IIIEE Theses 2016:36

Users as Co-Creators?

An Analysis of User Involvement in Urban Living Labs

Mascha Menny

Supervisor

Kes McCormick

Thesis for the fulfilment of the
Master of Science in Environmental Management and Policy
Lund, Sweden, September 2016

iiiee
THE INTERNATIONAL INSTITUTE FOR
INDUSTRIAL ENVIRONMENTAL ECONOMICS

Published in 2015 by IIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,
Tel: +46 – 46 222 02 00, Fax: +46 – 46 222 02 10, e-mail: iiiee@iiiee.lu.se.

ISSN 1401-9191

Acknowledgements

This master's thesis is the final part of the Environmental Management and Policy Programme at the IIIEE. The last two years were not only a great but also an intense experience. I am thankful to everyone who supported and accompanied me during this time.

I would like to express my special thanks to my sister, Anna, who had an answer to every single question I asked and contributed both with her academic know-how as well as her empathy. You were always there for me whenever I needed you. Thanks.

A great appreciation and thanks goes to my boyfriend, Erik for always patiently listening to me, reading my texts and calming me whenever I was stressed. I cherish your encouragement and all your help and love.

My parents, Brigitte and Harald, support all decisions I take and taught me to go my own way. Thank you for always motivating and believing in me.

Furthermore, I would like to express my gratitude to my supervisor, Kes McCormick. Thank you for all your support, valuable guidance, and helpful comments during the thesis writing process.

Without the input and insights from all my interview partners, this research would not have been possible. I would like to thank you for your time and effort. You inspired my work.

I wish to extend my appreciation to Steven Curtis, who not only first introduced me to the topic of Urban Living Labs but also supported me during the topic finding and finally the thesis writing process. Thank you for your help, comments, and motivation.

Moreover, I would like to express my gratitude to my thesis colloquium colleagues for interesting discussions, helpful advices and, last but not least for proofreading. A special thanks to Ella, Fredrik, Hélène, Kim, and Tanja.

My gratitude also goes to the German Academic Exchange Service (DAAD) who granted me a scholarship and supported me financially during the second half of the master's programme.

Finally, I would like to thank the IIIEE staff and the friends I found during the EMP Programme. You made the last two years an amazing experience that I do not want to miss. It was a great time! Thanks to all of you.

Abstract

Urban Living Labs are a new form of urban governance. They are considered as promising opportunities to contribute to urban sustainability transitions by addressing climate change and other related challenges on a regional level. They serve as sites to design, test and learn from innovation in real time. One key element of Urban Living Labs is user involvement. Users are considered as co-creators who do not only serve as informants but also shape outcomes by contributing with their local knowledge and expertise. Despite its importance, user involvement often remains a practical challenge and only little research has been conducted on user participation.

The aim of this research is to explore and analyse if Urban Living Labs effectively engage in participatory methodology that facilitates co-creation with users. User participation in four Urban Living Labs is examined and discussed. The ways of user involvement are identified and analysed, looking at the phases of design, implementation and evaluation The discussion is guided by an analytical framework distinguishing between four different levels of participation.

The study finds that user involvement and the levels of participation varied between and within the different Urban Living Labs. Co-creation, as the highest level of participation, was present in the Urban Living Labs but lower levels could also be found. Co-creation was not the only one dominating level of participation. This research therefore questions if co-creation should be the single one level of user involvement that Urban Living Labs should aim for or if rather a combination of different levels of involvement should be the objective.

Keywords: co-creation, participation, Urban Living Labs, urban sustainability transitions, user involvement

Executive Summary

Urban Living Labs serve as sites to design, test and learn from innovation in real time. They are considered as promising opportunities to contribute to urban sustainability transitions by addressing climate change and other challenges related to an increasing urban population on a regional level.

Key elements of Urban Living Labs are co-creation and user involvement, exploration and experimentation in a real-life environment, and evaluation and refinement.

This research focuses on the element of co-creation and user involvement in Urban Living Labs. The involvement of a variety of stakeholders, especially the participation of citizens as users, is a key to this new form of urban governance. Besides co-creation and user involvement, terms such as co-production, participation, empowerment, quadruple helix-model, and multi-stakeholder or public-private-people-partnership are used to describe the collaborative aspects of living labs. Users are not only considered as informants but as project partners that help to create and shape the outcomes of Urban Living Labs. It is therefore considered as important to involve citizens as early as possible and already in the design phase of the project in order to identify their needs and to ensure a common goal and vision among all stakeholders.

Citizens contribute with local knowledge and expertise based on their experiences, needs and preferences. User involvement empowers the citizens and enhances their feeling in being part of decisions, which in turn builds up trust and commitment to the project goals. While the importance of user involvement is emphasised, Urban Living Labs often also face practical challenges to involve citizens and relevant stakeholders. The role and characteristics of users as well as the design of participation and the resulting influences is not fully understood. Little research has been conducted focusing on the analysis of user involvement in Urban Living Labs going beyond highlighting its importance and describing its characteristics.

The purpose of this research is to investigate how user involvement is understood and takes place in practice in Urban Living Labs. The aim is to explore and analyse if Urban Living Labs effectively engage in participatory methodology that facilitates co-creation with users.

To guide this study, there are two main research questions:

1. How are users involved during the design, implementation and evaluation phase of the analysed Urban Living Labs?
2. Which level of participation is achieved in the Urban Living Labs?

To address the research aim and to answer the research questions, a multiple case study approach was applied. The research employed a triangulation of data sources and collection methods. Data was collected through a literature review, semi-structured interviews and the participation in conferences. Data sources included academics, practitioners and other stakeholders.

The data is analysed using qualitative methods. The case analysis and discussion is guided by an analytical framework that distinguishes between four different levels of user involvement and participation: *No Participation*; *Information*; *Consultation*; and *Co-Creation* (see Figure 0-1). For each case, the methods and techniques used to involve citizens in the phase of designing, implementing and evaluating the Urban Living Lab are analysed and the level of user involvement achieved is discussed.

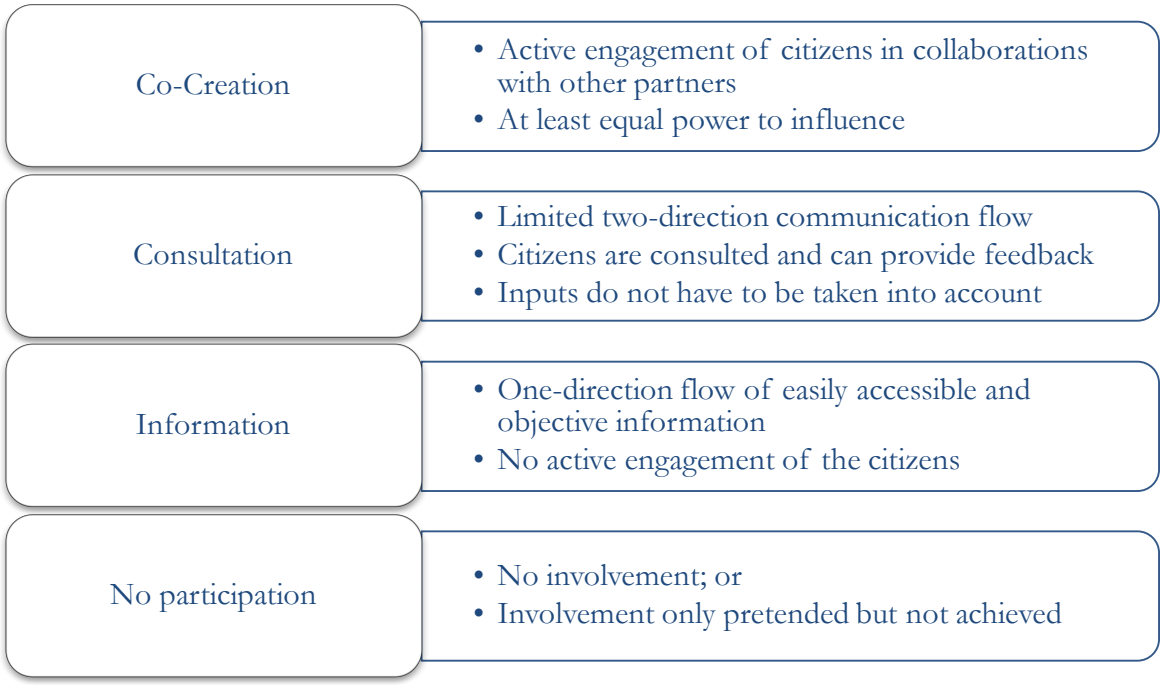

Figure 0-1. Analytical Framework: Categorisation of User Involvement and Participation

The four cases under analysis are *New Light on Alby Hill* (Stockholm, Sweden), *Nexthamburg* (Hamburg, Germany), *T-City Friedrichshafen* (Friedrichshafen, Germany), and *UbiGo* (Gothenburg, Sweden).

New Light on Alby Hill was a lighting project utilising ambient light and projections of four images (light installations) on the pavement and stonewalls with the aim to turn a pathway for pedestrians into a more attractive and frequently used walkway while experimenting with new LED technology. The residents of Alby Hill were involved in different ways ranging from information to surveys and questionnaires up to being part in the selection of images for the light installations. Citizens could not only contribute with images to the competition but also vote for their favourites. The residents' council of the housing area was given a special role as the representatives could take part in certain decisions during the design and the implementation phase of the Urban Living Lab. The different methods to involve users are reflected in the different levels of participation achieved. Co-creation was most dominant during the implementation phase but also present during the design of the Urban Living Lab. Other levels identified were information and consultation.

The crowdsourcing platform *Nexthamburg* encouraged citizens to develop and discuss ideas and wishes for the future urban design of Hamburg with the aim to develop a citizens' vision for Hamburg. While the frame of the Urban Living Lab was set by the *Nexthamburg* team, all the ideas originated from the citizens who could take part in workshops, online and offline dialogues, contribute with and vote for ideas, or just use *Nexthamburg* as source of information. During the design and implementation phase of the Urban Living Lab, co-creation was the most dominant level of participation, accompanied by information and consultation. The evaluation phase was characterised by consultation.

T-City Friedrichshafen was a smart city project initiated by the German telecommunication company Deutsche Telekom. The aim was to test how innovative information and communication technologies (ICT) can contribute to the solution of future urban challenges.

The project was set up and run in cooperation with the city of Friedrichshafen, the winner of the city contest. The project included not only the development and expansion of the broadband infrastructure in the city but also more than 40 individual sub-projects. Citizens were addressed by information and marketing campaigns, they contributed with their own ideas for the sub-projects or engaged within the sub-projects, and they could test new products and services. Some citizens had a special role as Ambassadors or Futurists. During the evaluation, interviews, questionnaire surveys, and observation were used as tools to involve citizens. The levels of participation achieved varied from partly no participation and information to consultation up to co-creation. Information and consultation were the most dominant levels of participation.

