	(iii) Focuses on Contemporary Events?
Experiment	How, Why?	Yes	Yes
Survey	Who, What, Where, How many, How much?	No	Yes
Archival Analysis	Who, What, Where, How many, How much?	No	Yes/No
History	How, Why?	No	No
Case Study	How, Why?	No	Yes

Source: Yin (2008)

3.3.1 Case Study Research Approach

Yin (2009, p. 14) defines case study research as "*an empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident".* Case studies have been found suitable for the 'how' and 'why' types of research questions that are being asked about a contemporary set of situations over which the researcher has little or no control (Yin, 1994). In this study, the research question *"how can co-creation be facilitated in LLs?"* is a 'what and how' question. The three sub-questions to be answered are firstly, "*what are the motivations for companies to engage with co-creation in LLs?",* which aims to find out why companies engage in such OI activities in LLs. Secondly, this research addresses the sub-research question: "what *are the factors that play a role in facilitating co-creation in LLs?".* Thirdly, the question *"what are the realised co-creation outcomes for companies in LLs?"* is posed to understand the outcomes of co-creation projects and how they compare against the initial objectives.

More precisely, case studies are employed, particularly, as a means to advance theory through the exploitation of in-depth insights on an empirical phenomenon and its setting (Dubois and Gadde, 2002). Eisenhardt and Graebner (2007, p. 25) argue that case studies are *"one of the best (if not the best) of bridges from rich qualitative evidence to mainstream deductive research".* In this study, the researcher follows a theory-building approach that is deeply rooted in rich empirical data; Eisenhardt and Graebner (2007) state that producing theory from cases is likely to build theory that is accurate, interesting, and testable. Therefore, valuable insights about the emerging research phenomenon can be empirically leveraged through case study research.

What has been seen as a limitation of case study research is now recognised as an opportunity (Dubois and Gadde, 2002, p. 554): *"Learning from a particular case (conditioned by the environmental context) should be considered a strength rather than weakness. The interaction between a phenomenon and its context is best understood through in-depth case studies."* It is a particularly suitable approach for new research areas and for those research areas where existing theory appears inadequate (Eisenhardt, 1989). Considering that only limited studies exist that are discussing the facilitation of co-creation in LLs, the research phenomenon is considered a new research area that would benefit from an in-depth case study analysis.

It is suggested that case study research should be considered more as a research approach or strategy than just a mere research method (Eisenhardt, 1989; Eriksson and Kovalainen, 2008). Correspondingly, in the context of this study, case study research is regarded as a holistic approach, where the case is utilised as an instrument to empirically present the research phenomenon. Stake (2005, p. 445) argues: *"The case is of secondary interest, it plays a supportive role, and it facilitates our understanding of something else. The case still is looked at in depth, its contexts scrutinised and its ordinary activities detailed, but all because it helps us pursue the external interest."* Similarly, Tellis (1997) states that what is common to case study research is that it is aiming for the creation of detailed and holistic knowledge founded on rich empirical data.

Given the exploratory nature of this study and the research question, a qualitative research study through a case study is employed, in order to gain an in-depth understanding of the phenomenon (Yin, 2015). When a scientific field is still underexplored, and considerable preliminary research is absent on the subject, Yin (2015) recommends employing exploratory case studies.

3.3.1.1 Single Case Study

The case study approach can include a single case or multiple cases; however, each is used for different purposes. More specifically, multiple case studies are employed to

compare different elements or conceptualisations between cases, while a single case study aims to understand the phenomenon (Yin, 2003). There is a tension between following a 'replication logic', using the multiple cases approach and looking for new theoretical understandings, with the richness obtained from a single case. Cases are often selected as a consequence of pragmatic considerations including access to data and its feasibility (Eriksson and Kovalainen, 2008). In multiple case studies, cases are chosen, for instance, based on the cases' capacity to represent the most 'critical' or appropriate cases for generalising the findings from other case contexts, or by deciding on cases that reflect maximum variation (Patton, 1990). However, Gobo *et al.* (2006, p. 417) emphasise that the cases should be selected on the basis of their relevance and not by the need for generalisability.

Due to its rich, contextual insights into the dynamics of a phenomena, the 'deep' or 'classic' single case study has the capacity to be 'paradigm creating' or 'paradigm challenging' (Dyer Jr and Wilkins, 1991). Dyer Jr and Wilkins (1991) suggest that single case studies are better than multiple cases because they generate additional and better theory. Yin (2008, p. 51) proposes five rationales for employing a single case study, which are *"critical, unusual, common, revelatory or longitudinal cases",* and a single case can be selected because it is *"unusually revelatory, extreme exemplars, or opportunities for unusual research access"* (Eisenhardt and Graebner, 2007, p. 27). Dyer Jr and Wilkins (1991) also argue that single case studies allow the researcher to investigate in much greater detail the context within which the phenomena under study occurs (Dyer Jr and Wilkins, 1991). In line with this argument, several studies on LLs are single case studies carried out in an isolated context (Kipp and Schellhammer, 2008; Schuurman *et al.*, 2010; Schuurman, De Marez and Berte, 2010). Reaffirming this choice, Kennedy (1979) argues that the value of single cases in producing non-statistical inferences should not be underestimated, particularly in circumstances where new paths arise for which the inference rules have not been recognised.

This study employs a qualitative explorative approach in the form of a holistic single-case study that is introduced in chapter 4. In line with the research objectives of this study, the designing of a holistic case study creates a research framework that *"draws from an array of stakeholders"* (MacQuarrie, 2010, p. 2). The design, implementation, and analysis should enable a synergistic blend of several aspects or elements of the case study. Therefore, a holistic case study comprises numerous components; the challenge for the investigator is to produce a credible synthesis of these elements of knowledge (MacQuarrie, 2010).

In conclusion, to acquire in-depth insights on the elements that are important for the facilitation of co-creation in LLs, qualitative case study research is a suitable

methodology. The LL represents the unit of analysis. Consequently, this thesis focuses on an in-depth analysis rather than aspiring to general claims (Yin, 2009). Jaakkola and Hakanen (2013) suggest using a qualitative, exploratory research approach in order to gain insights into the value co-creation process by multiple stakeholders. Consequently, the present study exposes a variety of the perspectives of multiple stakeholders, as a single case study, which is adding to a richer base of knowledge on how co-creation can be facilitated in LLs.

As introduced in the following chapter, JOSEPHS® presents a suitable case to study co-creation in LLs for two key reasons. Firstly, JOSEPHS® incorporates key LL features, as defined by Westerlund and Leminen (2011), which are drawing on the involvement of multiple stakeholders. In line with the definition, JOSEPHS® also offers a real-life context in which authentic use situations are captured, and there are a variety of contributions that stakeholders can make in the innovation process of technologies, services, products and systems. Secondly, JOSEPHS® has received multiple awards for its innovation as well as its research activities. This includes, amongst others, *"Wissenschaftspreis 2018"* (a Science Award for cooperation projects with a high relevance and innovative strength to power commerce), *"Ausgezeichnete Orte im Land der Ideen 2017"* (with the theme: Open thinking to develop something new), runner-up for the *"International Society for Professional Innovation Management Grand Prize 2017"* (where the prize goes to organisations that have significantly increased their innovative strength throughout the past three years), and finally the *"German Design Award 2016"*. Therefore, the alignment of JOSEPHS® with the LL definition by Westerlund and Leminen (2011), and its innovative strength and capacity to co-create technologies, services, products and systems, are, therefore, making it an interesting and suitable case to study the phenomenon in-depth.

3.3.1.2 Categorising Case Studies

There are several ways to categorise case studies. Harré (1979) suggests differentiating between intensive and extensive case studies; a taxonomy that has been widely used. An intensive case study is about concentrating on one or a small number of cases, while discovering as much as possible from those particular cases. On the other hand, an extensive case study is about comparing different cases against each other to reveal the differences and similarities in them. However, Yin (1994, 2009) has categorised three types of the uses of case study research: descriptive, explanatory, and exploratory. Descriptive case study research is concerned with obtaining a detailed description about events, whereas explanatory case study research is focusing on explaining presumed causal relations that are existing in the case study context (Yin, 2009). In turn, an explorative case

study allows the researcher to get an in-depth understanding of a research phenomenon by concentrating on the case at hand. Stake (2005) describes two types of case study: the intrinsic case study, where the attention is on the case itself; and an instrumental case study that is investigated, primarily, in order to get an understanding about a specific phenomenon. These different classifications for case study research are summarised in Table 10 and the ones applicable to this research are highlighted in grey.

Table 10 Classifying Case Study Research

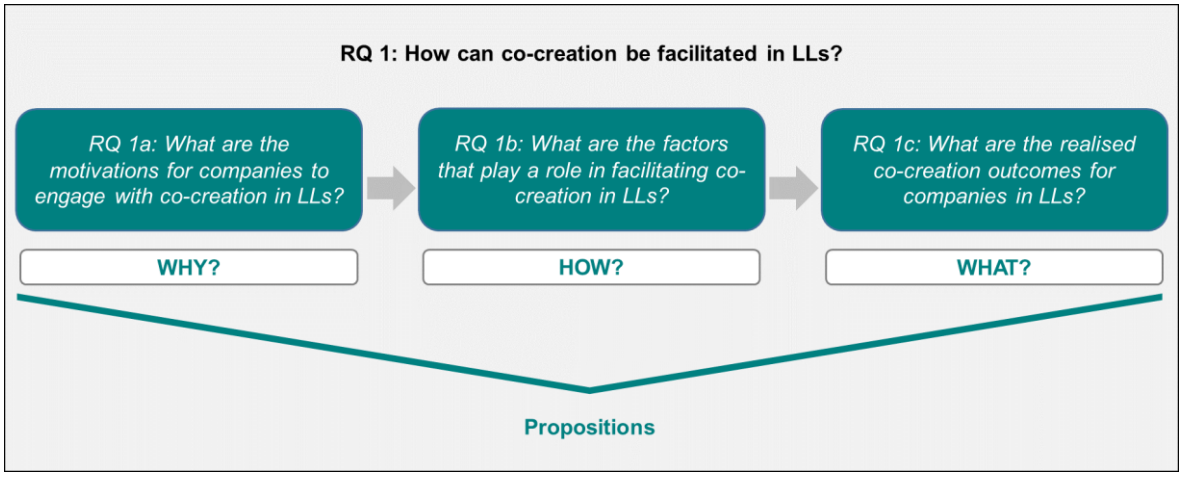
Harré (1979)	Yin (1994, 2009)	Stake (2005)
Extensive case study	Descriptive case study	**Instrumental case study**
Intensive case study	Explanatory case study	Intrinsic case study
	Exploratory case study	

Source: Adapted from Harré (1979), Yin (1994, 2009), Stake (2005)

3.3.2 Research Design

Based on Yin (2009) and Eisenhardt (1989), this section describes the research design, with regards to the data collection methods and sources, data analysis, and research quality, used in order to answer the research questions and fill the research gaps. Although, the needs of JOSEPHS® had to be considered as a partially managerially-orientated study (Gill and Johnson, 2010), the research approach (Figure 11) was selected based on its suitability to answer the research questions (Saunders, Lewis and Thornhill, 2009).

Figure 11 Research Approach



Based on the grounded theory approach, the data is analysed with no preconceived hypothesis (Glaser and Strauss, 1967). Following grounded theory, the data analysis consisted of the search for factors that facilitate co-creation. Through coding and memoing,

the overarching concepts and final categories emerge. Findings and conclusions were reached based on the final categories and by an analysis of the coding results (see section 3.4).

3.3.2.1 Data Collection Methods and Data Sources

The use of research methods relates to the techniques or procedures for data collection and analysis associated with the particular research objective and question(s) (Crotty, 1998). This research project takes a qualitative approach by exploring co-creation in a LL context; data triangulation will be employed to investigate the research phenomenon in depth and reveal new dimensions and perspectives with regards to the research problems (Dubois and Gadde, 2002). According to Breuer and Roth (2003), employing a variety of approaches to data collection and observation leads to a more comprehensive understanding of the social context and the participants therein. Therefore, five sources of data will be used: semi-structured interviews, focus groups, observations, as well as a paper-based survey and document analysis. Observations and focus groups are among the most frequently used methods of user involvement in the LL literature (Følstad, 2008a).

3.3.2.1.1 Semi-structured Interviews

Semi-structured interviews are employed with a fairly open framework in order to encourage focused, conversational, and two-way communication (Bernard, 1995). The approach is suitable for this exploratory research, which is investigating opinions, experiences and the expert knowledge of participants with respect to a topic that is scarce in literature (Nay-Brock, 1984; Mack *et al.*, 2005), and is allowing probing for further information and a clarification of the issues mentioned (Hutchinson and Wilson, 1992). Following Gordon's (1975) suggestions, the phrasing and structure of questions is standardised for each interviewee to ensure that any deviations in the response are due to differences among participants instead of the questions asked.

Both face-to-face and telephone interviews were carried out. In-person interviews have several strengths as a qualitative data source, yet challenges associated with this method must be considered as well. Face-to-face interviews are usually the best option when interviewing people who are geographically accessible. By conducting interviews face-to-face, researchers are better able to develop a rapport with participants, thus, increasing the probability of learning details about their views (Vicki and Plano, 2017). On the other hand, telephone interviews are quick and relatively inexpensive. Furthermore, respondents perceive telephone interviews to be more anonymous in comparison to personal interviews and can reveal more details. Shukla (2008, p. 50) also state that *"the technique is also quite useful in conducting executive interviews as sometimes executives*

are not ready for personal interviews but do answer telephone calls". While, this study predominantly conducted in-person interviews, telephone interviews were carried out when respondents were geographically dispersed or could not be interviewed face-to-face. At the start of each interview, the interviewer requested permission from the interviewee to take notes and record the interview. The interview structure was roughly followed, however, depending on the situation, and the interviewees' personality and expertise, the interviewer adjusted the focus and questions as needed. This flexibility did not impact the validity of the research generally (Eisenhardt, 1989).

Regardless of the interview mode, a rigorous research process was followed by considering Kvale's (1996) quality assurance criteria in order to guarantee the credibility of the interview procedure. The 10 criteria of a successful interviewer are outlined in Appendix 1. After the interviewee's approval, interviews were recorded and transcribed as the basis for a detailed analysis (Seidman, 2012).

3.3.2.1.2 Focus Groups

According to Kitzinger (2005), the focus group method is a useful approach for investigating attitudes, beliefs, feelings, experiences, reactions, needs and concerns of individuals. Kreuger (1988) points out that the focus group method can be employed at the preliminary or exploratory stages of a study. Race, Hotch and Parker (1994) adds that they can also be used during a study, for instance, to assess or create a particular programme of activities, or after a programme has been completed, to evaluate its impact or to generate additional streams of research. In this study, focus groups are used to complement other data sources, as well as for triangulation and validity testing, as suggested by Morgan (1988). Three focus groups were organised to individually learn from co-creators, companies, and the LL facilitators. Similarly to the interviews, at the start of each focus group, the researcher asked for permission from the participants to take notes and record the discussions.

3.3.2.1.3 Observations

Observation methods are beneficial to researchers in a number of ways. They provide researchers with opportunities to study nonverbal expression of feelings, examine who interacts with whom, investigate how participants communicate with each other, and assess how much time is spent on a number of activities (Schmuck, 1997). Observations can be conducted in the form of direct observations or participatory observation. In a case study, a direct observation takes place when the researcher observes the phenomena in the natural setting of the 'case'. During direct observations, the researcher usually sits passively in the case environment and records as accurately as possible what is going on. Direct observations are different from participant observations in several ways. Firstly, a direct

observer does not intervene nor becomes a participant in the context of the study. The researcher tries to be as unobtrusive as possible so as not to bias the observations, and by suggesting a more detached perspective.

On the other hand, participant observations enable researchers to verify the definitions of terminology used by participants in interviews, and to observe events that the informants may be not be able or willing to share (Marshall and Rossman, 1995). DeWalt and DeWalt (2002, p. 92) state that *"the goal for design of research using participant observation as a method is to develop a holistic understanding of the phenomena under study that is as objective and accurate as possible given the limitations of the method".* Further, they recommend that participant observation can be employed as a means to improve the validity of the study, as observations may aid the researcher to gain a better understanding of the context and phenomenon studied. Validity is considered to be more robust by means of additional strategies employed with observation, such as interviewing, document analysis, questionnaires, surveys, or other more quantitative methods. Participant observation can be used in order to answer descriptive research questions or to advance theory (DeWalt and DeWalt, 2002). This study employed both direct observations of the phenomenon and participant observations, in which the researcher gains insights from participating in the co-creation process.

3.3.2.1.4 Questionnaires

A questionnaire is defined as a *"tool used to gather information in a survey project using either paper-based or Web-based models of delivery"* (Thomas, 2004, p. 1). Questionnaires are employed as data collection tools for different kinds of survey projects, including fact-finding questionnaires; determining opinions; and identifying interests and experiences. Questionnaires can be web or paper based (Thomas, 2004). Although, questionnaires are used often for quantitative research, they are also applicable for qualitative studies. However, they are used much less in qualitative studies, because they usually do not stimulate the desired level of elaboration of information wanted by the qualitative researcher. Yet, with time and space constraints, questionnaires may be usefully employed in qualitative research too. In such cases, Elliott and Timulak (2005) suggest using open-ended questions and asking respondents for elaboration, and also examples. A good practice is to follow up on questionnaires (Hill, Thompson and Williams, 1997). In line with this suggestion, this study employed a short questionnaire to determine the level of experience that companies have with co-creation in LLs (see Appendix 2). As the questionnaire was handed out during a focus group, it was possible and very easy to directly follow up with the respondents. This short questionnaire was used complementary to the

focus group allowing all participants to elaborate on their experiences and provide the examples that underpin them.

3.3.2.1.5 Documentation

Documentation is one of the most commonly used sources of evidence used in case study research (Yin, 2009). The documentation can take a variety of forms including, for example, letters, memoranda, e-mail correspondence, agendas, written reports, internal records or newspaper articles. This type of information should be the object of explicit data collection plans. Although, these sources may not be lacking in bias, they can be very useful. In fact, Yin (2009) suggests using such sources, carefully, and not to consider them as the literal recordings of events that have occurred. For case studies, the most important use of documents is to verify and supplement them with other sources. Due to their overall value, documents present an explicit role in any data collection in a case study approach (Yin, 2009). This study used the websites of participating companies, and also JOSEPHS'® internal records (i.e. visitor statistics), JOSEPHS'®s website, its facebook and twitter page, newspaper articles, as well as press releases by Fraunhofer IIS (see Appendix 3 for an example), and a feedback report, all as documentary information.

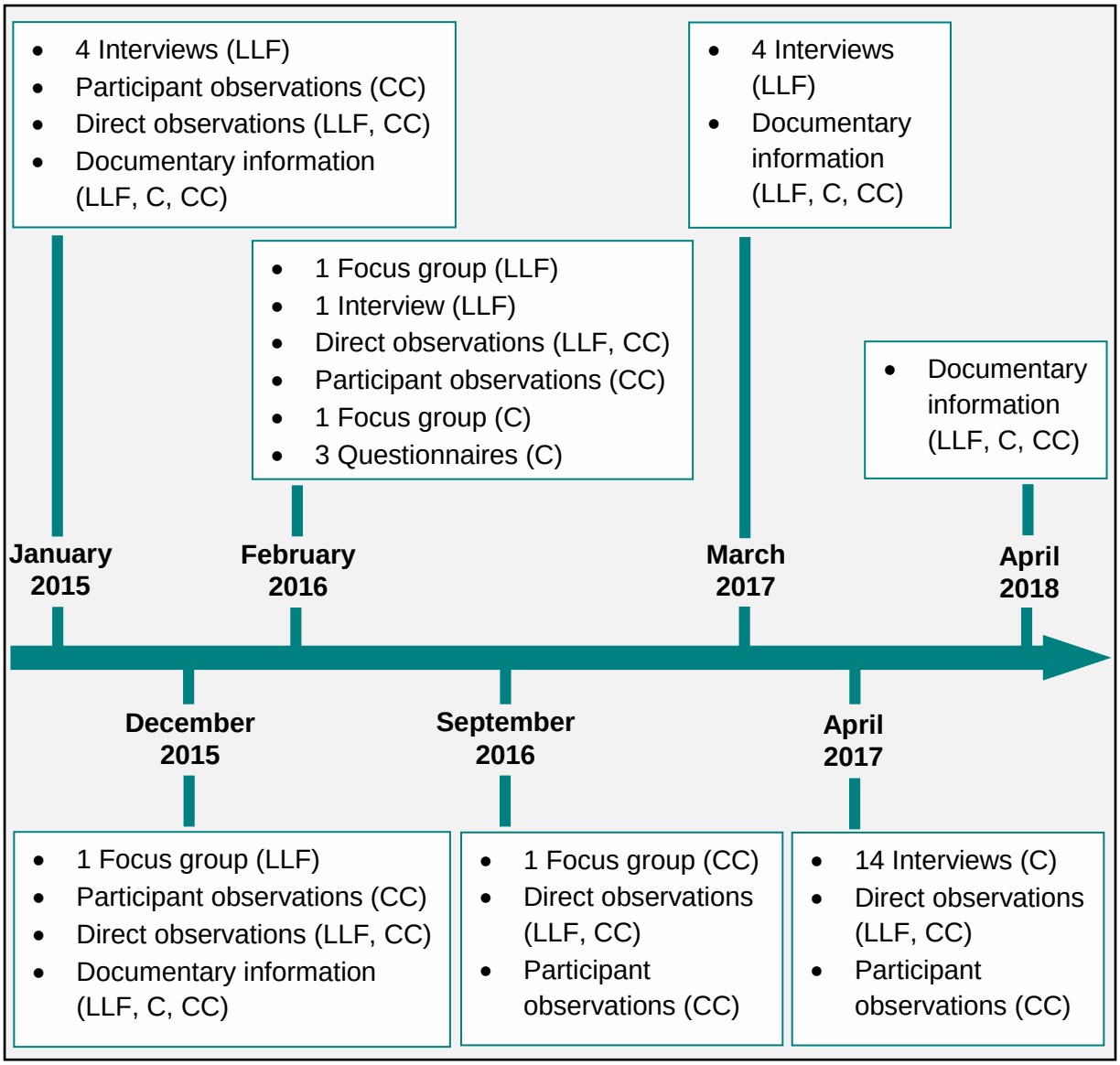
3.3.2.2 Collecting Case Study Evidence

As introduced in the previous sections, this thesis aims to answer the question *"how can co-creation be facilitated in LLs?"* Several research gaps have been identified from the existing literature in chapter 2; the following three sub-questions align with these research gaps:

a. *What are the motivations for companies to engage with co-creation in LLs?*
b. What *are the factors that play a role in facilitating co-creation in LLs?*
c. *What are the realised co-creation outcomes for companies in LLs?*

Five components of data were used to address the research gaps and to answer the research questions. The data sources include semi-structured interviews, focus groups, observations, documentary information and paper-based questionnaires. This research investigates three different perspectives to co-creation in LLs by studying three key stakeholders: LL facilitators (LLF), companies (C), and co-creators (CC). The entire data collection took place between January 2015 and April 2018 and is presented in Figure 12. The following sections discuss first the pilot study and then the data collection process organised by perspective: LL facilitators, companies, and co-creators.

Figure 12 Timeline of Data Collection



3.3.2.2.1 Pilot Study

In social science research, the term pilot study can be used in two different ways. It can describe so-called feasibility studies, which are *"small scale version[s], or trial run[s], done in preparation for the major study"* (Polit, Beck and Hungler, 2001, p. 467). The term can also refer to the pre-testing or trying out of a specific research tool (Baker, 1994). Conducting a pilot study enables the researcher to obtain an advance warning about where the main project could fail. Generally, pilot studies aim to improve upon the study design prior to the performance of a full-scale research project. *"Conducting a pilot study does not guarantee success in the main study, but it does increase the likelihood"* (Teijlingen van *et al.*, 2001, p. 1).

In January 2015, a pilot study was carried out before the research design had been finalised and in order to assist in defining the research question. The pilot study took place in a LL called JOSEPHS® in Nuremberg/Germany, which is introduced in more detail in chapter 4. The preliminary pilot study involved four semi-structured interviews with researchers from Friedrich-Alexander University Erlangen-Nuremberg (FAU) who are involved with JOSEPHS® since its opening. The aim of this preliminary study was to understand JOSEPHS'® concept, gather background information and investigate current issues in order to refine the research design of this study (Appendix 4). This data collection was enriched by participant observations. Specifically, the researcher engaged with JOSEPHS® like any other ordinary visitor, experiencing the co-creation process in the LL from the point of view of a co-creator. Additionally, direct observations took place examining the nonverbal expression of a co-creator's feelings, and who they interact with. Moreover, the direct observations helped to understand how co-creators both use, and behave in, the LL and how they communicate with the LL facilitator and vice versa. As a result of the pilot study it became clear that co-creation, in practice, is a very complex process with many variables present that can influence the success or failure of the projects at JOSEPHS®. Further complexity is added due to the number of stakeholders that are involved in the co-creation process. JOSEPHS® had no template to build on, to benchmark, or follow – the concept is very unique (see chapter 4). Therefore, there is not only a theoretical gap but also a practical need that requires a structured approach to identify how to facilitate co-creation in LLs.

3.3.2.2.2 Living Lab Facilitators

In this research, the LL facilitators at JOSEPHS® represent one of the key stakeholders that is studied in this thesis. In order to examine how co-creation can be facilitated in LLs, semi-structured interviews, two focus groups, and direct observations were carried out with operational and research staff of JOSEPHS®[3].

Following the pilot study, described in section 3.3.2.2.1, a focus group, with six operational and research staff of JOSEPHS®, was organised in December 2015. Lasting 3.5 hours, the aim of the focus group was to explore elements that enable co-creation at JOSEPHS®. The participants were split into two groups, mixing research and operational staff, and asked to discuss elements that enhance the co-creation process between co-creators and firms. Following the group discussion, each group presented their 'co-creation elements' on posters. Every participant was then asked to select three priority elements,

[3] In this thesis, JOSEPHS'® staff or Living Lab Facilitators refers to employees that are contractually linked to Fraunhofer SCS or Friedrich-Alexander University Erlangen-Nuremberg (FAU) and support JOSEPHS® as research or operational staff.

which helped to understand if an element is reflecting only one person's opinion or if it finds agreement among several participants. A follow-up meeting with two researchers, and a follow-up call with one operational staff, took place. These follow-ups allowed the researcher to receive additional votes on priority co-creation elements that facilitate the co-creation process at JOSEPHS®. Appendix 5 provides insights into the structure and contents of the focus groups.

Following the first focus group with JOSEPHS'® staff, a second focus group took place in February 2016. The objective of the 4.5 hours focus group was to present back the outcomes of the first focus workshop, validate the findings on one side and, on the other, to explore the co-creation elements in greater depth. In total, eight research and operational staff of JOSEPHS® participated in this focus group. First, the outcomes of the previous focus group were presented to open up a discussion and give participants the opportunity to add or amend co-creation elements. Next, a more detailed discussion about the 'priority co-creation elements' that were identified during the first focus group took place. Partakers were asked to discuss what makes up each priority co-creation element. For instance, participants initially identified the 'engagement of the JOSEPHS® team' in the LL as a priority element that facilitates co-creation. In this second focus group, participants specified what this means and what the engagement should look like. Breaking down these priority co-creation elements into individual components helped to better define what facilitates co-creation at JOSEPHS®. Appendix 6 offers insights into the activities that took place during the focus group in February 2016.

In addition to the pilot study and focus groups, direct observations were carried out on five occasions: January 2015, December 2015, February 2016, September 2016, and April 2017. In total, 12 hours were spent examining the co-creators' nonverbal expression of feelings whilst participating in the co-creation process at JOSEPHS®. The researcher studied how they interact with the LL, and investigated how co-creators communicate with the LL facilitators and vice versa. It was important to conduct these direct observations on different occasions as JOSEPHS® is continually changing its theme, and it rotates companies every three months, offering a different set up, tools and prototypes to test. More detailed information on JOSEPHS'® set-up and changing themes can be found in chapter 4.

In order to gain more in-depth insights on the contractual aspects between Fraunhofer IIS / SCS and the companies that get involved in the co-creation process at JOSEPHS®, a one-hour semi-structured interview with a senior staff member of the Fraunhofer SCS team was conducted in February 2016. The interview addressed questions about the type of contracts that are issued, how objectives are defined and how co-creation outcomes are measured. Furthermore, the researcher inquired how, overall project

performance is monitored and how the price point is determined. Finally, the interviewer asked if JOSEPHS® is following up with companies in order to identify the future needs for a project, or to identify the long-term achievements of the project. The complete catalogue of guiding interview questions can be viewed in Appendix 7.

In addition to interviews, focus groups and observations, also documentary information was incorporated throughout the entire data collection period between January 2015 and April 2018. Documentary information, including material available on websites, social media and newspaper articles, served as a useful source of information on JOSEPHS® and the companies that utilised the LL. In this context, it was an important asset that the researcher is fluent in German, as all press releases announcing a new theme world are written in German. Similarly, the majority of other documentary information such as websites and project reports are written in German, and hence, respective language skills were essential for this study. A final project report that JOSEPHS® produces at the end of a project with a company was reviewed. The report contains the results and recommendations that JOSEPHS® puts forward, as a result of the data they collected with co-creators. Reviewing this document helped the researcher to understand the format, length, and type of information that JOSEPHS® provides to the companies.

Since its opening in May 2014, JOSEPHS® encountered and overcame several challenges, and also accumulated knowledge and experience with regard to the co-creation process in their LL. As a result, JOSEPHS® introduced several changes and reopened on 18th March 2017 as JOSEPHS® 2.0. Four semi-structured interviews, lasting for 2.5 hours in total with JOSEPHS'® research and operational staff, helped to understand the changes that were implemented. These interviews also focused on key learnings and the challenges of the past three years that the interviewees reflected upon (Appendix 8). An overview of all LL facilitators that participated in interviews and the focus group can be viewed in Appendix 9.

3.3.2.2.3 Companies

In this research, the companies that utilise JOSEPHS® for innovation purposes are another key stakeholder that is studied in this research. To understand how co-creation can be facilitated in LLs from a company perspective, one focus group and 14 semi-structured interviews were conducted. To complement these data sources, also documentary information and a short paper-based questionnaire were employed.

First, documentary information, including newspaper articles, JOSEPHS'® website and social media, as well as company websites, served as an initial source of background information on the companies that used the LL. This way, the researcher was able to acquire information on the co-creation projects and on the type and size of the

respective companies. In some cases, companies heavily advertised their project at JOSEPHS® through their own media channels, and in other cases, not even a website existed. Therefore, it was important to complement this information source with other data. For this reason, the researcher conducted a 4.5-hour focus group with three companies in February 2016. The aim of the focus group was to discuss and identify elements that enable co-creation at JOSEPHS® from a company's point of view. The two focus groups with JOSEPHS'® staff, as described in section 3.3.2.2.2, served as a foundation by providing their priority co-creation elements, which were used as a basis for the discussion with the companies. The main objective of the focus group with the companies was to discuss and identify elements that enable and enhance co-creation at JOSEPHS®. Following the discussion, each company representative was asked to indicate and elaborate on their five priority elements in JOSEPHS'® co-creation process. Appendix 10 provides insights into the structure and contents of the focus group with these companies.

To reflect on the companies' level of prior knowledge and experience with regards to JOSEPHS®, and/or other LLs, a short paper-based questionnaire was handed out to the focus group participants in February 2016 (see Appendix 2). The first question asked company representatives if and how many times they had experienced JOSEPHS® as an ordinary visitor, and thereby tried out the products or services of other firms. Next, the respondents were questioned if they, or their colleagues, had been present in JOSEPHS® in order to directly interact with visitors. If they had been on-site as a company representative, they were asked to state how often this has happened. Finally, respondents were asked if they have had comparable experiences to JOSEPHS® by utilising a similar OI environment. If this was the case, the questionnaire asked for the type and location of that experience and how this had influenced the project at JOSEPHS®.

Building on the in-depth insights derived from the focus group that generated a list of priority co-creation elements, 14 individual semi-structured interviews with companies were carried out in April 2017, totalling 12h 07min of interview recordings. The interviews were conducted both face-to-face and via telephone. The 14 companies that were interviewed had experienced JOSEPHS® under six different themes between August 2015 and March 2017 and consisted of organisations from a variety of industries, ranging in size and experience with OI processes. Based on convenience, an opportunity sampling technique was employed to invite companies that were available and willing to participate. This was the only approach possible as the researcher was dependent on JOSEPHS'® staff to establish contact with companies in order to invite them to the interviews. The focus of the interview was on four main areas: (i) respondent's background and relationship with the JOSEPHS® project, (ii) objectives and goals of the co-creation project, (iii) co-creation elements, and (iiiv) outcomes and impact of the co-creation project. An overview of the

companies that have been interviewed and who participated in the focus group can be viewed in Appendix 11.

3.3.2.2.4 Co-creators

In this research, co-creators are the third stakeholder under investigation. In order to study how co-creation can be facilitated in LLs from a co-creator perspective, one focus group, and direct as well as participatory observations were carried out with individuals that had visited JOSEPHS® at least once in the past.

Initial observations of the co-creators over a period of time, totalling 12 hours, helped to understand their behaviour and reactions towards the LL facilitator. On the other hand, these observations also focused on the co-creators' behaviour and interaction with the OI setting and specific prototypes. Due to the changing themes in the LL, it was important to repeat the observations at different points in time. Therefore, the researcher carried out direct observations on five different occasions: in January 2015, December 2015, February 2016, September 2016, and in April 2016. Observations were captured through field notes on each occasion (see Appendix 12 for one example).

Similarly, the participatory observations aided the researcher's understanding of the co-creation process, through the lens of an ordinary co-creator. Based on 12 hours of participatory observation, the researcher was able to gain a close familiarity with the OI space, and LL facilitators and their practices, through an intensive involvement in the co-creation process. For the same rationale, as described earlier, participatory observation took place on five different points in time: January 2015, December 2015, February 2016, September 2016, and in April 2016.

In September 2016, a focus group with nine participants was organised in order to gain an in-depth understanding of the co-creation elements that encourage co-creators to participate and to provide feedback at JOSEPHS®. Based on convenience, an opportunity sampling technique was employed to invite the co-creators that are available and willing to participate in the focus group. Once again, the opportunity to contact these co-creators was established by JOSEPHS'® staff who also advertised this focus group publicly through their social media channels. For 2.5 hours, the focus of the discussion was on how co-creators can be encouraged to engage in co-creation in LLs. The participants, divided in two groups, discussed what exactly encourages co-creators to (i) come back to JOSEPHS®, and (ii) collaborate and give feedback at JOSEPHS®. Finally, the two groups presented their ideas to everyone, and each participant could identify their own personal five priority elements that facilitate co-creation. The participants included individuals diverse in age, and with different professional backgrounds – just like JOSEPHS'® ordinary co-creators. An overview, describing the participants of the focus group in terms of gender and profession,

can be viewed in Appendix 13. Additionally, Appendix 14 provides insights into the structure and contents of the focus group with co-creators.

3.3.2.2.5 Summary of Data Collection

The type of data collected with respect to the perspective of each stakeholder (LLF: Living Lab Facilitators; CC: Co-creators; C: Companies) is presented in Table 11. The table also presents the number of participants and hours of data collection, thus, providing an overview of the entire data collection process.

Table 11 Data Collection

Data Collection Method	Number of Participants	Hours of Data Collection
Pilot study: Semi-structured interviews (LLF)	4	3h
Semi-structured interviews (LLF)	5	3h 40min
First focus group (LLF)	9	3h 30min
Second focus group (LLF)	8	4h 30min
Direct observations (LLF, CC)	Not applicable	12h
Documentary information (LLF, CC, C)	Not applicable	37h
Focus group (C)	3	4h 30min
Semi-structured interviews (C)	14	12h 07min
Paper-based questionnaire (C)	3	Not applicable
Focus group (CC)	9	2h 30min
Participatory observations (CC)	Not applicable	12h
Total Hours of Data Collection		**94h 47min**

3.4 Data Analysis and Interpretation

Data analysis is a process of examining a phenomenon and is about giving data its significance (Corbin and Strauss, 2008, p. 46). Qualitative analysis involves the researcher's intuition about what is happening, and to have confidence in the research process, as well as having the capacity to be creative, flexible and honest with the research data, all simultaneously (Corbin and Strauss, 2008). In the context of case study research, studies often only describe the data generation but do not elaborate enough on the data analysis. Subsequently, a chasm often divides the empirical data from the conclusion (Eisenhardt, 1989). Yin (2009, p. 127) states that *"the analysis of case study evidence is one of the least developed and most difficult aspects of doing case studies".* Following the coding process, the researcher has to study the outputs to assess whether any meaningful patterns are emerging. Considering the challenges associated with case study research, and the utilising of multiple sources of evidence, Yin (2009) suggests to 'play' with the data to develop an analytical strategy.