UbiGo was part of the project Go:Smart which aimed to support the citizens in Gothenburg, to make their travel smarter and more sustainable. With the purpose to reduce the gap between private and public transport, car sharing, car rental, bike sharing, a taxi service as well as public transport were integrated and united in a subscription service, available through a mobile application. The aim was to develop and test a new business model that would help to address the negative impacts of urban mobility. Citizens were mainly involved through interviews and questionnaires as well as information meetings. Furthermore, a selected group of citizens could take part in a field operational test, trying out and giving their feedback on the travel broker service. The level of participation achieved varied from information to consultation up to co-creation.

In summary, the level of user involvement varied between and within the different Urban Living Labs. Only *Nexthamburg* consistently allowed for co-creation. In the other cases co-creation was more prevalent during the implementation phase and less present during the design and evaluation of the Urban Living Labs. Co-creation can therefore not be considered as the one level of participation that was dominating the Urban Living Labs.

Possible explanations for the varying levels of participation might lie in the different drivers of the Urban Living Labs or in the different project ideas. To increase the level of involvement, this research recommends to engage citizens as early as possible and already in the design phase. The projects should be tangible for the citizens in order to reduce obstacles to participate. For the same reason, more citizens can be engaged by going to places where people already are instead of waiting for them to come to events. Finally, a common goal and vision that all stakeholders share is important to motivate the engagement of users.

While co-creation is an important element of Urban Living Labs, the question arises if co-creation should be the single one level of user involvement that Urban Living Labs aim for or if rather a combination of different levels of involvement might be more appropriate. Further research is needed in order to better understand the role of citizens and successful user involvement in Urban Living Labs. This is needed in order to fully utilise the potential of Urban Living Labs to drive urban sustainability transitions.

Table of Contents

List of Figures

List of Tables

Abbreviations

CEO – Chief Executive Officer

CO_2 – Carbon Dioxide

E-voting – Electronic voting

ENoLL – European Network of Living Labs

GUST – Governance of Urban Sustainability Transitions

ICT – Information and Communication Technology

IIIEE – International Institute for Industrial Environmental Economics

IT – Information Technology

JPI Urban Europe – Joint Programming Initiative Urban Europe

LED – Light-Emitting Diode

LL – Living Lab

MaaS – Mobility as a Service

Owlet – Open Web Lab

QR-Code – Quick Response Code

SubUrbanLab – Social Uplifting and Modernization of Suburban Areas with an Urban Living Lab Approach

ULL – Urban Living Lab

UN DESA – United Nations Department of Economic and Social Affairs

1 Introduction

The proportion of the world's population living in cities is expected to increase from 54% in 2014 to 66% in 2050 (United Nations Department of Economic and Social Affairs, UN DESA, 2014). According to UN DESA, this increase in urban population will not only be traced back to the overall growth of the world's population but also to an increased urbanisation. Not only the number of people living in cities but also the number of cities will increase in the future (Hatzelhoffer, Humboldt, Lobeck, & Wiegandt, 2012).

A central problem of growing cities and the urbanisation trend is climate change, as already now two-thirds of carbon emissions are produced in cities (Bulkeley, 2015). However, the carbon emissions are not only produced in the urban areas, cities also face the related challenges, such as decreasing air quality, temperature increases, water shortages and increased flooding (Baccarne, Logghe, Schuurman, & De Marez, 2016; Evans & Karvonen, 2010). Urbanisation also leads to an increase in use of urban land area and a decrease of urban green spaces. Cities need to deal with increased levels of noises and a rise in demand for energy and transport infrastructure (Frantzeskaki & Kabisch, in press; Hatzelhoffer et al., 2012). In addition, the urbanisation trend is likely to cause social problems such as poverty, inequality and segregation (Voytenko, McCormick, Evans, & Schliwa, 2016).

However, cities provide at the same time promising opportunities to address climate change on a regional level and can therefore not only be seen as central to the problem but also to the solution of climate change (Bulkeley, 2015). As places that facilitate knowledge exchange and generate value, cities are considered to be able to enhance changes and sustainability transitions (Baccarne, Schuurman, Mechant, & De Marez, 2014). The local and regional level is recognised as being most effective when addressing climate change and the related impacts (Evans & Karvonen, 2014). According to a study by Ecofys, urban initiatives to reduce CO_2 emissions might amount to up to a fifth of the commitments of national governments (as cited in Bulkeley, 2015). To conclude, cities both face challenges but also allow for opportunities to address these challenges (Baccarne et al., 2014).

New forms of urban governance are developed and tested in European cities in order to address the challenges related to the increase in urban population. To make cities more sustainable it is not enough to improve the current systems of provision and services but their design and organisation need to be changed (Voytenko et al., 2016). One form of experimental governance that is currently emerging is the concept of Urban Living Labs (ULLs) (Voytenko et al., 2016). The term has been introduced by the Joint Programming Initiative (JPI) Urban Europe that defines ULLs as "a forum for innovation, applied to the development of new products, systems, services, and processes, employing working methods to integrate people into the entire development process as users and co-creators, to explore, examine, experiment, test and evaluate new ideas, scenarios, processes, systems, concepts and creative solutions in complex and real contexts" (JPI Urban Europe, 2013, p. 29). By experimentation and learning based on participation and user involvement, ULLs can be used to test new working methods in order to address sustainability issues. They provide participatory possibilities that go well beyond common dialogue practices and can replace other forms of participation (Buhr, Federley, & Karlsson, 2016; Voytenko et al., 2016).

A high number of ULL publications can be found in the Technology Innovation Management Review, user handbooks or policy documents. Most living lab literature consists of case studies or conceptual studies with only some empirical research existing (McCormick & Schliwa, 2016; Schuurman, De Marez, & Ballon, 2015).

1.1 Problem Definition

Participation is not only increasingly seen as democratic right (Reed, 2008), it is also key to urban sustainability transitions. Collaborative and inclusive approaches are needed as there is no single actor that can address the described sustainability challenges on its own. Different stakeholders need to be involved and be able to contribute to decision-making with their own knowledge and perspectives (Baccarne et al., 2016; Franz, 2015; Wittmayer, Roorda, & van Steenbergen, 2014).

Participation and networking with different stakeholders is considered to be one key characteristic of ULLs that is critical for the success of an ULL (Juujärvi & Pesso, 2013). Terms such as co-creation, co-production, participation, involvement, empowerment, quadruple helix-model, and multi-stakeholder or public-private-people-partnership are used to describe the collaborative aspects of living labs (Baccarne et al., 2014; Budweg, Schaffers, Ruland, Kristensen, & Prinz, 2011; Feurstein, Hesmer, Hribernik, Thoben, & Schumacher, 2008; Franz, 2014, 2015; Leminen, 2013; Schuurman & De Marez, 2012; Westerlund & Leminen, 2011). However, the inclusion of all key relevant stakeholders often constitutes an important practical challenge for ULLs. Even though a majority of living labs aims for achieving a high level in the involvement of citizens, most often referred to as users in living lab literature, many ULLs often still apply top-down approaches (Eskelinen, Muente Kunigami, Marsh, Robles, & Lindy, 2015; JPI Urban Europe, 2013; Juujärvi & Pesso, 2013; McCormick et al., 2015).

It is therefore important to identify those stakeholders that are most important and necessary to involve and to effectively engage them (Friedrich, Karlsson, & Federley, 2013). This selection of stakeholders as well as the design of participation and involvement are considered to influence the impact ULLs can have in terms of quality of outcomes and outreach (König, as cited in Schliwa, 2013). Referring to transition management theories, Voytenko et al. (2016) suggest that the extent to which an ULL can have impacts on a broader scale, is dependent on the exact composition and structure of ULL partnerships and stakeholder involvement. However, the role of stakeholders and especially citizens, as well as the needed level of involvement in ULLs have not yet been fully understood (Franz, Tausz, & Thiel, 2015; Juujärvi & Pesso, 2013). Similarly, the role of the ULL design of participation and user involvement and the resulting influences as well as the characteristics of users are not studied in greater detail (Schuurman et al., 2015; Voytenko et al., 2016).

To summarise, despite the important role of user involvement and participation, little ULL research has been conducted focusing on the analysis of user involvement beyond highlighting its importance and describing its characteristics (see Chapter 2.3). While the high degree of participation is often emphasised (cf. Buhr et al., 2016; Schuurman & De Marez, 2012), other than a few exceptions, not much academic research analytically analyses the level of participation and the methods used to involve users. A common understanding of the concept of co-creation seems to be missing and different interpretations of user involvement in ULLs exist.

Therefore, the purpose of this research is to investigate how user involvement is understood and takes place in practice in ULLs. The aim is not only to contribute to the ongoing research on ULLs and their role in urban sustainability transitions but also to support practitioners in successfully designing and implementing ULLs. Since ULLs are seen as drivers for innovation in sustainable urban development, further research will help to better understand the projects and the up-scaling possibilities, thus contribute to address the challenges resulting from the urbanisation trend.

1.2 Research Questions

With this background in mind, this research aims to assess user involvement in four selected ULL cases. The purpose is to get a better understanding of user participation in ULLs and the levels to which users are involved in ULL processes.

- *The aim of this research is to explore and analyse if Urban Living Labs effectively engage in participatory methodology that facilitates co-creation with users.*

To guide this study, there are two main research questions:

1. *How are users involved during the design, implementation and evaluation phase of the analysed Urban Living Labs?*
2. *Which level of participation is achieved in the Urban Living Labs?*

1.3 Overview of Methodology

Qualitative research methods are used to achieve the research aim and to answer the research questions. The study applies a multiple case study approach. As cases, four ULLs in different cities are selected and analysed.

A triangulation of data sources and collection methods is employed. Data is collected through a literature review, semi-structured interviews and the participation in conferences. Data sources include academics, practitioners, and other stakeholders. Interviews with ULL practitioners and stakeholders constitute the backbone of the case study analysis and discussion. The analysis of user involvement in the selected ULLs (Chapter 4) is structured according to the different stages of an ULL – design, implementation and evaluation.

The discussion (Chapter 5) is guided by an analytical framework that is developed and presented in Chapter 3.2. It defines different levels of participation ranging from no participation up to co-creation. For each ULL the levels of user involvement in the different ULL stages are determined and described.

For a more detailed explanation of the methodology, see Chapter 3.

1.4 Limitations and Scope

The focus of this research is on user involvement and participation in ULLs. The scope of the study is therefore limited to one key characteristic of ULLs. For the case study, four Urban Living Labs have been selected that constitute the core of this research. The geographical scope of the case studies is limited to cities in Sweden and Germany. The thematic scope is on user involvement without examining the remaining characteristics and topics of the selected ULLs in detail. Further limitations related to methodological choices and the research design are discussed in Chapters 3 and 6.3.

Different terminologies are used that are further explained in Chapter 2. The focus of this research is on *Urban* Living Labs. However, it also refers to Living Labs from which the concept of *Urban* Living Labs evolved. The distinction between the two terms is often not sharp and other terms even exist to describe the concept. The definition of Urban Living Labs as well as the distinction from Living Labs can be found in Chapter 2.1. Participation or involvement are relevant concepts that are applied in this research. Both terms are used interchangeably, a definition can be found in Chapter 2.2.

In particular, this study looks at the involvement of citizens in ULLs, in literature most often referred to as user involvement. This research uses both terms, users and citizens, to describe the same stakeholder group. For further explanation of these two terms and their differences, it can be referred to Chapter 2.3.

1.5 Ethical Considerations

Since the study is partly based on interviews, ethical considerations regarding the interview partners needed to be considered. It has been ensured that responses to interview questions have been provided voluntarily and all interview partners consented to be referred to by name. Interviewees were provided a draft version of the thesis prior to publication. In addition, quotes have been approved by the interviewees.

Finally, the thesis honours common academic standards and clearly attributes ownership to foreign texts and ideas. Although the research aims for objectivity, it is, as every academic text, influenced by the author's subjectivity and points of views.

1.6 Audience

This research has been written as part of the Master of Science programme in Environmental Management and Policy at the International Institute for Industrial Environmental Economics (IIIEE) at Lund University in Lund, Sweden. It aims to contribute to the ongoing research on Urban Living Labs. In particular, the paper contributes to the Governance of Urban Sustainability Transitions (GUST) project. At the same time, the study may be of interest for the actors involved in the ULLs that have been selected for the case studies. Furthermore, other ULL practitioners can benefit from the better understanding of user involvement when designing and implementing an ULL.

1.7 Disposition

Chapter 2 introduces the concept of Urban Living Labs. It gives an overview of the opportunities and challenges of participation and presents the ULL literature dealing with user involvement and participation.

Chapter 3 provides the research methodology that is applied in this thesis. It describes the multiple case study approach as well as the methods for data collection. Furthermore, the analytical framework used for the discussion of the cases is developed and presented.

Chapter 4 and Chapter 5 present the findings of the case study and the answers to the research questions. First, the cases are presented and the involvement of users in the phases of design, implementation and evaluation is analysed. In a second step, the analytical framework presented in Chapter 3 is applied and the level of participation in the cases is discussed.

Finally, Chapter 6 provides reflections on the findings and the research methodology. It presents the key conclusions and suggests further research.

2 Background and Theory

2.1 Urban Living Labs

Urban Living labs serve as sites to design, test and learn from innovation in real time (Bulkeley et al., 2015). They offer an alternative to other forms of governance, in order to address particular societal and environmental issues (Bulkeley et al., 2015). They are seen as a mode of governance that drives the transformation of cities into sites of knowledge co-production by bringing together scientists, politicians, business and civil society (JPI Urban Europe, 2013). ULLs promote partnerships and interaction between different actors and give each of them the opportunity to influence and change the current arena (JPI Urban Europe, 2013). As such they promote democracy and lead to more democratic and effective outcomes that enjoy a higher acceptance among the different stakeholders (Salter & White, 2013). According to ULL literature, sustainable urban development can be experimented with and results can be translated into real life situations. As a consequence, cities can become more economically viable, socially robust and environmentally friendly (Evans & Karvonen, 2014; JPI Urban Europe, 2013). It is assumed that "by producing knowledge 'in the real world' and 'for the real world', urban laboratories can catalyze [sic] rapid technical and economic transformation." (Evans & Karvonen, 2014, p. 415). Because of the expected potentials of this new form of urban governance, ULLs are referred to as key drivers for urban sustainability transitions (Voytenko et al., 2016).

The concept of Urban Living Labs has evolved from the concept of Living Labs (LLs). The LL approach has been developed in the field of product-testing and the Information and Communication Technology (ICT) sector. Since 2001 it has been increasingly applied and tested (Franz et al., 2015; McCormick & Schliwa, 2016). The Massachusetts Institute of Technology and especially William J. Mitchell are often mentioned as main contributors in the development of LLs and many consider Mitchell as the creator of the LL concept (Franz et al., 2015; McCormick & Schliwa, 2016). In 2006, the European Network of Living Labs (ENoLL) was founded as the international federation of benchmarked Living Labs in Europe and worldwide under the auspices of the Finnish European Presidency (ENoLL, n.d.). The aim was to stimulate research, help to distribute knowledge and best practice as well as to promote mutual learning and support (ENoLL, n.d.; McCormick & Schliwa, 2016; Veeckman & van der Graaf, 2015). Since its establishment, the ENoLL network has grown in waves and counts today 170 active LL members worldwide (ENoLL, n.d.). Among other international LL organisations ENoLL can be considered as the most influential initiative (Veeckman, Schuurman, Leminen, & Westerlund, 2013). This influence of ENoLL is also depicted in LL literature, as most LL research has been conducted in Europe (Schuurman et al., 2015).

The recent development of LLs has increasingly focused on social innovation and the context of urban governance and sustainability research (Franz, 2015; McCormick & Schliwa, 2016). Topics vary from sustainable resource use to community well-being (Devaney, Doyle, & Davies, 2014; Franz, 2015; McCormick & Schliwa, 2016). In Northern Europe, where ENoLL has its roots, the living lab approach was first applied to urban contexts and labelled by the Joint Programming Initiative Urban Europe, the main funding agency for living lab related projects in European cities, as "Urban Living Labs" (Voytenko et al., 2016). While living labs are mainly oriented on ICT and commercial product or service development, Urban Living Labs focus more on an urban context including societal, political and technological questions; however, there is no clear distinction between the two concepts (Baccarne et al., 2016; Evans & Karvonen, 2010; Franz et al., 2015; McCormick & Schliwa, 2016; Veeckman & van der Graaf, 2015).

Following McCormick & Schliwa (2016), the scope of ULLs compared to LLs is usually a broader geographically bounded space and a longer time horizon. Experimentation in ULLs focusses not only on testing a product or a service but can also include experimentation with new forms of collaboration, employment and education. Furthermore, the real-life environment is less controlled. Finally, ULLs enhance civic participation and see people rather as citizens than as users (McCormick & Schliwa, 2016).

According to the definition of JPI Urban Europe, which is also the base of this research, ULLs are "a forum for innovation, applied to the development of new products, systems, services, and processes, employing working methods to integrate people into the entire development process as users and co-creators, to explore, examine, experiment, test and evaluate new ideas, scenarios, processes, systems, concepts and creative solutions in complex and real contexts" (JPI Urban Europe, 2013, p. 29). However, for both terms, Living Lab and Urban Living Lab, there is no commonly accepted and consistent definition. Various key characteristics are mentioned in academic literature (Juujärvi & Pesso, 2013; Leminen, 2013; McCormick & Schliwa, 2016).

Franz (2015) summarises the key elements of LLs as co-creation, exploration, experimentation, and evaluation. The real-life environment that turns the lab into a *living* lab (Ingrid Mulder, 2012) is highlighted as one key characteristic by many (Almirall, Lee, & Wareham, 2012; Budweg et al., 2011; Dell'Era & Landoni, 2014; Evans & Karvonen, 2010; Leminen, 2013).

In reviewing academic publications, policy and grey literature, and current research projects pertaining to living labs, Voytenko et al. (2016) have identified five key characteristics of ULLs: geographical embeddedness; experimentation and learning; participation and user involvement; leadership and ownership; and evaluation and refinement. They suggest that the exact composition and structure of ULL partnerships as well as the design and operation of ULLs have a direct influence on the extent to which broader changes can be stimulated beyond the scope of the laboratory.

Table 2-1. Characteristics of Urban Living Labs

Characteristic	Description
Geographical Embeddedness	ULLs are located in a real urban context. Innovation happens at a local and more manageable scale. Examples for the geographical area can be the whole city, a district or neighbourhood, or only one house.
Leadership and Ownership	Having a clear owner or leader that coordinates and manages the ULL is identified as a key success factor. However, at the same time the leader needs to allow other stakeholders to participate.
Experimentation and Learning	Experimentation and learning are not only considered as a side-effect, but experiments constitute a main element of ULLs. They focus on user-centred experimentation and co-production of knowledge and ideas with the users.
Evaluation and Refinement	Actions and impacts of an ULL need to be evaluated on a frequent basis in order to establish a feedback loop. This allows to adjust the goals and visions accordingly and enhances the learning effects.
Participation and User Involvement	ULLs provide platforms for participation and user involvement. Participation is a core element of ULLs and it appears throughout all stages of an ULL.

Source: Voytenko et al., 2016

Friedrich et al. (2013) have developed key success factors for ULLs (see Figure 2-1) suggesting that the following elements must be taken into consideration when starting an ULL: context;

goals and vision; people and motivation; management and decision-making; and interaction process and methods. One element that all success factors have in common is the involvement of citizens and other stakeholders (Friedrich et al., 2013).