Moving on from these considerations, section 3.4.1 introduces grounded theory as a suitable method and theory building approach (Eriksson and Kovalainen, 2016) in this research. Then, the process of analysing the data sources, utilised in this study, is described in section 3.4.2.

3.4.1 Grounded Theory

Grounded theory encompasses the ongoing identification and integration of categories of meaning from data (Willig, 2013). Glaser and Strauss (1967) state that grounded theory is ideal for unfamiliar research contexts. Stern (1980, p. 20) reinforces their argument by affirming that *"the strongest case for the use of grounded theory is in investigation of uncharted waters, or to gain a fresh perspective in a familiar situation."* In the context of grounded theory, scholars argue that theory emerges and progresses during the research process, which is as a result of the continuous overlap and interplay between the data collection and data analysis (Glaser and Strauss, 1967; Charmaz, 1990, 2000, 2008, Strauss and Corbin, 1990, 1998). Compared to other qualitative methods and approaches, grounded theory follows a specific procedural and rather formal form during the data collection and data analysis phases. New theory should emerge as a process of the analysis, regardless of the field where the method is employed. The authors further elaborate that this new theory should include a set of plausible relationships proposed among concepts and sets of concepts (Eriksson and Kovalainen, 2016). Addressing a relatively under explored topic, a bottom-up theory building approach based on rich qualitative data was required, making grounded theory a suitable approach to study this phenomenon, and leading to the emergence of conceptual categories. Indeed, grounded theory is considered both a method and a theory (Willig, 2013). As a method, it relates to the process of category identification and integration, offering guidelines on how to identify categories, how to make connections between categories, and how to create relationships between them. On the other hand, grounded theory, as a theory, refers to the final product of this process. It delivers an explanatory framework capable of shedding light on the phenomenon under investigation. To identify, refine and integrate categories, and finally to develop theory, grounded theory scholars employ several important strategies, including constant comparative analysis, theoretical sampling and theoretical coding (Willig, 2013). Theoretical sampling is used as a process of data collection, whereby the researcher jointly collects codes, analyses data, and decides what data to collect next to develop a theory as it emerges. As suggested, also a theoretical coding process is adopted. Theoretical coding must not be predetermined, instead it emerges from in the data (Glaser, 1998). It produces meaning and generates scope to the theory that is emergent and involves conceptualising

the relationship between categories. In line with Glaser and Strauss (1967), this study employs the constant comparison method by following a non-linear process of coding, comparing and memoing of data. Through this iterative process, concepts that explain patterns in the data are developed. Data analysis continues until theoretical saturation is reached. Theoretical saturation refers to the situation in which *"no additional data are being found whereby the (researcher) can develop properties of the category. As he sees similar instances over and over again, the researcher becomes empirically confident that a category is saturated [...] when one category is saturated, nothing remains but to go on to new groups for data on other categories and attempt to saturate these categories also."* (Glaser and Strauss, 1967, p. 65).

Data analysis in this grounded theory approach includes handling extensive amounts of written transcripts and field notes. The iterative process of data collection and data analysis allowed the researcher to take advantage of the new insights derived from the data, which produces an empirically valid theory (Eisenhardt, 1989). The specific approach to analysing the data is discussed in the following section.

3.4.2 Organising and Coding Data

According to Dörnyei (2007), a 'good' qualitative interview flows naturally, and is rich in detail. Although, some of the interviewees may be able to communicate adequately in English, the additional effort required can result in impoverished accounts (Nicassio *et al.*, 1986; Westermeyer, 1990) making the value of the data uncertain (Marshall and While, 1994). Therefore, in order to allow respondents whose first language is not English to fully express themselves, the interviews with companies were conducted in German. The researcher is bilingual and is also familiar with the culture, and hence, no challenges in the interpretation and representation of meaning occurred. While interviews with companies were carried out in German, interviews with research staff of JOSEPHS® was conducted in English, as all participants are fluent in the language and use it on a day-to-day basis. All interviews were recorded and then transcribed word-for-word.

Similar to the interviews, also focus groups were recorded and transcribed. In addition, detailed notes of the discussions were taken whilst listening in. Also, posters were produced by focus group participants capturing the outcomes of the discussions. Yet, it was important to distinguish between the individual opinions that were voiced, apart from the group, and the actual group consensus. Hence, deviant case analysis is essential, and attention was paid to possible minority opinions. To address this point, each participant could select their personal priorities within a list of co-creation elements that were derived from the discussions, as described in section 3.3.2.2.2. As a result, it became clear which

co-creation elements found agreement across participants and which were not selected as a 'priority element' by anyone. Also, *"the only distinct feature of working with focus group data is the need to indicate the impact of the group dynamic"* (Kitzinger, 1995, p. 301). Therefore, the researcher also analysed the group dynamic in order to examine the interaction between research participants. As suggested by Kitzinger (1995), the script of the group discussions was coded, similar to the process undertaken for the semi-structured interviews. However, special categories for specific types of narratives such as jokes, and types of interactions, such as questions, were employed (Kitzinger, 1995).

When analysing observations, Kutsche (1998) proposes to map out a setting by describing the relationship between the sociocultural behaviour one detects and the physical setting. Therefore, the researcher took note of the physical environment, using as much detail as possible. Counting, census taking, and mapping are vital methods to gain a better understanding of the social setting in the early phases of participation (Schensul, Schensul and LeCompte, 1999). Furthermore, as suggested by Kutsche (1998), the researcher visited the LL several times during the day to understand how it is used differently at different times of the day. The same logic applies to the different visits that took place throughout the year, considering the fact that the changing themes also attract different audiences. Field notes were the main way of capturing the data gathered during participant and direct observations. The notes detailed what is observed, including informal discussions with participants, records of activities, and journal notes that were written on a daily basis. In writing field notes, best practices were employed (Schensul, Schensul and LeCompte, 1999) which are presented in Table 12.

Table 12 Features and Evidence of Good Field Notes

Features of Good Field Notes	Evidence in Thesis
Pseudonyms or unique identities (numbers/letters) are used throughout to ensure anonymity and confidentiality.	Appendix 9 Appendix 11 Appendix 13
Exact quotes are included with selected words to convey to the readers a sense of being there and meeting the actors in the scene.	Appendix 12
The observation notes describe the activities in the sequence in which they happened.	
The notes included relevant history related to incidents or individuals to situate the event.	
The researcher has differentiated his/her own summary of the events and conversation from the direct quotes of the speakers.	
The date, place, time, and name of the researcher are recorded at the top of the set of notes.	

Source: Adapted from Schensul, Schensul and LeCompte (1999)

In addition to the field notes and transcripts, derived through the semi-structured interviews, focus groups and observations, also a short questionnaire and documentary information were analysed. Following Scott's (1990) recommendation, four quality control criteria for dealing with documentary sources were taken into account. These quality control criteria include authenticity, credibility, representativeness and meaning. Authenticity is concerned with whether the evidence is genuine and from impeccable sources; credibility relates to whether the evidence is free from error and distortion; representativeness focuses on whether the documents under review are representative of the totality of the relevant documents; and meaning refers to whether the evidence is clear and comprehensible. To address these criteria, the researcher relied on official company websites, press releases by Fraunhofer and documentation produced by JOSEPHS'® staff.

Moreover, a short questionnaire regarding the companies' level of prior knowledge and experience, with regards to JOSEPHS® and/or other LLs, was handed out to participants of the focus group with representatives from companies. Due to the length of the questionnaire (see Appendix 2), and the limited number of participants, it was not necessary to use any of the advanced data analysis methods. Instead, the questionnaire served as background information about the participants and their respective companies. Simultaneously, it gave the opportunity for companies to state if they had any prior experience without letting other focus group participants know about it. The data of this questionnaire are purely used in a descriptive manner providing details on the focus group participants.

In line with grounded theory, the analysis started by coding the first focus group and a number of interview transcripts, highlighting any important and interesting aspects mentioned by the respondents. After getting acquainted with the data then categorising and thematising took place to study similarities and interesting aspects concerned with the research phenomena. Coding of the data allows the researcher to select and emphasise information that is significant enough to record, and remove any irrelevant information (De Munck and Sobo, 1998). Based on the initial coding, further data coding was carried out using Microsoft Excel. For a detailed analysis of the 14 individual interviews with companies, NVivo 10 was utlised. As the understanding of the empirical data improved, the categories were further advanced through hierarchical elements. This was achieved using NVivo's tree nodes. To further refine, readjust and improve the coding of data, categories were merged into broader entities or divided into sub categories as necessary. This reorganisation of data took place as a result of perceiving the data more as a whole, as well as detecting evolving patterns and similarities and recognising the interrelations of the categories.

Following Yin's (2009) recommendation to 'play' with the data, the author intially categorised the findings by themes, identifying five critical factors for co-creation facilitation. These factors consisted of a set of elements that provided further details. In order to improve the clarity and terminology used to describe these co-creation elements, researchers and students, independent of this research, were consulted for feedback. For this reason, a 1.5-hour workshop with 12 academics and students was organised. First, the researcher briefly introduced the research and presented a list of co-creation elements (i.e. a clear structure and storyline of LL) that were identified during the study. Then the group was split into six pairs of people to review and discuss the co-creation elements. Independent from each other, each group identified a number of co-creation elements that were not clear to them and required rephrasing. As a result of this exercise, the researcher was able to firstly identify which elements were not clear, and secondly, refine the terminology employed to describe each co-creation element more clearly.

3.4.2.1 Method and Data Source Triangulation

Two types of data triangulation were carried out: method triangulation, and data source triangulation. The first type of triangulation takes into account the use of multiple methods of data collection about the same phenomenon (Polit and Beck, 2012). In this case they include interviews, observations, focus groups, documentary information, and a questionnaire. The second type of triangulation that is applied in this study is data source triangulation. It involves the gathering of data from different types of co-creators, companies, and LL staff to gain multiple perspectives and the validation of data (Carter *et al.*, 2014). Yin (2009, p. 115) states that the most important benefit of using multiple sources of evidence is the *"development of converging lines of enquiry, a process of triangulation and corroboration".* The data analysis process is described in more detail with respect to each data source in the following sections.

3.5 Research Quality

Case study research, as a tool for generating and testing theory, has provided the strategic management field with many revolutionary insights (e.g. Penrose, 1960; Chandler, 1962; Pettigrew, 1973; Burgelman, 1983). Notwithstanding, the case study method has been the subject of criticism regarding its methodological rigour with regards to validity and reliability (e.g. Campbell, 1975; Miles, 1979; Yin, 1981; Daft and Lewin, 1990; March, Sproull and Tamuz, 1991). Several scholars proposed research strategies that improve the accuracy of case studies in terms of their internal validity, construct validity, external validity and reliability (Gibbert, Ruigrok and Wicki, 2008). In order to address these four criteria of case

study rigour, a number of best practices can be followed. These four criteria are briefly introduced in Table 13 and are discussed in more detail in the following sections, together with the processes employed in this research to ensure that the expectation of research rigour is met.

Table 13 Validity and Reliability Criteria

Criteria	Description
Internal Validity	Internal Validity is *"the approximate truth about inferences regarding cause-effect or causal relationships"* (Trochim, Donnelly and Arora, 2015, p. 28).
Construct Validity	Construct Validity is *"the degree to which inferences can legitimately be made from the operationalizations in your study to the theoretical constructs on which those operationalizations are based"* (Trochim, Donnelly and Arora, 2015, p. 28).
External Validity	External Validity is *"the degree to which the conclusions in your study would hold for other persons in other places and other times"* (Trochim, Donnelly and Arora, 2015, p. 28).
Reliability	*"Reliability is defined as the extent to which studies can be replicated, using the same methods, and getting the same results. It is the degree to which data are independent of the accidental circumstances of the research"* (Clonts, 1992, p. 1).

Source: Adapted from Clonts (1992) Trochim, Donnelly and Arora (2015)

3.5.1 Internal Validity

Internal validity, also called logical validity (e.g. by Cook and Campbell, 1979; Yin, 1994), refers to the causal relationships between variables and results. The issue is whether the investigator offers a plausible causal argument and logical reasoning that is convincing enough to defend the conclusions drawn from the research. In order to improve internal validity, it is suggested that researchers, who are employing a case study method, should formulate a clear research framework, which establishes that variable x leads to result y, and that y was not triggered incorrectly by a third variable z. Moreover, through pattern matching, investigators should compare empirically observed patterns with either projected ones or the patterns recognised in existing research and in different contexts (Eisenhardt, 1989; Denzin and Lincoln, 1994). For this reason, a thematic analysis of interviews, focus groups and observations is conducted allowing the researcher to detect patterns across data sources, which is then, in chapter 6, compared to findings from the systematic literature review.

3.5.2 Construct Validity

The construct validity of a process refers to the quality of the conceptualisation or operationalisation of the relevant concept. As such, construct validity describes the degree to which a study investigates what it claims to investigate, that is, to the degree to which a procedure leads to a correct observation of reality (Denzin and Lincoln, 1994). In order to improve construct validity in case studies, three measures are recommended. Following the recommendation by Yin (1994), a clear chain of evidence was established to enable readers to recreate how the investigator went from the early research questions to the ultimate conclusions (Gibbert, Ruigrok and Wicki, 2008; Yin, 2015). This includes citing specific sources, such as interviews, focus groups or observations, and detailing the circumstances under which the evidence was collected – for example, the place and time of an observation (Appendix 12). Therefore, this study presents clear cross-referencing to its methodological procedures, and the resulting evidence, ensuring construct validity. Second, Franklin and Blyton (2013) argue that construct validity can be improved by using multiple sources of evidence in the data collection phase, as they provide multiple measures of the same phenomenon. In this study, for instance, the triangulation of interview transcripts, documents, the focus group, as well as observation notes helped to study the same phenomenon from different angles (Flick, 1992; Denzin and Lincoln, 1994; Yin, 1994; Peräkylä, 1997) ensuring confidence in both the theoretical constructs and the reliability of the interpretation (Franklin and Blyton, 2013). Third, two key informants (Living Lab Facilitator B, and Living Lab Facilitator E) that are very familiar with the case, independently, reviewed drafts of the case study report. Thus, this study considered three recommended measures in developing constructs, measures and testable theoretical propositions that enable the inductive case study to be geared to normal-science streams of research (Eisenhardt and Graebner, 2007).

3.5.3 External validity

External validity, also called ‘generalisability,’ is based on the intuitive belief that theories must be presented to explain phenomena, not only in the context in which they are studied, but also in other settings (e.g. Calder, Phillips and Tybout, 1982; McGrath and Brinberg, 1983). However, neither single nor multiple case studies allow for statistical generalisation, for instance, drawing conclusions about a population (Yin, 1994; Numagami, 1998). Often this is articulated as an absence of external validity - the impossibility of extending the case study results to a population of other cases (Kennedy, 1979; Donmoyer, 1990; Yin, 2009). However, scholars, in favour of single case studies, have developed a number of arguments to address the problem of ‘a sample of one’. Scholars, such as Donmoyer (1990), Kennedy

(1979) and Yin (2009), argue that increasing the amount of data points in a single case would eliminate the issue. Yet, even with a larger quantity of data points, the single case remains unique (Ruddin, 2006). However, this does not mean that case studies are not appropriate to make generalisations. Methodologists distinguish between statistical generalisation and analytical generalisation. Different to statistical generalisation, analytical generalisation refers to the generalisation derived from empirical observations to theory, rather than a population (Yin, 1994). This way, the findings of this case study are considered as a preliminary stage in the process of building a general theory, holding law-like propositions, supposedly, which are valid to a population of similar cases. While, the researcher acknowledges that single case studies generally lack external validity, due to their nature, this research involved a data collection not only from multiple sources but also from three different perspectives: LL facilitators, companies, and co-creators.

3.5.4 Reliability

Reliability refers to the inexistence of random error, allowing subsequent investigators to derive the same insights if they conduct the study following the same steps (Denzin and Lincoln, 1994). Thereby, two aspects are key: transparency and replication. Transparency can be improved through documentation and clarification of the research procedures. This research achieves transparency using a case study protocol – a report that outlines how the entire case study has been conducted. To allow for replication, as suggested by Yin (1994), a case study database was created. The database consists of field notes from observations, transcripts, recordings, photos, narratives, tabular material, and case study documents, which are organised in a manner to simplify retrieval for later researchers (Yin, 1994) and to enable the replication of the case study (Leonard-Barton, 1990). To achieve reliability, the researcher produced detailed research procedures and protocols (Gibbert, Ruigrok and Wicki, 2008) allowing for replication of the case study.

3.5.5 Summary of Validity and Reliability Test

It is suggested that an investigator should continually evaluate the case study design's quality (Yin, 1998). For this purpose, *internal validity*, *construct validity, external validity* and *reliability* are commonly tested. Yin recommends that these tests should be conducted during the case study process: design, data collection, data analysis and a reporting phase. Consequently, this will *"increase the quality of your case study tremendously and overcome traditional criticisms of the weakness of case study research"* (Yin, 1998, p. 242). Table 14 summarises 11 recommended tactics regarding the four tests, and specifies the research design, as well as the conduct for the case studies, to address the stated recommendations.

Table 14 Case Study Tactics and Responses

Tests	Case Study Tactic	Research Phase in which tactic occurs	Action taken in this research
Internal Validity	Do pattern matching	Data analysis	Search for patterns across cases
	Do explanation building	Data analysis	Some causal links identified
	Do time series analysis	Data analysis	Not performed in this research
	Do logic models	Data analysis	Not performed in this research
Construct Validity	Use multiple sources of evidence	Data collection	Use of interviews, observations, focus groups, documentary information, and a questionnaire
	Establish chain of evidence	Data collection	Interview data both recorded and transcribed; multiple evidence sources entered into customised database
	Have key informants review draft case study report	Composition	Conference papers based on case studies reviewed by key informants before publication
External Validity	Use rival theories within single cases	Research design	Not used because of exploratory nature of research and lack of existing theory
	Use replication logic in multiple-case studies	Research design	Not applicable due to single case study approach
Reliability	Use case study protocol	Data collection	Use of case study protocol outlining how the entire case study has been conducted
	Develop case study database	Data collection	Interview transcripts, and other notes entered into database

Source: Adapted from Yin (1998)

3.6 Summary

To sum up, this research stands at the philosophical position of interpretivism. The research employs a single exploratory case study. To address the research question *"how can co-creation be facilitated in LLs"*, interviews, focus groups, observations, documentary information and a questionnaire are utilised. In total, 94 hours and 47 minutes of data collection was carried out. When analysing the data, three key stakeholder perspectives are considered: LL facilitators, companies, and co-creators. Data source and data method triangulation is completed. The study is based on grounded theory. Finally, the rigour of this case study is verified against four criteria associated with research quality: internal validity, external validity, construct validity, and reliability.

4 JOSEPHS®

In this chapter, the case of 'JOSEPHS'® is presented by reference to findings from the pilot study, secondary data and follow up interviews, to examine changes over time. The first section discusses JOSEPHS'® objectives, its physical space, theme worlds, staff, events and workshops. Furthermore, it provides insights into the companies and co-creators that jointly innovate at JOSEPHS®. The second section is devoted to the co-creation process, whilst section three provides a longitudinal account of how a company engaged in the co-creation process and the lessons they learnt. Section four describes the challenges that JOSEPHS® encounters and the changes that have been introduced over time are presented in the fifth section. Finally, the chapter is concluded by a brief summary.

4.1 Introduction to the Case JOSEPHS®

JOSEPHS® is a living laboratory located in the city centre of Nuremberg, south of Germany. It is a physical space enabling the active involvement of users in the development, introduction and commercialisation of new services and products. JOSEPHS® invites visitors to experience ongoing innovation journeys of established brands as well as new start-ups. Companies present ideas, early prototypes, or even products and services at an advanced development stage, in order to receive authentic feedback from users. JOSEPHS® was initiated by the Fraunhofer Center for Applied Research for Supply Chain Services (SCS) in cooperation with the Chair of Information Systems I at Friedrich-Alexander University Erlangen-Nuremberg (FAU). Fraunhofer SCS is operating the LL and conducts applied research on JOSEPHS®. Furthermore, Fraunhofer SCS is responsible for securing funding and administrative activities. On the other hand, FAU delivers design focused research, and develops methods as well as tools for data collection purposes at JOSEPHS®. The LL is funded by the Bavarian Ministry for Economic Affairs and Media, Energy and Technology. The name JOSEPHS® was established to build a connection to Joseph von Fraunhofer, the name giver of the Fraunhofer organisation. JOSEPHS® is open to the public and was established as a meeting point for co-creators. In line with the opening hours of surrounding stores, JOSEPHS® is open from Monday to Friday, 10am to 7pm, and Saturdays from 11am until 6pm. Part of JOSEPHS'® concept is to organise the LL in themes for a period of three months reflecting on the companies' common ground. Established in May 2014, JOSEPHS® attracted about 33,000 visitors until January 2018. During this period, 15 theme worlds, and 78 research collaborations with companies took place.

The following subsections discuss JOSEPHS'® objectives, the physical space, and the theme worlds in greater detail. Also, JOSEPHS'® staff and their area of work is introduced. Further subsections are devoted to the events and workshops that are delivered

in the Think Tank. Moreover, another subsection discusses the companies and co-creators that participate in the co-creation process. Then, section 4.2 describes the co-creation process by reference to its three distinctive phases. Section 4.3 presents the key challenges JOSEPHS® encounters, and finally, the changes that were implemented for the relaunch of JOSEPHS® 2.0 in March 2017 are presented in section 4.5. Ultimately, a summary of this chapter is presented in section 4.6.

4.1.1 Objectives

During the pilot study, LL Facilitator A, B, and C explained that JOSEPHS® started as a collaborative idea between Fraunhofer SCS and FAU. It was clear since the beginning that the objective of JOSEPHS® relates to societal and economic goals. Furthermore, the aim was to conduct research with and about JOSEPHS®.

A lot of large product-oriented firms, such as Quelle and Grundig, were located in the Nuremberg area in 2005/06. However, three or four years later, a number of these large companies closed down which destroyed many jobs. The interviewees explained that they realised that the region had been dependent on the production of goods but that this had to change. Thus, their aim was *"to create a lighthouse for services"* (LL Facilitator B) and foster service thinking. As a centre for market research and already having a Fraunhofer Institute on-site, Nuremberg as a location for JOSEPHS® became a natural choice, and also due to the presence of large businesses like Siemens, Datev and Schaeffler that could potentially be interested in using the space. Essentially, JOSEPHS® wants to *"change the mind-set [so] that people get service addicted"* (LL Facilitator A).

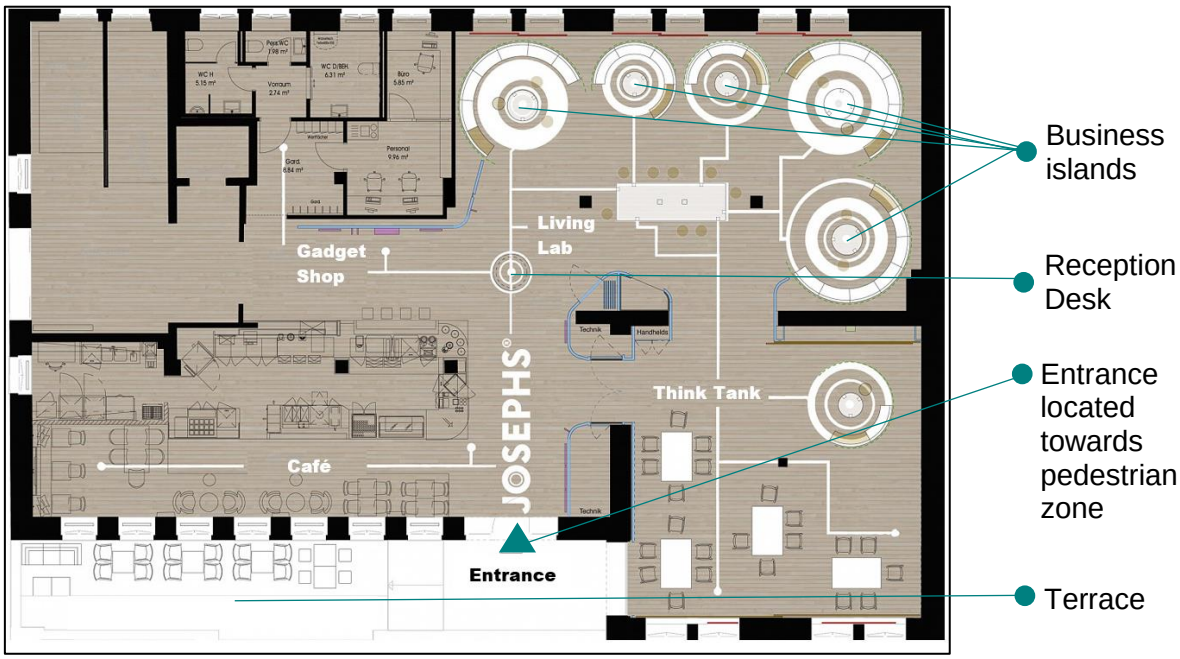
Apart from the societal objectives, there were also economic considerations that were to be taken into account. JOSEPHS® secured funding from the Bavarian Ministry for Economic Affairs and Media, Energy and Technology with the initial aim to succeed in the first year and run for at least three years. When probing what succeeding means for JOSEPHS®, LL Facilitator B specifies that breaking-even in business would be a success. Yet, this is also relating to the kind of reputation that JOSEPHS® is planning to establish over time. In the future, LL Facilitator B envisions that JOSEPHS® could open in other cities and countries. LL Facilitator D also stressed that JOSEPHS® has to be run like a business and deliver economic returns, as it is not clear if public funding will be available in the future.

4.1.2 Physical Space

LLs can be either virtual or physical environments (Westerlund and Leminen, 2011). JOSEPHS® is a physical space located right near the pedestrian zone in Nuremberg making it easy to find and an attractive place for people passing by. The 400 m² open setting

of JOSEPHS® attracts co-creators through four different areas: LL, think tank, Café, and the Gadget Shop. The LL area is where companies have their products or services tested by users. This open space is divided into five business islands, each occupied by a company for three months under one common theme. During the period of three months, on average, about 3000 users try out the products and services and provide their feedback to improve them. JOSEPHS® also has a 'Think Tank', which is often used to run university seminars, events with an external speaker, or lead user workshops for companies to further deepen their co-creation activities. The Think Tank can also be rented for closed company events. JOSEPHS® hosts an Italian Café. Positioned right at the entrance, the café attracts visitors without them necessarily knowing that JOSEPHS® has more to offer, which helps in lowering barriers to interaction. Finally, the smallest space within JOSEPHS® is occupied by Ultra Comix's "Gadget Shop". The shop offers gift ideas, such as board games and books. JOSEPHS'® four areas are presented in Figure 13.

Figure 13 Layout of JOSEPHS®



Source: Fraunhofer-Gesellschaft (2014)

As described in the literature, LLs differ from each other in terms of their nature and characteristics (Leminen and Westerlund, 2015). The combination of the four described areas are unique to JOSEPHS® and are not common components of a LL. Yet, this arrangement offers an attractive and appealing space for co-creators to generate interest in visiting the space. This is a prerequisite in order to be able to provide the user with the insights that companies are seeking in such an environment.

4.1.3 Theme Worlds

Since opening in May 2014, JOSEPHS® has hosted 15 different theme worlds addressing a variety of topics ranging from ‘Leisure – active and self-made’ to ‘Smart Services’. A complete list of the theme worlds and their descriptions can be viewed in Appendix 15. Usually, LL Facilitator A and LL Facilitator E from JOSEPHS® (see Appendix 9 for details) put forward ideas for a new theme, which are then discussed in the JOSEPHS’® team. Often, the ultimate titles of the theme world are tailored towards the businesses that are utilising the space during that theme. For example, initially, a theme world was going to be called ‘With all Senses’, but after finalising with the companies participating under this topic, it became clear that a more suitable title would have been ‘Senses in a Digital World’ (see Appendix 15).

In order to promote the theme worlds and events that JOSEPHS® is running, staff is heavily relying on Facebook and the website. More recently, they also set-up a twitter account. More traditional media outlets are utilised as well. For every new theme world decided upon, and other major announcements, such as the awards that JOSEPHS® receives, Fraunhofer SCS gives a press release. The press releases associated with new theme worlds are usually published at the start. The press report includes information about the new topic, the start date of the theme world, and the co-creation concept, as well as JOSEPHS® being briefly introduced, encouraging people to visit the LL. Also, the companies are introduced and some of their questions are posed to excite the reader’s curiosity.

The changing themes and the rotating of companies not only attract a large number of visitors but also different audiences, depending on the focus of the theme world. For example, a theme world focusing on the latest technology attracts a younger audience. However, it is not only technology enthusiasts, who enjoy experimenting with new devices and software, who come to such a theme world, but also people from all age groups and all walks of life visit JOSEPHS® and contribute with their ideas to the development of a prototype.

4.1.4 Staff

Staff associated with JOSEPHS® is employed by the Fraunhofer Center for Applied Research for Supply Chain Services (SCS) and the Chair of Information Systems – Innovation and Value Creation (Wi1) at Friedrich-Alexander University Erlangen-Nuremberg (FAU). The team is divided into two main areas of work that can be labelled as ‘JOSEPHS® Guides’ and ‘R&D Researcher and Business Development’.

Considering the fact that often student workers fill positions within the local team, and are guiding the co-creators around the LL, moderate levels of staff turnover is also naturally present. Yet, the vast majority of staff has been involved since JOSEPHS'® establishment and has accumulated a great amount of knowledge about the co-creation process, the co-creator, the companies, events and more generally what works and what does not work in such a space. Table 15 presents an overview of JOSEPHS'® staff and their areas of work.

Table 15 JOSEPHS'® Staff

	JOSEPHS® Guides	R&D Researcher and Business Development
Number of staff	4	8
Key responsibilities and tasks	Providing a co-creation experience, service and raise visibility to visitors	Acquiring companies for theme worlds
	Guiding co-creators through the theme world	Generating ideas for theme worlds
	Collecting data from co-creators	Developing research as well as a business island design
	Creating an ideal JOSEPHS®-atmosphere	Supervising co-creation projects as a point of contact for the company
	Informing visitors about LL, companies, prototypes, events, and workshops	Processing and analysing data to provide feedback to the company
	Delivering short presentations on JOSEPHS® and Service-Design (i.e. for schools)	Initiating bookkeeping processes
	Shop management tasks	Documenting data and where appropriate prepare publications and presentations

4.1.5 Events and Workshops

JOSEPHS'® Think Tank is utilised for various events and workshops ranging from business island facilitated workshops to Start-Up pitches. Regularly, companies book the space for internal meetings. Often companies ask JOSEPHS® to give a tour around the LL to inspire their staff with this open approach to innovation. Also, integrating Service Design / Design Thinking aspects into the company meetings, in order to facilitate prototyping sessions, is a request that JOSEPHS® receives on a regular basis. Generally, the Think Tank offers an opportunity for companies to go into further depth with their co-creation project through the additional workshops that they can run. For example, a company can invite a more targeted audience, such as lead users, developers, or suppliers to explore one specific aspect of their co-creation project in greater detail. This could be related, for instance, to the price

point of a product or its design. The total number of events that took place since the opening of JOSEPHS® in May 2014 until December 2017 can be viewed in Table 16.

Table 16 Overview of Events at JOSEPHS®

Year	Total number of days open	Total number of events	Events per open day
2014	186	134	0.72
2015	304	289	0.95
2016	296	382	1.29
2017	275	330	1.20

Based on the growing experience, and the knowledge that JOSEPHS'® staff has developed throughout the past years, JOSEPHS® started offering consulting services. JOSEPHS® assists companies with establishing their own innovation laboratory. Staff is drawing on their experience in order to help companies in setting up the structure and daily business of their LL. This specific service runs through Fraunhofer SCS.

Two services that JOSEPHS® offers address a younger audience. On the one hand, they have recently introduced innovation /service design workshops for school classes in order for children and youths to learn about services, service design methods and apply the theory in practice. On the other hand, the Chair for Information Systems I - Innovation & Value Creation (Wi1) of the Friedrich-Alexander University Erlangen-Nuremberg (FAU) manages the children's university at JOSEPHS®. This offer gives children insights into science and current topics that are delivered through a 45-minute interactive lecture. Thereby, children have the opportunity to playfully discover JOSEPHS® in the current theme world. The number of school classes coming to JOSEPHS® grew from 25 in 2015 to about 40 in 2016 and have been stable since.

4.1.6 Companies

Companies can use JOSEPHS'® real-life environment to test physical, as well as digital ideas and prototypes, under simulated circumstances with a diverse, self-selected group of users. The firms utilising the LL for innovation purposes come from a wide variety of backgrounds and sizes, ranging from start-ups in consumer products to technology providers and larger firms (Beutel, Jonas and Möslein, 2017). Not only do business-to-consumer firms use this space, but also business-to-business enterprises that would like to explore what the end-consumer thinks about their offering. However, not all of the companies that come to JOSEPHS® have had experience with co-creation or LLs.

Consequently, JOSEPHS® often has to first address their preconceptions and explain JOSEPHS'® concept, its potential and possible limitations. Up to January 2018, a total of 78 research collaborations with companies and organisations have taken place. The 20-25 research projects that are completed during a year focus on a variety of questions. Table 17 summarises the exemplary questions from three different projects indicating the diverse range of companies and research questions tackled at JOSEPHS®.

Table 17 Exemplary Research Questions from three Companies

Company	Background Information	Research Question
Company Q	German start-up	In the retail industry, which configurable features are suited to influence the acceptance of offerings for individual measurement, as well as the utilisation of measurement data by end-users?
	Developed an app to measure your own feet online to achieve a better fit when choosing shoes	
	They also offer an in-store 3D scanner to identify the best shoe size and select the best fitting shoes	
Company R	Big online store for personalised genuine jewellery	In jewellery personalisation, can online elements support an offline presence?
	Premium segment in the jewellery industry	Which elements are used at the point of sale?
	Products include engagement rings, weddings rings, earrings, necklaces, and cufflinks	How can a customer journey look like at the point of sale?
		Is a feedback function used by customers at the point of sale?
Company B	Company specialised in developing smart and digital products	Which usage scenarios, and in what kind of life and work environment can co-creators imagine using this product?
	Core business is Virtual and Augmented Reality, Internet of Things, Wearables and Beacons	Which format is comprehensible for users and where are the challenges when using it?
	Tested product that allows customers to experience a virtual world via virtual reality Smartphone app	Which interaction opportunities are interesting and particularly important?

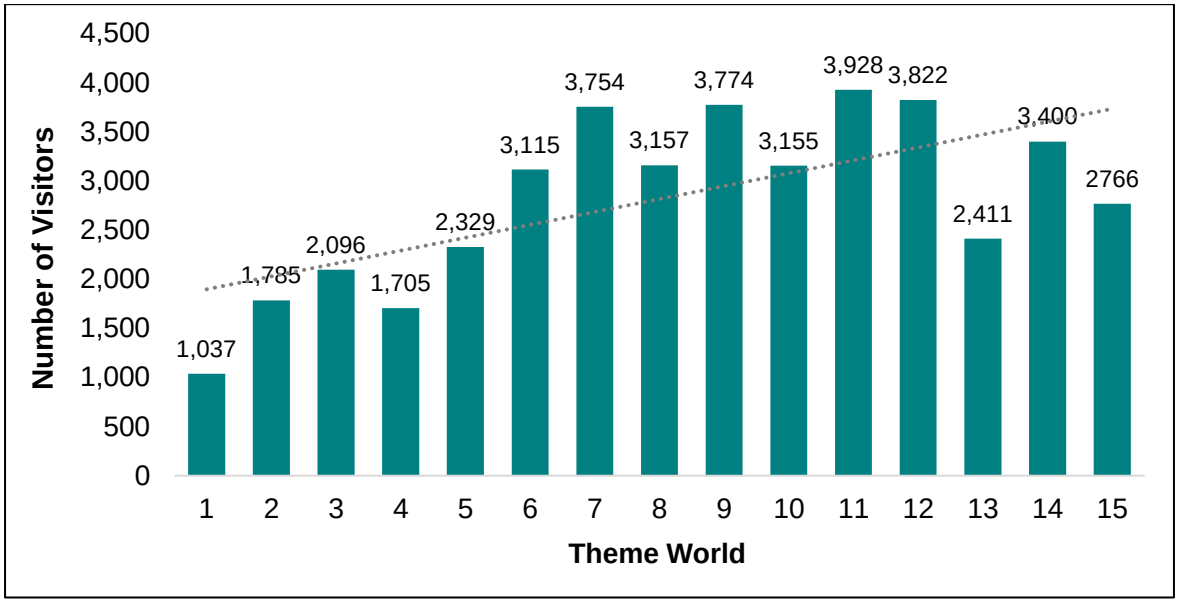
Source: Fraunhofer-Gesellschaft (2018a)

4.1.7 Co-creators

Co-creators play a critical role in the innovation process in LLs (Garcia Robles *et al.*, 2016). It is vital to encourage them to participate in the co-creation process and provide feedback on specific ideas and prototypes. Therefore, a lot of attention is paid to them ensuring they have a positive co-creation experience. During one theme world, JOSEPHS® has on average about 3,000 visitors of which 1,000 actively engaged in co-creation. Figure 14

presents the number of visitors for each theme world from May 2014 until February 2018. As displayed in Figure 14, the number of visitors has steadily increased from those who first attended the first couple of theme worlds to about 3,000 visitors per theme world. The trendline in the graph indicates a slight upwards trend in terms of visitor numbers.