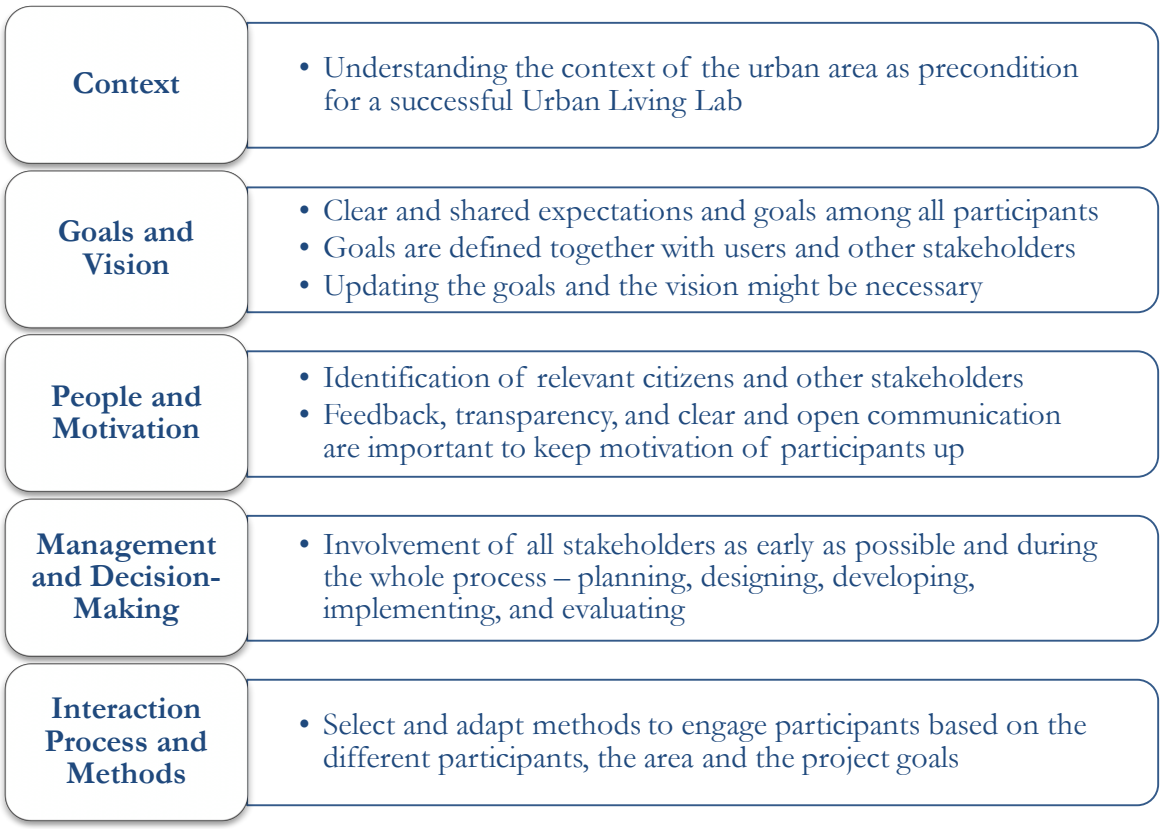

Figure 2-1. Key Success Factors of Urban Living Labs

Source: Friedrich et al., 2013

ULLs undergo different stages of development (see Figure 2-2). According to Friedrich et al. (2013), first, the context needs to be understood and the ideas as well as the further activities need to be planned, designed and developed. In the second stage, the ideas need to be implemented and put into practice. The third stage is evaluation. Monitoring and evaluating the processes and outcomes enhances learning and improvement. To summarise, ULLs are composed of the three phases *design*, *implementation*, and *evaluation*. However, these phases are sometimes not clearly distinguishable and overlapping. Especially the evaluation phase does often not only happen at the end but throughout the project so that the evaluation results can directly be fed back into the processes.

Possible actors involved in an ULL are users, producers, companies, public agencies, universities, institutes, non-profit organisations, special interest groups, and municipalities (Franz, 2015; Franz et al., 2015; Nyström, Leminen, Westerlund, & Kortelainen, 2014). The motivation, purpose, and level of involvement of different stakeholders can vary throughout the ULL stages. While some stakeholders are only consulted, others actively take part in the decision-making processes (Franz et al., 2015; Salter & White, 2013). To engage the stakeholders and to motivate their participation, the involvement needs to be rewarding and the benefits need to outweigh the costs (Buhr et al., 2016; Friedrich et al., 2013; Salter & White, 2013).

Figure 2-2. Stages of Development of Urban Living Labs

Source: Friedrich et al., 2013

Buhr et al. (2016) point out that the type of actor that is driving the ULL can have influence on the characteristics of a LL. Leminen, Westerlund, and Nyström (2012) have identified four different types of LLs that are driven by different types of stakeholders – utiliser-driven, enabler-driven, provider-driven, and user-driven (see Table 2-2). Utilisers are often companies that use the LL approach to test and develop new products and services. Public-sector actors as well as non-governmental organisations and financiers often act as an enabler for LLs addressing societal needs and aiming for societal improvements. The purpose of provider-driven LLs is to generate knowledge, and to develop research and theory. The drivers include educational institutes, universities, or consultants. Finally, LLs can be established by users. User-driven LLs are typically, driven by user communities that aim to solve a specific (everyday-life) problem. The operation of a user-driven LL is often facilitated by a provider (Leminen et al., 2012).

Table 2-2. Different Types of Living Lab Drivers

	Utiliser-Driven	Enabler-Driven	Provider-Driven	User-driven
Driver	Companies	Public-sector actors; Non-Governmental Organisations; Financiers	Educational Institutes; Universities; Consultants	User Communities
Aim	Test and develop new products and services.	Address societal needs; aim for societal improvements.	Generate knowledge; develop research and theory.	Solve a specific everyday-life problem.

Source: Leminen et al., 2012

The driving actor does not only influence the purpose, the way values are created, and the results and impacts of the LL but also the coordination and participation approaches vary accordingly (Leminen, 2013; Leminen et al., 2012). LLs can be distinguished based on different characteristics, including their driving party, the coordination of innovation and the way that participation is organised (Leminen, 2013).

The focus of this research is limited to the differences in the level of user involvement and participation. Not much academic research has been done analysing the involvement of users

in general and the level of participation in particular. The role of user participation in LL and ULL research will be presented in more detail in Chapter 2.3, after shortly introducing the concept of participation.

2.2 Opportunities and Challenges of Participation

"Co-creation, […] involvement, or simply participation generally refer to the integration of stakeholders into innovation processes, and [the terms] share the common view that such an approach should generally associate with positive outcomes." (Ommen, Blut, Backhaus, & Woisetschläger, 2016, p. 2410). All these different terms have a similar but not identical meaning, however, the distinction between them is not sharp. While "some count an informative meeting about research findings as a form of participation, others ask for stakeholders to be actively involved in the analysis, and some even need to see the actual influence of the participants upon the outcomes of the process." (Hage, Leroy, & Petersen, 2010, p. 262).

For the purpose of this research, the terms involvement, participation and at times engagement are used as synonyms. They are seen as generic terms that refer to the integration of users or citizens in the processes of ULLs. In contrast, the term co-creation is understood as the highest level of participation by the analytical framework presented in Chapter 3.2.

Participation in that generic sense can be defined as "a process where individuals, groups and organisations choose to take an active role in making decisions that affect them" (Reed, 2008, p. 2418). While the term stakeholder participation often refers to the participation of organised groups, the focus of this research lies on the participation of the users of Urban Living Labs and the citizens of a city. This stakeholder group is typically unorganised as it is the case with public participation in general (Luyet, Schlaepfer, Parlange, & Buttler, 2012).

Public participation is a core element of good governance and essential for modern democracies, being closely linked to human rights (Arnstein, 1969; Ebbesson, Gaugitsch, Jendroska, Marshall, & Stec, 2014). Especially in environmental decision-making, public participation is becoming more and more important and was officially constituted a democratic right in the United Nations Economic Commission for Europe's 1998 Aarhus Convention (Reed, 2008). Public Participation allows for comprehensive information inputs and can therefore increase the quality of decisions (Reed, 2008). It can contribute to better decisions with local knowledge and expertise. Furthermore, participatory processes and transparent communication empower the citizens and help in building up trust and commitment (Bush, Gillson, Hamilton, & Perrin, 2005; Friedrich et al., 2013; Gramberger, 2001; Hage et al., 2010).

However, participation also comes along with potential risks and disadvantages such as being an expensive and time consuming process, stakeholder frustration, identification of new conflicts, involvement of stakeholders that are not representative, or empowerment of already powerful stakeholders (Luyet et al., 2012). The benefits of public participation are not guaranteed: The nature of the participation process, the participation techniques as well as the context have an influence on the quality of resulting decisions and whether or not the participatory process can be seen as a success (Luyet et al., 2012; Reed, 2008). Different approaches have been made to identify the principles of successful stakeholder involvement. The promotion of equity and trust, the integration of local and scientific knowledge, involvement of stakeholders from the outset to the evaluation, as well as adequate participation methods that address the stakeholder heterogeneity are only some examples (Langlet, 2013; Luyet et al., 2012; Reed, 2008).

Despite the described benefits of public participation and practical experiences made in Sweden showing that a citizen dialogue is possible regarding almost all questions (Langlet, 2013), citizen engagement is often not achieved or only happens during the implementation phase of a project cycle (Eskelinen et al., 2015; Reed, 2008).

2.3 User Involvement and Participation in Urban Living Labs

A focus of current research on Urban Living Labs lies on the analysis of their potential to govern urban sustainability and to address urban sustainability challenges but also to identify opportunities that cities have. ULL methodologies and cases are studied, explored, tested and applied in order to gain further understanding of this innovative concept (Brask, 2015; Buhr et al., 2016; Curtis, 2015; Evans & Karvonen, 2014; Schliwa, 2013; Voytenko et al., 2016). Literature is mostly focussing on case studies and conceptual studies, with only limited systematic and empirical research on the topics (McCormick & Schliwa, 2016; Schuurman et al., 2015).

The central role of users is a common element of both ULLs and LLs (Veeckman et al., 2013). Buhr et al. (2016) highlight that user involvement in ULLs exceeds common dialogue processes and that "Urban Living Labs go beyond engaging urban stakeholders and residents, as suggested by other user-centered [sic] or participatory research approaches, in that various stakeholders are partners throughout the co-creative process." (Buhr et al., 2016, p. 27). Similarly, Schuurman and De Marez (2012) emphasise the higher degree of user involvement and realism of LLs compared to other approaches.

The term *user* involvement originates from the Living Lab concept that focuses on product-testing and the ICT sector. People are involved in order to use, test, and evaluate new products and services. LLs thus focus on people in the role of users (McCormick & Schliwa, 2016). Even though the terminology used for LLs was adopted by the ULL concept, ULLs see people rather in their role as *citizens* and not necessarily as users. This can be explained by the broader scope of ULLs that are not only focussing on products and services but are applied to the urban context dealing with sustainability challenges (McCormick & Schliwa, 2016). Urban Living Labs do often not target a distinct and specified group of people but interested citizens in general. When for example experimenting with new forms of collaboration or urban governance, there is usually an aim to involve as many citizens as possible. The purpose is then to involve the people as citizens rather than as users. However, an ULL can for example also focus on testing the use of a new service, looking at citizens taking the role of users.

In this research both terms, user involvement and citizen involvement, are used. The terms are not clearly defined and distinguishable and often employed interchangeably (McCormick & Schliwa, 2016). The term citizen involvement better emphasises the need to involve citizens as part of the public society when addressing urban sustainability challenges and might therefore be more appropriate to use. However, in ULL literature, user involvement is the term most widely used. It was therefore decided to refer to the common terminology when formulating the problem definition and research questions. However, depending on the context, the term citizen involvement is used for analysing the cases.

Co-creation and other catchwords such as co-production, participation, involvement, empowerment, quadruple helix-model, and multi-stakeholder or public-private-people-partnership can be found to describe the collaborative aspect of LLs (Baccarne et al., 2014; Budweg et al., 2011; Feurstein et al., 2008; Franz, 2014, 2015; Leminen, 2013; Schuurman & De Marez, 2012; Westerlund & Leminen, 2011). User involvement is implied by the experimental setting of LLs. Users are used to help shaping and creating new products and services, and to test new ways of addressing sustainability challenges (Bulkeley et al., 2015;

Franz, 2015). An ULL shall by design be open for learning and exploration in any direction, allowing users to adapt the experiment and to spring surprises (Evans & Karvonen, 2010; JPI Urban Europe, 2013). To summarise, users do "not only act as sources of information, but they are also testers, developers, and designers of innovation on an equal basis with the others in the living lab" (Nyström et al., 2014, p. 483).

As an ULL is based on users as co-creators in the innovation process, it is important that they are actively involved from the early stages of the project to ensure that they can shape the process rather than only responding to it (Bergvall-Kåreborn & Ståhlbröst, 2009; JPI Urban Europe, 2013). Early user involvement helps to identify the users' needs and ensures that every stakeholder involved follows a common goal or vision (Baccarne et al., 2014; Devaney et al., 2014; Salter & White, 2013). Users often are not only most affected by decisions, but can also provide specific local knowledge based on their user experiences, needs, and preferences. This compromises that they are usually less resourced and possess less formalised knowledge (Juujärvi & Lund, 2016; Salter & White, 2013). User involvement empowers citizens through co-creation and enhances their feeling of being part in decisions. As a consequence, they identify with the project, which enhances trust and commitment to the project goals (Friedrich et al., 2013; Hatzelhoffer et al., 2012; Juujärvi & Lund, 2016).

Participation of users and other stakeholders in ULLs can take several forms, including face-to-face as well as online methods. Ways to involve participants include giving feedback, answering questions, participating in the development processes, influencing political decisions, voting, and participating in the decision-making (Friedrich et al., 2013).

The aim is to include different kinds of stakeholders and make the co-creation processes rewarding and efficient for everyone involved (Friedrich et al., 2013). While the ideal would be to include all possible stakeholders, this is often not feasible. Friedrich et al. (2013) suggest that the narrower the issue the larger the number of participants and vice versa. It is therefore necessary, to identify the most important stakeholder or user groups that need to be involved, for example by using scales of relevance. Special attention needs to be given to special groups, such as youth and children, when designing the participatory processes. Everyone who is interested or affected by a decision should have the possibility to get involved and get access to information (Friedrich et al., 2013; Manville et al., 2014). At the same time, it needs to be ensured that the involved user group is representative and does not only consist of the most active participants but also covers marginalised or under-represented voices (Franz, 2015). This inclusion of key relevant stakeholders is emphasised as one important practical challenge for many ULLs (Bergvall-Kåreborn & Ståhlbröst, 2009; Budweg et al., 2011; McCormick et al., 2015; Voytenko et al., 2016). A study by Curtis (2015), for example, revealed that even though ULLs are embedded in disadvantaged communities, equal engagement of all end-users within the community is a challenge often resulting in an engagement of highly educated individuals with a lack of diversity.

Despite the important role of user involvement and participation, little LL research has been conducted focusing on the analysis of user involvement beyond highlighting its importance and describing its characteristics. While the high degree of participation is often emphasised (cf. Buhr et al., 2016; Schuurman & De Marez, 2012), other than a few exceptions, not much academic research analytically analyses the level of participation.

As part of their systematic review of LL literature, Schuurman et al. (2015) study the appearance of user innovation within the analysed LL papers. Using the categorisation of Kaulio (1998) as framework, they analyse if the mode of user involvement is dominantly *design for, with* or *by users*. While design for users is characterised as passive user involvement, design

with users takes a co-creation approach, and finally design by users means that the users themselves innovate. The literature review by Schuurman et al. (2015) shows that design with users or the co-creation approach is the most common mode of user innovation. Furthermore, while design by users is not dominant at all, some of the analysed papers suggest design for users. Even though the result, that design with users is dominant, is in line with the authors' expectations, Schuurman et al. (2015) are in surprise that user innovation is not more often mentioned as anchoring paradigm. They also conclude that the roles and characteristics of end-users in LLs is researched in surprisingly little detail despite the user-centric nature of LLs.

Leminen (2013) has identified a research gap regarding the understanding of innovation mechanisms in LLs from the perspectives of coordination and participation. He addresses this gap by developing a framework that links the different innovation mechanisms with the possible drivers of a LL (provider, enabler, utiliser, and user) based on a literature review and an analysis of 26 living labs. The innovation mechanisms distinguish between *top-down* and *bottom-up* (coordination approach) and *exhalation-dominated* and *inhalation-dominated* (participation approach). He suggests that provider- and enabler-driven LLs are exhalation-dominated meaning that their purpose is not primary to fulfil the needs of the LL-driver but rather the needs of other stakeholders. Utiliser- and user-driven LLs, in contrast, follow an inhalation-dominated approach aiming to fulfil the needs of the driving party. Even though this study does not analyse the different levels of user involvement, it helps to better understand the coordination and participation approaches in LL networks.

Another study by Nyström et al. (2014) analyses the roles of different network actors in LLs assuming that the actor-role sets have an impact on the innovation in networks. By empirically analysing 26 LLs in four different countries 17 actor roles are identified. The study suggests four user roles: *informant, tester, contributor* and *co-creator*. Informants take a passive role of providing information about their knowledge and opinions. The testers test innovations in a real-life environment and provide their opinions. A contributor takes the role of a collaborator that together with other actors develops new products, services, processes and technologies. The fourth user role is the co-creator. Co-creators co-design as equal partner and developer a service, product or process with other actors. Among the analysed cases, contributor is the most common user role, followed by informant and tester. Co-creator is the less frequently adopted role. In most cases, more than one user role is present (Nyström et al., 2014).

Without analysing or determining the level of participation, Feurstein et al. (2008) examine eight LLs in Europe and identify the methods used to engage users in the different stages of a product or service development process. For each stage – product (or service) idea, product (or service) concept, product (or service) development, and market launch – they determine the methods that are most widely used in order to support companies that are going to implement a LL in finding the most appropriate methods. The most widely spread methods include interviews, user design, usability tests, and market and product tests (Feurstein et al., 2008).

Westerlund and Leminen (2011) analyse the steps to become an open innovation company, presenting the living lab approach as one form of open innovation. The authors of the study emphasise that in contrast to conventional innovation development, the open innovation living lab approach considers users as co-creators and equal to other LL actors. Westerlund and Leminen (2011) further examine the challenges that companies face when becoming an open innovation company. They suggest four steps, each representing an increased degree of user involvement: *producer-driven, user-centric closed, user-centric open,* and *user-driven*. Only in the last step, user-driven, a long-term collaboration with users takes place and well-established

procedures exist to involve users and co-create value with them. The results of this study are not used to analyse LL cases but aim to guide firms in becoming an open innovation company (Westerlund & Leminen, 2011).

Similarly, a study by Almirall et al. (2012), mapping living labs in the field of innovation, suggests four levels of user involvement ranging from users as a passive subject of the study to users as co-creators: *user centred, design driven, participatory,* and *user driven*. The authors map LLs in the landscape of other user-contributed methodologies for innovation looking at the two dimensions: level of user involvement and lab-like versus real-life context. On a 2x2-matrix, they locate LLs in the upper right corner, meaning high level of user involvement and real-life environment.

Veeckman et al. (2013) have developed an analytical framework to analyse the link between the building blocks of LLs and their effect on the LL outcomes. Several of the analysed building blocks refer to user involvement. Examples are the type of co-creation and the role users take. For each building block, four levels are identified that guide the analysis of the LLs. The user roles employed are the ones identified by Nyström et al. (2014): informant; tester; contributor; and co-creator. In the case of co-creation, the levels are:

1. *No interaction with users;*
2. *User feedback is captured, but users have no decision-making power in the innovation process;*
3. *User feedback is captured (iteratively), which may lead to some modifications/ alterations of the innovation;*
4. *User feedback is captured (iteratively); user can make changes to the innovation themselves; the user is part of the innovation process* (Veeckman et al., 2013, p. 11).

Veeckman et al. (2013) apply the developed framework to four case studies analysing these main characteristics in different LLs. A low score is assigned when a characteristic is not present and accordingly a high score is assigned when the characteristic is present. According to the coding results of the framework, in none of the four analysed cases, the users take the role of a co-creator and the role as informant is the most dominant one being present in two cases. Similarly, the coding results of the framework suggest, that the highest level of co-creation is achieved in only one of the analysed cases. Also looking at the other building blocks concerning user involvement, the highest possible score is rarely assigned. The authors summarise their lessons learned from this study and develop recommendations based on their findings (Veeckman et al., 2013).

As part of the evaluation of the fulfilment of the ULL definition, Karlsson, Federley, Bonnier, et al. (2016) have evaluated if stakeholders have been actively involved in *New Light on Alby Hill*, one of the case studies of this research, and the other SubUrbanLab-ULLs. However, the evaluation is mainly descriptive and does not apply an analytical framework.

In conclusion, while co-creation and user involvement are highlighted in both, ULL and LL research, only little systematic and empirical research can be found on the topic of co-creation. The part of research that analytically analyses user involvement is limited to literature on living labs, thus mostly focussing on testing of products and services rather than the broader urban context. No systematic case study research has been conducted, analysing if Urban Living Labs effectively engage in participatory methodology that facilitates co-creation.

3 Methodology

In this chapter, the research design and the analytical framework are presented. Section 3.1 explains the chosen case study design as well as the methods used for data collection and analysis. In section 3.2 the analytical framework is developed and presented.

3.1 Research Design

To answer the research questions, a multiple case study approach has been applied. Qualitative research methods were used to collect and analyse the data. A qualitative research approach is well suited for this study as it looks at situations and people trying to understand meanings, the context and processes of events. It can serve to identify unanticipated phenomena and be used to develop causal explanations (Walliman, 2006). In this study, the qualitative approach helps to explore how user involvement takes place in practice. A categorisation of user involvement (see Chapter 3.2) has guided the discussion of the cases as presented in Chapter 5.

3.1.1 Multiple Case Study Approach

A case study design has been chosen due to the exploratory nature of the research questions. According to Yin (2014), case study research is a suitable approach when asking how or why questions that aim to explore contemporary events. Case studies are good when little is known about the phenomenon as they can be used to provide descriptions, to test or generate theories (Eisenhardt, 1989). Typically, the researcher has little or no control over the behavioural events under observation so that the phenomenon is studied in its real-life context (Yin, 2014).