Figure 14 Visitor Statistics

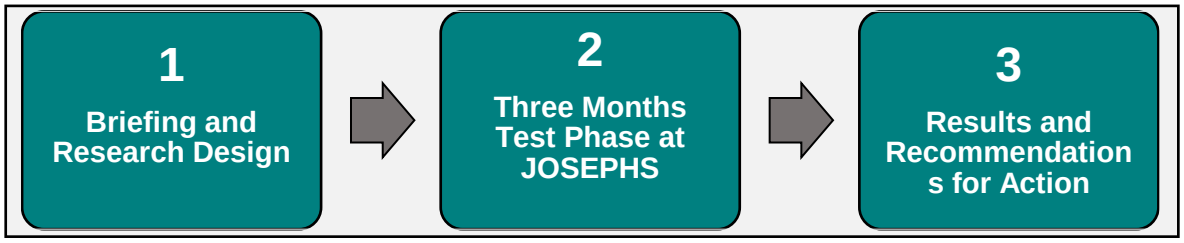


Source: Schmidt (2018)

4.2 JOSEPHS'® Co-creation Process

JOSEPHS'® co-creation process can be described by reference to three key phases, as displayed in Figure 15.

Figure 15 JOSEPHS'® Co-creation Process



Source: Fraunhofer-Gesellschaft (2016)

4.2.1 Briefing and Research Design

First, a new theme for the upcoming theme world is decided on. Then, in order to fill the business islands with companies that would like to undertake a co-creation project at

JOSEPHS®, two different scenarios usually take place. On the one hand, JOSEPHS'® employees reach out to companies that could potentially be interested in involving users in their innovation process through a LL. On the other hand, companies also increasingly start approaching JOSEPHS® and express their interest in participation. When a company decides to take part in a theme world, a formal contract is set up and payment negotiated. Once the company acquisition is completed, a briefing takes place. The primary function of this briefing is to clarify JOSEPHS'® concept and set realistic expectations for the collaboration with JOSEPHS®, but also for the users that provide feedback. This meeting is also an opportunity to address any questions the company may have. One of the key objectives in this first phase, is to establish a research question that the company would like to find answers to during their three months at JOSEPHS®. This process is happening in collaboration with JOSEPHS'® staff, who are able to guide the conversation as they are able to draw on their experience. As a next step, the research design is decided on. Again, JOSEPHS'® staff acts as a service provider by drawing on their expertise informing the company about different options and sharing examples from past cases. Similarly, various data collection tools are presented for the company to choose from. The data collection tools range from simple surveys to very interactive and technology supported tools. JOSEPHS® emphasises the importance of haptics and interactivity as a way to collect user feedback. During this first phase, the company usually selects one or a couple of employees responsible for the project at JOSEPHS®. In start-ups it is likely that the CEO or founder is directly involved in the process. Surprisingly, also in large established companies, the Public Relations (PR) manager, the Research and Development (R&D) manager, or even senior management are involved in the process. Although JOSEPHS® can provide certain equipment and furniture to set-up the co-creation space, companies are strongly encouraged to be creative and start thinking and designing their very own space under the guidance and support of the local JOSEPHS'® team. Once all of this is planned and organised, the second phase starts.

4.2.2 Three Months Test Phase at JOSEPHS®

Phase two is the start of the three months theme world. To begin with, JOSEPHS® closes for two days in order to allow the five new companies to set-up their own co-creation space for the new theme world. The local JOSEPHS® team is part of this reconstruction process, providing manpower and expertise in the set-up of the space. Following the reopening, visitors are invited to try out prototypes and participate in the co-creation of new products and services. However, it is worth mentioning that not every visitor becomes a co-creator – some people just wish to have a look around without further involvement. Supporting the

co-creation process, JOSEPHS'® staff welcomes and guides visitors through the LL. The guides provide background information about the company, inform the visitor about the prototype that is presented, and encourage them to test it and finally leave feedback. At this stage, the guides usually try to find answers to specific questions that the company is interested in, for example, "Which design do you prefer?" However, at the same time the guide is trying to observe behaviour and capture any other feedback or comments that are made in relation to the prototype or company presentation. While this kind of feedback is very important, JOSEPHS® also aims to continuously improve the experience that they provide visitors with, and hence, they invite them to provide feedback on JOSEPHS® itself at the end of the guided tour. Throughout this entire process, no company representative is usually on site to ensure co-creators can experience the theme world without any pressure from the company. Nonetheless, JOSEPHS® leaves it up to the company to decide if they would like to have a company representative on-site. The feedback collected from co-creators is then presented back to the companies in order for them to review their prototypes and make possible adjustments to the design of their co-creation space or the focus of their project. The frequency of the feedback JOSEPHS® delivers back to the company depends on the agreement that is in place, ranging from weekly updates to one interim report. On average about 1,000 co-creators contribute to the innovation process at JOSEPHS® during one theme world.

4.2.3 Results and Recommendations for Action

Upon completion of the theme world, the third phase begins. Qualitative and quantitative analysis are performed on the feedback collected throughout the three months. This process is undertaken by a person that has been responsible for the company right from the start. Usually, this person is an employee of Fraunhofer SCS or FAU and acts as JOSEPHS'® project leader and point of contact for the company throughout the three months. In accordance with the individual agreement, a report, a presentation or both is presented back to the company. A typical report includes between 60 and 100 pages, and the presentation usually contains 50 – 70 PowerPoint charts. Presentations are normally delivered, any time between two and eight weeks after project completion at JOSEPHS®. Feedback to companies comprises results as well as recommendation for action. Finally, JOSEPHS® conducts a follow-up interview to determine if and how feedback from co-creators has been implemented and to assess the overall long-term outcomes of the co-creation project. Usually, these follow-up interviews take place between two and four months after the closing of the theme world in order to give companies sufficient time to

reflect on their 'JOSEPHS® experience', and the opportunity to implement changes to their prototype.

4.3 Co-creation Projects at JOSEPHS®

Since the opening of JOSEPHS® in May 2014, a wide variety of companies carried out co-creation projects. Appendix 16 provides an overview of all companies included in this study and briefly describes their co-creation project. Through the example of Company N, this section, however, provides a longitudinal account of how a company engaged in the co-creation process and the lessons they learnt from using JOSEPHS®.

4.3.1 Company Background

Company N is a German start-up that manufactures luxurious strollers using environment-friendly materials. The focus of the company lies on sustainability, high-quality materials as well as design. Customers can select their preferred design and materials for their stroller through an online configurator. Due to the custom production, the company works with small businesses that are highly flexible and able to realise changes quickly. With regards to their suppliers, Company N pays close attention to the highest social and environmental standards. Given their local sourcing of materials, overall high-quality standards and customised approach to producing luxurious strollers, Company N targets the high-end market with retail prices averaging above €1000 per stroller.

As a start-up with limited financial resources, Company N's business island at JOSEPHS® has been sponsored by the Bavarian Centre for the Cultural and Creative Industries which supports start-ups in the region. The aim of the Bavarian Centre for the Cultural and Creative Industries is to further strengthen the economic performance of cultural and creative professionals and to contribute to their success at national and international level. As a result of their support, start-ups can exploit the knowledge and experience of JOSEPHS'® staff and gain access to co-creators in order to address some of their most pressing innovation challenges.

4.3.2 Project Guidance

Company N's initial objective was about testing their stroller and obtaining feedback in relation to the material, design, and use of the product. However, it became quickly apparent that most of JOSEPHS'® co-creators do not represent Company N's typical customers and due to the specifics of the product, it was difficult to receive insightful feedback from them. The continuous feedback that JOSEPHS'® staff provides companies

during the test phase, together with their experience and knowledge of other co-creation projects helps to identify such challenges, discuss them and redirect the attention of the project. As a result, the project slightly changed from testing the actual product to focusing more on their online configurator. The online configurator allows people to customise strollers to their needs and wants. This includes for example selecting a stroller frame, wheels, hood, handle and much more. The new project goal, therefore, was to gather feedback on Company N's online configurator. The interviewee states: *"It is always a challenge when you just offer your products online to communicate the quality of the product via the configurator"* (Company N). To address this challenge, the company collected feedback from co-creators to better understand the market acceptance of their online configurator. Through the guidance offered by the LL facilitators, a challenging project objective could be turned round and better aligned with the capacity of JOSEPHS® to deliver beneficial insights. Aside from testing market acceptance of the online configurator, Company N also pursued other project objectives which are summarised in section 4.3.3.

4.3.3 Project Objectives

For the three-month test phase at JOSEPHS®, Company N articulated four specific project objectives which are presented in Table 18.

Table 18 Summary of Company N's Project Objectives

Project Objective	Quotes	Objective achieved
Market acceptance	To better understand the market acceptance of their online configurator, Company N gathered direct feedback from co-creators: *"One gets direct feedback […] which we indeed did; we went to JOSPEHS once a week, on Saturdays, then you had there for example a pin board, where everybody wrote down their first impressions."*	Yes
Price acceptability	In relation to the stroller itself, *"we started testing the price, […], where we could measure a price tendency."*	Yes
Exposure	The start-up also articulates product exposure as an objective of their project because they *"don't have a typical shop. We have in Berlin a showroom, as well as in Zurich and in Bregenz."* For this reason, it was *"somewhat also about showing the [product]."*	Yes
Market intelligence	Company N's objective is to gather market intelligence: *"To know where customers are from helps us with the decision where we want to open a shop. Where can we expect good returns?"*	Yes

Conducting co-creation projects in a LL like JOSEPHS® not only allows to obtain answers to the questions posed but also offers a deeper understanding of the user behaviour and the rationale behind it. For example, Company N not only derived information about a specific price point for the stroller but also learned more about the rational of customer's willingness to pay a certain price*: "Even though the production costs might not differ proportionally that much from a plastic leather handle, people are willing to pay more than they would be if we use the same margin with the plastic leather handle."* While, Company N obtained feedback on their price, they also received feedback regarding the design which was not very useful. The interviewee explained that *"the feedback was given in this case by many people who are not in the age where you need a buggy."* Considering these challenges regarding the target audience, Company N decided to focus more on the online configurator instead of the product itself as the co-creators at JOSEPHS® are not limited to the company's usual target audience. *"Especially when it comes to an older audience […]. So if you put someone who is 50, 55 and let them configure and then it works, then you know it is really good, that is completely clear."* (Company N). To ensure that the company derives useful insights, the role of the LL facilitator is critical in guiding the process and continuously reflecting on the insights, and their usefulness to the company. A prerequisite for this is an iterative process of continuous feedback which allows to further improve the co-creation process or change the focus of it, as it has been the case for Company N.

4.3.4 Project Outcomes and Lessons Learnt

Company N started implementing changes to the online configurator two to three months after the project at JOSEPHS® was completed: "*That also includes different [configurator] perspectives, 3D perspectives, a realistic representation of the user interface, how is the user guided through the configurator […]"* (Company N). The company confirms that everything they have discovered during their time at JOSEPHS® have been changed: *"That was quite a lot"* (Company N). The interviewee states that the implementation process *"went very well […], with the configurator […]. We are now in the process of the third re-launch of the configurator"*. As a result of studying the price acceptability among JOSEPHS'® co-creators, Company N even *"increased the price [of their product] by 200 Euro".* Company N also acknowledges that *"the local press coverage was great"* and has given them exposure. Through an article by the Nürnberger Nachrichten people were attracted to visit their business island at JOSEPHS®: *"We even had people visiting our manufactory and when we ask them where they have heard about us, they said JOSEPHS®".* The interviewee further highlights that they can imagine returning to JOSEPHS® *"regularly with*

the configurator, because we always add things and also take things out again". They consider JOSEPHS® particularly useful because it allows them to get objective feedback from people who have no prior experience with the configurator. Ideally, the company would like to return with their configurator regularly, however, they also point out that "*when it comes to the product, the intervals would be bigger, […]. Those are longer cycles than it would be with the configurator. You can put it like this, an interval of every half a year, I would even say sometimes even shorter, would make sense, especially concerning the configurator."*

Company N represents a successful co-creation project that has been conducted in a LL. The case also highlights the important role of the facilitator in guiding the project, redirecting its focus to an area that is beneficial for the company and aligned with the ability of JOSEPHS® to address it. Thereby, the LL facilitators play an essential role in identifying potential challenges for the company. In this case, the LL facilitator was able to direct the focus from the product to the configurator which was a more suitable area that a wide range of co-creators visiting JOSEPHS® could provide feedback on. Due to the initiative of the facilitator and the regular updates during the test phase, the project evolved in a direction that was more beneficial to the company. This example underpins the need for informed and qualified guides that are knowledgeable and experienced to transform a challenge into an opportunity for the benefit of the company. On the other hand, this case shows that JOSEPHS® has limitations due to its specific characteristics which includes, for example, co-creators belonging to a variety of demographic categories.

4.4 Key Challenges

Based on the pilot study at JOSEPHS®, three main challenges in the co-creation process could be identified.

Firstly, education plays a significant role in order to enable and stimulate the co-creation process. While, innovation hubs, creative spaces, and department stores inspired the concept; the interviewees state that JOSEPHS® is unique, and it requires explanation (LL Facilitator A, B, C). *"The uniqueness and difference to other concepts is that it is open to people from the street"* (LL Facilitator B). The interviewee elaborates: *"Other concepts are only open on paper, but intangible barriers exists"* (LL Facilitator B). For example, a university campus as a location might not be accessible or sought after by the average person. Instead, JOSEPHS® is open to the public, which is also reflected through the location in the city centre of Nuremberg. As the concept is new, it does not fit into ordinary categories and it involves Fraunhofer SCS, companies, and people. For example, describing the concept to the town hall was challenging: *"Is it a teaching area or café?"* (LL

Facilitator A). Not only did the public authority have difficulties making sense of JOSEPHS®, but also many companies, as well as visitors, are new to the co-creation concept. "*There is the danger that companies see JOSEPHS® just like a trade fair […]. We have to educate businesses and make them rethink to offer co-creation*" (LL Facilitator A). Therefore, the LL hosting companies have to stress that the co-creation space is interactive, and co-creators are encouraged to give feedback, often with unexpected suggestions. Also, people have to be encouraged to be an active participant in the co-creation process. LL Facilitator A explains: "*Customers used to be passive*". In shops, people can take a look at a product but trying it out is often not possible, so interacting with it and breaking down these first barriers of engagement is important (LL Facilitator B). For this reason, it is important that people receive an introduction to the concept emphasising that active participation is not only allowed but desired.

Secondly, it can be difficult to execute co-creation in a LL like JOSEPHS®. Fraunhofer SCS had no prior experience in setting up and running a LL. Furthermore, their LL operations are subject to restrictions, for example in terms of advertisement. Also, JOSEPHS® is not allowed to rent out business islands. Instead, they deliver research projects for which they are receiving payment. Moreover, LL Facilitator A also points out that *"Fraunhofer SCS and JOSEPHS® have a different corporate identity".* Another challenge associated with the execution of co-creation projects relate to the novelty of the concept. As co-creation is often an unfamiliar concept to companies, JOSEPHS'® staff has to spend time identifying what their challenges are, and why and how the companies want to address their particular questions. LL Facilitator B explains that *"the questions the businesses initially have might not be the question they will be tackling but one level beyond it".* The time spent identifying and articulating a suitable question for the project also depends on how well the company is prepared. One company already knew the co-creation concept. JOSEPHS'® team just had to modify the approach slightly and take it one step further. However, if companies are not so well prepared, *"JOSEPHS'® team has to push them more, suggest ideas and put emphasis on interactivity"* (LL Facilitator B). Also, it can be difficult to execute co-creation in a LL like JOSEPHS®. The guidance offered by JOSEPHS'® staff in relation to the co-creators could limit creativity or lead co-creators in a certain direction. Co-creators may be interested in one particular business idea but due to the guided tours given by JOSEPHS® staff, this initial interest might not be captured or reflected in their behaviour, as they are likely to remain at a business island until the guide is moving to the next business island. Moreover, it is not always clear what motivates people to engage in co-creation which displays a challenge for those facilitating the process at JOSEPHS®.

Thirdly, capturing feedback and customer behaviour appropriately, collecting information, processing data and communicating findings accurately and effectively displays a challenge. For instance, due to the regular innovation related seminars carried out at JOSEPHS®, a group of experts may visit the LL and provide feedback. This feedback influences the results and perspective that is given by an otherwise non-expert audience. Furthermore, JOSEPHS'® staff is heavily involved in the daily operations and acquisition of companies that they have not been able to follow-up with the many companies that have completed their co-creation projects. Their objective is to also understand to what extent were these companies able to identify and exploit opportunities at JOSEPHS®. To summarise, LL Facilitator A highlights that they would like to obtain "*detailed knowledge on how to explore the process of […] of co-creation*".

To conclude, the pilot study identifies three key challenges associated with the co-creation process at JOSEPHS®, which are summarised in Table 19.

Table 19 JOSEPHS'® Key Challenges

Education	Execution	Exploitation
• New concept requires explanation and education of customers and firms. • Public authorities are unfamiliar with the concept.	• Fraunhofer SCS has no experience in running a LL. • Guides may influence the behaviour and creativity of co-creators. • Companies require support from JOSEPHS'® staff.	• Capturing feedback and customer behaviour appropriately. • Following-up with companies to understand to what extent they were able to exploit opportunities at JOSEPHS®.

4.5 JOSEPHS® 2.0

Based on the learnings throughout the years, JOSEPHS® evolved and made a number of changes to their concept and physical space. For this reason, JOSEPHS® closed in February 2017 and relaunched as JOSEPHS® 2.0 on 18th March 2017.

With regards to the physical setting, a new reception desk was introduced in order to welcome visitors and offer a point of contact. This desk serves also as a work place for the guides. Before this reception desk was introduced a table served as the information point, and guides were mostly working at a very big table that took up a lot of room in the middle of the LL. The earlier set-up did not reflect the open layout and atmosphere that JOSEPHS® is striving for, generating the impression of a more confined and less organised space. The changes introduced created more space for interaction, and hence, room for co-creation. Also, some boards that co-creators could share their ideas on were introduced, as they had proved useful for the data collection in the past. In the Think Tank, smaller

tables for catering were introduced. Moreover, the opening hours were adjusted to align with surrounding stores and shops in the city centre. Initially, JOSEPHS® was open from Monday to Friday, 10am until 8pm, and Saturdays from 10am until 6pm. Now, it closes at 7pm on weekdays and opens on Saturdays at 11am, which proved to be better aligned with visitor peak times. Moreover, a new Café was established at JOSEPHS®. A major step forward in terms of marketing was the new partnership with 'Nürnberger Nachrichten', a local newspaper that started to report more regularly on the activities of JOSEPHS®.

Aside from the noticeable changes, also some modifications on the methods and tools were implemented. JOSEPHS® wanted to reduce tools that are usually used in market research, replacing moderated meetings with methods and tools that better capture the experience journey of the co-creator. At the same time, JOSEPHS® recognised the need for more social and technical methods that allow for a real gain of knowledge for innovation, whilst providing a solution to co-creative interactions. A feedback tool is currently implemented to get insights from companies and visitors to further improve JOSEPHS®. Also new tools for interaction with co-creators are developed. This, however, is still work in progress. At the relaunch of JOSEPHS® 2.0, it was pointed out that the implementation of JOSEPHS'® vision not only leads to a reviewing of the methods that are employed but even the words that are used. As a result, JOSEPHS® consistently removed 'non-co-creative terminology' such as 'shop', 'exhibition', or even 'questionnaire' from the vocabulary. Instead they are actively looking for more suitable methods and words in order to reflect more upon the nature of JOSEPHS® as a LL.

The relevance of these changes and the preliminary findings discussed so far, emerging through the carrying out of the pilot study and the collection of secondary materials about the case study, are further explored in the next chapter. They indeed clearly signal some factors associated with successful co-creation, and those that emerged with prominence in the subsequent data collection are carried out with the three key stakeholder groups identified in the pilot study: LL facilitators, companies, and co-creators.

4.6 Summary

LLs are driven by two core ideas: 1) involving users as co-creators in the innovation process on equal grounds with the rest of participants and 2) experimentation in real-world environments (Almirall, Lee, and Wareham, 2012). While JOSEPHS® meets these two criteria, this chapter also highlights its uniqueness by drawing on very specific aspects that distinguish this LL from others. There are three main aspects that underpin JOSEPHS'® uniqueness:

(i) changing theme worlds that attract different companies and co-creators,
(ii) combination of four areas that complement and enhance each individual area, and
(iii) interactive and engaging data collection tools that align with the LL environment.

As a result of the pilot study, it is clear that co-creation in practice is a very complex process with many variables present that can influence the co-creation projects at JOSEPHS®. Further complexity is added due to the number of activities and stakeholders involved in the co-creation process. No template to build, or benchmark JOSEPHS® exists. JOSEPHS® encounters a number of challenges that they have to continuously address to foster co-creation. The pilot study confirms that there is a practical need for a structured approach to identify what facilitates co-creation in LLs.

To conclude, this chapter presents the reader with background information of the case and specific details relating to the concept and operations. The findings are largely based on data collected from the pilot study, which focused on understanding JOSEPHS'® concept, as well as gathering the background information and investigating the current issues in order to refine the research design of this study. To supplement this information and present the development of JOSEPHS® over time, also secondary data and interviews with JOSEPHS® staff were utilised. Firstly, JOSEPHS® as the single case under investigation in this thesis is discussed. JOSEPHS'® objective, physical space, its theme worlds, staff, events and workshops are discussed. Furthermore, this chapter presents information on the companies and co-creators that jointly innovate in the LL. Secondly, attention in this chapter is drawn to the three specific phases of the co-creation process: Briefing and Research Design phase, Three Months Test phase, Results and Recommendation for Action phase. Thirdly, as a result of the pilot study, three key challenges were identified which influence JOSEPHS'® operations.

Responding to some of the challenges that the pilot study revealed, the fourth section outlines the changes that have been implemented over time at JOSEPHS® leading to a relaunch in March 2017. Ultimately, the insights derived through the pilot study, presented in this chapter, build the foundation for the second phase of the enquiry in this thesis. Based on the theoretical but also the practical gap, there is a need to better understand LL practices and how these complex activities can be facilitated; the next chapter addresses the research question of this thesis: *"How can co-creation be facilitated in LLs?".*

5 Findings

This chapter addresses the research questions of the study by presenting insights from the data collected from JOSEPHS®, companies, and co-creators. Each research question is discussed so to develop an integrative framework presenting how to facilitate co-creation in LLs.

5.1 Research Objective

The purpose of this research is to build a framework that outlines how co-creation can be facilitated in LLs. The framework is informed by three key stakeholders that are involved in the co-creation process at JOSEPHS®: the LL facilitators, the companies, and the co-creators. The overarching research question (RQ 1) *'How can co-creation be facilitated in LLs?'* is addressed through three sub-questions, presented in Table 20.

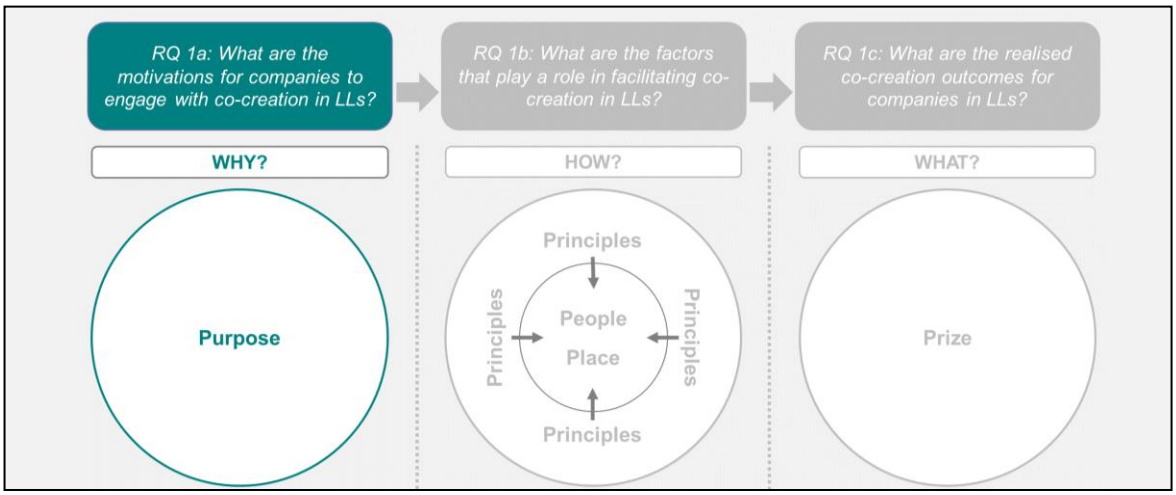
Table 20 Research Questions

RQ 1	How can co-creation be facilitated in Living Labs?	Section
RQ 1a	*What are the motivations for companies to engage with co-creation in LLs?*	5.2
RQ 1b	*What are the factors that play a role in facilitating co-creation in LLs?*	5.3
RQ 1c	*What are the realised co-creation outcomes for companies in LLs?*	5.4

5.2 RQ1a: Motivations to Engage in Co-creation

As the beneficiary of the facilitation service at JOSEPHS®, it is important to understand what motivates companies to engage in co-creation. This section presents the findings related to research question 1a (Figure 16).

Figure 16 Purpose



This study finds that companies engage in co-creation at JOSEPHS® for different reasons, which mainly belong to two broad categories. On the one hand, companies wish to gain access to JOSEPHS'® co-creators, and on the other hand, they would like to gain access to JOSEPHS®. Within these two areas, the interviews with companies reveal seven different motivations why companies engage in co-creation. Table 21 presents these motivations in order of the frequency that they have been mentioned during the interviews. The following subsections explore these themes in more detail.

Table 21 Overview of Project Objectives

Company Code	Type of Transactions	Project Objectives						
		Access to Co-creators					Access to JOSEPHS®	
		Market acceptance	Price acceptability	Exposure	Product testing	Market intelligence	Method testing	Networking
A2	B2B	X			X		X	
D	B2C	X	X					
E	B2B	X						X
F	B2B	X						
G	B2C			X				
H	B2C	X	X					
I	both	X						X
J	B2B	X	X					
K	B2C	X						
L	B2C	X		X				
M	B2C	X					X	
N	B2C	X	X	X		X		
O	B2C	X						
P	B2C	X	X		X			

5.2.1 Access to Co-creators

Companies stress the importance of accessing JOSEPHS'® wide range of co-creators that differ in age, income, and education, and also receiving feedback from them. The feedback they seek relates to market acceptance, price acceptability, exposure, product testing, and market intelligence.

5.2.1.1 Market acceptance

Apart from one, all participating companies aim to understand whether their product or service is suitable to satisfy a large customer base and thus be accepted on the market. A number of examples clearly emerge from the viewpoint of several companies.

Company D states that "we want to present our ideas and concepts, before they are fully finalised and are on the market" (Company D). The company wanted to examine the customers' perception of the product and to identify *"what is important for the user".* This is with respect to their specific product. The same company, in a second topic concerning a mobile app, wanted to understand its potential customers better by exploring *"what they find important, or rather, how should the app be so that it would be used. Because there is nothing worse [than] to have an app for our end customer, which nobody wants, which nobody uses. And because of that, it was really important for us, to find out how the visitors at JOSEPHS® find our ideas. What are their perspectives? What are their suggestions, ideas, and criticisms? But also what do we have to improve? What do we have to rethink?"*

Company F utilised JOSEPHS® to develop an app as well: *"The validation through real user feedback is […] important in this case [because] we don't have in our sector many research projects for the end customer […] there was the question, how to do user-testing and in which way and because we offer mostly b2b solutions"* (Company F). The interviewee states that their *"aim was to get as much user feedback as possible."* As the development of the app was already well on the way, the company implemented a continuous development cycle of one to two weeks, where the developers were posing questions that required further investigation through the co-creation project at JOSEPHS®, and simultaneously they were incorporating feedback from the users at JOSEPHS® to update the app according to the suggestions received. Company F also express that they wanted to receive ideas for future developments.

Company K presented a new company website and posed questions related to the navigation of their main page in order to test new features: *"So, some people have certain expectations, and that is the typical image of [Company K], that you can find in every newspaper; what we wanted to try was: 'Okay, we put this new product in front of you, how do you like it? How do you manage with it? What associations come to mind when you think about [Company K]?'"* Although, Company K could use clickstream analysis to collect, analyse and report aggregate data about which pages a website visitor visits, and in what order, their objective was not only to understand how users navigate the new website, but also to understand what kind of associations come up with regards to the company and the services they offer. In contrast to clickstream analytics, JOSEPHS® offered a more comprehensive platform that is able to gather opinions and the perceptions of people who are engaging with Company K's new website.

Company O provided three different versions of an app and asked, *"Which one do you prefer, A, B or C?"* Similarly, Company I offered options for JOSEPHS'® co-creators

to evaluate. Company I displayed two different designs for an exhibition for the co-creators to comment on.

Company C explained that although the company receives feedback from family and friends, as an online business, they are struggling to collect feedback from their customers to understand the market acceptance of their products: *"To get this authentic feedback is a core issue we have, specifically in the online business it is something we cannot get immediately"* (Company C). The company acknowledges the unique opportunity JOSEPHS® offers to online businesses like Company C: *"If they [customers] see a product online, they have a first impression and for us to get this first impression is a make-or-break factor, so that we know how to improve our products. In the online world, we actually have a barrier [..]. There are of course 1000 opportunities to conduct surveys or get in touch with people directly, but usually, then, there is so much disruption there between [them] so that the first impression has gone - and it is partially too artificial, especially if you create a question situation."* Company C concludes, *"To me JOSEPHS® is actually the opportunity to receive feedback without asking."*

Establishing contact with end-customers is of particular importance to Company A2 which operates in a B2B context: *"We had in the past […] not much direct contact to the end-customer and can't really accurately say how the end-customer […] perceives our products, how they assess it and what suggestions of improvement the customer may have"* (Company A2). In the context of their specific products, Company A2 states, *"We have realised that we need to get much closer to the end-customer, in this case the user of [our product].* Through JOSEPHS®, Company A2 was able to test the market acceptance of two technologies in comparison to one another, directly with the end-customers.

5.2.1.2 Price acceptability

Five of the companies wanted to find out what customers are willing to pay for their products and services. The comment from Company P is particularly meaningful: *"We wanted to find out especially what price range people are expecting. What are people willing to pay for the product?"* For example, Company D initially developed a concept that was very pricey and potential customers pointed out that they cannot afford such a high price point. For this reason, the company revisited the topic and asked JOSEPHS'® co-creators what they would be willing to pay for a specific service. To avoid overengineering a concept that is not affordable for the mass market, Company D posed some questions to JOSEPHS'® co-creators: *"What is important for them? What can they imagine?"*

5.2.1.3 Exposure

Three companies valued the exposure they received as a result of their project at JOSEPHS®. This is different to the companies who are trying to examine market acceptance through co-creators' feedback, as these companies are identifying exposure as their motivation, and do not actively seek feedback from co-creators at JOSEPHS®. Company G states that *"we didn't really have an objective. We just wanted to introduce it [the product]."* Similarly, Company L explains that *"my expectation was mainly the exhibition".* Furthermore, the interviewee explains that the objective was to exhibit the product to *"the walk-ins, but also the people that have been invited by JOSEPHS®."* Company N, a start-up from the region, also articulates product exposure as an objective of their project: It was *"somewhat also about showing the [product]."*

5.2.1.4 Product testing

Aside from general feedback, and insights into the market acceptance of products and services, two companies considered JOSEPHS® as an opportunity to test their products for functionality. For example, an interviewee of Company A2 states, *"My objective was to see how the installation of the two systems work out in general. […] Just the fact that something like that was installed on-site; to find out how smoothly does it work. […] It was important to find out the stability of the systems on-site; to find out not only what problems do occur with the end-customer, but also in interaction with the supervising team."* Also, Company P stated that testing the device and its functionality at JOSEPHS® was one of their project objectives.

5.2.1.5 Market intelligence

One company's objective is to collect information that can be used in defining market opportunities, market penetration, or market development. Company N's objective is to gather market intelligence: *"To know where customers are from helps us with the decision where we want to open a shop. Where can we expect good returns?"* To understand where the customers are from, Company N offered *"some coupon codes on a blanket, worth 10 euro",* in order to track where the customers are from when redeeming the coupon.

5.2.2 Access to JOSEPHS®

Four companies that were interviewed point out the importance of accessing JOSEPHS® as a resource in itself. Companies would like to access JOSEPHS® in order to test the suitability of the LL as an innovation method, or to access its wider ecosystem to network with other stakeholders.

5.2.2.1 Method testing

Two of the interviewed companies stress their interest in testing JOSEPHS® as a method for co-creation. Company A2 explains that they want to understand the following, *"How does such a probe work with JOSEPHS®? How many people come? How many people participate? How does the supervision work on-site? How much do you have to directly engage in the supervision and evaluation as a company and how much does JOSEPHS® do? I would say also [it is] a test of the service of JOSEPHS®, because for us it is obvious, that we want to use those kinds of format more often in the future and for that you have to start somewhere. And that was a start."* Although, not many of the companies explicitly present 'method testing' as an objective, one can assume that every company that participated in a co-creation project at JOSEPHS® has directly or indirectly assessed for themselves if their project was worthwhile.

5.2.2.2 Networking

Establishing new contacts through JOSEPHS'® wider network of stakeholders was an objective for two companies, who were interested in the exchange of knowledge and ideas with the companies that are part of JOSEPHS'® theme world, but also external companies, distributors and other stakeholders as well. For instance, Company E explains that they did not have any specific objectives for the project but would like to establish new contacts. Similarly, aside from testing the market acceptance of their products, Company I's objective was also to establish new contacts with distributors who may "*buy a few [products] for their shops."*

5.2.3 Summary: Purpose

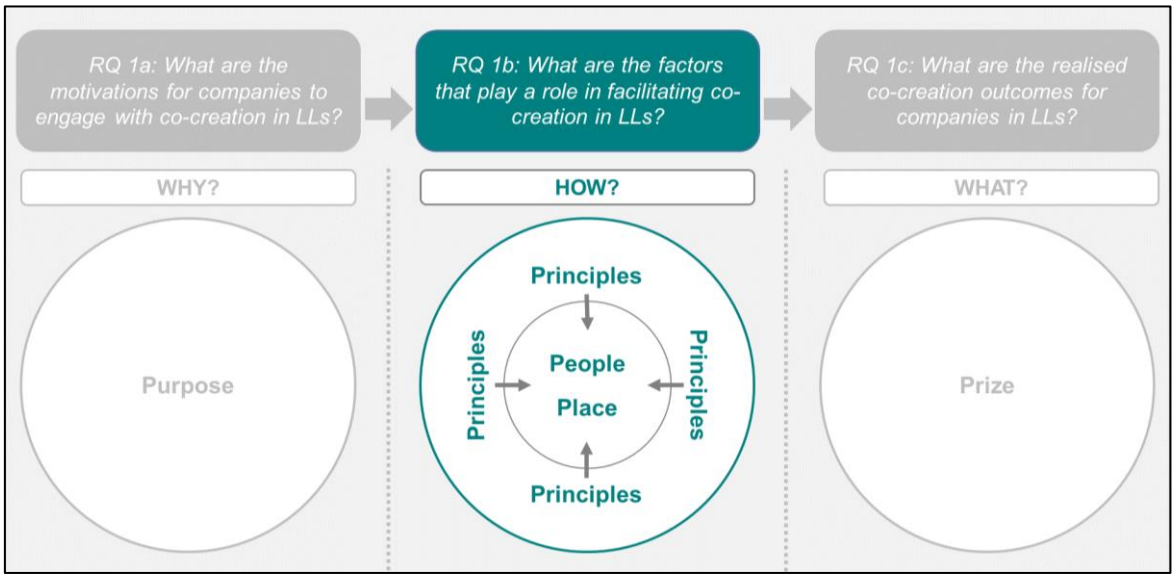
The study finds that companies engage in co-creation at JOSEPHS® for seven reasons. These seven reasons are associated either with the access to JOSEPHS® itself, or to its co-creators. Companies focused on one to a maximum of four project objectives during their test phase at JOSEPHS®. However, most companies concentrated on two project objectives. The vast majority of companies aim to address questions related to the market acceptance of their product or service at JOSEPHS®. As JOSEPHS® devotes a lot of effort in attracting a variety of co-creators, the majority of companies consider having access to them as a unique opportunity. There are several reasons why companies value JOSEPHS'® co-creators. First, some B2B firms usually do not have any contact to their end consumers. Second, some companies wish to have a facilitator that enables this interaction without interfering or influencing the co-creation process directly. Third, some businesses, intentionally, want to reach out to an untargeted audience, or even people that

lie outside their usual customer segment. Fourth, the space created, and support offered by JOSEPHS®, presents a unique opportunity to engage with co-creators in a relaxed atmosphere that simulates a real-life setting. Unsurprisingly, companies often formulate rather general research questions with respect to market acceptance, as they wish to receive, unfiltered, and honest feedback from potential customers.