Case studies can be defined based on the unit under observation. Within-case studies, on the one hand, focus on only one case in order to become familiar with the patterns and differences among the elements within this one unit. They aim to provide a holistic understanding of the case (6 & Bellamy, 2012; Eisenhardt, 1989). Cross-case analysis, on the other hand, focuses on the comparison of different cases. The aim is to identify patterns and differences among the cases (Eisenhardt, 1989). A good number of cases for multiple case studies lies between four and ten. While a generalisation of findings is easier with a large number of cases, analysing only a few cases allows the researcher to gain a more holistic understanding of the complexities of each case (6 & Bellamy, 2012; Eisenhardt, 1989).

Since the aim of this research was to study how stakeholder involvement in Urban Living Labs takes place in practice, a multiple case study design with elements of within-case analysis was considered appropriate. The combination of conducting in-depth case studies while having the possibility to draw comparisons between the cases was expected to contribute to a holistic understanding of the complexity of each case while providing the possibility to identify patterns and differences between the cases. Based on the Living Lab typology developed by Leminen, Westerlund, and Nyström (2012) (see Table 2-2), it was chosen to focus on four cases. Cases have been selected accordingly so that they broadly represent the different types identified by Leminen et al. (2012) – provider-driven, utiliser-driven, user-driven, and enabler-driven. Cases were not required to use the term *Urban Living Lab* but were selected if they fulfilled any of the ULL definition or key characteristics that can be found in literature. It was decided to focus only on mature Urban Living Labs that have already been finalised because they allowed for more data regarding not only their design and the implementation but also their evaluation. While all cases were required to contain elements of stakeholder involvement, a diversity of the remaining characteristics among the cases was an aim. This allowed for the analysis of a variety of factors.

Suitable cases were identified by searching through the European Network of Living Labs' (ENoLL) database, internet searches and recommendations from researchers in the field. The final selection of cases resulted in the following four Urban Living Labs: *New Light on Alby Hill* in Stockholm, Sweden; *Nexthamburg* in Hamburg, Germany; *T-City Friedrichshafen* in Friedrichshafen, Germany; and *UbiGo* in Gothenburg, Sweden.

3.1.2 Methods for Data Collection

Case study design typically relies on a combination of different data collection methods (Eisenhardt, 1989). This triangulation enhances external validity and the substantiation of the results (6 & Bellamy, 2012; Eisenhardt, 1989). This research applied a triangulation of data sources as well as collection methods. Data was collected through a literature review, semi-structured interviews, and the participation in conferences. Data sources included academics, ULL practitioners, and other ULL stakeholders.

The literature review covered the topic areas of participation, involvement, co-creation, and engagement of users and citizens as well as other stakeholders in (Urban) Living Labs. In order to prepare for the cases studies and the in-depth interviews, an initial literature review of the four cases and the concepts of Urban Living Labs and stakeholder involvement was conducted. Throughout the research process, a more throughout literature review was used to deepen the understanding and to further guide the analysis. It included the review of academic articles, books, master theses, conference papers, as well as grey literature.

The four case studies were mainly informed by in-depth stakeholder interviews. Another information source were websites and documents published by the ULLs themselves, by research bodies, or by third parties. Furthermore, all selected ULLs were accompanied by a research institution that evaluated the project. The evaluation reports supplemented the information gained through the interviews, especially by providing detailed insights into the user perspectives.

The participation in two conferences -– *EU-SPRI 2016* in Lund, Sweden, and *Ett nationellt Strategiskt innovationsprogram för Smarta Hållbara Städer* (A national strategic innovation programme for smart sustainable cities) in Malmö, Sweden, – provided background information about stakeholder involvement in general and stakeholder involvement in ULLs in particular. This information was used to guide the research and the analysis of the data.

While the literature review and the participation in conferences mainly provided background information and guidance, semi-structured stakeholder interviews constituted the backbone of the case studies. Semi-structured interviews allow the interviewer to vary the order of questions and also to follow-up to answers of the interviewee by adding questions (Bryman, 2012). By doing that, semi-structured interviews focus more on the interviewee's point of view and are flexible in taking a direction that the interviewee considers important (Bryman, 2012).

Thirteen interviews were conducted with partners involved in designing and setting up the respective ULLs. In addition, two interviews with experts in the field of ULLs and stakeholder involvement were held. Interview partners were identified by browsing the ULL websites, through referrals from researchers, and using snowball sampling, i.e. through recommendations by initial interview partners (Bryman, 2012). Site visits were not conducted due to the fact that the ULLs were already finalised. It would therefore not have been possible to observe and study the processes of the ULLs onsite.

It was decided to exclude the users of the ULLs from being potential interview partners but to rather focus the interviews on the stakeholders that designed and ran the ULLs, and their

experiences and challenges. As the ULLs had already been finalised it would have required extensive efforts to contact the users, a stakeholder group that is usually not organised (Luyet et al., 2012). Including interviews with users and the related challenges would therefore have required to reduce the number of cases and narrow down the scope of this research. However, it was considered as particularly important to investigate four different cases in order to have a base for comparisons (see also Section 3.1.1). Furthermore, the ULLs themselves conducted comprehensive evaluations that had a special focus on the user group. Thus, empirical data on the experiences and opinions of users could be provided by the interview partners and the documentation of the ULLs. In consideration of these circumstances, the available data was deemed to be appropriate.

Potential interview partners were contacted via email and telephone and the interviews were conducted via skype, telephone, or in person. A comprehensive list of interview partners can be found in Appendix II. The interviews were held in June and July 2016 and lasted between 30 and 75 minutes. They were conducted in English, Swedish, or German. The semi-structured interviews followed an interview guide that had been developed and peer reviewed beforehand. A general interview guide that formed the base and guided the individual case study interviews can be found in Appendix III. The interview guide focused on stakeholder involvement but also covered more general information about the ULLs.

While conducting the interviews, notes were taken to oversee that all questions have been answered and to facilitate follow-up questions. In addition, the interviews were recorded with kind permission of the interview partners and afterwards partially transcribed. However, one interview could not be recorded due to technical difficulties. In that case, comprehensive notes were taken during the interview. Quotes were translated to English, when necessary. All interviewees were provided a draft version of the thesis prior to publication.

In addition, transcripts of interviews conducted by Madeleine Brask were used as information sources for the ULL *UbiGo*. M. Brask had conducted these interviews in March and April 2015 as part of her Master's thesis (Brask, 2015). Finally, one interview with Anja Karlsson was already conducted in February 2016. It was part of a course project at the IIIEE and the interview was conducted together with Giulia Mariani and Oana Arseni. The transcript of this interview was used to inform the analysis of *New Light on Alby Hill*.

3.2 Analytical Framework

The study applied qualitative methods in order to analyse and discuss the collected data (Walliman, 2006). Through the literature review, key concepts could be established as initial coding categories. A directed approach to content analysis was used to identify patterns within and between the cases (Hsieh & Shannon, 2005). This section introduces the analytical framework that was designed in order to discuss the user involvement in the four selected cases.

Different approaches and typologies have been developed to better understand the concepts of participation and stakeholder involvement as well as the different contexts in which they occur, such as approaches analysing the level of involvement, the direction of communication flows, or the objectives for the use of participation. Furthermore, stakeholder analysis methods deal with the questions how to identify the most important stakeholders to involve, how to differentiate and categorise them, and the analysis of the relationships between stakeholders (Reed, 2008; Reed et al., 2009). The typologies can be used when choosing participatory methods but also ex post as means to categorise participation (Reed, 2008).

The aim of this study is to analyse if the selected ULLs effectively engage in participatory methodology that facilitates co-creation with users. Co-creation does not only describe a process or strategy, in this research, the term is understood as a certain level of user involvement. In the following, the focus will therefore be on the participation typologies that analyse the different degrees or levels to which stakeholders participate in decision-making processes. Other typologies and approaches are excluded as they go beyond the scope of this research. Based on a selection of existing literature, an analytical framework for the case study analysis is designed and presented below.

In 1969, Arnstein (1969) developed the first "ladder of participation" as a simplification of the reality that guides the categorisation of different levels of empowerment. It includes eight different levels ranging from no participation up to the highest degree of citizen power, citizen control (see Figure 3-1).

Figure 3-1. Arnstein's Ladder of Citizen Participation

Source: Arnstein, 1969 (p. 217)

Since Arnstein developed his ladder of participation, it has been adapted to other contexts and further developed by numerous academics as well as practitioners. According to Fung (2006), Arnstein's ladder of participation "remains perhaps the most cited work in the literature on participatory democracy" (p. 66). Table 3-1 presents the different approaches to classify the levels of participation that were used for this research to guide the development of the analytical framework. A more detailed table including short explanations of the different categories can be found in the Appendix I.

Table 3-1. Levels of Stakeholder Involvement

Levels *(presented on a continuum of decreasing stakeholder involvement)*	**Author(s)**
Degrees of Citizen Power	**(Arnstein, 1969)**
Degrees of Tokenism	
Non-participation	
Empowerment	**(Davidson, 1998)**
Participation	
Consultation	
Information	
Active Participation	**(Gramberger, 2001)**
Consultation	
Information	
Representation	**(Alam, 2002)**
Extensive Consultation with Users	
Information and Feedback on Specific Issues	
Passive Acquisition of Input	
Direct Authority	**(Fung, 2006)**
Co-Governance	
Advise and Consult	
Communicative Influence	
Personal Benefits	
Empower	**(Disterheft et al., 2012; International Association for Public Participation, 2007)**
Collaborate	
Involve	
Consult	
Inform	
Co-Decide	**(Hage et al., 2010)**
Co-Produce	
Take Advice / Consult	
Non-Interactive / Listen	
Study	
Inform	
No Participation	
Empowerment	**(Luyet et al., 2012)**
Co-Decision	
Collaboration	
Consultation	
Information	
Co-Decisions	**(Langlet, 2013)**
Influence	
Dialogue	
Consultation	
Information	

While Arnstein's ladder metaphor suggests that the aim of participation is to always strive after the highest level of participation, this view is not un-questioned. In many publications it is highlighted that different contexts might require different levels of participation (Davidson, 1998; Fung, 2006; Hage et al., 2010; Luyet et al., 2012). Davidson (1998) therefore suggests to replace the ladder metaphor by the "Wheel of Participation" that was developed by the South Lanarkshire Council. Fung (2006) emphasises that in some contexts public empowerment may be strived after, "but there are certainly others in which a consultative role is more appropriate for members of the public […]" (p. 67). According to Luyet et al. (2012) the level of participation needs to consider the heterogeneity among stakeholder groups but also within stakeholder groups. To allow for an inappropriate level of participation can result in too much or not enough power of a stakeholder. It is therefore necessary to identify, characterise and organise the different stakeholders to adjust the level of participation and the participation techniques used accordingly (Luyet et al., 2012).

The different categorisations consist of a varying number of levels with different gradations. While some authors use distinct expressions, other terms occur repetitively so that a pattern can be identified.