5.3 RQ1b: Factors Facilitating Co-creation

The insights derived from the LL facilitators, companies, and co-creators suggest three broad factors that play a role in facilitating co-creation at JOSEPHS®: Principles, People, and Place. 'Principles' guide the operations of the LL, by shaping the place that is established to facilitate co-creation, and through influencing the people that are interacting in such a space. 'People' integrate the co-creation elements that are associated with the activities and behaviour of stakeholders that are involved in the co-creation process. Thereby, the focus lies on the interaction of JOSEPHS'® staff with companies on the one hand, and, on the other hand, on the interaction of JOSEPHS'® staff with co-creators. The third co-creation factor 'Place' describes the location, physical layout, complementary facilities, as well as methods and data collection tools of the LL. The three factors are strongly interrelated: 'People' create and interact with the 'Place' and introduce, as well as execute, 'Principles' that define JOSEPHS'® concept. Figure 17 provides an overview of this approach.

Figure 17 Principles, People, Place



5.3.1 Principles

Seven key principles provide the foundation that defines the place and guides the behaviour of people that interact at JOSEPHS®. The *principles* offer the foundation for the design of the *place* (see section 5.3.5) and behaviour of the *people* (see section 5.3.3) in the LL.

5.3.1.1 Explicitness

LLs are a rather new concept, and both companies and the people that are visiting such settings are often not familiar with it and require guidance and explanation. For this reason, a key principle of JOSEPHS® relates to explicitness by ensuring that the LL concept, and its opportunities and shortcomings, are clearly communicated. Companies can only fully exploit the co-creation opportunities if they are knowledgeable about the potential and possible limitations of the LL concept. For example, Company C said, *"I think what would be good from JOSEPHS® side is to clearly describe the expectations to company representatives that would like to develop products here."* Due to the nature of the LL, characterised through its openness to the public, and its main focus on qualitative data collection, results are not representative of a specific target segment nor are they statistically generalisable outcomes. This must be taken into consideration when companies evaluate the feedback they receive from JOSEPHS®. Companies point out that they would like to receive an indication with regards to the number of co-creators that have given specific suggestions. To address certain limitations, Company B recommends that JOSEPHS® should *"play a more active role, in a kind of coaching of companies, about what is achievable through the platform" […]. There are perhaps opportunities for JOSEPHS® to strengthen, specifically, the coaching of companies. […] It's getting to the point where you could consider if JOSEPHS® should check if the companies use the platform optimally."*

On the other hand, co-creators' expectations have to be managed. Many people are not used to being actively involved in the creation of a product or service, and are not familiar with the concept of a LL. LL Facilitator G explains that at JOSEPHS® the co-creators should be clear that their active involvement is appreciated: *"I have this expectation here. I can do something here. I'm allowed to do it and it's not bad if I figure out that something's not working."* Aside from the concept itself, co-creators also wish to receive background information about the company and how their feedback will be used: *"Then we figured out, that clearly the visitors or co-creators are interested in the story of the company. They want to know why this specific company actually participates in JOSEPHS®. Why? What are they looking for?"* (LL Facilitator L).

To support co-creators in their activities in the LL, it is important to create business islands that follow a logical order, by creating a natural story flow that is explicitly

communicated to the co-creator. Company B recognises that a clear structure and storyline helps in facilitating co-creation. JOSEPHS'® staff specifies that co-creators should be gradually fed with information so that the storyline can evolve: *"For instance, with these [products], […] you actually can just play around without actually knowing anything about the company, get your ideas, and then you really start to get information, about, ok, this is produced locally, regionally, in a sustainable manner, and then you answer the question accordingly, right! But it has to have some logical flow"* (LL Facilitator L). JOSEPHS'® staff also highlights that an *"explicit research question is of high importance"* to direct the co-creator, on the one hand, but also to derive useful insights for the company, on the other (LL Facilitator J). Thereby, the question should be clearly formulated to achieve this objective. Similarly, LL Facilitator L from JOSEPHS® states, *"We need to specify the research question and create the appropriate instrument for data collection"* (LL Facilitator L).

5.3.1.2 Adaptiveness

A LL that is capable of adapting to changing circumstances is considered beneficial for the co-creation process, as it can be continuously tailored to the needs of the companies and co-creators. Therefore, a key *principle* applied at JOSEPHS® is associated with the adaptation of themes, the design of the business islands, and data collection tools. Furthermore, the LL is an innovation space that needs to be adaptable to serve B2C as well as B2B projects.

One of JOSEPHS'® cornerstones is its theme world, which changes every three months. The design of the space is continuously adapted to the theme (LL Facilitator A). Consistently, across the interviewed companies, JOSEPHS'® theme worlds are perceived as added value that drives co-creation. Company A explains that a theme world plays a bigger role and that there is also an image factor attached to it: *"Other companies that perhaps have similar ideas also attract visitors"* (Company A). People, inspired by the theme, are more likely, also, to be interested in several business islands at JOSEPHS®, which is beneficial to every individual company (Company B). Co-creator B explains that sometimes he is aware in advance of the theme world, and sometimes he is just coming to JOSEPHS® to see what is exhibited. He elaborates, *"My degree of participation differs; it depends on how much the theme world interests me. If it doesn't interest me, fine, I will come back in three months' time"* (Co-creator B). Company H explains that they appreciate the overall concept that different projects are presented in a theme world. Similarly, an interviewee says, *"I really like the theme world. I think it's great that all five islands are to the same topic. [It] opens up creativity but also opens up challenges"* (Company D). While, theme worlds attract a more specific audience, and they open up opportunities for possible

collaborations among companies, they also create an environment where five companies compete for the attention of the co-creator. The changing themes allow JOSEPHS® to continuously attract new visitors, but also arouse interest among regular visitors.

In addition to the changing theme world, and the design associated with it, also the tools that are used for data collection purposes are adapted to the specific needs of the companies. The new ways of giving feedback, that are continuously developed, appeals to co-creators. For example, some business islands ask co-creators to comment on the prototype through post-it notes, whereas other business islands offer technology supported tools that capture the feedback. The tools are adapted to the specific co-creation project and give variety to the co-creation experience. In addition to a variety of tools that are utilised at JOSEPHS®, also new tools are continuously introduced which arouses curiosity among visitors. Co-creator H and Co-creator G explain that *"a new way of giving feedback"* is exciting. Co-creator B points out that *"the varying forms offered to provide feedback satisfy my play instinct. Once I had five tubes where I had to throw peas in, and all feedback of 30-50 co-creators a day, over a period of 3 months, showed that one tube with peas, like a bar chart, reflected that version two was the most desired one."* On other occasions *"I am sitting there and have two tablets to assess two systems. […] or I was filmed, […] with another tool. I throw something in or stick something on [a wall]; in another situation I give feedback, and somebody takes notes."* He further describes that *"even hanging a small post-it with my answer on it gave me the feeling that it is valuable."* Observations confirm that co-creators are often very excited about using new feedback methods, but also that tools differ across the five business islands in a theme world. It is important that JOSEPHS® continuously adapt the data collection tools to maintain the co-creators interest in sharing their ideas, but also to tailor the tools to the needs of the company.

The LL must also be flexible enough to serve both B2C and B2B projects. For example, Company A conducts business with other companies and states, *"For us it is difficult as we have a high-tech product, but there are a lot of end consumers coming to JOSEPHS® who cannot relate to it and pass [on] to the next business island, or they give feedback that perhaps leads onto the wrong track."* Given this challenge, companies explained that JOSEPHS® should overcome this barrier by creating a platform suitable for B2B firms by focusing more on workshops to which a very specific audience of experts could be invited: *"The 'ordinary' JOSEPHS® is very broad and you need a few chance hits, because not everyone that comes to JOSEPHS® is the best feedback provider. But if one runs a workshop and it becomes more concrete, the probability to get into a more substantial conversation and achieve more substantial results will be higher"* (Company B). Also, Company A reflects on their own experience in running workshops in-house and explains, *"That if we do a workshop at our place, it is good to have an external facilitation*

but it's also costly. If you do it here […] you can introduce questions better, as if I was asking and digging." Moreover, it is important to recognise aspects of a B2B prototype that also the end-consumer can comment on. Thereby, it is important to leverage JOSEPHS'® experience to understand how B2B firms can utilise such a space, and derive value from the interaction with end-customers that differ greatly in terms of age, interests, profession, and skills.

5.3.1.3 Interactiveness

The interaction between companies and co-creators through facilitators is a distinctive feature of JOSEPHS®. The LL aims to generate knowledge about how co-creators interact with the prototypes that companies present in the LL. To facilitate this process, JOSEPHS'® guides interact directly with co-creators learning about their use experience and capture feedback from them. A prerequisite for interaction at JOSEPHS® is a positive and open atmosphere. For example, Company N describes JOSEPHS'® atmosphere as very open - not only with respect to its set-up but also with regards to the staff. The interviewee describes it as a *"young vibe"*. Company K agrees and calls it a *"feel-good atmosphere."* The interviewee explains that JOSEPHS® is not a *"research lab in the stricter sense of the word, because people also come in to have fun; that definitely helps."* JOSEPHS® makes people feel comfortable, which helps when collecting feedback from them (Company K). Company G explains, *"I really find it comfortable how you can enter. [You] are welcomed, [and they ask] if one needs help; very subtle"* (Company G). Similarly, Co-creator E describes the atmosphere as inviting and specifically identifies the elements that contribute to this welcoming atmosphere at JOSEPHS®, which are *"employees, music, everything."* Co-creator D points out that *"the atmosphere is not necessarily sterile, instead one is inside, one can contribute, I am invited, incorporated."* Co-creator B summarises the atmosphere as *"a departure from convention",* and explains what makes the atmosphere so special: *"I got the combination of a Café and LL, a mix between [a] shop and [a] manufacturing plant […], the design with the blocks of sockets which is associated with production, I got the reception, [and an] exhibition space here. It is a mixture that I cannot categorise straight away, but it is aesthetically very pleasing."* As a result of this inviting atmosphere, *"you easily have access to the user"* (Company F). Company O describes how the atmosphere and approach at JOSEPHS® allows for the extracting of information from ordinary people. One *"goes in there, without knowing what [one] can expect"* and then engages with a product without extensive explanations. Co-creators point out that one does not want to embarrass themselves in front of others, so the atmosphere has to be comfortable. Moreover, attention is paid to the atmosphere that is created in the workshops to encourage participants to answer honestly and contribute to the discussion. Company C points out that

the success of workshops *"extremely depends on the atmosphere. It has to be very relaxed and people can informally say something so that non-artificial question time is created. We notice that always if there is an artificial question situation the respondents readjust and perhaps give misleading feedback, because they feel they have to go deeper into the topic without sharing their first impression, which for us, would be most important.*" Company C recognised that *"this is extremely difficult to achieve and not everyone can create this atmosphere. I think the idea of JOSEPHS® to achieve exactly this is implemented really well."*

However, it is not only the human-to-human interaction that is critical at JOSEPHS®, because interactiveness is also a key principle that is defining JOSEPHS'® physical layout, as well as its methods and data collection tools. Co-creators emphasise that the layout and design should be intuitive and interactive by *"offering a playful connection"* (Co-creator H). In line with this argument, Company D stresses that interaction *"is the core concept of JOSEPHS®"* and this in turn *"depends on the design".* The interviewee elaborates, *"I noticed that the more you motivate visitors and can engage them, the more time they spend there and the more ideas are communicated, the more insights can be gained from that"* (Company D). Also, JOSEPHS'® staff explains that playful elements help to engage co-creators (LL Facilitator L). LL Facilitator B states that this is *"something where we always push the companies"* so they come up with something playful making it a fun co-creation process for those contributing ideas.

Similarly, the data collection process at JOSEPHS® is supposed to be fun for the co-creator, hence, interactive tools are employed whenever possible. Co-creators confirm that they wish to provide feedback in an interactive manner – in line with JOSEPHS'® overall concept. LL Facilitator L explains that *"it has to be pragmatic to a certain degree, right. People don't wanna learn for half an hour how to use something and how to give feedback, so it has to be clear; ah, a post-it I know what this is. I write something on it and I clip it. So again this also reduces the effort for the visitors."* Elements of familiar behaviour support the co-creation process.

5.3.1.4 Iterativeness

Iterativeness is a central principle of JOSEPHS® and manifests itself through a sequence of repetitive feedback cycles for the continuous improvement of a prototype. The feedback loop involves co-creators and LL staff, on the one hand, and companies, on the other. Co-creators provide feedback, and together with the observations made by JOSEPHS'® staff, companies can continuously improve their product, or service prototypes, throughout the test phase, and receive feedback on the new versions of their prototype. The frequency of interim reporting depends on the individual agreements between JOSEPHS® and the

companies that exhibit their prototypes in the LL. Company O believes that *"one of the success factors is really that I have the opportunity to amend the tests and that I can implement the feedback quickly."* Company A also highlighted the opportunity to change the research question and address several aspects of importance during the test phase: *"What I like about it is that it runs over a period of 3 months, and if someone uses this time effectively, and prepares it professionally, the question can be constantly changed. Based on the feedback, the products can be altered. Then, one can tackle another question which I think is very valuable."* The importance of having the opportunity to alter the focus of the co-creation project, and refining several aspects of it, ranging from a research question to a business island design, helps to better address the needs of the company. Incorporating co-creator feedback early on, and improving prototypes during the test phase, allows for enhanced co-creation outcomes. Therefore, feedback enables the iterative development process, which in turn drives co-creation.

One of the requirements that allow iteration to take place is the presentation of prototypes that reflect a work-in-progress status to encourage co-creators to provide feedback. LL Facilitator J from JOSEPHS® mentioned that a fully designed prototype is not very appealing to co-creators, because it does not inspire them, and gives the impression that it is fully developed and does not require further input. Also, the barrier to engage in the process is bigger for co-creators, as they may not feel confident about suggesting improvements to a prototype that is already designed to a high standard. For this reason, it is important that JOSEPHS'® staff reassures companies that early prototypes that have not been fully designed are adequate for an iterative co-creation process.

5.3.1.5 Realism

An essential principle that guides the operations and layout of JOSEPHS® is realism. To produce results that are applicable to real markets, it is essential to facilitate realistic use situations and behaviour as much as possible. For this reason, JOSEPHS® focuses on engaging real users, in real-life situations, which distinguishes the LL concept from other types of OI environments. Re-creating or simulating the real-world settings encourages co-creators to give authentic feedback. Company O describes the impact of the feedback they received: *"I would almost say [a] crass and ruthless feedback of users, who were suddenly confronted with the topic and gave the feedback in a real-live environment and not in an artificial one. That had a big impact."* Realism is a principle that is also reflected in the physical layout of the LL. JOSEPHS® tries to place prototypes in realistic use situations and replicate an environment that can simulate this (LL Facilitator B). For example, Company A tested two smart home systems on a business island that was designed as a home with windows and lamps that could be operated through a tablet. Testing such

systems in realistic settings allows the company to better understand how they function and fit into the customer's usage context. In order to extract feedback from co-creators, JOSEPHS'® guides ask questions without the co-creators really noticing that they are being questioned: *"I think that is a very, very big success factor because that reflects a little bit [of] reality […]. The approach and the idea of JOSEPHS®, I really, really like it"* (Company O).

5.3.1.6 Openness

Having access to a variety of co-creators allows the companies to gather different perspectives from co-creators which helps foster creativity. JOSEPHS® is open to the public and especially its central location makes the LL convenient to visit (LL Facilitator B). Indeed, co-creators state that they appreciate the openness of JOSEPHS®. Company F explains that due to its openness, JOSEPHS® has easy access to a wide range of co-creators. Interviewees recognise the value of having access to *"a good average of the society"* at JOSEPHS® (Company N). Company D describes JOSEPHS'® co-creators as *"a complete mix of people regarding age, gender, partly regarding origin, [and] education […]."* The interviewee elaborates, *"The people that go to JOSEPHS® often engage intensively with one of the islands and are really creative. That means, you get content, approaches, that you, as the company, or as the project manager, didn't even think about and that was incredibly good"* (Company D). Company I reinforces the need for feedback from an untargeted audience by highlighting that *"target audiences are by now so vague, [as] everything is getting vaguer, because everyone has more possibilities and because of that you can't narrow it down as much anymore."* Thus*, "it is a wonderful opportunity to receive unfiltered feedback and from all target audiences and above all without any sympathy factors"* (Company I). Although, Company I regularly ask friends about their opinion, it is questionable how valuable that feedback is *"because if they aren't honest enough, then they just share kind words and that is of no use."* This is especially the case as a start-up because *"it is really very difficult to launch an idea onto the market and then also generate feedback"*, explains Company I. Also, a large established company acknowledges the value of the self-selected audience that JOSEPHS® attracts, as they *"generate new and different ideas"* (Company E). Nonetheless, Company E recognises that a non-targeted audience has its advantages, but possibly also disadvantages, because they are *"not experts, which is good if one just wants to get an external perspective for a specific project."* However, "*if you have […] very specific technologies, […] an external opinion is not necessarily that useful"* (Company E). While this could be a limitation of the LL, one can also argue it is JOSEPHS'® responsibility to provide guidance in identifying a suitable research approach for the companies that utilise the space. Having access to this

diverse group of co-creators enabled Company J to *"hear some opinions from people that wouldn't normally come to those kinds of things. That was really handy because we get some opinions that we normally don't get. That is important for us because we want to produce products that are appealing to many people and not just geeks"* (Company J).

5.3.1.7 Connectedness

Connectedness is a core principle of JOSEPHS®. There are numerous opportunities for companies and co-creators to connect, including the events and workshops that take place at JOSEPHS®. Apart from the indirect connection that is established between companies and co-creators, also co-creators connect to one another through the LL. Similarly, companies often share a common interest due to the theme world which links them. This provides an opportunity for them to start collaborating.

Also, co-creators point out that they appreciate the opportunity to network with other people at JOSEPHS®. Co-creator B explains that he regularly attends events at JOSEPHS® and that the theme world on its own would be *"too little".* The events and workshops that are delivered at JOSEPHS® serve as a platform for people to connect. Co-creator B states, *"It is very exciting to always meet very different groups of people with differing backgrounds here."* These people are coming from *"creative backgrounds, lower social classes, […] which is fascinating and [is] enriching one's point of view"* (Co-creator A). Co-creator B acknowledges, *"Normally, I would never have found JOSEPHS®, if it wasn't for someone I had met that knew about JOSEPHS®."* There are not only visitors coming to the events as *"I am meeting very different people there"* (Co-creator B). As a result of the connections that are nurtured at JOSEPHS®, a knowledge transfer then takes place.

Although there are already a lot of occasions that foster networking, and knowledge exchanges among key stakeholders at JOSEPHS®, there are also a couple of suggestions that study participants put forward in order to strengthen this principle. Companies exchange ideas amongst themselves and on some occasions they also start to collaborate. While these informal networks are valuable, study participants state they would like to be part of a more institutionalised network that is formally established by JOSEPHS®. During a focus group with the companies, participants suggested that to enhance the knowledge transfer an 'alumni network' could be established. Connecting different companies with each other would allow them to exchange knowledge based on individual learnings at JOSEPHS®, which could also build a basis for future collaborations (Company A). Supporting this argument, Company C provided an example of a situation where they consulted another company that utilised JOSEPHS® during the same theme world: *"We often exchanged knowledge with Company XYZ. Not that we systematically met up but*

every time we were at JOSEPHS® we had discussions. […] This was a very valuable exchange. In hindsight, I would like to still have it." Company B confirmed the need for knowledge exchanges with other companies through a structured interaction portal where key learnings from companies and JOSEPHS® are made available. However, Company B noted that it is challenging because *"there is not even a list of companies that have been at JOSEPHS® in the past."* However, since the focus group took place, JOSEPHS® has made this information, on all past theme worlds and the respective companies that participated, available on their website. Company B calls for more transparency in the process and a communication of best practices: *"From JOSEPHS® side, documentation of best practice would be beneficial, whether this is contents wise, links to other company projects, or tools that have been successful in other projects. The beauty is that you can create a knowledge base as time goes on, and hence, added value can be created which is based on best practices. Experience starts to build up and more potential to enable interactions becomes possible through documentation that is made available."* Company B further elaborates and explains that an online platform could serve as an additional resource that companies can access and, if relevant, it could be used to reach out to other companies that have completed a similar project at JOSEPHS®.

Another aspect to knowledge transfer relates to networking with start-ups. Company A suggests that it could be interesting to *"have an exchange between start-ups and those that look out (to buy) start-ups."* Company B expands on that argument and explains that JOSEPHS® does not need to restrict itself to the theme world with five companies at a time, but rather it can create a *"network around the topic"* calling for the creation of a whole ecosystem: *"It would make sense to develop an event format where you expand the physical theme world and its players to a wider ecosystem"* (Company B). JOSEPHS® could *"analyse which start-ups exist and invite them here and let them present their product or service. In return, JOSEPHS® also invites companies that are interested in buying a start-up. They watch the presentations and then an exchange takes place"* (Company B).

5.3.2 Summary: Principles

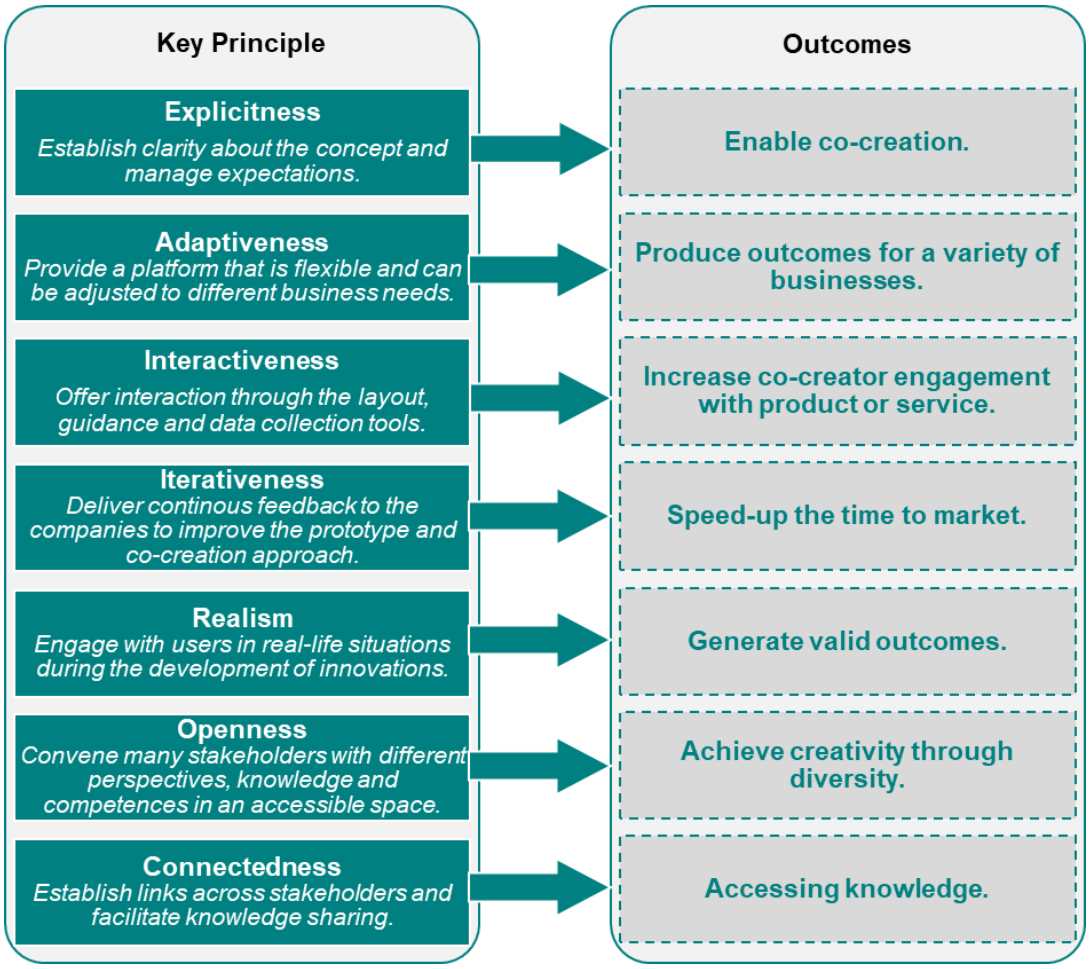
Section 5.3.1 presents seven principles that support JOSEPHS® operations. An overview of these principles and a brief summary of the dimensions describing them are provided in Table 22.

Table 22 Summary of Principles' Section

Principles	Dimensions
Explicitness	• Ensuring the LL concept and its opportunities and shortcomings are clearly communicated to companies. • Clarifying the concept to co-creators encouraging active involvement. • Providing company background information and explaining how co-creator's feedback is used. • Creating a clear structure and storyline on the island and in the theme world.
Adaptiveness	• Offering changing themes to attract new companies, new co-creators and arouse interest among regular visitors. • Applying varying and new methods for co-creators to provide feedback. • Providing a flexible platform suitable for B2B and B2C projects.
Interactiveness	• Establishing a comfortable and open atmosphere is a prerequisite for interaction. • Offering an informal and casual atmosphere in workshops. • Designing an interactive physical space. • Setting-up an intuitive and playful layout. • Deploying fun and interactive data collection tools. • Introducing elements of familiar behaviour to support the co-creation process.
Iterativeness	• Utilising continuous feedback loops to improve prototypes and speed up the development process. • Receiving feedback on new prototype versions throughout the test phase. • Presenting prototypes that reflect a work-in-progress status to encourage co-creators to provide feedback.
Realism	• Facilitating realistic use situations and behaviour as much as possible. • Re-creating or simulating the real-world settings.
Openness	• Providing access to a variety of co-creators. • Receiving unfiltered feedback from a non-targeted audience.
Connectedness	• Linking companies through a common interest that is reflected in the theme world. • Networking with co-creators and start-ups. • Sharing of knowledge and ideas among different stakeholder groups.

These seven principles play a critical role in supporting companies and LLs to achieve positive co-creation outcomes. Some examples of the outcomes that can be realised by embracing the seven principles, as discussed in section 5.3.1, are presented in Figure 18.

Figure 18 Key Principles and Outcomes



5.3.3 People

'People' are a vital factor enabling co-creation at JOSEPHS®. As discussed in section 4.1.6, companies engaging with JOSEPHS® have diverse profiles; equally the co-creators have different backgrounds, skills and knowledge. The role of JOSEPHS® is to act as an interface between companies and co-creators. JOSEPHS'® staff refers to employees that are contractually linked to Fraunhofer SCS or Friedrich-Alexander University Erlangen-Nuremberg (FAU) and support JOSEPHS® as research or operational staff. This includes the staff that guides visitors around the LL, but also the staff that is more engaged in the scientific support of the co-creation projects at JOSEPHS®. JOSEPHS'® staff plays a pivotal role, when mediating between companies and co-creators, and facilitating the matching of expectations and experiences, while liaising with both stakeholders. For this reason, this section is divided into two parts: firstly, the interaction with companies is discussed, while later the interaction with co-creators is presented. Three of JOSEPHS'® principles, discussed in section 5.3.1, particularly influence their behaviour and activities (Table 23).

Table 23 Principles that influence People

Co-creation Factors	Principles						
People	Explicitness	Adaptiveness	Interactiveness	Iterativeness	Realism	Openness	Connectedness
JOSEPHS'® staff interacting with companies	X		X	X			
JOSEPHS'® staff interacting with co-creators	X		X				

5.3.3.1 Interaction with Companies

This study identifies three principles that influence the interaction between JOSEPHS'® staff and companies: Explicitness, Interactiveness, and Iterativeness. This section discusses how these three principles (see section 5.3.1), continually, guide the interaction between JOSEPHS'® staff and companies.

Explicitness influences JOSEPHS'® interaction with companies on a number of different occasions and for different reasons. Companies, initially, interact with JOSEPHS® during the briefing phase, and this is when they have to provide JOSEPHS'® staff with all the information that they consider relevant for the co-creation process. Guides need to fully understand the company background, and important information about the prototype, to give qualified guidance and information to the co-creators (LL Facilitator J). LL Facilitator L states that *"at the beginning when you have your initial contact with the companies, they might just drop [in] any information what they think they want to put out there which obviously has to be somehow sorted out."* Receiving background information is an important prerequisite for the staff to be able to create an appropriate storyline on the business island. Also, companies state that JOSEPHS'® staff are critical enablers of the co-creation process. For example, a lot of companies that are utilising JOSEPHS® for co-creation purposes do so for the first time without any prior experience with LLs. Hence, *"it is important for someone to have the time to really get to know the format, because if someone is […] for the first time confronted with it on-site, I believe then you would need more time to understand it" (Company A2).* Also Company D was not familiar with a concept like JOSEPHS® and explains that LL Facilitator E *"took us then by the hand […] and through that the process became clear […]. As soon as we started working with the JOSEPHS® team that also really supported us, and we knew what JOSEPHS® is, how they work; from that point we knew what to expect, we knew what we were able to do, and now it was on us to implement that."*

Secondly, interactivity characterises the relationship between staff and companies. For example, Company H appreciates the approach and support of JOSEPHS'® staff: They *"talked us through the project and asked us what we want to exhibit, what our objectives are, and they told us what they can do for us. […] We were able to say what particular questions we are interested in and developed together really good ideas [about] what we actually can ask*." The employee of Company K praises his point of contact at JOSEPHS®: *"I have a direct point of contact, LL Facilitator F. This is my guardian angel here, who I contact at every opportunity, when there are changes, when something moves along. We are in very close contact."* During the building phase of the business island, Company M explains, *"Everybody was there, all guides, and we explained everything and we had really good follow up questions, which made me feel confident that the guides knew what sort of questions they can expect from the visitors."* Company H also noticed that the staff at JOSEPHS® get briefed very quickly. Often, they put forward their own ideas and make suggestions to the company which was very appreciated by Company H. The interviewee mentions that *"I really liked the mutual understanding and the way one was able to communicate with each other and implement changes directly and swiftly".* This is another example of how interactivity characterises the collaboration between staff and companies.

The staff continuously communicates with companies to allow for iterations to the prototype, or to follow an approach with the aim of optimising the co-creation experience. For example, Company O mentions that they received a weekly report with feedback and *"through that [we had] the opportunity to develop our conceptional thoughts: Okay, why doesn't this work? And what feedback did the users give?"* This is an example highlighting how the principle of 'iterativeness' translates into the behaviour of JOSEPHS'® staff.

5.3.3.2 Interaction with Co-creators

Aside from the interaction with companies, JOSEPHS'® staff is also engaging with co-creators to receive their feedback on the prototypes that are presented at JOSEPHS®. This study identifies two principles that influence the interaction between JOSEPHS'® staff and co-creators: Explicitness, and Interactiveness.

Explicitness influences the interaction of JOSEPHS'® staff with co-creators as reflected in a statement by Co-creator A: *"I think that many people are coming inside because they are curious, but we also established earlier that if I don't know JOSEPHS® and its concept, then the biggest barrier is the entrance door. Inside everything is super but first I have to get in."* Therefore, explaining the concept explicitly to co-creators is critical. Further, it is important to emphasise the importance of touching and trying out the prototypes. LL Facilitator L from JOSEPHS® emphasises that *"it has to be clear that [co-creators] should touch [products] […]. Especially here in Germany, as everyone is very*

afraid of 'I don't wanna go to jail and break something and I have to pay something.'" This statement highlights the importance of considering the suitability of the organisational design of a LL with respect to the local culture. Also, as prototypes are not fully developed end-products, they might break when co-creators try them, and this has to be communicated to not only co-creators, but also to companies. This is important in terms of expectation setting, which is ensuring that co-creators are allowed to try out products that might break in the process; *"If they break, they are poorly designed, so it is actually this expectation setting that is important"* (LL Facilitator G). Another important aspect that focus group participants put forward is the value they put on the co-creator's contribution to the process, and that has to be conveyed to them. This ensures that they take the co-creation process seriously, but also understand that their feedback is highly valued by JOSEPHS® and the companies. Finally, staff offers opportunities for people to provide feedback about JOSEPHS® itself, in order to further improve the concept, which is critical, ensuring that an ideal platform for co-creation is created.

Secondly, interactiveness also affects the interaction with co-creators. JOSEPHS'® staff emphasise that it is important to find a balance between excitement and containment when presenting the prototype. You have to *"be fascinated about the product […] but it's not about selling the product. So you have to somehow reduce your amount of fascination, like not talk too much, let the customer also experience it […] and not lead customers to your decision or your opinion. Because when you're too fascinated about it, it might lead to it"* (LL Facilitator E). Therefore, guides need to show a certain level of enthusiasm, whilst avoiding influencing the co-creator and ensuring he/she feels comfortable. LL Facilitator A stresses that *"guides should give room for action, reaction, and discontinuation"* allowing co-creators to freely interact with the space.

Co-creator G also explains, "*If there is too much guidance, it is losing attraction to me. It is like a playground as an Open Innovation lab. For me it is about letting it flow and you see what's attractive to you. […] Sometimes people have no idea and they just come in and they say, 'Hi what's that, can you explain that to me?' – so they are asking for guidance."* However, Co-creator G also states that *"the guides have to be aware how the person is interacting with the space"* and not just be waiting to be approached by a visitor that is lost. The LL guides have to be proactive and make a judgement based on the situation and person they are interacting with. Co-creator C offers more specific insights explaining in which situations he prefers to receive guidance: "*It depends on the size and complexity of the prototype. For example, when Company Q* (see section 4.1.6 for details) *presented its 3D foot scanner, I was afraid to touch it because the machine was so big and I didn't know how to set it up myself."* When asked if he was afraid to break something, Co-creator C said, *"Yes, exactly".* Co-creator H emphasises that it is important to have access

to human guidance *"because sometimes there are lots of writings and you can get lost, and you don't know exactly where to start […]. You can call someone to help you or someone comes to you and advises you."* Co-creator I describes how she is experiencing the LL: *"I feel free to ask the guides 'what is this or can you show me how it works?' Because I don't want to read everything, just quickly tell me what it is and what you can do with something."* Interactivity is a principle that guides the behaviour of JOSEPHS'® guides by proactively engaging with co-creators. Co-creator B explains that for him JOSEPHS'® guides are key in reducing the inhibition threshold for engagement: *"You cannot believe how difficult it is to get two people in their late forties to sit down and take a smart phone in their hands and try the app from [the company]. One could make a fool of oneself. […] Not that one wants to avoid breaking something, but one could embarrass oneself."* Company P observed on-site that *"how the customers were guided through the space was really professional and very good, very well thought out; also the concept of the guided tour through the different stops makes complete sense."* Company M states that the guides are an advantage: *"You can easily develop an exhibition, but it is not enough to just put items in a room. In the best case you have someone present that can explain everything and also can ask people for their thoughts regarding the product."* (Company M). Company D goes one step further and argues that *"JOSEPHS® would not work without the guides. […] If you don't get explained [to], what is on the different islands, then I think the output would be much less. Because often, [there are] times [when] these things are rather abstract and if you stand in front of it you might wonder what it is. The guides take you through it, explain everything and make sure that the visitors understand everything. Actually, it depends completely on the guides who take them through the island"* (Company D).

Aside from guiding co-creators through the LL, JOSEPHS'® staff is also actively involved in the data collection. Co-creator I mentions that she does not come to JOSEPHS® with the intention of leaving feedback, and instead her motivation is to have a look around and *"play around".* She states that she does not always give feedback but sometimes she does: *"I don't know what happens and why I give feedback. Sometimes I do, sometimes I don't."* When further probed about what the situations are that she provides feedback for, she admits, *"Usually, I give feedback with a guide. For example, [if] the guide requests feedback I give feedback but I have not done it on my own."* Therefore, interactiveness plays a critical role that encourages co-creators to provide feedback.

5.3.3.3 Characteristics, Skills and Attitudes of JOSEPHS'® staff

In addition to the principles that guide the interaction between stakeholders at JOSEPHS®, there are also a number of characteristics, attitudes and skills that JOSEPHS'® staff should possess as well.