Arnstein (1969) and Hage et al. (2010) start their categorisation with *No Participation* as lowest level of involvement. This can simply mean that citizens are from the beginning not intended to be involved at all. However, it can also mean that participation is pretended but not really happening in reality.

Other authors (Disterheft et al., 2012; Gramberger, 2001; International Association for Public Participation, 2007; Langlet, 2013; Luyet et al., 2012) start their categorisation with the level of *Information*. Information can be understood as a one-direction flow of easily accessible and objective information from the decision-making body to the citizens without actively engaging the latter ones (Gramberger, 2001; Langlet, 2013).

The next level following information can be characterised by a limited two-direction communication flow. This next level is referred to by most authors as *Consultation* (Arnstein, 1969; Davidson, 1998; Disterheft et al., 2012; Gramberger, 2001; International Association for Public Participation, 2007; Langlet, 2013; Luyet et al., 2012). It suggests that citizens are consulted and given the possibility to provide feedback. However, their input and opinions are not necessarily taken into account during the decision-making process (Luyet et al., 2012).

The terminology for the following levels is most distinct. Different levels of empowerment are identified and described. Terms used vary from citizen control and empowerment over direct authority and representation to active participation and co-decision. While the highest level in some categorisations requires that citizens can exert direct authority and have autonomous decision-making power (e.g. Arnstein, 1969; Davidson, 1998; Fung, 2006), others consider the highest level as achieved in the case of an equal distribution of decision-making power between citizens and officials (e.g. Alam, 2002; Gramberger, 2001; Hage et al., 2010).

Though slightly distinct, all these categories have in common that the citizens have the ability to actively engage in decision-making processes with at least equal power to influence compared to other decision-making bodies (Arnstein, 1969; Gramberger, 2001; International Association for Public Participation, 2007; Luyet et al., 2012). These characteristics are reminiscent of the term co-creation and also similar expressions that are used to define the concept of ULLs and its main characteristics (cf. Almirall et al., 2012; Baccarne et al., 2014;

Dell'Era & Landoni, 2014; Franz, 2015; JPI Urban Europe, 2013; Juujärvi & Pesso, 2013; McCormick & Schliwa, 2016; Westerlund & Leminen, 2011). Therefore, the analytical framework adopts the term *Co-Creation* to describe and summarise this broad category of empowerment when investigating participation in ULLs.

Veeckman, Schuurman, Leminen, and Westerlund (2013) define co-creation as a collaborative development approach to innovation including two or more actors that jointly create value and benefits. Likewise, Franz, Tausz, and Thiel (2015) understand co-creation as "collaborative new outcome between two or more groups of actors that include residents as a prerequisite" (p. 49). Ståhlbröst and Holst (2013) emphasise the importance to take the step from user involvement to influence so that there is a balance between the different partners in terms of participation, influence, and responsibility.

To summarise, Figure 3-2 presents the categorisation of citizen involvement that will be used as an analytical framework to discuss the case studies in Chapter 5.

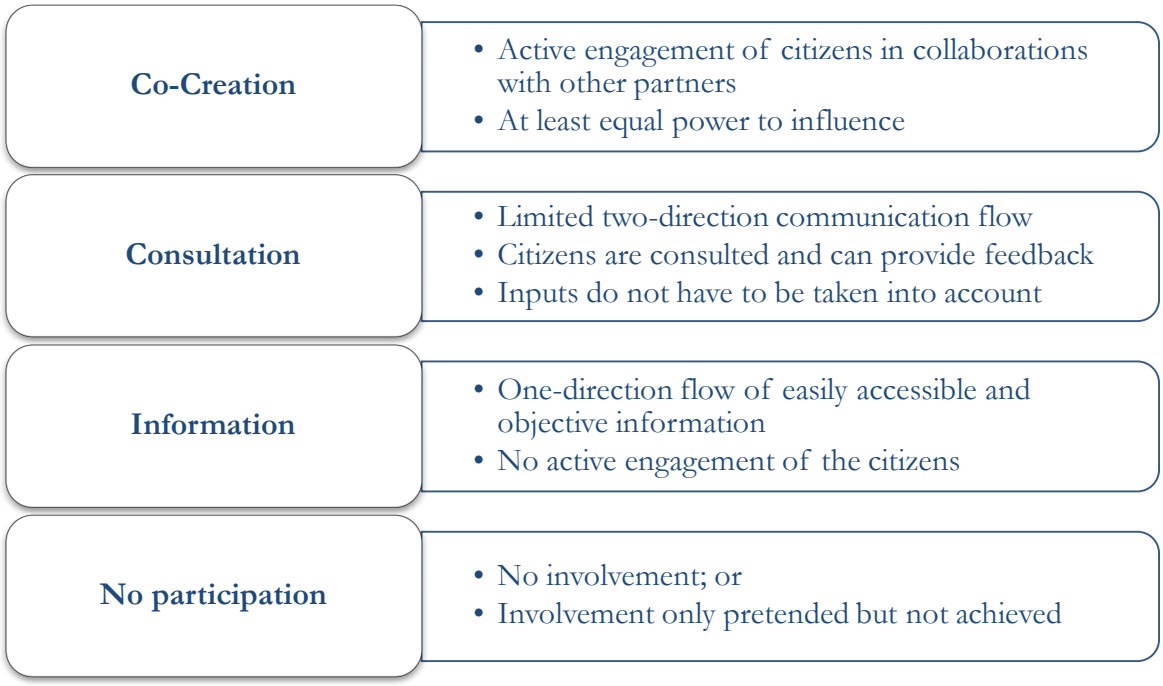

Figure 3-2. Analytical Framework: Categorisation of User Involvement and Participation

For the three stages of design, implementation and evaluation of an ULL (see Figure 2-2), it will be analysed to which extent the chosen cases involve the users of the ULLs and if the level of co-creation is achieved. This will be done by identifying the participation techniques used and the directions of the communication flows.

4 Case Study Analysis

This chapter seeks to analyse to what extent the users were involved in the four different cases and which different methods were used to engage them. The section is subdivided according to the four different cases. First, an overview of each ULL is presented guided by the five key characteristics identified by Voytenko et al. (2016) (see Table 2-1). Second, the user involvement as well as the participation of the other stakeholders is examined looking at the three stages of the ULLs – design, implementation and evaluation (see Figure 2-2). The case studies are thus to some extent following a chronological structure. However, the evaluation phase needs to be distinguished as it usually does not only happen at the end but throughout the project. It further needs to be clarified that the three stages are overlapping and the boundaries of the categories are floating.

A short summary of the case findings can be found in the table below (Table 4-1).

Table 4-1. Overview of Urban Living Lab Cases

Characteristic	New Light on Alby Hill	Nexthamburg	T-City Friedrichshafen	UbiGo
Aim	To turn a pathway for pedestrians into a more attractive and frequently used walkway while experimenting with new LED technology	To encourage citizens to develop and discuss ideas for the future urban development of Hamburg	To test how innovative information and communication technologies (ICT) can contribute to the solution of future urban challenges	To support the citizens in Gothenburg to make their travel smarter and more sustainable To develop and test a business model for a travel broker service
Duration	2013 - 2016	2009 - 2011	2006 - 2012	2012 - 2014
Location	Alby, Sweden	Hamburg, Germany	Friedrichshafen, Germany	Gothenburg, Sweden
Geographical Embeddedness	City district / a pathway	City	City	Parts of a city
Leadership and Ownership	Enabler- / Provider-driven	User-driven	Utiliser-driven	Provider-driven
Leading Partners	Municipality of Botkyrka IVL Swedish Environmental Research Institute Mitt Alby	Urbanista / Nexthamburg team Citizens	Deutsche Telekom City of Friedrichshafen	Chalmers University of Technology Viktoria Institutet Volvo IT Arby Kommunikation
Experimentation and Learning	LED technology and light installations New working methods and forms of collaboration with citizens	New forms of collaboration and public participation in urban development	Smart city and innovative ICT solutions New forms of collaboration between Telekom and the urban society	Travel broker service – new and sustainable business model

Evaluation	Impacts of the ULL on the social and environmental sustainability Fulfilment of the ULL-characteristics	Involvement of citizens with special focus on online participation	Achievement of the project objectives Impacts of digitalisation on the development of a city Governance aspects regarding the cooperation between the two leading project partners	User behaviour Transportation habits People's attitudes towards private car ownership Motivations (not) to take part in UbiGo Matches and mismatches in the expectations
Participation and User Involvement	Botkyrka municipality IVL Swedish Environmental Research Institute Mitt Alby Konstfack Residents of Alby Other local stakeholders	Nexthamburg team Citizens Experts City of Hamburg	Deutsche Telekom City of Friedrichshafen Local businesses Citizens Research institutions Institutions of public services	Travel broker UbiGo Transport service providers Citizens Service developers (ICT) Research institutes City of Gothenburg Region of Västra Götaland

4.1 New Light on Alby Hill

The ULL *New Light on Alby Hill* was part of the project "Social Uplifting and Modernization [sic] of Suburban Areas with an Urban Living Lab Approach" (SubUrbanLab). The SubUrbanLab was funded by the Swedish or respectively Finnish innovation agencies Vinnova and Tekes through the Joint Programming Initiative Urban Europe (Karlsson, Federley, Bonnier, et al., 2016). According to Karlsson et al. (2015) the goal of SubUrbanLab was to examine how less valued suburban areas can be modernised and socially uplifted in collaboration with the residents and other stakeholders. The project's aim was to turn suburbs into more attractive, sustainable and economically viable urban areas (Karlsson et al., 2015). The SubUrbanLab project ran between 2013 and 2016 and included six ULLs in total – three in Alby in Sweden and three in Peltosaari in Finland (Karlsson, Federley, Bonnier, et al., 2016). *New Light on Alby Hill* was a lighting project utilising ambient light and projections of four images (light installations) on the pavement and stonewalls with the aim to turn a pathway for pedestrians into a more attractive and frequently used walkway while experimenting with new LED technology (Karlsson et al., 2015; Karlsson, Federley, Holopainen, & Seitsonen, 2016). The area of the pathway had been formerly identified as unsecure through surveys assessing the sense of security in Alby as well as by walking around in the municipality together with residents during so called safety walks (IVL Svenska Miljöinstitutet, 2014). In total, the objectives of the ULL were three-fold: First, improving the sense of security in the area; second, using LED technology in order to create a more attractive and energy-efficient street lighting; and third, applying an ULL-approach in order to increase the involvement of citizens and other stakeholders and thus, enhancing future dialogue processes (Karlsson, Federley, Bonnier, et al., 2016).