Company K explains that the social skills that LL Facilitator F possess are *"simply that you get along to a certain extent, even if it's a professional setting; that can be a good thing."* The interviewee summarises two important aspects in their collaboration with JOSEPHS'® staff, which are *"the human side, [which is] very important, and also the will to implement"* (Company K). Company I stresses the importance of qualified guides because *"it is of no use to anyone if everything looks pretty but nobody knows anything about the project and can't respond in a qualified manner. For me it is the most important aspect that everyone is qualified and motivated and makes an effort."* The interviewee (Company I) explains that staff was well informed: *"Everybody knew everything and no matter who I asked […]. I thought that was great." […] The staff was completely well informed about the brand, the products; one didn't have to start explaining […], but rather there was already a certain understanding about us and I thought that was extremely great"* (Company I). To ensure staff is well informed and up-to-date with what is happening at JOSEPHS®, regular team internal emails are circulated: *"We figured out that these status-quo emails are quite nice, because even when you have not been there you just get a short summary of the day, what happened here. So this was perceived as [a] good component"* (LL Facilitator L). Training staff plays a key role: *"If you have new members, or if there's a new shift, a new theme world, somehow training […] ensures that they actually know what they have to know in order to engage in co-creation"* (LL Facilitator L). As there are different shifts, *"all the guides have to have a certain amount of knowledge about the product but then they also need to be enthusiastic"* (LL Facilitator L).

For companies, it is very important that staff is knowledgeable and experienced. For example, Company I worked with LL Facilitator L from JOSEPHS® and describes the collaboration as *"brilliant",* because LL Facilitator L *"understands the product, he understands the consumer and he has a lot of experience: How does this person work? What are they doing? How are they reacting? And so on. And he has a lot of know-how when it comes to developing a questionnaire and in what sequence to pose the questions."* The staff supports companies by addressing the questions, such as *"how do I present this to the people? How do I introduce that? How do I approach that?"* (Company I). The interviewee recognises JOSEPHS'® expertise and its proactive approach: *"Staff was completely confident and made suggestions and I didn't have to say, do it like this or like that. I thought that was high quality work all throughout"* (Company I). Company F says that they did not have many expectations in the beginning *"but what was important for me, and I noticed that quite quickly, that I have qualified people; simply, how people dealt with me, my wishes and also my expectations, and how flexible, and how much experience people brought along, and that was the most important part for me, [and] that I get results, even if*

I didn't quite know how [the results] were supposed to look like. I had a good feeling very quickly and it was a deciding factor to convince the bosses, we have to do this."

LL Facilitator L summarises the skills and interests that a JOSEPHS® guide should possess: *"You need to hire the right people who are able to do small talk; they are somehow outgoing, open, motivating, curious, [and] open to new things. Obviously, here in this setting [for] each [of the] three months they have to somehow get to know new technologies, new products and services. So you have to have a certain level of interest in new developments."* Also, guides should be proactive because *"they need to somehow motivate the visitor to co-create."* Similarly, *"if they see something not working correctly, they see that there's something wrong with the questionnaire […], or something is broken, then they need to proactively engage or contact the appropriate team members that are responsible for that. So there has to be this level of pro-activeness. Coordination and communication is critical" (LL Facilitator L).*

5.3.4 Summary: People

Section 5.3.3 discusses the role of JOSEPHS® as an interface between companies and co-creators in the co-creation process. Table 24 summarises the required characteristics, skills, and attitude of JOSEPHS'® staff, and specifies the nature of their interaction with companies on one hand and with co-creators on the other.

Table 24 Summary of People's Section

People	Details
JOSEPHS'® staff interacting with companies	**Explicitness** • Explaining the LL concept to companies. • Receiving background information about the company to create an appropriate storyline. **Interactiveness** • Putting forward their own ideas and make suggestions to the company. **Iterativeness** • Supporting companies throughout the co-creation process with regular updates to allow for iterations during the test phase.
JOSEPHS'® staff interacting with co-creators	**Explicitness** • Explaining the concept explicitly to co-creators. • Emphasising the importance of touching and trying out the prototypes. • Providing an opportunity to give feedback about JOSEPHS®. • Conveying the seriousness of co-creator contributions. **Interactiveness** • Balancing excitement and inhibition when presenting prototypes.

	• Giving room for action, reaction, and discontinuation during the guidance. • Actively requesting feedback from co-creators. • Proactive guidance that is tailored to co-creator needs.
Characteristics, Skills & Attitudes of JOSEPHS'® staff	• Informed and qualified guides. • Knowledgeable and experienced staff. • Outgoing, open minded, and motivated staff.

5.3.5 Place

'Place' is another crucial factor that enables co-creation at JOSEPHS®. The study participants draw attention to four particular co-creation elements in this category: the location of JOSEPHS®, its physical layout, the complementary facilities and the methods and data collection tools. The following sections discuss these four elements in relation to the principles that influence them, as displayed in Table 25.

Table 25 Principles that influence Place

Co-creation Factors	Principles						
Place	Explicitness	Adaptiveness	Interactiveness	Iterativeness	Realism	Openness	Connectedness
Location						X	
Physical Layout	X	X	X		X		
Complementary Facilities						X	X
Methods & Data Collection Tools		X	X				

5.3.5.1 Location

This study identifies 'openness' as an important principle that enables co-creation with respect to the location of the LL. JOSEPHS® is located in Nuremberg, the second-largest city in Bavaria (after Munich), and the largest in the region of Franconia. The LL is benefitting from a large urban population with many large organisations, such as Adidas and Puma, and small innovative start-ups that are based in the area (LL Facilitator A). The location in the city centre of Nuremberg makes the LL easily accessible to the wider public. Surrounded by shops and large department stores and well connected to public transport,

JOSEPHS® also attracts people that are passing by. For example, Company M explains that they were benefitting from JOSEPHS'® central location: "*We could have done it ourselves, but we definitely did benefit from JOSEPHS'® established reputation and its central location" (*Company M). Also, Company A2 identifies the *"setting, location, name recognition of JOSEPHS®"* as success factors.

5.3.5.2 Physical Layout

The design of the LL defines the co-creators' interaction. Therefore, a lot of attention is placed on the design of individual business islands as well as the whole theme world. The physical layout of JOSEPHS® is influenced by four principles: Explicitness, Adaptiveness, Interactiveness, and Realism.

Firstly, the physical layout must mirror explicitness. By establishing themes, JOSEPHS® establishes a clear storyline, attracts visitors that show an interest in the theme, and provides an opportunity for companies to exchange knowledge. Also, JOSEPHS'® staff identify that a clear structure and storyline of the theme world, and its individual business islands, are all very important enablers of the co-creation process. LL Facilitator L also points out that *"the story has to be reflected with the components on the business island."* Each component within a business island has to build a coherent story that supports the overall design of the island. Also, LL Facilitator J states that *"we need to tell a story within the island."* The storyline of a business island should resemble a *"film script"* (LL Facilitator D) that is clear and easy to follow.

Adaptiveness is achieved by accommodating different themes and needs. As explained in section 5.3.1.2, changing themes, and the ability to cater for B2B as well as B2C projects, is of great importance. Adaptiveness also plays a role with regards to the availability of guides. To ensure that visitors are still able to co-create when JOSEPHS'® guides are not available, it is important to provide sufficient information on the business island. LL Facilitator L explains that *"it would be nice to have […] little signs, displays. […] I think the description, the explanation, [and] the information is critical."* Having signs and displays allows visitors to co-create whilst guides are not available for a tour, which in turn is not only an important feature of the physical layout but also a prerequisite for the collection of feedback.

Thirdly, the design must be interactive and appealing in order to motivate co-creators to contribute their ideas and suggestions. For example, Company K recognises the potential of the physical space of JOSEPHS® and explains that *"it matters that the island is designed in an attractive way: […] the more interactive it is and the more fun it is, the more appealing it gets."* Also, Co-creator G points out that the design of the space should not be *"too shiny nor a product presentation, [as] then it's not talking to me: 'hey use*

me, try me' or something like that. Then it's more like an exhibition." Instead, he states, *"It has to offer me an interaction by design."* Co-creator G discusses the fact that *"in a space like this, […] you should think about the setting and concepts of other islands and how are they designed, and how is the journey of someone influenced by the product or display – how is he interacting, how is the journey on this island."* However, in order to engage in the LL and interact with the space, it is vital that co-creators have their hands free. This is a key prerequisite in order for co-creators to try out and touch the prototypes exhibited at JOSEPHS®. LL Facilitator J summarises what their focus group discussed: *"If they come from the café or from outside they still have the bag in the hand, or whatever, a coffee, and it completely stops them from co-creating. Simply because they can't touch or try out stuff."* For this reason, JOSEPHS® has to accommodate this scenario, and so offers facilities for visitors to place their umbrellas, handbags or a coffee cup, because *"trying out [should be] as easy as possible"* (LL Facilitator J). These kind of barriers *"indicate how long someone will actually try it out"* (LL Facilitator J). Therefore, it is essential that the physical space is offering shelf space and storage for any item that could hinder visitors to engage with the prototypes.

Finally, realism is reflected in the physical layout of JOSEPHS® and the prototypes that are tested in the space. For example, a company used a small innovative car - 'the Elektro-City-Flitzer (Twizy)' to present a device that alerts drivers when they are falling asleep whilst driving. This type of presentation "*fits to the story. It is an eye catcher"* (LL Facilitator L). Placing an eye catcher that supports the storyline is an enabling element in the co-creation process because it grabs the attention of visitors. At the same time, it places the prototype in an authentic use situation which generates results that are applicable to real markets. This is an example of how realism is influencing the physical layout of JOSEPHS®. The interviewee of Company M affirms that JOSEPHS® created a space that is fit for purpose by replicating authentic use situations; it is a setting *"where people see themselves as co-creators and are happy to share their ideas. And that is something great."* Even an employee with extensive experience with LLs praises JOSEPHS®: *"I come from a LL concept, that's why I had a look at the setting and it was: bingo, bingo, bingo. Everything fits"* (Company F).

5.3.5.3 Complementary Facilities

Aside from the 'Werkstatt' (German for shop floor) where the different prototypes are presented, JOSEPHS® is also made up of a gadget shop, a think tank where events take place, and a Café complementing the actual co-creation space (see section 4.1.2). The complementary facilities of JOSEPHS® are guided by two principles: Openness and Connectedness.

Firstly, openness is reflected in the overall design of the complementary facilities, which is important as they lower the initial barrier to entry and encourage people to participate in the co-creation process. Companies discuss the importance of the Café that is located inside JOSEPHS®, which attracts visitors and lowers the barrier for engagement (Company F, P, N). This set-up enhances the co-creation space and draws new visitors into the theme world. Observations confirm that people visiting the Café, who initially did not plan to engage in co-creation, are attracted to the theme world. Thus, confirming the positive effect that these complementary facilities have in engaging visitors in the co-creation process. Co-creators explain that the open layout of the facilities is very welcoming. Company A2 describes JOSEPHS'® setting as *"really beautiful. You enter; on the left-hand side is the coffee shop and straight on you enter and then it is right there. That is great."* Similarly, Company I points out that the space worked very well for them: *"The coffee shop makes it lively and is well done and has a bit of a big city feeling to it. I like how the room is divided in cubicles [business islands]. You have your own space but at the same time it is very transparent, open and you can walk through."* Company H describes a lot of *"small opportunities to engage with customers",* which the company made use of not only through their business island but also by delivering a lecture in the Think Tank. Also, the Think Tank complements the 'Werkstatt' as it attracts visitors for a variety of events and to workshops that can be related or independent of the theme world.

Secondly, the events and workshops that take place in the Think Tank also facilitate networking and knowledge exchange across key stakeholders. Moreover, observations verify that people attending events and workshops usually also enter the theme world. In addition, the Think Tank also offers a physical space to companies on-site to run workshops, in order to delve into a subject of their interest or network with other stakeholders. Company B said that *"through the workshops one can get a bit more concrete with the topics and target audience."* This opinion was also shared by other companies. For example, Company C stressed the importance of running workshops at JOSEPHS® to derive further in-depth insights about a very specific aspect of the prototype. Therefore, the Think Tank complements the co-creation space by providing a platform for networking with co-creators.

5.3.5.4 Methods and Data Collection Tools

In order to capture co-creators' feedback, it is important to use methods and offer data collection tools that are capable of gathering these insights and adaptable to the company's needs. This study finds that both adaptiveness and interactiveness are principles that are reflected in the methods and data collection tools that are used at JOSEPHS®.

Firstly, the data collections tools have to be adaptable to the specific project and company needs. Both, quantitative and qualitative information is collected; however, JOSEPHS® focuses predominantly on in-depth qualitative data. Depending on the co-creation project and the preference of the company, JOSEPHS® employs a variety of methods and tools to collect data, ranging from questionnaires to the latest technology supported tools from the Fraunhofer Institute for Integrated Circuits IIS. Secondary data, based on a study on JOSEPHS®, identifies the different types and methods that are used to capture co-creators feedback, which are presented in Table 26 (Beutel, Jonas and Möslein, 2017).

Table 26 Characterisation of Applied Methods at JOSEPHS

Purpose	Innovation Research			Complementary
Type	Quantitative questioning	Qualitative questioning	Observing	
Methods	• Price assessments • Questionnaires • Usability-tests (quantitative) • Voting	• Focus Groups • Interviews • Open feedback • Personas • Usability-tests (qualitative) • Workshops	• Observation and shadowing • Tracking	• Artefacts • Storytelling • Information material • Toolkits • Prototypes • Prototyping • Service staging

Source: Beutel, Jonas and Möslein (2017)

The selection of data collection methods not only depends on the kind of project and the question that is posed but also on the company's preferences. While JOSEPHS® always recommends utilising interactive and engaging data collection tools, companies sometimes have specific preferences and want to use more traditional methods, such as questionnaires. Nonetheless, even then JOSEPHS'® guides prefer taking an approach that does not require co-creators to fill out paper-based questionnaires. Instead, JOSEPHS'® staff attempts to conduct a natural conversation with the respondent to capture their answers. Simultaneously, the guide captures user behaviour and records anything that may help the company in improving their prototype. For example, if a co-creator uses a tablet to try out a company's configurator, to personalise a product, and gets stuck not knowing how to proceed, the guide will make a note. More specifically, the stage of the process that needs improving would be noted, and the guide would follow up exploring why the co-creator did not find the process self-explanatory and how he or she would improve it. If companies want to use questionnaires for data collection purposes, JOSEPHS® frequently

incorporate tablets, as people often prefer and enjoy responding via a tablet computer more than through paper-based questionnaires.

Interactiveness is also of great importance with regards to the data collections tools. Co-creator G points out that the way data is collected matters: *"It has to be interactive".* For example, co-creators can place coins in specific boxes indicating which design a co-creator prefers: *"It has to be intuitive, it has to include elements which we all commonly use. […] The product can be new but the way we evaluate it has to be in a way known to us. Like the coins for instance. Everybody knows how to evaluate with a coin"* (LL Facilitator J). Technology is also often employed to deliver interactivity in the way data is collected. Fraunhofer Institute for Integrated Circuits IIS provides technology that can support data collection, for example SHORE™, which is a real-time face detection and analysis software. The software detects people's faces through its integrated camera and determines their emotions by analysing their facial expressions. Simultaneously, it estimates the person's age and detects, among other things, their gender (Fraunhofer-Gesellschaft, 2014a). Observations revealed that technology supported tools like SHORE™ or the 'Real-liker' are very popular amongst co-creators due to their interactiveness. The real-liker, for example, is a tool that asks people to show a thumbs-up or thumbs-down to a camera connected screen, indicating if the respondent likes or dislikes a prototype or an aspect of it. In the beginning, Company F was not convinced by the real-liker: *"I thought, that is silly, compared to talking robots, not very appealing, but people had fun and that was the most important thing."* While these kinds of technologies attract a lot of attention at JOSEPHS®, simpler methods such as sticky notes in different colours are also used. For example, a question is presented that can be answered by leaving a positive note through green sticky notes, or a negative response by using a red sticky note, and by using white ones for neutral comments. This not only gives co-creators the opportunity to write comments, but they, also, can inspire further comments by the other co-creators that read them. Aside from these data collection methods, the guides also spend a significant amount of time observing co-creators and tracking their length of stay at each business island, and the route they have taken around the lab. Company K witnessed that *"JOSEPHS'® employees run around, take notes and look [at] what people are doing and how they are doing it, [and] how they react to it."* LL staff explain that involving tactile feedback and haptics at business islands is very useful and provides an opportunity for co-creators to interact not only with the prototype but also with the data collection tool. Using haptics to provide feedback addresses the sense of touch and the related perception and manipulation of objects that result from any form of interaction involving touch.

5.3.6 Summary: Place

Section 5.3.5 presents four co-creation elements that characterise the 'Place'. These four co-creation elements are discussed with regards to the principles that guide them. A summary of the 'Place' with its four co-creation elements and details are summarised in Table 27.

Table 27 Summary of Place's Section

Place	Details
Location	**Openness** • Situated within large urban population. • Located in city centre. • Accessible to all people. • Attractive for by-passers.
Physical Layout	**Explicitness** • Clear structure and storyline of business island. **Adaptiveness** • Establishing themes to adapt to changing needs. • Offering signs to adapt to situations where no guide is available. **Interactiveness** • Creating attractive and interactive business islands and theme worlds. • Hands-free approach to enable interactivity with prototypes. **Realism** • Space that encourages co-creators to share information. • Placing of eye catcher in authentic use situations.
Complementary Facilities	**Openness** • Complementary facilities lowers barrier for engagement. **Connectedness** • Café and Think Tank complements LL as they attract visitors and foster networking.
Methods & Data Collection Tools	**Adaptiveness** • Focus on in-depth qualitative data. • Variety of methods and data collection tools, ranging from traditional methods to latest technology. **Interactiveness** • Offering interactive data collection tools.

5.3.7 Three Key Stakeholder Perspectives

This section provides an overview of the three key stakeholder perspectives and the respective co-creation factors they consider important. Table 28 offers insights into the perspective of the LL facilitators, companies, and co-creators.

Table 28 Key Stakeholder Perspectives and Co-creation Factors

Factor	Element	Perspective		
		LL Facilitators	Companies	Co-creators
Principle	Explicitness	X	X	X
	Adaptiveness	X	X	X
	Interactiveness	X	X	X
	Iterativeness	X	X	
	Realism	X	X	
	Openness	X	X	X
	Connectedness		X	X
People	JOSEPHS'® staff interacting with Companies	X	X	
	JOSEPHS'® staff interacting with Co-creators	X	X	X
	Characteristics, Skills and Attitudes of JOSEPHS'® staff	X	X	
Place	Location	X	X	X
	Physical Layout	X	X	X
	Complementary Facilities	X	X	X
	Methods and Data Collection Tools	X	X	X

Table 28 shows that there is agreement across stakeholders with regards to the importance of most co-creation factors. Yet, there are five factors, obtained through the data collection, which did not emerge as essential when considered by all of the stakeholders.

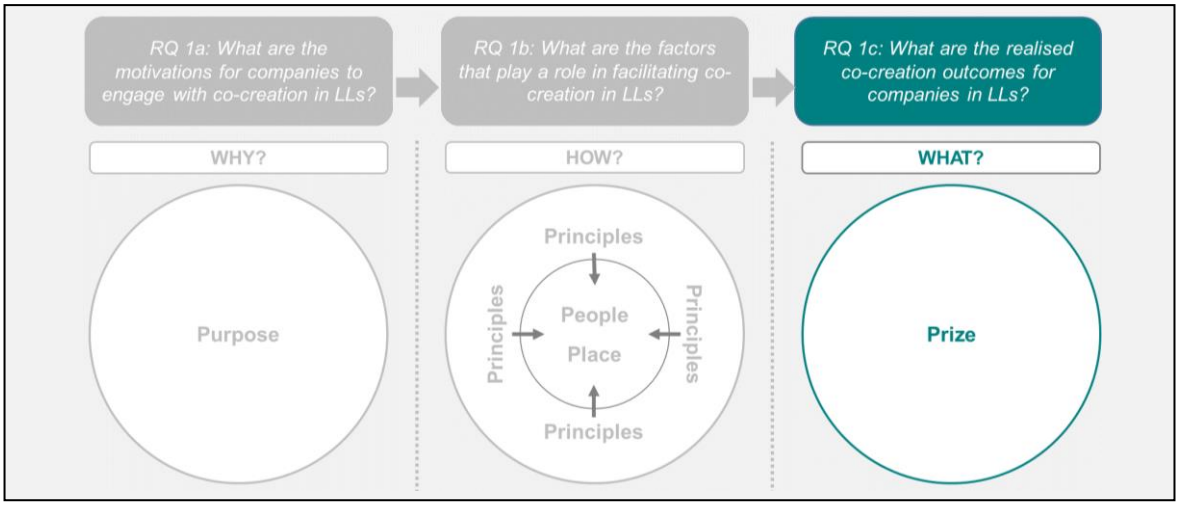
Co-creators do not identify 'iterativeness', and 'realism' as important principles. In particular, iterativeness mainly focuses on the opportunity for JOSEPHS® and companies to adjust their approach. For this reason, this principle might not be at the forefront of a co-creator's perception about what enables co-creation; furthermore, most co-creators only engage with a prototype once; and therefore, this factor is of less relevance to them. Similarly, realism might not play such an important role for co-creators, as long as the overall use experience is positive. Again, realism is of great importance for companies in order to test prototypes in authentic use situations; whereas, co-creators do not consider this critical. For similar reasons, co-creators also do not view the interaction between JOSEPHS® and the companies as being essential for the co-creation process. While, co-creators identify the importance of JOSEPHS'® staff in the co-creation process, they do not

reflect on the specific characteristics, skills and attitudes they should possess. Instead, for companies this is critical because the staff is the intermediary that connects them with the co-creators. On the other hand, LL staff did not focus on the connectedness that JOSEPHS® delivers to its stakeholders. They do offer events and workshops that naturally connect people; however, the value that lies in this network, and the knowledge that can be exchanged through it, is not recognised. The reason for this may also be limited resources that are put towards other priorities. Setting-up and managing a platform that enables knowledge transfer, or organising particular events that facilitate networking across stakeholders, might require more human and financial resources, which are currently not available. On the one hand, it seems that JOSEPHS® focuses mainly on the interaction between them and the companies, and on the other hand, there is interaction between co-creators and companies through JOSEPHS®, because that is where they see value being created. The value that lies within JOSEPHS'® wider ecosystem is not actively nor systematically leveraged for co-creation purposes.

5.4 RQ1c: Co-creation Outcomes

This section addresses research question 1c: "*What are the realised co-creation outcomes for companies at JOSEPHS®"?* The project outcomes are compared with the objectives discussed in section 5.2 to determine the extent to which performance is congruent with expectations (see Figure 19). This is important, as the success of co-creation projects in LLs can be based on the congruence or discrepancy between planned objectives and outcomes (Gardner, 1977). Further, presenting planned and unplanned project outcomes separately helps to identify what outcomes companies expected to accomplish and what was unexpectedly achieved.

Figure 19 Prize



5.4.1 Project Outcomes

This section presents the planned and unplanned project outcomes. Overall, eight categories of planned project outcomes, and one category of unplanned project outcomes are identified and discussed in this section (Table 29).

Table 29 Project Outcomes

Company Code	Type of Transactions	Project Outcomes							
		Access to Co-creators						Access to JOSEPHS®	
		Market acceptance	Price acceptability	Exposure	Product testing	Market intelligence	Legitimisation	Method testing	Networking
A2	B2B	X			X		✓	X	
D	B2C	X	X	✓					
E	B2B	X							X
F	B2B	X							
G	B2C	✓		X					
H	B2C	X	X						✓
I	both	X		✓			✓		X
J	B2B	X	X				✓		
K	B2C	X							✓
L	B2C	X		X					✓
M	B2C	X						X	
N	B2C	X	X	X		X			
O	B2C	X					✓		
P	B2C	X	--		O				

X objective achieved; **--** objective not achieved;
O objective not achieved for company internal reasons; ✓unplanned project outcomes

In total, eight categories of realised co-creation outcomes are identified. Seven out of these eight categories correspond to the motivations why companies wanted to engage in co-creation at JOSEPHS® (section 5.2). The only category that was not mentioned by any company is legitimisation. Involving co-creators in the project, in spite of this not being a planned objective, has legitimised the actions and endorsed the decision making of four companies. The reason that this has not been mentioned, as an objective, might be because legitimisation as a benefit is perhaps only recognised by the company once clients or retailers have expressed their appreciation for the end user testing.

While 13 out of 14 interviewed companies have met their original objectives completely, it was only Company P who has not achieved all their project objectives. Company P put forward three project objectives and was not able to meet two of them. Although, only one project objective was met, Company P still considers the project

successful. The majority of companies achieved more project outcomes than what they intended to at the beginning of their project. All unplanned and therefore additional project outcomes were considered beneficial to the company, apart from Company G that received insights on the market acceptance of their product but did not consider this feedback as useful. Overall, more than half of the interviewed companies achieved three or four project outcomes with regard to the categories that were identified in this study.

5.4.1.1 Market Acceptance

The project objective that has been mentioned the most, among interviewed companies, is market acceptance. Out of 14 companies, 13 state that they are interested in understanding if their product or service is satisfying customer's needs by engaging in co-creation. All of the 13 companies achieved their original project objective. Overall, four different kinds of results could be observed. Moreover, one company obtained unplanned project outcomes with regards to the market acceptance of a product.

Firstly, five companies received completely new insights through their co-creation project at JOSEPHS® (Company A2, E, F, H, M). For example, Company H was confronted with *"some uncomfortable questions"* that indicate where the ideas from the company differ from *"what the customer actually wants. Sometimes it was an eye-opening experience and we had to admit that we had completely different expectations"* (Company H). With regards to the device they tested, *"people said that they do not want another device in the car. Many already use their mobile as a navigation device and could imagine using our device if that would be integrated in the mobile. But they do not want to have another device in the car. […] And that was one thing, that we really didn't expect, that people tell us here that they don't want another device in the car. That they do think it is an important device but not if you have another device, and another device, but rather that it is integrated in something that one already possesses"* (Company H). The feedback Company H received was *"mainly along the lines that the device is too big".* Co-creators also criticised the alarm signal of the device, and instead *"people came up with other ideas, some of them we already knew, for example, that you don't have an alarm tone but that your steering wheel or seat starts vibrating."* While some of the feedback was already known to the company, the company took a closer look at the co-creator's feedback and realised *"that there are sometimes expectations or ideas - sometimes quite funny ideas, that we didn't think of before and that motivated people on our side to think again about what direction we want to develop the product."* As a result, not only were the original objectives met, but Company H also received a fresh impetus to their product.

In other cases, co-creators confirmed pre-existent assumptions from companies (Company I, K, L, O, P). For example, Company I's objective was to understand how they can best present their brand. For this reason, they let co-creators evaluate two different designs for an exhibition appearance. One design was influenced by an airplane style involving a lot of decoration, while the other design was less elaborate and realisable without any great effort. Due to their B2B relationships, Company I was particularly interested in the question concerning which design is more appealing. As a result of their project, Company I found out that they do not need to decorate their exhibition stalls in an airplane style: "*We already knew that beforehand, but it confirmed our hypothesis. And for us [it] personally changed that we don't take any airplane decoration along to trade fairs."* While these insights confirm the company's assumptions, they describe it as *"a turning point for us as an organisation."*

Thirdly, to obtain valuable insights from co-creators, two companies had to readjust their approach during the test phase (Company J, N). While Company J met their objectives, they also experienced challenges in receiving content-related feedback, as they were not interested in the design aspects of the product: *"We are interested in opinions regarding the content and not design. Many, many visitors said the box on the [product] is too big, it is way too big and way too heavy. […] Many still focused on the design and just after we told them, that we are already aware of it then they told us other content related feedback. It was really difficult to make people not think about the design but about the content. That was tricky"* (Company J). For this reason, it was important for the company to reflect on interim feedback and adjust their approach. Integral to the success of the project was the information guides who convey guidance to the co-creator, by steering them to the aspects that the company wishes to receive feedback on.

Fourthly, one company completely changed their business model as a result of their co-creation project at JOSEPHS®. Company D reflects on their experience at JOSEPHS® and state that it *"opened our eyes".* The interviewee explains that the project had a far-reaching impact on the overall offering: *"We completely left our original thought [about] how to offer [a] technology supported [service] to our [clients]. We originally thought that we equip our facilities with certain things […]. But that is often not wanted […] This is something that we discovered at JOSEPHS®, and that's why we now say, we develop a kind of exhibition catalogue, where we tell the [client], 'hey, you could have all of these things, we can put you in touch with specialist companies, give you contacts, advice services' […]. This is the direction we are going in now. So [it is] not anymore, that we think, [that] we equip the [facilities] with these technical devices, but rather, no, we prefer to function as advisors."* Thus, the co-creation project at JOSEPHS® had a major impact on

the overall strategy and offering of Company D: *"JOSEPHS® was really interesting and gave us a different reference point."*

With regards to unplanned project outcomes, Company G did not articulate any particular objectives apart from exhibiting their product as their target market, which is very specific – disabled people, and old people. Yet they received feedback from JOSEPHS'® co-creators. The interviewee explains, *"Our target audience wasn't represented [at JOSEPHS®]. This was very noticeable. Some of the young people thought it was a bit boring, but our problem is, that if we design games, that also work with only having to press one button, they can't be as complex and adventurous. This was one of the most common criticisms […]. It is proven, that especially for disabled children this is really important, that they get the connected balance exercise and especially get to practice stepping backwards and so on, and in addition it is a lot of fun. And also for older people it is really good, for balance exercises and so on; one of the criticisms was there that the dance mat is too small. It needs to be bigger, but the problem is there, which we are aware of, for children, it is already almost too big, for grown-ups it too small."* Company G received feedback and suggestions, even if they did not find it useful.

To conclude, one company received feedback with regards to market acceptance; yet, this has not been one of their original project objectives. With regards to the planned project outcomes, all 13 companies that planned to test market acceptance also met their initial project objective. Five companies received completely new insights, another five companies received feedback confirming initial ideas, two companies had to readjust their approach to receive feedback from co-creators, and one company completely changed its business model as a result of their co-creation project at JOSEPHS®. The findings confirm the value of the principle, 'iterativeness', which allows companies to readjust their approach or prototype based on interim feedback by JOSEPHS'® staff and co-creators.

5.4.1.2 Price Acceptability

The second most important motivation for companies to engage with JOSEPHS® relates to price acceptability. Four out of five companies achieved their purpose and identified a price range that customers are willing to pay for their product or service.

For example, Company J states that as a result of their co-creation project they identified a price range that is acceptable among customers: *"We know now the price range."* Company D also achieved their objective. As a result of studying the price acceptability among JOSEPHS'® co-creators, Company N even *"increased the price [of their product] by 200 Euro […]. In this case, just positive, and no negative effects.*" While four companies met their objective, one of them also had to test aspects that could influence the price.

Company H's objective was also to identify *"how much would someone be willing to pay for"* for their device. However, the company had to understand if customers would prefer an entire device or prefer an app. JOSEPHS'® co-creators favoured an app: *"We already had that idea but we didn't know how much people would be interested in that, but it became apparent that it […] is worth pursuing"* (Company H). Receiving those insights are *"key for the further development of the product because then we have the results of an opinion poll that tells us that people are, on average, willing to pay a certain amount for the product and people are, on average, willing to spend a certain maximum amount"* (Company H).

Not all companies achieved their objective with respect to price acceptability. Company P realised that they have to *"further test the price, maybe in a different setting. It became clear that we have to test that differently because the way we have tested so far didn't lead to a result"* (Company P). Moreover, Company P states that they have to reflect on the way they collect data. The project at JOSEPHS® prompted another question, *"Do we really engage our target audience?"*

To conclude, four companies achieved their planned outcomes and identified a suitable price range for their products or services (Company D, H, J, N). However, Company P has not met their initial objectives and was unable to define a price range for their product. Company P explained that the quality of the data was not satisfactory: *"It was difficult because the quality of the data was not sufficient. For example, we have 20 questionnaires that state that the customers are willing to pay two euro for the device, which is of course not very useful for me."* Considering the complexity of the electrical device, the suggested price is far below any reasonable assessment: *"As a consequence, we intend to further test the price, maybe in a different setting. It became clear that we have to test that differently because the way we have tested so far didn't lead to a result."* Aside from Company P, also four other companies, B2B as well as B2C, tested the price acceptability for a range of products and services. All of them identified successfully a suitable price range. Therefore, the objective in itself may not be the cause of the problem. Although JOSEPHS'® openness can be beneficial to companies, staff also have to consider the specifics of the prototype and the suitability of co-creators to provide input. This could be taken into account in the data processing phase allowing for more differentiated feedback.

5.4.1.3 Exposure

JOSEPHS® can offer exposure for the companies and their prototypes. While some companies may see this as a natural consequence of their engagement with JOSEPHS®, three companies specifically identified exposure as one of their project objectives. In addition to these three companies, Company D and I have not defined 'exposure' as their

original project objective; however, both explain that this has been an unplanned project outcome.

Three companies stated exposure as one of their motivations to engage in co-creation (Company G, L, N). Company L's objective was to showcase their prototype and the interviewee says, *"With that I was really satisfied*". The interviewee explains that this was the first time the prototype was presented to potential customers. Company N explains that they benefitted from a newspaper article that has provided exposure for the company: *"The local press coverage was great."* Through an article by the Nürnberger Nachrichten people were attracted to visit their business island at JOSEPHS®: *"We even had people visiting our factory and when we ask them where they have heard about us, they said JOSEPHS®."*

The reason for Company G to utilise JOSEPHS® was solely based on the idea to gain exposure. Company G knew from the beginning that their *"target audience wasn't represented"* at JOSEPHS®. Company G's target audience are *"disabled and severely disabled children, that expanded to overall disabled people and both, with physical impairment and mental impairment. Our second target audience are senior citizens."* Considering this very specific target audience, the company's main focus was general exposure of one of their products: *"We said, come, let's try it, Nuremberg is our main market, and that was the reason".* As a result of their project at JOSEPHS®, the interviewee explains, *"Many people got to know us"*. Although, Company G did not articulate any clear objectives with respect to the product, the amount of feedback they received was unexpected: *"We received a lot of feedback, predominantly positive. […] It was interesting to see how people react. We already knew, that it would be positive, but we were a bit surprised to see that even the people that walked past, left a note. We didn't think we would get that many notes, I honestly have to say that."* However, the interviewee also acknowledges, *"The contact with the people is nice, even if they aren't related to our work, but it isn't really useful for us."* Therefore, Company G met their original objective to exhibit one of their products, but has not been able to derive any further benefits from the experience.

While to some companies 'exposure' was an explicit project objective, two companies have not defined this as a goal but still benefitted from it. For example, Company I explains that they *"received a good media coverage."* The local newspaper *"Nürnberger Nachrichten published an article",* which the interviewee describes as *"a good side effect."* Company I did not plan to achieve such exposure but acknowledge the positive impact it had: *"We were able to communicate it well locally that we are currently having an exhibition at JOSEPHS® and that was positive."* Similarly, Company D recognises that the project

was *"also beneficial for the image. You are at JOSEPHS®; that raises awareness, [and] who knows what people go in and out there."*

To conclude, three companies met their project objective and two other companies gained exposure as an unplanned project outcome. While Company G achieved its objective, they only focused on exhibiting their product as their only objective. Considering the nature of LLs, this seems to be a missed opportunity. A number of reasons explain why Company G could not fully exploit this opportunity. Company G was approached by JOSEPHS'® staff as they had one business island still available: "*They approached us, because the theme was fitting, and there they had a bit of a problem to fill the stalls. And then they asked us if we could imagine taking part, and we said, that we probably won't reach our target audience. We knew that from the beginning, that's why we weren't very disappointed, because we knew we won't get much out of it."* Due to the need to fill one business island, shortly, before the start of the theme world, JOSEPHS® made a financially favourable offer to Company G. Considering the limited time available, and the low expenses associated with the project, as well as the limited rewards, which were expected by Company G, they did not invest much time or resources into developing the business island: *"We printed posters, but that was one, two weeks drafting, preparation, design. Because it is so close and we didn't have any other expenses, it was relatively simple for us. We also kept it simple."* For these reasons, they decided to exhibit their products without any further particular objectives.

However, when comparing Company G's challenge in reaching a specific target audience with Company N, which faced similar obstacles, it shows that the issue does not necessarily lie with the product. For example, Company N realised that they do not receive valuable input from people that would use or buy their product, which is why they changed their focus and asked for feedback with regards to their online configurator which is not product specific. Similarly, Company G could have reflected on their test phase throughout the process, and make adjustments to address aspects of their product or business model that does not require feedback from very specific audiences. Also, it was offered to them to run a workshop with their specific target audience: *"We can invite people, but that's where time interfered. When we were exhibiting correlated with the summer holidays, and institutions and schools, who would have been interested, were not available. […] And to organise then a trip for disabled children who need a driver to get them in town, would have been too difficult. […] We decided that we didn't want to force it, because that would have meant more work."* Due to the constraints and limited effort that Company G was willing to put into the project, the objective to exhibit their product remained the only focus of their project.

5.4.1.4 Product Testing

Two companies explicitly used their projects at JOSEPHS® to test their products to understand how they perform from a technical point of view. While, Company A2 achieved their project objective, Company P did not achieve their objective due to internal reasons within their company.

Company P intended to conduct product testing with their device: *"Originally, we wanted to observe how the device copes for one and a half months without supervision."* Though, it turned out that Company P was not able to do so: *"Right before the project started, we modified the device, so that just limited features were available and the particular part that we originally wanted to observe was omitted.*" Instead, they *"decided to build a mock-up with artificial flowers that performed consistently throughout."*

On the other hand, Company A2 achieved their objective by monitoring the stability of their two systems on-site. During their product testing, Company A2 received a call from JOSEPHS'® staff that their *"system is not working anymore and then we ask why not and then they say that the wireless network does not work and then we realise that the wireless network button was switched [off] and the colleagues then say, how can you be so stupid to switch the wireless network button [off], and then we answer, how can you be so stupid to install a wireless network button in the first place, that allows the customer to switch it [off]. That is the real stupid thing and not the other way around."* The results of this product test were not only "*used for the development of their own products but also to assess the products of [an Acquisition Company]."* The product testing for the 'Acquisition Company' was an important consideration for a possible acquisition: *"At that point the 'Acquisition Company' was not part of Company A2. It was in the preliminary stage in [the] context of ongoing discussions, so that one could also test the format of JOSEPHS® to find out where does this company stand, what can they do, what can't they do, to strengthen our assessment, which was very valuable."* The interviewee elaborates on the product testing: *"We tested […] our own smart home user interfaces products with the ones the 'Acquisition Company' offers."* The insights from the product testing was then *"used that to decide for a strategy, where to focus on in the next couple of months and indeed [Company A2 and 'Acquisition Company'] signed the contract a couple of months later. That means the 'Acquisition Company' […] is now a portfolio company of the Company A2."*

To conclude, two companies used JOSEPHS® as a way to test their products with regards to technical aspects. Due to the company's internal reasons, Company P did not achieve their project objective, whereas Company A2 fully utilised the LL for the testing of their own product, as well as for a company they later acquired. This example highlights the importance of JOSEPHS'® staff interacting with the company and feeding back information

on technical issues, as described in the case of Company A2. Furthermore, it underpins the value of testing products, services and technologies in a real-life context to understand how they perform in authentic use situations, which also highlight the importance of 'realism'.

5.4.1.5 Market Intelligence

Company N's objective was to gather market intelligence*: "To know where customers are from helps us with the decision where we want to open a shop."* For this reason, Company N offered *"some coupon codes on a blanket, worth 10 euro, which is not much [when] comparing to the overall price of a [the main product] but you would get that off if you buy [the product]."* As a result of this initiative, the company had the co-creators redeem their coupon: *"We could see who did use them and know that we benefited financially from the project" (Company N).* Finally, the company could also draw a conclusion from the initiative in terms of the location of their customers.

5.4.1.6 Legitimisation

Legitimisation is the only category of the project outcomes that has not been mentioned as an initial motivation to engage in co-creation at JOSEPHS® (see section 5.2). Yet, four companies explain that the involvement of co-creators in the project has legitimised their actions and endorsed decision making internally, as well as the fact that it supported communication external to the company.

For example, Company O identifies that the feedback from JOSEPHS'® co-creators provides more legitimacy internally to the company: *"We have clear user-feedback and this user-feedback is taken more seriously than the feedback of our family and friends. And our board completely agreed."* Also, Company A2 used the co-creator insights from JOSEPHS® internally: *"I also used it internally, not only to raise awareness for JOSEPHS®, but also used the results to bring on certain decisions. […] We discussed it with the board, because it is quite rare that we do these sorts of activities."* External to the company, Company J acknowledges that it *"helps us when we talk to our clients and producers. We can tell them that we did an end-user polling and we know that you can produce this in price range."* Similarly, based on the feedback from co-creators, Company I states, *"Through JOSEPHS®, you get rid of your gut feeling and get a rational profound sample size, that you can rely on and that you are able to work with. You no longer have to act blindly, because you know, okay, I now have the numbers to confirm this."* The interviewee stresses, "*Now, we can say to our traders 'okay, you don't need to decorate in an airplane style'. If that is, anyway, the topic and he has multiple products then that's of course not negative, but if he doesn't want that, then he can display the products in an ordinary way."* Involving co-creators at JOSEPHS® also legitimised Company I's action: *"When I tell the*

distributors that we went to Fraunhofer and tested it over three months in a LL and that we have a solid base of results, that is of course completely different than if we say, we tested it on one colleague and he said it is this way and that's now how it is. That has a completely different weight when you have actual data behind it."

To conclude, legitimisation is an unplanned project outcome for four companies that could ultimately benefit from it. Companies could test their protypes in a real-life environment, which offered them insights that are based on authentic use situations from 'real' people. The aspect of 'realism' further strengthens the legitimacy of the insights that companies could obtain through their co-creation projects.

5.4.1.7 Method Testing

Two companies also used JOSEPHS® in order to test the LL as a potential future opportunity for more co-creation projects (Company A2, M).

Company M articulated method testing as an objective of their co-creation project at JOSEPHS®. The interviewee explains, *"We gained some interesting methodological insights that we will make use of in the future."* Also, Company A2 states, *"We met our internal objectives and we also were able to meet our hidden objectives."* The latter refers to the method testing of JOSEPHS® as a LL which Company A2 did not openly communicate to JOSEPHS'® staff. The interviewee describes their experience as *"a very smooth cooperation, that was implemented well. One never had the feeling to be left alone, because we received proactively information, which we could use. We consider repeating it for different products."* Company A2 is satisfied with JOSEPHS® as a method and would use the LL again for future projects,

To conclude, two companies tested the LL method and gained valuable insights. Although, only two companies explicitly articulated this as an objective, all companies that have utilised JOSEPHS® are likely to have reflected on their experience and whether JOSEPHS® met their expectations or not. On a scale from 1 (not successful) to 7 (extremely successful), all companies except Company G (1), and P (4) rated their project success as 6 or 7. Therefore, it is likely that they are also satisfied with JOSEPHS® as a method. Considering the variety of companies that utilised JOSEPHS®, their satisfaction is evidence of the adaptiveness of the LL.

5.4.1.8 Networking

Different to the objective to increase awareness through exposure, Company I and Company E explicitly aimed to expand their network. Furthermore, Company H, K, and L also benefitted from networking opportunities, yet they have not defined this as one of their original project objectives.

With regard to planned project outcomes, Company I was hoping *"that maybe one or two distributors might come by, see it and buy a few for their shops. And of course, with Nurnberg it is ideal, because it's a great shopping city. It was definitely a wish that we would have liked to see one or two distributors coming by."* Although, distributors have not approached Company I, *"the comic shop owner bought some products for his own shop.*" Company E also met their objective to expand their network: *"Through the feedback new contacts were made."* The interviewee states, *"There was one project on smart school gear and then there was one evening at JOSEPHS®, where some people from schools and the education industry were there. And there was also a school backpack manufacturer there and we were able to connect; so customer engagement at JOSEPHS® held true."*

As unplanned project outcomes, three additional companies report that they benefitted from the networking opportunities that arose as a result of their co-creation project at JOSEPHS®. Company K was able to expand its network by establishing contacts with JOSEPHS'® staff *"and, of course, behind that [was] also the Fraunhofer Institute."* An employee from Company K *"facilitated workshops here, and he attended as a guest the re-launch [of JOSEPHS®] as well."* As a result of the co-creation project, Company H received *"two additional but really interesting enquiries that came through the JOSEPHS® exhibition."* Aside from the originally defined objectives, Company L also benefitted from the project through events and networking at JOSEPHS®: *"I got to know JOSEPHS® and I was able to listen to other presentations that were really interesting and also visit a project. For me personally, yes, there were additional advantages."* Those examples also stress the value of connectedness that JOSEPHS® has to offer to the stakeholders that engage in their facilities.

5.4.2 Summary: Objectives and Outcomes

In section 5.4, findings addressing research question 1c *"What are the realised co-creation outcomes for companies at JOSEPHS®?"* are presented. Eight categories of realised co-creation outcomes are identified. Seven out of these eight categories correspond to the motivations why companies wanted to engage in co-creation at JOSEPHS® (section 5.2). While 13 out of 14 interviewed companies have met their original objectives completely, only Company P has not achieved all their project objectives. The majority of companies achieved more project outcomes than what they intended to at the beginning of their project. Overall, more than half of the interviewed companies achieved three or four project outcomes with regards to the categories that were identified in this study. Additional quotes from companies in support of the eight identified categories are presented in Appendix 17.

6 Discussion

This chapter compares empirical findings from this study with existing literature. Moreover, how this thesis contributes to the literature in the field is discussed. Finally, this chapter puts forward three propositions, highlights the innovation potential of LLs and reveals three particularly interesting areas that require further investigation.

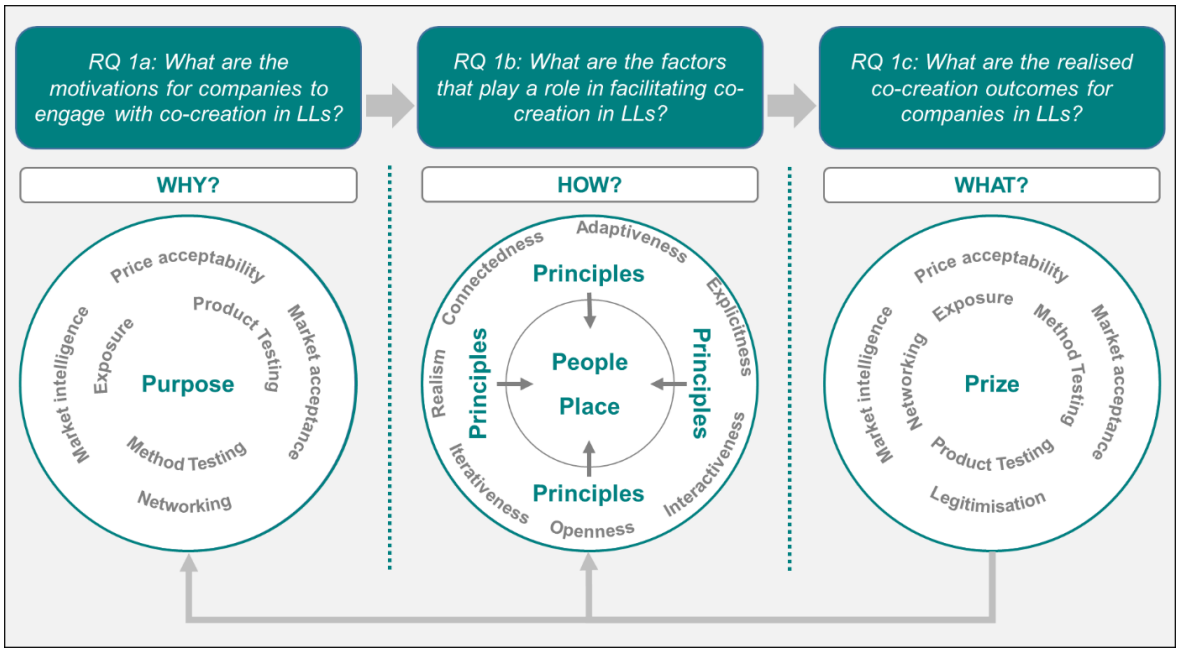
6.1 Contributions to Literature

This chapter discusses the empirical findings, as presented in chapter 5, in order to highlight contributions to the ongoing academic debate about co-creation in LLs. Findings are presented according to the research question and three sub questions posed in this thesis (see Figure 20). Drawing on the insights derived through the three sub-questions, the main research question is addressed first, by reference to *'The Five Ps of Co-creation Facilitation in Living Labs'* framework, which is developed through this study.

6.1.1 Co-creation Facilitation in Living Labs

This study contributes to the understanding of how co-creation can be facilitated in LLs by putting forward *'The Five Ps of Co-creation Facilitation in Living Labs'* framework. The five Ps refer to Purpose, Principles, People, Place, and Prize (see Figure 20).

Figure 20 The Five Ps of Co-creation Facilitation in Living Labs



This framework offers two main contributions to the LL literature. Firstly, *'The Five Ps of Co-creation Facilitation in Living Labs'* framework provides a holistic view on co-creation facilitation in LLs. The framework is defined by five Ps that build the cornerstones of the facilitation process. These five Ps have to be understood in order to carry out co-creation projects in LLs successfully. While the LL literature is silent on the importance of defining the project objectives and in measuring outcomes, the project management literature stresses the need to measure project success (Baccarini, 1999). There are a number of ways that project success can be determined (Davis, 2017). Interviews with companies, however, revealed that they have difficulties in quantifying the success of a project. Company O for instance said that *"one can't evaluate it on one figure alone, because there are too many factors that one has to consider, and that can't be expressed in a number."* Similarly, Company K states that *"coming up with a number is very, very, very difficult."* Indeed, companies emphasise that their success is expressed through the attainment of their often-qualitative goals. Taken into consideration the challenges of measuring project success in LLs, the framework examines the congruence or discrepancy between planned objectives and outcomes (Gardner, 1977) as an indicator for project success. To use this evaluation method, it is essential to define the project objectives in order to *"judge relative success or failure in the attainment of those objectives"* (Gardner, 1977, p. 578). Comparing project objectives to realised outcomes also allows companies to learn from their experience, and adjust their actions and expectations in future co-creation projects. Integrating companies' objectives, and their achievement, together with the characteristics of the LL (captured in the framework by the interaction of principles with people and place) provides a contribution to the existing literature.

Moving on from this consideration, the second contribution, which is embedded in the framework, is represented by the relationship that is linking these different components - the five Ps. In order to facilitate co-creation in LLs, it is important to understand the Purpose (see section 6.1.2) behind a company's co-creation project. This is critical for the LL facilitator in order to be able to tailor the facilitation service to the needs of the company. Awareness of the motivations that stimulate companies to engage in co-creation can help LLs to systematically facilitate the identification of areas for companies to address during their LL test phase. Principles, People and Place are discussed in the second sub-research question. Seven principles influence the interaction of People and Place of the LL (see section 6.1.3). The findings of this study suggest that the principles, and their effect on the people and place, have to be understood to enable co-creation practices in LLs. This is important in order to align the behaviour of people and the design of a LL with the principles that guide the LL operations. Outcomes of co-creation projects in LLs, referred to as the Prize in this framework, have to be evaluated. The project outcomes are analysed in the

third sub-research question of this thesis (see section 6.1.4). This study reports eight different categories of project outcomes, which are important to assess in order to define the success of LLs. As a result, these project outcomes can inform current and future LL activities and support facilitators. This is taking into account the fact that the project outcomes can reveal any shortcomings, and can help in revising and further improving the LL offerings. Depending on the purpose of the co-creation project, and its execution through the LL principles, people and place are affected, which then ultimately influences the prize of the project. While some aspects of this framework have been analysed in isolation, previously, by other scholars Ståhlbröst (2012) on LL principles, or by Schuurman, De Marez and Ballon (2016) on co-creation outcomes, this study highlights the relevance and interconnectedness of the five Ps in order to understand, and facilitate co-creative innovation processes in LLs. Indeed, '*The Five Ps of Co-creation Facilitation in Living Labs*' framework captures the conditions required that allow for more systematic and tailored facilitation services, concerning present and future co-creation projects, which is filling an important gap in the literature.

6.1.2 Motivations to Engage in Co-creation

As described in section 5.2, this study identifies the seven types of project objectives that motivate companies to engage in co-creative innovation activities in LLs. An overview of these objectives is displayed in Table 30: market acceptance, price acceptability, exposure, product testing, market intelligence, method testing, and networking. These objectives can be summarised into two broader types of motivations. On the one hand, companies wish to gain access to JOSEPHS'® co-creators, and on the other hand, they would like to gain access to JOSEPHS® itself.

Table 30 Summary of Project Objectives

Project Objectives	
Access to Co-creators	Market Acceptance
	Price Acceptability
	Exposure
	Product Testing
	Market Intelligence
Access to JOSEPHS	Method Testing
	Networking

Differently, to previous studies, this research provides a list of specific objectives, which can be measured and are associated to particular organisational activities and functions. LL literature in this area is, indeed, particularly scarce. In the context of co-creation projects,

Bhalla (2014) identifies three broad intents that companies pursue when engaging in co-creation. Firstly, 'Generation' refers to cases where the company's objective is to obtain ideas, suggestions or designs from customers and other stakeholders. Secondly, 'Refinement' includes cases where co-creators work with firm representatives in order to refine features of a product or service. Thirdly, 'Creation' refers to the situation where both co-creators and a company's professionals work together to develop a completely new product or service. These three categories are high-level co-creation objectives, but are not translated in the paper into more specific areas of interest, and its measurable aims. Bhalla (2014) uses these categories to define the specific actions of co-creators, and indirectly refers to the extent of their involvement in the co-creation process. In contrast, this study defines specific objectives that include, for example, testing 'price acceptability' or 'market acceptance' of a prototype.

Some of the objectives, identified in Table 30, are identified in the literature. Market acceptance (Ponce De Leon *et al.*, 2006; Hsiao and Yang, 2010; Buhl *et al.*, 2017) and networking (Niitamo *et al.*, 2006; Juujärvi and Pesso, 2013), for example, are mentioned in the literature, but only as assumed objectives of co-creation, and without the motivations of firms being really explored. As a result, potentially complementary objectives might have been overlooked. Product testing is also identified as an objective in the work of Schumacher and Feurstein (2007). The authors state that LLs carry out product tests with users prior to the final launch of new products and services. In the context of this research, however, the value of product testing, also done earlier in the development phase, is recognised. The seven project objectives identified in this study, are summarised in Table 31 and compared against existing studies.

Table 31 Summary of Project Objectives and Contributions from this Research

Project Objectives		Existing Literature	Contributions
Access to Co-creators	Market Acceptance	Ponce De Leon et al., 2006; Hsiao and Yang, 2010; Buhl et al., 2017	
	Price Acceptability	→	X
	Exposure	→	X
	Product Testing	Schumacher and Feurstein (2007)	
	Market Intelligence	→	X
Access to JOSEPHS	Method Testing	→	X
	Networking	Niitamo *et al.*, 2006; Juujärvi and Pesso, 2013	

Results from this research, therefore, expand the current knowledge, which is about the motivations firms have in order to carry out co-creation in LLs, and this is done in two ways. Firstly, a list of measurable objectives, associated with access to the LL itself or its co-creators, is provided. Secondly, while some of the objectives identified in this way are partially acknowledged in the literature, the empirical evidence gathered allows for their deeper discussion and understanding, and adds further motivations to the current knowledge about co-creation in LLs.

6.1.3 Factors Facilitating Co-creation

This study identifies three factors that play a role in facilitating co-creation in a LL: Principles, People and Place. Firstly, seven principles are recognised that guide the co-creation process. Secondly, this study acknowledges the importance of people facilitating the co-creation process in LLs. Thirdly, the place in which co-creation takes place is an important factor facilitating the joint innovation process. The three factors are not isolated, but are strongly interconnected, with the principles affecting the behaviour of People and the design of the Place. The following sections discuss each factor in detail, constrasting findings with existing literature.

6.1.3.1 Principles

The study of JOSEPHS® led to the identification of seven overarching principles, which inform the activities of the LL and shape the interaction between people, as well as the place where co-creation takes place. Results contribute to the understanding of co-creation in LLs in two ways. Firstly, the list of principles is provided, and such principles are made explicit by providing details of different dimensions through which they manifest (see Table 32). Some of the dimensions identified in this way are novel contributions to the field of LLs. Secondly, the interaction and influence of such principles on the people and place, characterising a LL, are discovered, which is something that the extant research, so far, does not address.

Four studies that make an attempt to characterise LLs (Almirall and Wareham, 2008; Ståhlbröst, 2012; Schuurman, Marez, *et al.*, 2013; Veeckman *et al.*, 2013) are identified in the literature. However, they all differ in terms of the principles that they describe as important, and the level of detail they provide. Only Veeckman *et al.* (2013) offer an attempt to integrate the characteristics of the LL environment, the LL approach, and the innovation outcome. This thesis identifies LL principles, and examines their effect on the place and the people that interact in a LL, focusing, therefore, on a different set of

aspects. The seven LL principles, including their specific dimensions, which are identified in this study, are summarised in Table 32 and compared against existing studies.

Table 32 Summary of Living Lab Principles and Contributions from this Research

LL Principles	Dimensions	Existing Literature	Contributions
Explicitness	Ensuring that the LL concept and its opportunities and shortcomings are clearly communicated to companies.	→	X
	Clarifying the concept to co-creators to encourage active involvement.	Explicit explanation of innovation activities (Katzy *et al.*, 2013)	
	Providing company background information and explaining how co-creator's feedback is used.	→	X
	Creating a clear structure and storyline on the island and in the theme world.	→	X
Adaptiveness	Offering changing themes to attract new companies, new co-creators and arouse interest among regular visitors.	→	X
	Applying varying and new methods for co-creators to provide feedback.	Offering different tools (van der Graaf and Veeckman, 2014; Rosado *et al.*, 2015; Voytenko *et al.*, 2016)	
	Providing a flexible platform suitable for B2B and B2C projects.	→	X
Interactiveness	Establishing a comfortable and open atmosphere is a prerequisite for interaction.	Passionate atmosphere (Leminen, Westerlund and Kortelainen, 2012), constructive and supportive atmosphere (Juujarvi *et al.*, 2016), open and informal atmosphere (Kaasinen and Koskela-Huotari, 2013), atmosphere where everyone can express their opinion (Friedrich, Karlsson and Federley, 2013), relaxed atmosphere (Ståhlbröst *et al.*, 2013)	
	Offering an informal and casual atmosphere in workshops.	→	X

	Designing an interactive physical space.	Interactive space (Parker, Wills and Wills, 2013), interactive setting (Beutel, Jonas and Möslein, 2017)	
	Setting-up an intuitive and playful layout.		X
	Deploying fun and interactive data collection tools.		X
	Introducing elements of familiar behaviour to support the co-creation process.		X
Iterativeness	Utilising continuous feedback loops to improve prototypes and speed up the development process.	Feedback loops (Kviselius *et al.*, 2009; Katzy, Baltes and Gard, 2012; Liedtke *et al.*, 2012; Krogstie *et al.*, 2013)	
	Receiving feedback to new prototype versions throughout the test phase.	Continual iteration (Bergvall-Kåreborn *et al.*, 2010), iteration (Gulliksen *et al.*, 2009), iterative process (Schuurman, Mahr, *et al.*, 2013)	
	Presenting prototypes that reflect a work-in-progress status to encourage co-creators to provide feedback.		X
Realism	Facilitating realistic use situations and behaviour as much as possible.	Authentic use situations (Bergvall-Kåreborn, Holst and Ståhlbröst, 2009)	
	Re-creating or simulating the real-world settings.	Realism (Ståhlbröst, 2012), Real-Life Contexts (Almirall and Wareham, 2008), Natural Setting (Schuurman *et al.*, 2013), LL Environment - Real-world context (Veeckman *et al.,* 2013)	
Openness	Providing access to a variety of co-creators.	Openness (Ståhlbröst, 2012), LL Environment - Level of openness (Veeckman *et al.,* 2013)	
	Receiving unfiltered feedback from non-targeted audience.		X
Connectedness	Linking companies through a common interest that is reflected in the theme world.		X
	Networking with co-creators and start-ups.	Networking among LL actors (Juujärvi and Pesso, 2013), networking (Niitamo *et al.*, 2006)	
	Sharing of knowledge and ideas among different stakeholder groups.	Wide knowledge sharing and communication (Niitamo *et al.*, 2006)	

Firstly, this study stresses the importance of explicitness in the co-creation process, as many stakeholders are not familiar with the concept. Katzy *et al.* (2013) suggest that an *"explicit explanation of the innovation activities"* is needed (p. 304). However, additionally, this study provides further details on how such communication should take place to maximise the effectiveness of the co-creation activities. For example, the LL concept has to be explained clearly to co-creators, but also to companies, to ensure expectations are managed and co-creative activities are fostered. Furthermore, three dimensions representing explicitness that are not covered in the literature emerged throughout the study. Firstly, the opportunities and shortcomings of LLs must be communicated explicitly. Secondly, company background information and how the co-creator's feedback is used has to be clearly communicated. Thirdly, a clear structure and storyline of the business islands, and in the overall theme world, has to be established. Insights derived in relation to the principle explicitness are largely new contributions to the literature and have not been highlighted in existing studies.

This study also recognises adaptiveness as a key principle in the co-creation process in LLs. There are three dimensions to this principle (offering changing themes, applying varying and new methods, providing a flexible platform) two of which have not been recognised in existing research. Consistent with earlier studies, this thesis demonstrates the importance of applying varying and new methods for co-creators to provide ideas and suggestions. Indeed, to increase usage and improve the abilities for actors to participate – regardless of the skill level – extant literature (van der Graaf and Veeckman, 2014; Rosado *et al.*, 2015; Voytenko *et al.*, 2016) recommends offering different tools, and this is *"to guarantee that every citizen, also those who lack specific capacities, is able to become involved and be heard"* (van der Graaf and Veeckman, 2014, p. 82). In addition, this study also highlights two dimensions of adaptiveness that have not been discussed in earlier studies. The case of JOSEPHS® stresses the importance of changing themes in the LL to attract, continuously, not only new companies but also new co-creators, and also arouse interest among regular visitors. Furthermore, providing a flexible platform to serve B2C as well as B2B projects is considered a beneficial feature that relates to the adaptiveness principle. To summarise, these two dimensions of the principle 'adaptiveness', which are the changing LL themes as well as having a flexible platform, contribute new knowledge to the academic debate.

Moreover, interactiveness is identified as a core principle comprising six dimensions, two of which are not discussed in the relevant literature. Similar to earlier research (Leminen, Westerlund and Kortelainen, 2012; Friedrich, Karlsson and Federley,

2013; Kaasinen and Koskela-Huotari, 2013; Ståhlbröst *et al.*, 2013; Juujarvi *et al.*, 2016), this study highlights the significance of establishing a comfortable and open atmosphere, as an essential prerequisite to foster co-creative activities in LLs. However, this study draws, also, particular attention to an informal and casual atmosphere in workshops, which is not emphasised in existing LL literature. Some studies mention that a LL is an interactive space (Parker, Wills and Wills, 2013), or offers an interactive setting (Beutel, Jonas and Möslein, 2017); however, these studies do not further explore how such a space should be designed to reflect interactiveness. Instead, this thesis contributes to the literature by describing how interactiveness is promoted through the specific design of the physical LL space. Further aspects demonstrating interactiveness, and which are not, previously or explicitly, discussed in the literature, are an intuitive and playful layout, and the use of tools, which are fun and familiar to the experience of co-creators.

This study also discovers the core role of iterativeness, as one of the cornerstones of LLs. In line with several studies stating that feedback loops (Kviselius *et al.*, 2009; Katzy, Baltes and Gard, 2012; Liedtke *et al.*, 2012; Krogstie *et al.*, 2013), and an iterative process (Gulliksen *et al.*, 2009; Bergvall-Kåreborn *et al.*, 2010; Schuurman, Mahr, *et al.*, 2013), are an important LL feature, this research recognises the opportunity to utilise continuous feedback loops as an important element that is advancing the development process of prototypes throughout the test phase in LLs. Adding to extant literature, this study also finds that presenting prototypes that purposely reflect a work-in-progress status encourages co-creators to provide feedback.

Further, this study acknowledges the critical role of realism in co-creative innovation processes in LLs. Indeed, several LL frameworks stress the role of realism (Ståhlbröst, 2012), real-Life contexts (Almirall and Wareham, 2008), natural settings (Schuurman *et al.*, 2013), or a real-world context (Veeckman *et al.,* 2013). Similarly, Bergvall-Kåreborn, Holst and Ståhlbröst (2009) highlight the presence of authentic use situations in LLs. Therefore, the principle of realism, identified in this study, is aligned with the findings of earlier research (Almirall and Wareham, 2008; Bergvall-Kåreborn, Holst and Ståhlbröst, 2009; Ståhlbröst, 2012; Schuurman, Marez, *et al.*, 2013; Veeckman *et al.*, 2013).

As the phenomena under study has its roots in the OI literature, it is of no surprise that openness as a principle is a critical one. Two other frameworks that discuss LL characteristics (Veeckman *et al.,* 2013) and principles (Ståhlbröst, 2012) also emphasise this aspect. For example, Ståhlbröst (2012, p. 4) states that *"openness is crucial for innovation processes in LLs due to efforts to gather a multitude of perspectives in order to develop as attractive an innovation as [much as] possible."* Similarly, Veeckman *et al.* (2013) argue that the innovation process should be as open as possible to incorporate a

multitude of perspectives, which can speed up the development and deliver more innovative ideas. In this vein, the findings of this study also stress that openness provides important access to a variety of co-creators, which in turn offers access to their feedback. In addition to the existing research, this thesis also recognises the value of receiving unfiltered feedback from a non-targeted audience, underpinning the openness of the LL to all people and not from a predefined and limited target group. This particular aspect has not been discussed in the literature, and hence, makes a new contribution to the existing knowledge.

Finally, this study recognises connectedness as a principle that guides LL operations. This principle is informed by three dimensions. This study identifies that connecting companies through the theme world is addressing a common interest that helps to facilitate connectedness and a knowledge exchange. This aspect has not been explored in the context of LLs, and therefore, depicts an addition to the current knowledge on co-creation in LLs. In accordance with earlier research (Niitamo *et al.*, 2006; Juujärvi and Pesso, 2013), which recognises networking among LL actors as a beneficial feature of LLs, this study describes the value that companies may derive from networking with co-creators and start-ups in such a space. Moreover, this thesis has put an emphasis on wide knowledge sharing and communication among the different stakeholders in the LLs. These insights also align with the work of Niitamo *et al.* (2006).

6.1.3.2 People

In line with extant literature, this research acknowledges the multi-stakeholder nature of JOSEPHS®*.* Indeed, various studies stress the engagement of multiple stakeholders (Schaffers and Kulkki, 2007; Feuerstein *et al.*, 2008; Almirall and Wareham, 2011; Westerlund and Leminen, 2011), and consider the facilitation of the co-creation process as the core service of a LL (Mulder and Stappers, 2009).

Compared to previous studies, the findings from this research show the importance of facilitation, and unpack the role of people, who are facilitating the co-creation process between the various different actors. JOSEPHS'® staff act as an intermediary, on the one hand, by interacting with the companies, and on the other, with the co-creators to enable the joint innovation process. No previous studies explore how people, as facilitators, enable the co-creation process in LLs. To support human facilitation in LLs, this study offers insights in relation to the characteristics, skills, and attributes that LL staff should possess to guide the stakeholder interaction and facilitate the co-creation process. Also, the literature remains silent on how people can facilitate the co-creation process. In response, this study recognises a number of principles that guide the facilitation of co-creation, through people, at JOSEPHS®. Firstly, the interaction of JOSEPHS'® staff with companies is guided by explicitness, interactiveness and iterativeness. Secondly, also the interaction

between JOSEPHS'® staff and co-creators is influenced by explicitness and interactiveness.

6.1.3.3 Place

This study recognises the critical role of the place as the setting for co-creative activities in a LL; and as it is currently unexplored in the present literature, this thesis offers new in-depth insights into the LL as a place that is defined by the location, physical layout and complementary facilities that support the co-creation process. Furthermore, this research also draws on the principles, identified in this study (see section 5.3.1), which are used to describe the place and its individual aspects.

Scholars acknowledge the presence of a LL environment, by defining it as having a real life context (Ballon, Pierson and Delaere, 2005; Eriksson *et al.*, 2005; Bergvall-Kåreborn *et al.*, 2009; Westerlund and Leminen, 2011), and a multi-contextual, and real-world setting (Konsti-Laakso, Pihkala and Kraus, 2012), and multi-contextual empirical real-world environments (Ponce De Leon et al., 2006). Although, studies recognise the environment, whether it is virtual or physical (Westerlund and Leminen, 2011) as an important aspect of LLs, they do not provide guidance concerning the location, physical layout of the space, as well as the complementary facilities that could enhance LL operations. Some LLs are established, for example, on university campuses (Femenías and Hagbert, 2013), or inside companies (Ståhlbröst and Holst, 2012), which naturally defines their location. However, for LLs like JOSEPHS® a location had to be chosen. While some studies document the geographical location of the LL, they do not explain why the specific location was chosen nor how the location is supporting the LLs' goals. In contrast, the rationale for JOSEPHS'® location and its consequences are explained in this study. With regards to the physical layout of LLs, Gascó (2017) stresses the importance of the infrastructure which needs to reflect upon the open culture that stimulates innovation inside its walls. The study identifies that *"the space, the building, matters a lot"* (Gascó, 2017, p. 94). Yet, Gascó (2017) does not specify how the building and space must be set-up in order to realise an open culture. Again, this is an insight that this study delivers by outlining the physical space and specific features that support the co-creation process. The findings concerning the realism principle are consistent with existing literature and therefore not marked as a contribution in Table 32. This research, however, provides, through the case description of JOSEPHS® (chapter 4) additional knowledge with respect to this principle. By focusing on the specific LL features that constitute the real life context in which innovation takes place, which has not been discussed in such detail in earlier studies, this research contributes to a better understanding of the manifestations and practical implications associated with realism.

Methods and tools in LLs remain an under researched area (Bergvall-Kåreborn and Ståhlbröst, 2009; Leminen and Westerlund, 2017). However, a recent study by Leminen and Westerlund (2017) draw attention to the methods and data collection tools employed to support innovation in LLs. While various studies on LLs refer to the adoption of a standardised, and predefined set of tools in a number of activities (Ponce De Leon *et al.*, 2006), they do not explicitly describe them (Leminen and Westerlund, 2017). Budweg *et al.* (2011) suggest that LLs should adjust the application of their methods depending on their maturity phase, with the more experienced LLs being inclined to seek a standardisation of their usage methods. Følstad (2008) presents an overview of the literature assessing the state-of-the-art of LL processes and methods. The study identifies five LL methods: an analysis of the system that logs or automatically collects behavioural data, ethnographic research, questionnaires, focus groups, and observations. Evidence from this thesis confirms the use of such a portfolio of tools.

6.1.4 Co-creation Outcomes

This research makes three contributions to the knowledge about co-creation outcomes in LLs. Firstly, this study reports eight categories of measurable project outcomes, and these include market acceptance, price acceptability, exposure, product testing, market intelligence, legitimisation, method testing, and networking. An overview of the project outcomes is presented in Table 33.

Table 33 Overview of Project Outcomes

Project Outcomes		
Access to Co-creators	Market Acceptance	Product Testing
	Price Acceptability	Market Intelligence
	Exposure	Legitimisation
Access to JOSEPHS®	Method Testing	
	Networking	

Further, this study not only highlights what companies have achieved in comparison to their original project objectives, but also identifies the additional unplanned outcomes that they accomplished. In this study, seven out of the eight categories of co-creation outcomes are consistent with the categories of the project objectives discussed in section 6.1.2; this section refers to them as planned outcomes. They include market acceptance, price acceptability, exposure, product testing, market intelligence, method testing, and networking. In addition to the planned outcomes, also one new category of unplanned project outcomes is identified: Legitimsation.

Moreover, this research recognises that companies seek input from co-creators but also from JOSEPHS® itself. This is highlighted in the two categories that present the project outcomes in Table 33. Although, the current literature acknowledges the involvement of multiple stakeholder in the co-creation process (Schaffers and Kulkki, 2007; Feuerstein *et al.*, 2008; Almirall and Wareham, 2011; Westerlund and Leminen, 2011), the focus predominantly lies on the co-creator with regards to their ideas, suggestions and feedback, which ultimately produces value to the companies. Thus, these findings expand on the current literature, which predominantly focuses on the value user feedback generates for companies (Dutilleul, Birrer and Mensink, 2010; Nyström *et al.*, 2014), by accentuating the value that the LL, itself, can deliver to the firms as beneficiaries of the LL services.

6.2 Filling the Research Gaps

The systematic literature review reveals three gaps in the literature (see section 2.2.5) that this thesis addresses through the following research questions:

RQ 1: How can co-creation be facilitated in LLs?

a. *What are the motivations for companies to engage with co-creation in LLs?*
b. What *are the factors that play a role in facilitating co-creation in LLs?*
c. *What are the realised co-creation outcomes for companies in LLs?*

Firstly, the systematic literature review uncovers a gap in the literature related to the companies' specific motivational drivers for participating in a co-creation project. Understanding the motivation of companies to carry out such projects helps guiding firms and facilitators on how to fully utilise LLs. As a result of this study, in-depth insights regarding the specific motivations of companies to engage with co-creation in LLs are presented in section 5.2. This is the first study that identifies seven types of project objectives that motivate companies to engage in co-creative innovation activities in LLs. The findings further differentiate between 'access to co-creators' and 'access to JOSEPHS®' that companies seek in the LL under study. Specifically, the access to a LL per se, and not just to its co-creators, is a finding not discussed in existing literature. Differently to previous studies, this research provides a list of specific objectives, which can be measured and are associated to particular organisational activities and functions. Table 31 offers an overview of the findings in comparison to existing studies.

Secondly, the systematic literature review highlights that numerous studies focus on the conceptualisation of LLs by identifying different characteristics. However, studies fail

to explain how such characteristics affect LL operations with respect to the people and the environment in which they interact. Considering the multi-stakeholder nature of LLs, this study incorporates the views from companies, co-creators and LL facilitators to understand the co-creation process in LLs, and explores the factors that play a role in facilitating it. Findings presented in section 5.3 show that seven principles support JOSEPHS® operations. More specifically, this study reveals how these 'Principles' (see section 5.3.1) relate to the 'People' (see section 5.3.3) that create and interact with the 'Place' (see section 5.3.5). While some principles have been analysed in isolation, previously, by other scholars, this study highlights the relevance and interconnectedness of principles with the people and place. Table 32 presents the seven LL principles, including their specific dimensions, which this study identifies, mapping them against existing research.

Thirdly, the systematic literature review uncovers that studies on co-creation outcomes are rather vague and refer to the general benefits associated with co-creation, such as a faster speed to market (Alam, 2002) and a closer fit with customer needs (Fang, 2008), often not discussed in a LL context. Furthermore, the realised outcomes in comparison to their project objectives are not analysed in existing research. To understand and assess the effectiveness of LL operations, this study identifies eight categories of realised co-creation outcomes to determine the extent to which performance is congruent with expectations (see section 5.4). Also, in-depth understanding of the nature of projects that relate to these outcomes is offered. Furthermore, this thesis differentiates between planned and unplanned project outcomes to highlight what outcomes companies expected to accomplish and what was unexpectedly achieved.

This study fills three research gaps related to (i) the motivation of companies carrying out co-creation projects, (ii) the factors that play a role in facilitating the process, and (iii) the outcomes of the co-creation projects. Finally, the relationship linking these three areas is presented through *'The Five Ps of Co-creation Facilitation in Living Labs'* framework which is discussed in section 6.1.1.

6.3 Propositions to Facilitate Co-creation in Living Labs

Based on the empirical findings discussed in this chapter, this study puts forward three propositions, which are summarised at the end of this section in Figure 21. The propositions are falsifiable and supported with evidence, as referenced in the following sections.

6.3.1 Proposition #1

This study investigates the motivations for companies to engage with co-creation in LLs (RQ1a). By studying a range of co-creation projects and the companies' motivation to pursue them (see section 5.2), it became apparent that the motivations to carry out co-creation projects differ. Equally, also the innovation stage of products and services presented in the LL vary from early ideas to pre-commercialisation validation. Insights from this study suggest that the suitability of a LL depends on the innovation stage of the product or services that is co-created. For example, Company P presented a mock-up because their prototype was not ready for the test phase and, therefore, co-creators could not authentically engage with the device (see section 5.4.1.4). Indeed, Company P states that one of their project objectives could not be addressed: *"Originally we wanted to observe how the device copes for one and a half months without supervision. However, right before the project started, we modified the device, so that just limited features were available and the particular part that we originally wanted to observe was omitted."* On the other hand, LL facilitators stress that the product or service should not be fully developed. Indeed, they argue that the presentation of prototypes that reflect a work-in-progress status encourages co-creators to provide feedback (see section 5.3.1.4). LL Facilitator J from JOSEPHS® elaborates that a fully designed prototype is not very appealing to co-creators, because it does not inspire them, and gives the impression that it is fully developed and does not require further input. Also, the barrier to engage in the process is bigger for co-creators, as they may not feel confident about suggesting improvements to a prototype that is already designed to a high standard. In line with this argument, Co-creator G explains that a product or service at a later development stage is not appealing to him: *"If it is too shiny or more product presentation and it's not talking to me "hey use me, try me" […]. Then it's more like an exhibition."* As a result, co-creators are less inclined to give feedback which in turn has negative implications for the co-creation project. For this reason, it is important that JOSEPHS'® staff encourages companies to present early prototypes that have not been fully designed to promote an iterative co-creation process (see section 5.3.1.4). Considering these findings, the following proposition is articulated:

Proposition #1: A LL is most suitable for products or services that are in a prototyping stage of the innovation process.

6.3.2 Proposition #2

This study examines the factors that play a role in facilitating co-creation in LLs (RQ1b). Interaction is identified as a key principle that supports all three phases of the co-creation

process at JOSEPHS® (see section 4.2; section 5.3.1.3). However, the insights from this study also suggest that the level of interaction between LL facilitators and companies changes throughout the three phases of the co-creation process. During the briefing and research design phase, LL facilitator present the LL concept, offer advice and guidance in defining the research question and design of the business island, the company, instead provides background information about the business and respective product or service to the LL facilitator. This first phase is characterised by information exchange and interaction to set-up the project. Also, the last phase requires LL facilitators and companies to interact when results and recommendation for action are being presented. Yet, the level of interaction is far less during this phase compared to the test phase. Participating companies of this study praise the interaction with LL facilitators in general (see section 5.3.3.1) but put even greater emphasis on their important role during the test phase. In particular, interaction during the three months test phase represents a prerequisite for continuous prototype iterations which speeds up the development process. This phase is characterised by a greater level of uncertainty as reactions and feedback from co-creators are difficult to predict. Therefore, high level interaction to assess the effectiveness of their project, and for iterative development purposes is required. For example, Company F relied upon frequent feedback provided by the LL facilitators because their developers abroad *"wanted to get regularly feedback and not just in the end, because they had to keep developing it"* (see section 5.2.1.1). Also, Company K stresses the importance of frequent contact with the LL facilitator responsible for their business island. The interviewee refers to the LL facilitator as his *"Guardian Angel"* who he contacts *"at every opportunity, when there are changes, when something moves along"* (see section 5.3.3.1). Also, Company O benefitted from regular interaction with LL facilitators: *"What was good was, that we, let's say, received very early the feedback, not after three months […] but we had, let's say, at any time access to the questionnaires. We received a weekly report and were able to see the feedback to each point. And had through that the opportunity to develop our conceptional thought: Okay, why doesn't this work? And what feedback did the users give?"* (see section 5.3.3.1). Another example highlighting the importance of high levels of interaction between LL facilitators and companies relates to refinement of project objectives during the three months test phase. For example, Company N changed their project focus in the beginning of their test phase at JOSEPHS® (see section 4.3). Due to regular communication and project progress updates, it became apparent that most of JOSEPHS'® co-creators do not represent Company N's typical customers and due to the specifics of the product, it was difficult to receive insightful feedback from them. The continuous feedback and interaction that JOSEPHS'® staff provides companies during the test phase helps to identify such challenges, discuss them and redirect the attention of the project. As a result, the project of

Company N slightly changed from testing the actual product to focusing more on their online configurator. Also for Company J it was important to reflect on interim feedback and adjust their approach. The company experienced challenges in receiving content-related feedback, as co-creators were not interested in the design aspects of the product. The company explains: *"We are interested in opinions regarding the content and not design. Many, many visitors said the box on the [product] is too big, it is way too big and way too heavy. […] Many still focused on the design and just after we told them, that we are already aware of it then they told us other content related feedback"* (see section 5.3.1.6). These examples provide further evidence that interactiveness is important, in particular throughout the test phase which enables companies to iterate their prototypes, redirect attention to a different area of the project or prototype, as discussed in section 5.3.1.3 and section 5.3.1.4. Considering these findings, the following proposition is articulated:

Proposition #2: Successful co-creation projects require high levels of interaction between LL facilitators and companies during the three months test phase.

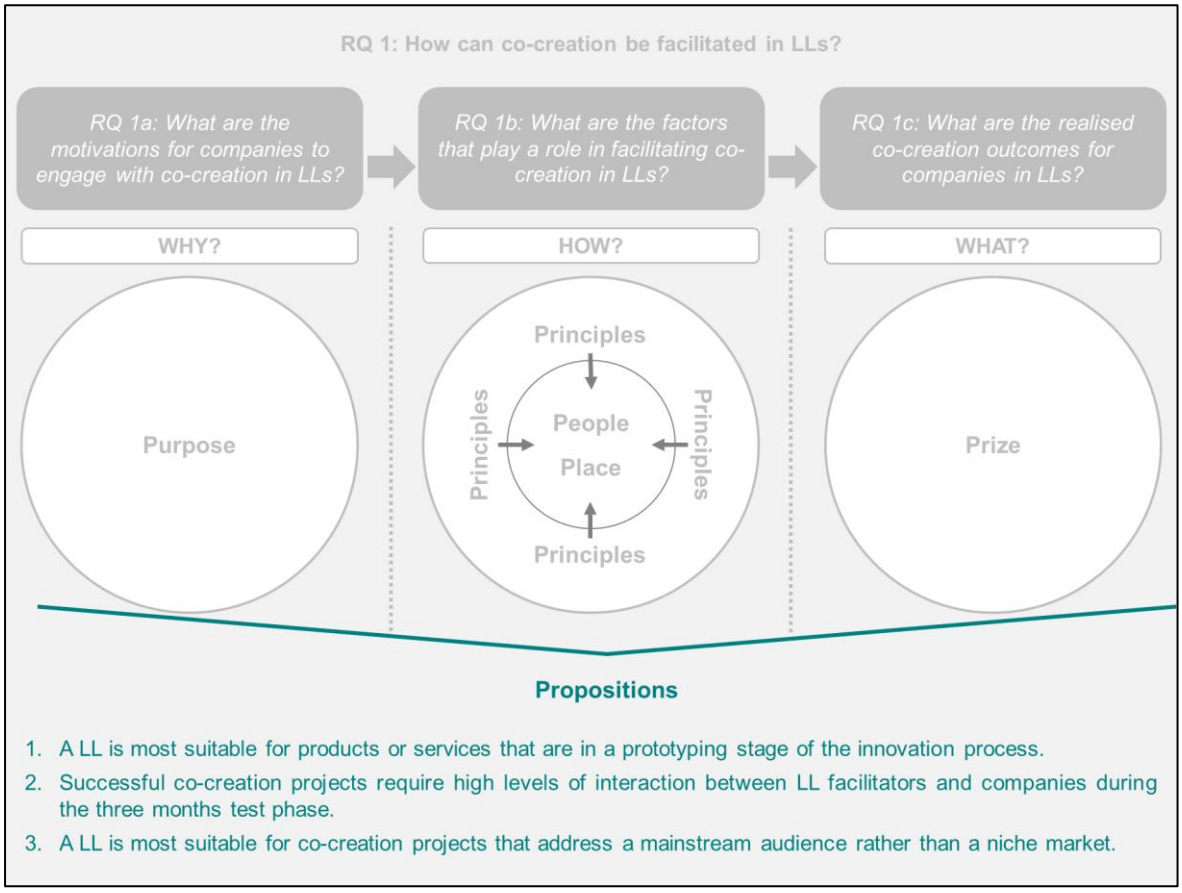
6.3.3 Proposition #3

Taking into account if companies met their initial project objectives, this study examines their realised co-creation outcomes (RQ1c). The findings of this study show that the vast majority of companies met their initial co-creation objectives (see section 5.4.1). However, the findings also suggest that projects which focus on products or services that are aimed at a niche market face difficulty in obtaining useful feedback from co-creators. For example, Company G's product is aimed at disabled children: *"Our target audience wasn't represented [at JOSEPHS®]. This was very noticeable. Some of the young people thought it was a bit boring, […] This was one of the most common criticisms […]."* Although co-creators provided feedback on the product, Company G did not find it useful (see section 5.4.1.1). As explained in section 4.3, Company N also faced challenges in obtaining valuable insights due to the specific target audience of the product which is not widely represented at JOSEPHS®. While it does not mean that companies with niche products or services cannot benefit from a co-creation project in a LL, these companies need to focus on aspects of their products and services that are suitable for co-creation contributions from a mass market audience – in case of Company N, the online configurator. Indeed, the large number of projects that met their initial project objectives all focused on aspects that a mainstream audience can offer feedback on. Companies that show awareness regarding the multitude of co-creator demographics at JOSEPHS®, also consider it in their project design from the start. For example, Company A2 explains they that were interested in

asking *"people on the street how they like the product"* (see section 5.2.1.1). Similarly, Company M states their focus was on a variety of demographics: *"We wanted to engage a range of people."* The companies that stated that they obtained useful insights and met their initial project objectives all showed awareness of the variety of co-creators that JOSEPHS® attracts and focused on aspects in their project that this audience can offer feedback on. For this reason, the following proposition is articulated:

Proposition #3: A LL is most suitable for co-creation projects that address a mainstream audience rather than a niche market.

Figure 21 Propositions



6.4 The Innovation Potential of Living Labs

This study highlights the innovation potential of LLs and reveals three particularly interesting areas that require further investigation.

Firstly, the multifaceted nature of LLs is reflected in the variety of motivations that drive companies to engage in co-creation projects, but also in the range of outcomes that can be achieved (see section 5.2 and 5.4). This study shows that companies pursue

multiple objectives when engaging in co-creation projects in LLs. Further, more than half of the companies, examined in this study, achieved more outcomes than what they had anticipated, which underpins the innovation potential of LLs. However, it is unclear why this is the case. One possible explanation could be linked to the specific project guidance that the LL facilitators provide to the companies. Does the time, effort, information, and general project support, provided by the LL facilitators, influence the overall number of project outcomes? For example, one can assume that companies that receive extensive support through the LL facilitators achieve more project outcomes. By clearly describing the broadness of the projects that can be carried out in a LL, and by drawing on the examples and best practices of previous cases, companies are more aware of the potential and opportunities that they can exploit during the co-creation project at a LL. Another reason to explain the number of project outcomes could be related to the length and depth of the briefing and research design phase (see 4.2.1), which could mean that companies that spend more time and effort in the preparation of their co-creation project, and are guided through the process by the LL facilitator, achieve more outcomes, as they are better prepared. On the contrary, companies that receive less project support from the facilitator could be more likely to receive fewer outcomes. Yet, this could also lead to more unplanned outcomes because they have not recognised or exploited the versatility of the LL. Similarly, one can assume that less time spent on the initial planning phase could lead, overall, to less outcomes. In contrast, the reason that some companies achieve more outcomes, as a result of their co-creation project, can also be due to firm specific characteristics that are linked to their specific product or service, or their level of experience with such projects. However, these assumptions have to be proven in future research.

Secondly, this study also highlights that companies do not identify legitimisation as a project objective, whereby, almost one third of the companies recognise it as an unplanned outcome (see section 5.4.1.6). The findings highlight that companies value the testing with co-creators as it reinforces and supports their communication with the internal and external stakeholder. The reason why legitimisation is not mentioned by any company, as a project objective, is not clear. However, one reason may be that LLs are not aware of some of the outcomes that are only taking effect after a project is completed; and therefore, the facilitators do not communicate during the briefing phase that legitimisation can be achieved through a co-creation project. For this reason, it would be useful to further explore how legitimisation, achieved through co-creation projects, empowers companies, both internally and externally. This could provide evidence for LL facilitators to leverage this during the initial briefing and research design phase.

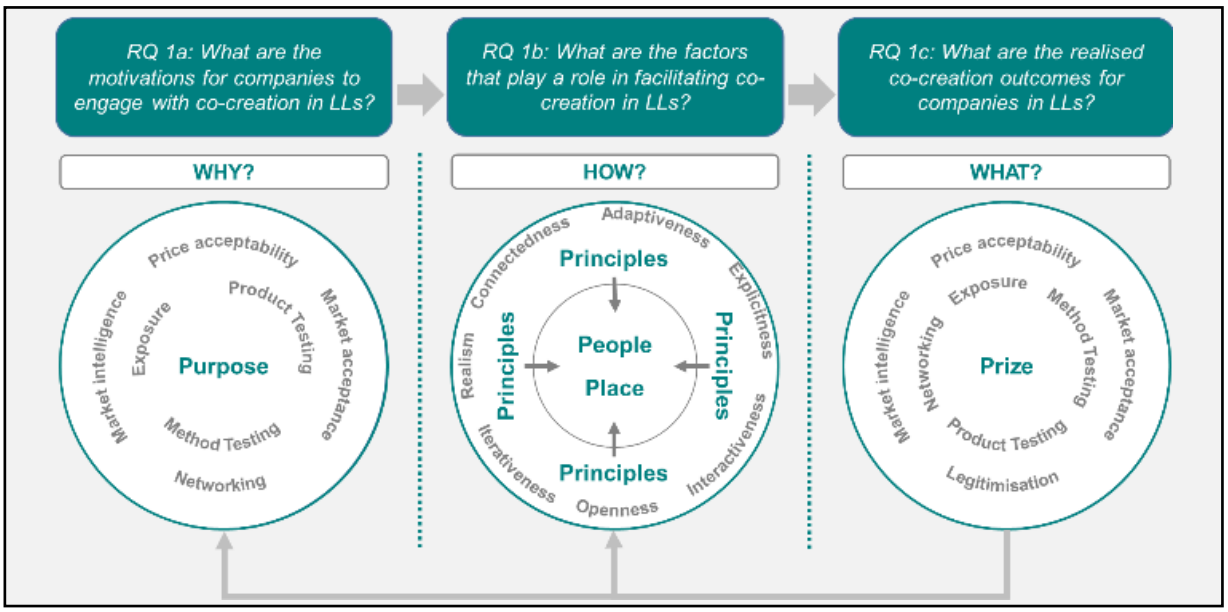
Thirdly, while extant literature discusses a number of benefits that are derived through the involvement of co-creators, or other stakeholders such as universities and

suppliers in the innovation process, this study also recognises the value that LL facilitators add to the process. For example, companies want to engage with JOSEPHS® also because of their experience with co-creation projects. Since JOSEPHS'® opening, LL staff was able to acquire a lot of tacit knowledge over time that is not easily accessible by others. Yet, through the interaction and guidance of JOSEPHS'® staff, companies are able to tap into their tacit knowledge and make use of it in the context of their own co-creation project. Although, some information is accessible through JOSEPHS'® website and other sources, it is a challenge to make this knowledge available to other stakeholders. Internally, through regular email updates all LL staff are informed about any news. Externally, the LL provides access to a number of case studies and publications on their website. Also, the staff is conducting workshops on a variety of topics that can support companies in their endeavour to engage in co-creation activities. More recently, they also started offering consulting services to help companies in setting up the structure and daily business of their LL. However, how to effectively capture and transfer the knowledge that LL facilitators hold, to fully make use of the innovation potential of LLs, is an area for future research.

6.5 Summary

This chapter discusses the empirical findings and highlights the contributions of this study to the ongoing academic debate about facilitating co-creation in LLs. Insights associated with each of the three sub-research questions are addressed in the context of the existing literature by highlighting the findings related to the purpose of companies' engagement in co-creation, the principles that shape the interaction of people in the place where co-creation takes place (Table 32), and the prize as an ultimate co-creation outcome. The integration of the three sub-research questions build the foundation for answering the overarching research *question "how can co-creation be facilitated in LLs?"*, through the formulation of the original '*The Five Ps of Co-creation Facilitation in Living Labs*' framework (see Figure 22). Finally, the chapter draws attention to three very interesting findings that require further exploration. Firstly, more than half of the companies examined in this study achieved more outcomes than anticipated. Secondly, companies do not identify legitimisation as a project objective; whereby, almost one third of the companies recognise it as an unplanned outcome of their project. Thirdly, companies derive value not only through the interaction with co-creators but also through the LL facilitators.

Figure 22 The Five Ps of Co-creation Facilitation in Living Labs



7 Conclusion

This chapter concludes the thesis. Contributions to theory and practice are presented. Also, research limitations and opportunities for future research are discussed.

7.1 Contributions

This research aims to address the research question: ***"How can co-creation be facilitated in LLs"***. Three sub-questions, connected to the overarching one, that are explored in this research are:

a. What are the motivations to engage with co-creation in LLs?
b. What are the factors that play a role in facilitating co-creation in LLs?
c. What are the realised co-creation outcomes for companies in LLs?

This research contributes towards a better theoretical and practical understanding of co-creation in LLs and how this process can be facilitated successfully. Section 7.1.1 discusses the contributions to theory, whereas section 7.1.2 presents contributions to practice.

7.1.1 Contributions to Theory

This study makes a number of contributions to theory. Firstly, through the conceptual framework and findings, this research has identified and linked important factors of co-creation practices in LLs. To the researcher's knowledge, this is the first study that takes an integrated approach to the principles, people, and place that shape the co-creation process in LLs. Generally, previous studies have attempted to define LL principles and guidelines for interaction without necessarily considering how this translates into the design of the physical space, or the behaviour of the people that interact in the space. Therefore, existing research fails to identify and specify how these aspects are linked and affect one another. This research has expanded on these issues and combined themes into an integrated framework that conceptualises the key co-creation factors by building a foundation for three critical propositions that should be considered when facilitating co-creation in LLs.

Overall, seven categories of co-creation objects could be identified in this study, four of which have not been addressed in the LL literature: price acceptability, exposure, market intelligence, and method testing. Furthermore, this study also recognises that companies not only derive value from the involvement of co-creators in the innovation process, but also through the interaction with LL facilitators. With regards to the seven

principles identified in this study, six of them reveal new dimensions that have not been discussed in the literature. These include explicitness, adaptiveness, interactiveness, iterativeness, openness, and connectedness (see Table 32). Finally, this study also reported eight categories of co-creation outcomes that companies achieved through their project. Extant literature has not provided insights about the measurable outcomes of co-creation projects in LLs, making this a novel contribution. Moreover, this study reveals planned and unplanned outcomes which highlights the congruence and discrepancy of individual projects between objective and realised outcomes.

Also, this study attempts to contribute to clarifying the nature of co-creation in LLs through empirical research that is drawing on an in-depth case study and three different stakeholder perspectives. The study identifies that the three stakeholder groups largely agree on the elements that are contributing to the successful facilitation of co-creation in LLs. However, co-creators do not focus on iterativeness or realism as key principles. Similarly, they do not pay attention to the interaction between LL staff and companies. While co-creators value the interaction with LL facilitators, co-creators do not reflect on the specific characteristics, skills and attitudes that are necessary to engage in such relations. These findings are new but are not surprising, as co-creators are detached from the direct interaction with companies, and are less interested in the relationship between the LL staff and companies. On the other hand, this study reveals that LL facilitators do not report 'connectedness' as a key LL principle. The value of being connected to one another through the LL is clearly articulated by companies but also by co-creators; however, the facilitators have not recognised or exploited the full potential of the wider ecosystem of the LL.

7.1.2 Contributions to Practice

In addition to the theoretical contributions, this study has also made a number of contributions to practice. This research is of particular interest to managers, LL facilitators, and policy makers.

Understanding co-creation in LLs is particularly important for managers considering the fact that they may be likely to lose out on the rewards associated with this approach if they do not understand how value is co-created in LLs. There is a growing recognition that collaborative relationships between businesses and customers can offer opportunities to create competitive advantages. Co-creation offers companies and their network of stakeholders important opportunities for innovation, as each stakeholder provides access to new resources. The interaction process between stakeholders, therefore, can provide them with opportunities to facilitate value creation for and with each other (Grönroos 2008). It is critical that managers are able to understand the concept and

the activities that are carried out internally, or developed in conjunction with other stakeholders, in order to execute co-creation well. The findings show that this is relevant for companies across industries, irrespective of their size, who want to utilise a LL as effectively as possible. Furthermore, the results from the thesis are also relevant to those companies interested in building their own LL. The findings of this study identify important principles that should be considered in the design of such an environment, and in the interaction with stakeholders. This study provides guidelines that can support companies' innovation processes and offers insights into the potential, as well as the limitations, of LLs.

This study is also of importance to LL facilitators. As the core service of a LL is to facilitate co-creation by acting as an interface between multiple stakeholders (Mulder and Stappers, 2009), it is important for the LL staff to understand the motivation of different stakeholders involved in the process. In order to encourage people to engage in the co-creation process, it is important to understand what they expect from co-creation (Füller, 2010). Füller (2010) argues that people only engage voluntarily in the co-creation process if they consider it to be rewarding. Therefore, it is an essential prerequisite to first investigate what motivates people before the facilitator can develop the capacity to address their motivational aims. This study identifies seven reasons why companies engage in co-creation at JOSEPHS®, which build the foundation for the framework that outlines how the process can be facilitated. Moreover, the findings of this study can serve as a practical guide for designing the organisation of a LL, and the implementation of its capabilities, by drawing on the best practices that have proved valuable to JOSEPHS'® operations. This study specifies how LL principles influence the place itself, and also the activities that people carry out in the space. These insights can help in the designing of the physical space for a new LL, establish the relevant infrastructure, and guide the interaction of facilitators to foster co-creative behaviour among companies and co-creators. However, this study also serves established LLs and managers, by providing a practical framework for continuous improvement of their own LL by opening the "black box" of a LL. Furthermore, the planned and unplanned project outcomes, identified through this study, can also inform them about LLs communication strategies, so that they can articulate their value proposition more clearly, and set and manage expectations consistently. The study provides a better understanding of the co-creation experience in LLs, and adds important new knowledge to the literature by creating insights into the LL practices on a project level.

Finally, this study is highly relevant for public body stakeholders. As policy makers and local governments support LL activities by providing financial, and legislative resources, as well as geographical space (Katzy, 2012; König and Evans, 2013; Karvonen, Evans and Van Heur, 2014), the findings of this study can deliver important insights by explaining how innovation performance can be nurtured in LLs. This study can help policy

makers to understand what works in practice, and what kind of policy environment is needed, in order to support regional and national innovation efforts more effectively. For example, based on the insights provided in this thesis, public authorities can establish conditions for companies to engage in LLs. Public funding can be made available for companies that utilise a LL in accordance to specific requirements, and designed according to the results of this study. For instance, the Bavarian Center for Cultural and Creative Industries enables companies with limited resources to conduct a co-creation project at JOSEPHS®. While they make the financial resources available for companies to carry out such a project, the Bavarian Center for Cultural and Creative Industries do not provide any guidelines to companies on how to engage with the project. Including such guidelines can represent an opportunity to maximise the innovative potential of the companies' engagement with LLs. The findings of this study can be deployed to harmonise national and regional innovation initiatives with the aim of optimising public and private investments in the targeted market. The framework of this study allows public authorities to support co-creation activities in LLs more systematically and enables them to formulate public policies around them. This study also puts forward four propositions that should be considered for successful co-creation facilitation in LLs.

7.2 Limitations

This study has two main limitations.

First, the single case study approach that is employed in this research has its limitations. The single case study of JOSEPHS® does not lend itself to generalising findings, statistically, about an entire field of practice, which is often expressed as the absence of external validity. Thus, the findings of this study are not necessarily entirely applicable to other LLs. However, single case studies deliver a deeper understanding of the subject under exploration and are deemed more suitable when the researcher wants to create a high-quality theory (Dyer Jr and Wilkins, 1991). Dyer Jr and Wilkins (1991) also argue that single case studies allow the researcher to investigate, in much greater detail, the context within which the phenomena under study occurs. Thus, given the various types and characteristics of LLs, it is important to note that these findings have to be seen in the context of this specific case. Kennedy (1979) argues that the value of single cases in producing non-statistical inferences should not be underestimated, particularly in circumstances where new paths arise for which the inference rules have not been recognised. Single-case studies are considered to be *"strongest for exemplary circumstances where a researcher has gained access to a phenomenon that has been under-researched or even unknown"* (Zivkovic, 2012, p. 93). Therefore, to acquire in-depth

insights on how co-creation can be facilitated in LLs, a single case study research has been a suitable methodology for such an underdeveloped phenomenon (Yin, 2009). Future research, however, would benefit from comparative approaches, or from quantitative studies, to further explore the results of this study.

Second, this study took into account the perspective of LL facilitators, co-creators and companies. The sample size with regards to the data collection with companies can present some limitations. Although several different companies have been included in this study, only one representative per company has been involved in the focus group or interviews (with the exception of Company A). However, getting multiple respondents from the same company was in some cases either not suitable or not possible. About one third of the companies that participated in this study are micro or small companies. This means that these companies consist of very few people, often only the founder and co-founder. Larger organisations, on the other hand, often had only one designated project manager that was responsible for their project at JOSEPHS®. In both cases, to address this potential limitation while ensuring companies were equally represented irrespective of their size, a key informant for each company was invited to take part in the study: the designated project manager or founder. This ensured that company representatives with the greatest knowledge and experience with the project were involved in this study.

7.3 Future research

Limitations also provide opportunities for future research, as an aid to enable a greater understanding of co-creation in LLs and how this process can be facilitated. Moreover, the findings and contributions from this study create exciting opportunities for future theoretical development as a result of the contributions made.

The propositions highlight the potential of LLs, but at the same time also the conditions required for such potential to be fully exploited. This study suggests that LLs are particularly suitable for projects addressing a mainstream audience (see section 6.3.3) and products or services at the prototyping stage (see section 6.3.1). LLs are just one example of a much broader family of innovation and demonstration environments, including for example OI labs, prototyping facilities, testbeds and scale-up facilities. However, the concepts to describe such environments are not clearly defined, and some terms are used interchangeably without coherence. Also, these environments differ with regards to their characteristics and focus (Ballon, Pierson and Delaere, 2005). For example, innovation and demonstration facilities differ in relation to their degree of realism they offer and the purpose they serve. Future theoretical contributions should seek to generate a clear taxonomy of innovation and demonstration facilities and identify their key characteristics. Findings from

this study suggests LLs, and potentially other innovation and demonstration environments, are not equally effective throughout the innovation life cycle and not for all project audiences. Thus, it would be beneficial to identify suitable innovation and demonstration facilities for projects addressing audiences ranging from niche to mainstream. A clear mapping of the most suitable facilities to support co-creation all along the innovation journey and for different audiences will represent an essential contribution to theory as well as a fundamental tool to support managers in their decision-making.

Furthermore, a clear evidence, emerging repeatedly throughout this thesis, is the critical role of LL facilitators. The importance of feedback and openness to external input to promote the innovation process is widely acknowledged in the literature (Enkel, Gassmann and Chesbrough, 2009; Gassmann, Enkel and Chesbrough, 2010; West and Bogers, 2014; Bogers, Chesbrough and Moedas, 2018); however this thesis creates novel opportunities to discuss organisational learning (Cohen and Sproull, 1996) and absorptive capacity (Cohen and Levinthal, 1990) in the specific context of LL engagement. Organisational learning refers to the process of creating, retaining, and transferring knowledge within an organisation. The theory suggest that an organisation improves over time as it gains experience (Argote and Miron-Spektor, 2011). Based on this growing experience, an organisation is able to create knowledge. In the case of JOSEPHS®, both the LL itself but also companies undertaking projects and returning to carry out further projects learn from their previous project engagement. In order to be innovative, an organisation should develop its absorptive capacity, which is defined as *"a firm's ability to recognise the value of new information, assimilate it, and apply it to commercial ends"* (Cohen and Levinthal, 1990, p. 128). Todorova and Durisin (2007) state that firms with high levels of absorptive capacity recognise the value of new external knowledge, acquire, assimilate or transform, and exploit new external knowledge. Future studies could seek to contextualise findings from such theoretical approaches with respect to LLs, due to their unique characteristics. Facilitators, for example, play a particular role in LLs and are fundamental stakeholder characterising the engagement with LLs. In a real-life environment with multiple stakeholders, the direction of the innovation and challenges the project may encounter are very difficult to predict. Therefore, the capability of facilitators and firms to adjust their role and actions to changing circumstances is essential. Future studies could focus on assessing companies' innovativeness as a result of their LL engagement, by understanding the extent to which they are able to recognise the value of new knowledge contributed by co-creators and facilitators and their ability to exploit it. At the same time, several of the companies studied in this thesis declared they are interested in carrying out further co-creation projects at JOSEPHS® in the future. To advance understanding of successful co-creation in LLs, it would be essential to understand, through an organisational learning

perspective, how past experience and knowledge acquired in previous co-creation activities shape and inform future interactions with LLs and their facilitators. For example, future research can investigate the organisational mechanisms that are put in place to learn from previous experience and continuously enhance the effectiveness of their co-creation efforts. Indeed, as companies have started to return to JOSEPHS® for a second project, it would be of interest to investigate how such projects are being developed, and how previous experience is shaping the co-creation process, their expectation and goal-setting for the new project.

Furthermore, building on this study, there are opportunities to apply *'The Five Ps of Co-creation Facilitation in Living Labs'* framework to assess other LLs. For example, through a multiple case study approach, future research can investigate under which conditions the framework holds true and what type of LLs require a revised version of the framework. This would allow researchers to validate the framework and prove that those LLs that consider the five Ps achieve better facilitation services. Also, a quantitative approach could be employed to test three aspects of the framework across a large number of companies that have utilised a LL: (i) What are the motivations to engage with co-creation in a LL? [Test against 7 categories that were identified in section 5.2], (ii) What are the principles that play a role in facilitating co-creation in LLs? [Test against 7 principles that were presented in section 5.3.1], (iii) What are the realised co-creation outcomes for companies? [Test against 8 categories that were identified in section 5.4].

Future studies could help to investigate any potential differences in motivation or project outcomes that may be attributable to the industry, company size, product or service tested in a LL, or phase of the innovation. This would allow researchers to further specify the circumstances and context in which the framework developed through this study is applicable. Also, it is important to examine why some companies achieve more co-creation outcomes than others. This could be due to factors associated with the company or product itself or relate to the support that the LL facilitators provide. Similarly, understanding differences across the three phases of the co-creation process with regards to challenges companies encounter prior, during, and after a co-creation project can support the facilitation efforts of the LL and ultimately influence the success of a project. To do so, researchers could observe and interact with companies during their LL project in the form of an ethnographic study.

To conclude, this study contributes to the research on co-creation facilitation in LLs and advances knowledge in the area of innovation studies. Although, this scholarly field receives growing attention, it is still in its infancy with many research gaps that need to be addressed. I hope the opportunities for future research, stated above, will attract attention and can be pursued in the near future.

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Appendices

Appendix 1 Kvale's List of Qualification Criteria of an Interviewer

Knowledgeable:	Is thoroughly familiar with the focus of the interview; pilot interviews can be useful.
Structuring:	gives purpose for interview; rounds it off; asks whether interviewee has questions.
Clear:	asks simple, easy, short questions; no jargon.
Gentle:	lets people finish; gives them time to think; tolerates pauses.
Sensitive:	listens attentively to what is said and how it is said; is empathetic in dealing with the interviewee.
Open:	responds to what is important to interviewee and is flexible.
Steering:	knows what he/she wants to find out.
Critical:	is prepared to challenge what is said, for example, dealing with inconsistencies in interviewees' replies.
Remembering:	relates what is said to what has previously been said.
Interpreting:	clarifies and extends meanings of interviewees' statements, but without imposing meaning on them.

Source: Kvale (1996)

Appendix 2 Questionnaire for Companies[4]

Questionnaire

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Cambridge Service Alliance

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Name .....

Company .....

1. Apart from your company's project at JOSEPHS®, have you explored JOSEPHS® as an 'ordinary visitor' and thereby tried out the prototypes of other companies?

Yes ☐ No ☐

a) How often have you visited JOSEPHS® as an 'ordinary visitor'?

_____

2. Have you or your colleagues supported the project as a 'company representative' on-site in order to get in contact with visitors directly?

Yes ☐ No ☐

a) How often have you visited JOSEPHS® as a 'company representative' in order to get in contact with visitors directly?

[4] Original questionnaire was in German

3. Have you had a similar experience to JOSEPHS® elsewhere? For example: Another Living Lab, Open Innovation Platform or similar.

Yes ☐ No ☐

a) In what form and where have you gained this experience?

b) How has this experience influenced the project at JOSEPHS®?

Appendix 3 Example of Fraunhofer IIS Press Release

Fraunhofer IIS

FRAUNHOFER-ARBEITSGRUPPE FÜR SUPPLY CHAIN SERVICES SCS

PRESSEINFORMATION

»Freizeit – aktiv und selbstgemacht«: die neue Themenwelt im JOSEPHS® entdecken

Seit Anfang November lädt das »JOSEPHS® – Die Service-Manufaktur« in der Karl-Grillenberger-Straße 3 in Nürnberg mit neuer Themenwelt wieder Besucher zum Gestalten, Ausprobieren und Mitmachen ein. Die nunmehr 3. Themenwelt steht unter dem Motto »Freizeit – aktiv und selbstgemacht«: Technologie für den Freizeitsport, digitale Häkeltrends, Basteln mit moderner Lasertechnologie und Public Gaming.

Auf der Themeninsel von [redacted] des fränkischen Erfolgs-Start-ups, werden mit einer neuen App und dem notwendigen Handwerkszeug neueste Häkeltrends gleich vor Ort ausprobiert, Anleitungen getestet und über den Lieblingsplatz zum Häkeln entschieden. Wie digital ist Handarbeit eigentlich heute und wo häkelt es sich am besten? Auf Omas Fernsehsessel, auf den Regionalbahnsitzen des DB Museums, auf den Flugzeugsitzen des Flughafens Nürnberg oder ganz woanders?

Das [redacted] zeigt, wie sich mit dem sogenannten Lasercutting-Verfahren kreative Bastelarbeiten realisieren lassen. Hier werden eigene Projekte entworfen und vektorisiert, die dann im Fab Lab Nürnberg mittels Lasercutting-Technologie geschnitten werden – so entstehen Christbaumschmuck, Schlüsselanhänger oder Kühlschrankmagneten aus verschiedensten Materialien.

Unter dem Thema Public Gaming können Besucher im ausklingenden Wissenschaftsjahr »Die Digitale Gesellschaft« auf der Themeninsel von [redacted] erfahren, wie digitale Spiele und Lernen sinnvoll verbunden werden. Die Besucher können mehrere Spiele ausprobieren, beispielsweise »hooked on music« und »remission 2« oder sich spielerisch über Themen wie Lichtverschmutzung informieren.

Unter dem Thema Public Gaming können Besucher im ausklingenden Wissenschaftsjahr »Die Digitale Gesellschaft« auf der Themeninsel von [redacted] erfahren, wie digitale Spiele und Lernen sinnvoll verbunden werden. Die Besucher können mehrere Spiele ausprobieren, beispielsweise »hooked on music« und »remission 2« oder sich spielerisch über Themen wie Lichtverschmutzung informieren.

Die Themeninsel des [redacted] zeigt, was sogenannte »Wearables« in Zukunft leisten. Wearables sind Technologien, die ihre Träger ständig oder in bestimmten Situationen begleiten. Gezeigt wird z.B. ein FitnessSHIRT, welches sowohl die Messtechnik für EKG als auch für die Atemerfassung integriert. Außerdem kann der Besucher ActiSENS selbst testen – einen Bewegungssensor mit dazugehöriger App, der erkennt, ob man springt, läuft oder stürzt, und dies grafisch darstellt.

Wer den Besuch im JOSEPHS® mit einem spannenden Aktionstag verbinden möchte, der kommt am **22. November zur »Winterfreizeit im JOSEPHS®«** vorbei. Neben den

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Fraunhofer IIS

FRAUNHOFER-ARBEITSGRUPPE FÜR SUPPLY CHAIN SERVICES SCS

ständigen Themeninseln findet der Besucher weitere Angebote, wie z.B. einen Häkel-Crash-Kurs von myboshi, die Preisverleihung der Consumenta 2014-Aktion, eine offene Sitzung des »Nürnberg Weltretter Jams« sowie musikalische Untermalung durch die Band luftlinie 391.

Das JOSEPHS® ist ein Laden in der Nürnberger Innenstadt und bietet auf über 400 m² Fläche »Werkstatt, Denkfabrik, Gadget-Shop und Genusswelt« in einem. Im JOSEPHS® können die Besucher auf Themeninseln die aktuellen Konzepte der Unternehmen vor Ort und in realem Umfeld testen und mit eigenen Ideen weiterentwickeln – kostenlos, so oft sie möchten und zu normalen Ladenöffnungszeiten. In der »Denkfabrik« finden Workshops und Vorträge statt. Entspannen und sich inspirieren lassen können die Besucher im angeschlossenen »Gadget-Shop« (Ultra Comix) und der »Genusswelt«, die von Mr. Bleck betrieben wird. »JOSEPHS® – Die Service-Manufaktur« ist ein Projekt der Fraunhofer-Arbeitsgruppe für Supply Chain Services SCS, das in Kooperation mit der Friedrich-Alexander-Universität Erlangen-Nürnberg durchgeführt und durch das Bayerische Staatsministerium für Wirtschaft und Medien, Energie und Technologie gefördert wird.

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Öffnungszeiten:

Montag-Freitag: 10-20 Uhr
Samstag: 10-18 Uhr

Die Mitarbeiter der Fraunhofer-Arbeitsgruppe für Supply Chain Services SCS untersuchen seit 1995 die komplexen Zusammenhänge von logistischen Netzwerken, ihrer Märkte, Prozesse und Dienstleistungen, um Versorgungsketten nicht nur schneller, besser, transparenter und profitabler zu machen, sondern vor allem auch nachhaltiger. Unsere langjährige Erfahrung in der Logistikbranche ist die Basis für unsere in der Praxis und Wissenschaft nachgewiesenen Expertise bei der Analyse, Entwicklung, Bewertung und Optimierung von Dienstleistungen, die die Versorgung von Menschen mit Gütern wie Rohstoffen, Lebensmitteln, Ersatzteilen, Geld, Energie oder sogar Wissen garantieren. Als neutrale Forschungseinrichtung gewährleisten wir einen unvoreingenommenen Blick auf alle Fragestellungen unserer Kunden und Partner aus Industrie, Handel und Dienstleistung sowie öffentlichen Institutionen.

Leitung Unternehmenskommunikation: Thoralf Dietz | Fraunhofer-Institut für Integrierte Schaltungen IIS | Am Wolfsmantel 33 | 91058 Erlangen | www.iis.fraunhofer.de | thoralf.dietz@iis.fraunhofer.de

Appendix 4 Pilot Study Interview Questions

Area of interest	Interview Questions
JOSEPHS'® concept	How would you describe JOSEPHS'® business model?
	What are JOSEPHS'® goals?
	Why is JOSEPHS® located in Nuremberg?
	How unique is JOSEPHS®? How does it differ from other concepts similar to JOSEPHS® as a benchmark or inspiration for?
	What do you want to do with the data that you collect?
	When we talk about co-creation at JOSEPHS®, do we merely talk about products or also services?
Co-creators	How do you describe your co-creators? Lead users? Demographic of audience?
	Do you incentive co-creators? What motivates co-creators to participate in co-creation?
	Are people familiar with the concept or do they usually experience co-creation for the first time?
	How do plan and design the customer interaction to get the most out of the process?
	How do you ensure that you capture all information/feedback from the customer?
Companies	How do you select companies for JOSEPHS®?
	In which development stage do companies involve co-creators in the innovation process?
	Can you describe the relationship you have with the companies at JOSEPHS®?
	Is there a certain criterion that defines which business is allocated to which island?
	Do businesses have experience with co-creation prior exhibiting in JOSEPHS®?
	Do you offer advisory service for the companies that participate at JOSEPHS®?
	How do companies protect their innovation?
	In terms of pricing, do you distinguish between different size companies and their financial resources?
	Which department in a company do you work with and provide the feedback to?
	What is the response from companies afterwards? Have they changed something drastically? Do they want to come back?
Co-creation process	How do you describe the co-creation process?
	How do you plan and design the "interaction" of the visitor with the product?
	How much time do you usually spend on the initial project phase prior to the start of the theme world?
	How do you work out the "question" that businesses are interested in addressing during their co-creation project?
	How do you optimise the feedback process for co-creators?
	To what extent do companies take the data to improve their prototype?
	How much interaction takes place in the process whilst companies are inside JOSEPHS®?
	Do you plan to follow up with companies and measure the impact of the project?
	How do you collect data from the co-creators?

Appendix 5 First Focus Group with Living Lab Facilitators

Focus Group with Living Lab Facilitators

December 2015
Duration: 3.5 hours

Exploratory Activities

Activity 1

Discuss and identify (in two groups):

- Discuss an example where co-creation between ***Co-creator*** *and* ***Companies*** *worked well. Why? Identify elements that contributed to it.*
- *Discuss an example where* co-creation between ***Co-creator*** *and* ***Companies*** *did NOT work well. Why? Explore elements that caused it.*
- Vote on priority elements for both scenarios.

Activity 2

Discuss and identify (in two groups):

- Discuss an example where co-creation between ***Living Lab Facilitator*** *and* ***Companies*** *worked well. Why? Identify elements that contributed to it.*
- *Discuss an example where* co-creation between ***Living Lab Facilitator*** *and* ***Companies*** *did NOT work well. Why? Explore elements that caused it.*
- Vote on priority elements for both scenarios.

Activity 3

Discuss and identify (in two groups):

- Assessment Exercise: How do you assess the impact of these 'elements'?

Appendix 6 Second Focus Group with Living Lab Facilitators

Focus Group with Living Lab Facilitators

February 2016
Duration: 4.5 hours

Presentation of priority co-creation elements and summary of previous focus group with Living Lab Facilitators.

Activity 1

In-depth analysis of priority co-creation elements:

- Discuss the meaning of each priority element. What kind of components play a role that define each element?
- *Example: Clear structure and storyline* (priority co-creation element)
  - What does a clear structure and storyline mean? How do you achieve it and what kind of components (i.e. layout, clarity of signs, …) play a role?

Activity 2

Discuss and identify:

- How do you identify that you have achieved your desired outcome (i.e. clear structure and storyline)?

Activity 3

Discuss and identify (in two groups):

- Develop a template that helps you to enhance co-creation processes in day-to-day operations. You can also add further relevant and important elements that have not been mentioned before.
- Presentation and discussion: Each group presents for 20minutes their findings.
- Vote on priority elements.

Appendix 7 Interview with Living Lab Facilitator D

Interview with Living Lab Facilitator D

The interview focused on contractual aspects between Fraunhofer IIS / SCS and the companies that get involved in the co-creation process at JOSEPHS®. During the one-hour interview, the interviewee pointed out which parts of the contracts are standardised, customised as well as how and to which degree the project objectives are defined. He also gave examples of typical research questions, how these are approached during a project and how this manifested in contracts. Overall, the interview helped filling the gaps in understanding the operating system of JOSEPHS® and other stakeholders involved from a contractual point of view.

Objective: To understand better how feedback reports and contracts look like.

1. **What kind of contracts are in place for the co-creation projects at JOSEPHS®?**
    - Do you have standardised or customised contracts for companies?
    - Do all companies receive the same contract?
2. **What do you specify in these contracts?**
3. **When and how do companies renew their contract?**
4. **Can you define an objective in the contract or do you define the research question?**
    - Can you give us an example of a research question or objective that is contractually defined?
5. **How do you know you have achieved this and answered the research question/addressed the research objective?**
    - Do you measure your project success?
6. **What is the price point of co-creation projects at JOSEPHS®?**

Appendix 8 Interview with Living Lab Facilitators about JOSEPHS® 2.0

Interview with Living Lab Facilitators re

1. **What is your role at JOSEPHS®?**
    - Has this changed over time? If yes, why?
2. **What are you doing on a day-to-day basis?**
3. **Since you joined the JOSEPHS® team, have you noticed any changes? Which? Why?**
    - Layout, the way JOSEPHS operates, the number of visitors, the demands of companies, the material and advise you can provide, the company feedback, data collection methods, ...
4. **Why do you think companies come to JOSEPHS® with their projects?**
5. **Why do you think people co-create at JOSEPHS®?**
6. **What are the challenges you face in your role?**
7. **What would you change about JOSEPHS®? Why?**
8. **What are the key learnings from the first 3 years?**
9. **What changes have you implemented for JOSEPHS® 2.0 and why?**
10. **Do think JOSEPHS® has been successful? Why?**
11. **Which ones will be, in your view, the future challenges for JOSEPHS®?**
12. **How do you expect JOSEPHS® to be in 3 years from today?**

Appendix 9 Data Collection with Living Lab Facilitators: Participant Details

Time	Data Collection Method	Duration	Participant	Affiliation
January 2015	Semi-structured interviews (Pilot)	1h 30min	LL Facilitator A	Research team at FAU
			LL Facilitator B	Research team at FAU
		30min	LL Facilitator A	Research team at FAU
		30min	LL Facilitator C	Research team at FAU
		30min	LL Facilitator B	Research team at FAU
December 2015	Focus Group I	3h 30min	LL Facilitator D	Research team at Fraunhofer SCS
			LL Facilitator E	Research team at Fraunhofer SCS
			LL Facilitator F	Research team at Fraunhofer SCS
			LL Facilitator G	Local JOSEPHS® team
			LL Facilitator H	Local JOSEPHS® team
			LL Facilitator A	Research team at FAU
			LL Facilitator B	Research team at FAU
			LL Facilitator I	Research team at FAU
			LL Facilitator J	Research team at FAU
February 2016	Focus Group II	4h 30min	LL Facilitator D	Research team at Fraunhofer SCS
			LL Facilitator E	Research team at Fraunhofer SCS
			LL Facilitator K	Local JOSEPHS® team
			LL Facilitator H	Local JOSEPHS® team
			LL Facilitator A	Research team at FAU
			LL Facilitator B	Research team at FAU
			LL Facilitator L	Research team at FAU
	Semi-struct. interview	1h	LL Facilitator D	Research team at Fraunhofer SCS
March 2016	Semi-structured interviews	1h	LL Facilitator E	Research team at Fraunhofer SCS
		30min	LL Facilitator L	Research team at FAU
		30min	LL Facilitator B	Research team at FAU
		40min	LL Facilitator H	Local JOSEPHS® team

Appendix 10 Focus Group with Companies[5]

Focus Group with Companies

February 2016
Duration: 3.5 hours

Each company introduces their co-creation project at JOSEPHS®

Activity 1
Discussion:
- How does JOSEPHS® carry out the co-creation process?
- How can JOSEPHS® improve the co-creation process?

Presentation of current co-creation template (based on focus groups with LLF)

Activity 2
Discussion:
- What would you improve or change about the co-creation template?

Activity 3
Vote and discuss:
- Each company representative can vote on their priority co-creation elements.
- Explain the importance/benefits of the elements you voted on for your company.

Activity 4
Discussion:
- Based on your co-creation project at JOSEPHS®, what were your learnings?
- What kind of feedback have you implemented?

Appendix 11 Data Collection with Companies: Participant Details

Time	Data Collection Method	Duration	In-person or telephone interview	Company	Participant's job role
February 2016	Focus Group & Paper-based Questionnaire	4h 30min	Not Applicable	Company A1[6]	Director Strategic Marketing
			Not Applicable	Company B	Founder & CEO
			Not Applicable	Company C	Business Development Manager
April 2017	Semi-structured interviews	1h 20min	In-person	Company D	Enterprise communications manager
		34min	Telephone	Company E	Innovation and Intrapreneurship Manager
		1h 19min	In-person	Company F	Director Research & Innovation
		24min	In-person	Company G	Dean of Design Department
		34min	Telephone	Company H	IT specialist & Application developer
		1h 02min	In-person	Company A2	Head of Corporate Technology
		59min	In-person	Company I	Creative Director

[5] Original agenda and instructions were in German
[6] Company A was consulted twice during the data collection process. An employee (A1) of company A participated in the focus group, whereas a different employee of the same company (labelled A2) was individually interviewed.

		30min	In-person	Company J	Project leader & academic coordinator
		1h 19min	In-person	Company K	Management Consultant
		39min	In-person	Company L	Founder & CEO
		27min	Telephone	Company M	Researcher
		1h 06min	Telephone	Company N	Founder
		1h 29min	Telephone	Company O	Product manager mobile
		25min	Telephone	Company P	Co-founder & Managing Director

Appendix 12 Example of Field Notes – Direct Observations

Field Notes: Direct Observations	
Researcher	Katharina Greve
Date	02.02.2016
Time	13:00 – 15:00
Duration	2 hours
Place	JOSEPHS® Karl-Grillenberger-Straße 3, 90402 Nuremberg, Germany
Type of Observation	Direct Observation
Theme World	8: Fitness & Safe Mobility
Objective	• Examine nonverbal expression of feelings • Study who interacts with whom • Investigate how co-creators communicate with the LL facilitator and vice versa
Description of Activities	First, the researcher sits at the table (“Werkbank”) in the middle of the LL (“Denkfabrik”) and makes general observations about the interaction of visitors with the space without getting too close to the visitor. Second, the researcher follows the LL facilitator around whilst the facilitator guides the visitor through the space. Observing more closely is important in order to make more detailed observations about communication between the facilitator and visitor on one hand, and on the other to examine nonverbal expression of feelings that cannot be captured from distance.
Summary	• Although the facilitator is asking the visitor where he or she would like to start, the visitors usually approach the business islands in one dominant order which is reflected through the layout of the LL. • Among other factors, the enthusiasm and amount/kind of information provided by the guides influence the amount of time a visitor spends at an island. • Depending on personal preferences, some visitors prefer to ‘browse’ around, however, most visitors take up the opportunity to be guided when approached by staff. • Not every co-creator belongs into the usual target group of the companies that present their prototypes (see quotes). • Visitors spend more time in the LL if they are guided by JOSEPHS’® staff.

	• Turning visitors into co-creators by trying out prototypes and providing feedback about the experience is happening more frequently when a guide is facilitating this process. • The workshops drive people and larger groups into the LL but often less feedback is provided on an individual count. Often only one person within a large group participates in the co-creation process whereas the rest of the group is watching. • Something novel/unique like the small car is catching visitors' attention and interest. These kind of products or technologies that are either rare or not available on the market often receive the most attention in a theme world.
Quotes	• LL facilitator to visitor: *"Hello, welcome to JOSEPHS®! If you want I can show you around – where would you like to start?"* • Visitor: *"Great, thank you. This looks very exciting but what are you guys doing here exactly?"* • LL facilitator [after explaining JOSEPHS'® concept]: *"Here you can see some prams – which one do you like best?"* • Visitor*: "I don't have children, but I could imagine that this one is a good one – it feels easy to steer and I like the design."* • LL facilitator: *"What do you think about personalising a pram? Have a look on this tablet and see how you could personalise it?"* • Visitor [looks a bit confused by the technology]: *"I am not really sure how this works."* • LL facilitator explains technology and asks: *"How much would you be willing to pay for a personalised pram?"* • Visitor: *"I am not sure, I don't have a benchmark, I guess it depends…."*

Appendix 13 Data Collection with Co-creators: Participant Details

Time	Data Collection Method	Duration	Participant	Gender (F/M)	Profession
September 2016	Focus Group	2h 30min	Co-creator A	M	Consultant
			Co-creator B	M	Senior manager at a bank
			Co-creator C	M	Market research specialist and postgraduate student
			Co-creator D	F	Undergraduate student
			Co-creator E	M	Postgraduate student
			Co-creator F	F	Postgraduate student
			Co-creator G	M	Self-employed Lead Service Designer
			Co-creator H	F	PhD student
			Co-creator I	F	Postgraduate student

Appendix 14 Focus Group with Co-creators[7]

Focus Group with Co-creators

September 2016
Duration: 2.5 hours

Activity 1

Discussion (in two groups):

- What exactly encourages you to come (back) to JOSEPHS®?

Activity 2

Discussion (in two groups):

- What inspires you to collaborate and give feedback at JOSEPHS®?

Activity 3

Vote and discuss:

- Each group presents a summary of their discussion regarding both questions.
- Each co-creator can vote on their priority co-creation elements that facilitate co-creation at JOSEPHS®.

Appendix 15 Overview of Theme Worlds

Theme World Description (by JOSEPHS®)	Number of Visitors	Photo
1: Creative – Hands and Feet *May 2014 - July 2014*		
The countless opportunities to give to products and services a personal touch, characterized the first theme world »Creative - Hands and Feet« in JOSEPHS®. Regional as well as established Germany-wide companies presented their products and innovations.	1,037	
2: Around the Box *August 2014 - October 2014*		
JOSEPHS® ran the theme world »Around the Box«. All visitors were invited to design, test and experience design methods and new designs, try out time-saving future concepts and to co-develop new solutions through hearing and emotion.	1,785	

[7] Original agenda and instructions were in German

3: Leisure – active and self-made *November 2014 - January 2015*		
JOSEPHS® invited visitors to discover quite a number of new stuff: stylish crochet, DIY with the help of laser technology, newest technology for self-measuring and sports tracking and smart public games in the theme world »Leisure: Active and Self-made«.	2,096	
4: Everything about E – digital, mobile and energized *February 2015 - April 2015*		
Visitors were invited to the theme world »Everything about E – digital, mobile and energized« to feel music, experience a rollercoaster ride in 3D and get to know more about electronic mobility. Our partners for this theme were DEXPER.IO, Fraunhofer IIS, HYVE and the research project CODIFeY.	1,705	
5: Future Commerce *May 2015 – July 2015*		
JOSEPHS® was inviting visitors to test shopping-assistant apps, experience how advertisements individually try to address each person via emotion recognition, how to share one's wardrobe in a social network, learn the benefits and challenges of logistics and solve various tricky logistics tasks within the theme	2,329	
6: Playful Development of Innovations *August 2015 – October 2015*		
Visitors were invited to experience live robots, assess the quality of wooden board games, try out games for both older generations and for the little ones, as well as test a CityApp which was developed in the theme world »Playful Development of Innovations«.	3,115	
7: SMARTer Living *November 2015 – January 2016*		
With the motto »SMARTer Living« our visitors could experience smart technologies ranging from smart home systems, smart typing methods for tablets, smart research technologies or smart learning to smart shopping.	3,754	
8: Fitness & Safe Mobility *February 2016 - April 2016*		

Our visitors could experience the theme world »Fitness & Safe Mobility«. Here visitors could test a micro-sleep alerter, configurable strollers, new fitness trends and an online platform for patients with dementia.	3,157	
9: Adventure & Travel *May 2016 – July 2016*		
In the theme world »Adventure & Travel« visitors could experience a hotel check-in setting, different travel booking apps, recycled bags made out of life wests and three different crowdfunding projects.	3,774	
10: Human Machine Interaction *August 2016 - October 2016*		
In the theme »Human Machine Interaction« visitors could experience and try out things regarding the cohabit of machines and humans.	3,155	
11: Live and Work *November 2016 – January 2017*[8]		
Our visitors could discover the theme world »Live & Work«. During this time visitors could try out new ideas, concepts and products around the topics living and working in the future.	3,928	
12: Media *March 2017 - May 2017*		
Visitors could explore the theme world »Media«. Here visitors could experience various products and concepts regarding the future of the media, such as apps, digital newspapers, insurance products or new websites.	3,822	
13: Smart Services *June 2017 - August 2017*		

[8] February 2017 JOSEPHS® was closed to prepare for the relaunch: JOSEPHS® 2.0

During the theme world »Smart Services« visitors could discover the wide world of services: IT-security, electric mobility, interactive displays and a digital farmers market are ideas our visitors enhanced.	2,411	
14: Senses in a Digital World *September 2017 - November 2017*		
Visitors could explore the theme world »Senses in a digital World«. This theme world was all about new technologies, concepts or products regarding senses in a digital world.	3,400	
15: Megatrends *December 2017 - February 2018*		
In the new theme world »MEGATRENDS« visitors can experience new prototypes, products and ideas regarding the mega trends sustainability, human machine interaction and digitisation.	2,766	

Source: Fraunhofer-Gesellschaft (2018)

Appendix 16 Company and Project Descriptions

Type of Transaction	Company Description	Project Description[9]
Company A2		
B2B	Company A2 is a subsidiary of the A2 Group with the objective of driving innovation and new, promising technologies by supporting start-ups. Company A2 is looking primarily for technology-driven young enterprises with growth potential in the business areas of their five corporate divisions Metal, Controls, Aviation, Defence and Metering.	How does a smart home system look like in the future - and what can a smart home do? As part of the theme world, Company A2 is giving an insight into two different systems and invites visitors to experience and test the home of the future.
Company D		
B2C	Company D's business areas are in the real estate industry. Its portfolio management business unit is responsible for the	Company D is testing two different concepts during the three-months test phase at

[9] Based on Fraunhofer Press release for the respective theme world.

	management as well as the modernisation, maintenance and further development of properties. The property development and urban development sector builds owner-occupied apartments and homes. In the real estate division, Company D supports the municipal administration in sustainability management efforts. Company D also partners with a range of public organisations and, with their subsidiary company, they look after the management of owner-occupied houses.	JOSEPHS®. In the first six weeks, the topic of technology-assisted living takes center stage. Here the visitor has the opportunity to express his/her opinion on the presented technologies, to suggest improvements and to incorporate his/her own ideas about technology assisted living. During the second six weeks, visitors have the opportunity to create an app. Among other things, the app is intended to facilitate communication in the residential district.
Company E		
B2B	Company E was established to advance the transfer of scientific research findings and meet the growing start-up spirit in the [Company E Institutes]. The aim of Company E is to make innovations usable through spin-offs and lead them to economic value creation. As of today, Company E supported the successful start-up of more than 200 companies from life science/ medical science, energy and environment, information and communication, manufacturing and processing, micro-electronics, transport and logistics, materials, and photonics.	Based on a company-wide ideas competition, visitors are given the opportunity to follow and support three winning projects. The first project is a mobile app for individual hearing support for people with hearing loss, which lets them hear again without hearing aid as usual. The second project is a sleep aid that can rock babies to sleep. The last project is about an intelligent school bag that uses a sensor system for wearing comfort. In addition, all visitors are invited to propose product ideas for future campaigns, which can be realised together with Company E's technologies.
Company F		
B2B	Company F is a world leading enterprise application software company. A very important focus of its business is cloud computing - with more than 150 million users worldwide. Many of Company F's solutions and applications are based on the company's [particular] technology, delivering real-time live data.	The city of Nuremberg is developing a city app in cooperation with Company F. The city app is supposed to support all people in Nuremberg - in all their activities. At JOSEPHS® visitors were able to help shape their very individual version of a city app Nuremberg and to experience how the app has evolved and changed over time.
Company G		
B2C	Company G developed a concept through an interdisciplinary project with professors and students, software as well as hardware developers and designers in collaboration with educators, therapists, psychologists	Company G introduces its senior games at JOSEPHS®. Visitors could hop on a dance mat or expand the Nuremberg puzzle with their own photos.

	and its users. Their aim is to provide a learning, therapy and gaming system for barrier-free playing without limitations.	
Company H		
B2C	Company H is doing applied research in the field of audio-visual media. The company is known as a competent partner of industry when it comes to developing ground-breaking technologies for the digital media domain. Together with its contracting partners, Company H develops cutting-edge solutions consistently designed to meet user requirements and expectations. Together with its client, Company H, has designed a computer learning game series.	Company H presents a jumping mat to increase learning success for pupils. At JOSEPHS®, visitors are able to enter the correct answers to questions in German and mathematics via a special jumping mat and thus learn the subject matter in a fun way.
Company I		
both	Company I is designing unique, innovative and functional bags and accessories made of materials from the aircraft industry. Unique designs, eco-logical sustainability and a resource-saving production process characterise their products. The main materials to produce their products include disposed parachutes, recycled life vests and other components of aviation.	At JOSEPHS®, visitors could inspect, check and rate the bags and accessories of Company I. Furthermore, the company is testing two different exhibition designs.
Company J		
B2B	Company J is one of the world's leading application-oriented research institutions for microelectronic and IT system solutions and services. Research at Company J revolves around two guiding topics: 'Audio and Media Technologies', and 'Cognitive sensor Technologies'.	Company J has developed a fitness shirt which is equipped with numerous sensors and can thus detect sporting overload by means of welding sensors. At JOSEPHS®, visitors can inspect and partially test the shirt and the new sensors. For example, visitors can monitor the ammonia content on a PC monitor, or detect irregularities in the heartbeat using an ECG dataset.
Company K		
B2C	Company K is a German federal agency. The agency fulfills comprehensive service tasks for the public and for companies and institutions for the employment and training market. Essential tasks of Company K include, for example, the promotion of employment and capacity to work, placement in training and employment, occupational guidance, employers consulting, services for the safeguarding and creation of jobs and remuneration benefits. Company K is also the provider of basic security for jobseekers. In addition, the agency undertakes labor market research, labor market observation and	Company K has developed a new web portal, which brings all services, products and processes together in one platform and thus simplifies the digital service offering. The online presence is tailored to the life situations of Company K's customers. The objective of the project at JOSEPHS® is to understand how different users navigate the new website, what they think about it but also to learn what kind of perception different kind of users have of Company K.

	reporting, and leads labor market statistics.	
Company L		
B2C	Company L is a start-up that developed a keyboard design that affords ten-finger touch typing by utilizing a touch sensor on the back side of a device. Company L's prototype is a hardware/software combination that makes tablets more productive. After a short practice phase, the jogging speed of a PC keyboard can be achieved. The keyboard includes an algorithm for constant adaptation of key targets in the back.	Company L addresses the problem that typing on a tablet can be tedious and slow. With their keyboard prototype utilises a touch sensor on the back side of the device, visitors can try out an intelligent solution for text input for tablets and help shape the innovative product to market maturity.
Company M		
B2C	Company M develops new approaches and methods that allow research agendas and technology development processes to focus on societal demands from the very start. They advise organisations and companies as to how they can initiate and implement change processes in their organisational culture in order to achieve more diversity and use its potential for their benefit. Their aim is to develop innovative technologies, products, services, models and strategies that are accepted by society. The target audience of Company M's work includes foundations, companies, organisations, universities, associations and research institutions.	Company M presents results of its research project »Shaping Future«. Based on this topic, workshops were held with a non-expert audience. The ideas developed in these workshops were analysed by researchers and translated into future technological development tasks. Particularly pioneering solutions for the future were transformed into "design prototypes" by five professional designers. Visitors at JOSEPHS® are encouraged to further develop these prototypes.
Company N		
B2C	Company N is a start-up that manufactures luxurious strollers using environment-friendly materials. The focus of the company lies on sustain-ability, high-quality materials as well as design. Customers are able to select their preferred design and materials for their stroller through an online configurator.	At JOSEPHS®, Company N presents its stroller and enables visitors to customize their own individual stroller in order to test the online configurator.
Company O		
B2C	Company O provides consumer credit products in Germany. The company offers a number of credit products and a finance application to keep track of personal finances. This tool can be used as a smartphone app or in an internet browser. Once customers have linked their accounts to it, they can see at a glance how much money they have left over until the next pay day. The app not only factors in regular expenditure, such as rent, but also predictable costs, e.g. grocery shopping.	Company O presents a personal finance app. The app is forward-looking, provides forecasts until the next salary is received and warns early against financial bottlenecks. In addition to the app, visitors can also rate the associated marketing materials for the app.
Company P		
B2C	Company P develops, produces and	Company P developed a product

	distributes a fully automated kitchen device that can grow a wide variety of nutritious vegetables and herbs – without soil and independent from environmental influences. The company also distributes all the necessary refill supplies such as seeds and fertiliser to offer the customers a *"complete vertical farming package".*	that allows private households to harvest salads and vegetables directly before consumption, which is why the food should taste as if it had been grown directly in the garden behind the house. At JOSEPHS®, visitors can test and further develop the device for growing salads and vegetables indoors.

Appendix 17 Additional Company Quotes

Additional Quotes	
Project Objective: Market Acceptance	
Company A2*	*"We had in the past […] not much direct contact to the end-customer and can't really accurately say how the end-customer […] perceives our products, how they assess it and what suggestions of improvement the customer may have."*
Company D*	*"We want to present our ideas and concepts, before they are fully finalised and are on the market."* The company wanted to examine the customers' perception of the product and to identify *"what is important for the user". "[…] We wanted to get a range of opinions from people who are in age, income, education, in all ways, are very different and had nothing to do with [Company D] and maybe haven't even thought about this topic before.[…] it was really important for us, to find out how the visitors at JOSEPHS® find our ideas. What are their perspectives? What are their suggestions, ideas, and criticisms? But also what do we have to improve? What do we have to rethink?"*
Company E	*"We […] wanted qualitative goals, such as […], get feedback […]".*
Company F*	Company F utilised JOSEPHS® to develop an app as well: *"The validation through real user feedback is […] important in this case [because] we don't have in our sector many research projects for the end customer […] there was the question, how to do user-testing and in which way and because we offer mostly b2b solutions"*. The interviewee states that their *"aim was to get as much user feedback as possible."*
Company H	*"The market and customer acceptance regarding the product was really important to us".*
Company I*	*"It was always a problem at trade fairs […] that the traders think that if they take our product on board they should decorate in an airplane style. And this is one aspect that we want to address, […]. This is why we had two different [trade fair display] constructions at JOSEPHS®, […] and tested them in comparison to each other, that the end customer gives his feedback on which one he finds more welcoming, appealing, prettier or also worse and so on".*
Company J	*"We presented [the product] and had the aim that we want to develop it further. […] Our question was if they [co-creators] could imagine using it and we also had an integrated sweat sensor, that allowed us to analyse performance through sweat analysis and it was important to understand if they would use a sensor like that, if it is comfortable to wear a sensor like that, if it feels nice on the skin […]."*

Company K*	Company K presented a new company website and posed questions related to the navigation of their main page in order to test new features: *"So, some people have certain expectations, and that is the typical image of [Company K], that you can find in every newspaper; what we wanted to try was: 'Okay, we put this new product in front of you, how do you like it? How do you manage with it? What associations come to mind when you think about [Company K]?'"*
Company L	Company L was interested in *"qualitative feedback and how it [the product] is perceived. […] if people can imagine using the device".*
Company M	*"We wanted to see how we can motivate members of the general public to think about future technologies. We had a workshop in Berlin about future technologies and we also used the space at JOSEPHS® to have discussions based on our first drafts, that means our prototypes that we exhibited there. […] Think about what future technologies can do for us and how they should look like based on those prototypes".*
Company N	*"One gets a direct feedback […] which we indeed did; we went to JOSPEHS once a week, on Saturdays, then you had there for example a pin board, where everybody wrote down their first impressions."*
Company O*	Company O provided three different versions of an app and asked about the market acceptance in relation to three app versions: *"Which one do you prefer, A, B or C?"*
Company P	Company P's objective was *"to get some opinions [about the device] that have not been corrupted by our presence on-site."*
Project Objective: Price Acceptability	
Company D*	*"We asked them a lot and what they would be willing to pay."*
Company H	*"[…] for us the focus was really on the price and that is something that we were able to understand, for example how it was perceived by people and what they think a product like that should cost and one result was to do it as an app".*
Company J	*"It was important to understand […] what is an appropriate asking price. What would people be willing to pay for it? Because we need to be aware of it for production. Do we need to produce it low-priced or do people say that they gain such benefits from it that they are willing to pay more for it."*
Company N	*"[…] we started testing the price, not directly, but rather through the questionnaire, where we could measure a price tendency."*
Company P*	*"We wanted to find out especially what price range people are expecting. What are people willing to pay for the product?"*
Project Objective: Exposure	
Company G*	*"We didn't really have an objective. We just wanted to introduce it [the product]. […]* one advantage is that many people got to know us."
Company L*	*"My expectation was mainly the exhibition".* Furthermore, the interviewee explains that the objective was to exhibit the product to *"the walk-ins, but also the people that have been invited by JOSEPHS®."*
Company N*	Company N also articulates product exposure as an objective of their project: It was *"somewhat also about showing the [product]."*
Project Objective: Product Testing	
Company A2*	*"My objective was to see how the installation of the two systems work out in general. […] Just the fact that something like that was installed on-site; to find out how smoothly does it work. […] It was important to find out the stability of the systems on-site; to find out not only what*

	problems do occur with the end-customer, but also in interaction with the supervising team."
Company P	*"We wanted to observe how the device copes for one and a half months without supervision."*
Project Objective: Market Intelligence	
Company N*	Company N's objective is to gather market intelligence: *"To know where customers are from helps us with the decision where we want to open a shop. Where can we expect good returns?"* To understand where the customers are from, Company N offered *"some coupon codes on a blanket, worth 10 euro",* in order to track where the customers are from when redeeming the coupon.
Company Objective: Method Testing	
Company A2*	Company A2 explains that they want to understand the following, *"How does such a probe work with JOSEPHS®? How many people come? How many people participate? How does the supervision work on-site? How much do you have to directly engage in the supervision and evaluation as a company and how much does JOSEPHS® do? I would say also [it is] a test of the service of JOSEPHS®, because for us it is obvious, that we want to use those kinds of format more often in the future and for that you have to start somewhere. And that was a start."*
Company M	Company M was interested to *"try [a] new methodology. It is always part of a research project to explore new methods and methodologies. […] it was particularly interesting to understand how to engage people with a exhibition so that they don't only pass by but actually interact with the items and how can one observe this interaction."*
Company Objective: Networking	
Company E	*"There was one project on smart school gear and then there was one evening at JOSPEHS, where some people from schools and the education industry were there. And there was also a school backpack manufacturer there and we were able to connect."*
Company I*	Company I's objective was also to establish new contacts with distributors. *"A thought was that maybe one or two distributors might come by, see it and buy a few for their shops. And of course with Nurnberg it is ideal, because it's a great shopping city. It was definitely a wish that we would have liked to see one or two distributors coming by."*

The asterisk (*) highlights those company quotes that are already presented as examples in chapter 5.