Information about the ULL *New Light on Alby Hill* was gathered through interviews with Thomas Dottman, the lighting expert at Botkyrka Municipality and the technical manager of the ULL, and with Anja Karlsson (IVL Swedish Environmental Research Institute) who was responsible for the evaluation and served as the project manager for the three Swedish

SubUrbanLab-ULLs as well as the coordinator of *New Light on Alby Hill*. Furthermore, evaluation reports and other documents and information available on the ULL website as well as academic articles about the ULL served as a source of information.

4.1.1 Key Characteristics

Geographical Embeddedness. *New Light on Alby Hill* was located in Alby, in the municipality of Botkyrka, Sweden. Alby is a suburban area in the south of Stockholm with around 13 000 inhabitants. The area is shaped by large-scale uniform buildings and sterile public spaces that are in need of renovation. The suburb has to deal with social challenges including high unemployment, segregation and a lack of economic resources (Buhr et al., 2016).

The ULL focused on a pathway that connects the western side of Alby Hill with both, Alby's metro station and the centre of Alby (IVL Svenska Miljöinstitutet, 2014). Even though focusing on the pathway in Alby had put clear boundaries on the ULL, the project also positively affected the reputation of the whole area through good media attention (A. Karlsson, personal communication, February 24, 2016).

Leadership and Ownership. The initial idea for an ULL on lighting was discussed between the municipality of Botkyrka and IVL Swedish Environmental Research Institute. In the early beginning, the housing company Mitt Alby was invited to discuss possible topics for the ULL. Mitt Alby had just bought the housing area on Alby Hill and was considered as an important partner. Together, the three partners developed the project idea for *New Light on Alby Hill* (A. Karlsson, personal communication, June 21, 2016).

While IVL Swedish Environmental Research Institute was responsible for the evaluation of the project but also coordinating it, the housing company was involved as a private partner with an own interest in making improvements in the area. The municipality could pursue a two-fold objective – addressing the sense of insecurity in the area as well as implementing the municipality's decision to change from the conventional way of street lighting to more energy efficient street lighting (A. Karlsson, personal communication, June 21, 2016).

Experimentation and Learning. The municipal activities in Botkyrka have a strong focus on sustainability with a special emphasis on the social dimension. Furthermore, Alby municipality has developed a long-term plan with formulated objectives that guide the activities and policies in Alby (Karlsson, Federley, Bonnier, et al., 2016).

The main focus of the ULL was to explore how LED technology and light installations can contribute to the transformation of a pathway that the residents perceived as unsecure into a pathway that is seen as more attractive (Karlsson, Federley, Bonnier, et al., 2016). As part of the project, the municipality not only tested new working methods, such as the image competition with the residents, but also tested new ways of working with lighting in Alby. The light installations as well as ambient lighting were new approaches for street lighting that the municipality had not been using before. Furthermore, the LED-projector was a completely new product on the market. During the *New Light on Alby Hill* project the municipality could explore these new approaches and technologies in a real-life context (T. Dottman, personal communication, June 20, 2016; A. Karlsson, personal communication, February 24, 2016; IVL Svenska Miljöinstitutet, 2014; Karlsson et al., 2016). The experiences made could subsequently be used in following projects where both, light installations as well as the ambient light approach have been applied (T. Dottman, personal communication, June 20, 2016).

Evaluation and Refinement. The ULL *New Light on Alby Hill* was evaluated by IVL Swedish Environmental Research Institute with Anja Karlsson being mainly responsible for the evaluation. The focus of the evaluation was on the impacts of the ULL on the social and environmental sustainability as well as the fulfilment of the ULL-characteristics (Karlsson, Federley, Bonnier, et al., 2016).

Participation and User Involvement. The ULL *New Light on Alby Hill* brought together different actors including the municipality, IVL Swedish Environmental Research Institute, the housing company Mitt Alby, Konstfack (University College of Arts, Crafts and Design), the residents of Alby as well as other stakeholders.

4.1.2 Methods of Involvement and Participation

Design. To develop a suitable ULL for the SubUrbanLab project, the municipality of Botkyrka aimed to select a field of action that was in its early stage of development so that it would allow for participation by citizens and other stakeholders. Also, the municipality placed importance on the project being focused on the citizens' needs. The leading project partners, IVL Swedish Environmental Research Institute and Botkyrka municipality discussed their ideas in the planning phase (A. Karlsson, personal communication, June 21, 2016; Karlsson et al., 2015).

As the residents of Alby had previously highlighted the sense of security as low, especially related to poor lighting, a lighting project was considered to be a suitable approach to increase the sense of security in the area. Furthermore, such a project could be easily incorporated into the municipality's decision to change the lighting in the municipality towards more sustainable LED-lighting (A. Karlsson, personal communication, June 21, 2016).

Thomas Dottman, who is not only the lighting expert of Botkyrka municipality but already had insights into the area and experiences with participatory processes, was involved to further discuss suggestions and ideas (Karlsson et al., 2015). Possible locations were discussed between Anja Karlsson (IVL Swedish Environmental Research Institute) and different representatives of Botkyrka municipality, including Thomas Dottman, Gunilla Isgren (the municipality's contact person with IVL Swedish Environmental Research Institute), and the Områdesutvecklare (District Developer) for Alby (T. Dottman, personal communication, June 20, 2016).

The decision fell on a pathway on Alby Hill that residents perceived as unsecure as surveys and safety walks had previously identified (T. Dottman, personal communication, June 20, 2016; A. Karlsson, personal communication, June 21, 2016). The housing company, Mitt Alby, who owns the residential area surrounding the pathway was identified as a key stakeholder and the idea was presented to the company's CEO. Mitt Alby had just bought the residential area from the municipality which had caused discontentment among the residents who wished to have been more involved when selling the residential area to a private housing company. As a consequence, Mitt Alby wanted to make improvements in the area as fast as possible to show the residents that they were serious about improving the area and making it more socially sustainable (A. Karlsson, personal communication, June 21, 2016; IVL Svenska Miljöinstitutet, 2014; Karlsson et al., 2015).

According to Anja Karlsson "everyone was very open to listen to others and their suggestions and Mitt Alby was very open, they wanted to learn and they found it was a very good project and they were keen on involving the residents and making some visible projects." (personal communication, June 21, 2016).

The municipality of Botkyrka, IVL Swedish Environmental Research Institute, and Mitt Alby developed the objectives of the project and discussed how and when to engage the residents and other local stakeholders. Lighting designers, local entrepreneurs, and landscape architects were involved concerning the technical aspects (Buhr et al., 2016; Karlsson, Federley, Bonnier, et al., 2016). In addition, one of the teachers of Konstfack (the University College of Arts, Crafts and Design) who had previously been in a joint project with Thomas Dottman, contributed to the project as a lighting expert. He joined the discussions and gave input, mainly related to ambient lighting and the LED technology (A. Karlsson, personal communication, June 21, 2016).

Before taking any final decisions Borådet, the residents' council of the housing area, was invited for a presentation of the ideas. The council had just been founded, with the initiative coming from the housing company Mitt Alby. The residents' council met on a regular basis and it consisted of five residents who had shown interest in being part of the council and were active in the area as well as in contact with other neighbours. As such, they can be considered representing the residents to some extent, even though they were not formally elected (T. Dottman, personal communication, June 20, 2016; A. Karlsson, personal communication, June 21, 2016).

Two to three representatives joined the discussions with the ULL partners who presented their initial ideas for the ULL. The discussion was guided by prepared questions and allowed the representatives of the residents' council to provide their local knowledge about the people living on Alby Hill. They gave input on how and where to set up the ULL, who to involve and how to engage the possible stakeholders. The idea to have an image competition for the light installations was one outcome of the discussions. After the meetings with the residents' council, the ULL partners agreed upon a final project plan and the detailed planning began. During the first meeting a theme for the image competition was determined to be Vårt Alby (Our Alby). The decision was based on the comments contributed by the residents' council and the discussions of the ULL partners and other municipality representatives that were active in Alby (Federley & Karlsson, 2016; IVL Svenska Miljöinstitutet, 2014; Karlsson, Federley, Holopainen, et al., 2016).

As the residents' council emphasised the importance to involve children and youths, the art teacher of the local school, Grindtorpsskolan, as well as youth clubs and other local youth projects dealing with creative activities were contacted to ask them for their contribution and to spread the information about the project (T. Dottman, personal communication, June 20, 2016; A. Karlsson, personal communication, February 24, 2016; A. Karlsson, personal communication, June 21, 2016; Karlsson, Federley, Bonnier, et al., 2016). Furthermore, questionnaires were used to investigate the perceived sense of security of the residents in order to better understand the people and their needs in the development phase of the ULL. The questionnaires, including both open-ended as well as closed-ended questions, were filled in by representatives of the ULL partners, on-site on the pathway (Federley & Karlsson, 2016). In total, 75 users responded this ex-ante survey (Karlsson, Federley, Bonnier, et al., 2016).

To sum it up, the design phase of the ULL included several meetings during which the project partners, IVL Swedish Environmental Research Institute, Botkyrka municipality, and subsequently Mitt Alby, developed the project and discussed the steps of implementation. While the foundation was laid during the meetings, smaller decisions were also taken via phone or email. The project partners exchanged their knowledge and expertise. Decisions were made considering the input from stakeholders and residents and the residents' council

(A. Karlsson, personal communication, June 21, 2016; Karlsson, Federley, Bonnier, et al., 2016).

Implementation. After agreeing on a detailed plan, the implementation of the lighting project began. It included the selection of a suitable LED technology for the ambient lighting as well as selecting the images for the light installations and setting up the lighting.

Different LED-technologies from different suppliers were tested and evaluated by representatives of the ULL partners as well as the light expert of the University College of Arts, Crafts and Design, and two representatives of the residents' council. All participants of the field tests could express their opinions and give suggestions for improvement by contributing with local perspectives as well as expertise before finally deciding on a suitable technology (T. Dottman, personal communication, June 20, 2016; Federley & Karlsson, 2016; Karlsson, Federley, Holopainen, et al., 2016).

With regard to the image competition, first, information about the competition needed to be distributed. Information channels included the ULL website as well as the website of Mitt Alby and the municipality, Facebook, information leaflets in the post-boxes of every Alby Hill resident, posters all over Alby, a press release, and electronic information sent to relevant stakeholders such as schools and kindergartens (Federley & Karlsson, 2016; Karlsson, Federley, Bonnier, et al., 2016; Karlsson, Federley, Holopainen, et al., 2016). The ULL website was based on the online tool Owela that had been developed by VTT Technical Research Centre of Finland, one of the SubUrbanLab project partners. Through the website citizens and other stakeholders could comment on updated information and later vote on the images (Karlsson, Federley, Holopainen, et al., 2016).

Citizens including the pupils of the local school were encouraged to contribute to the competition by sending in images. The competition was not restricted to the residents of Alby Hill but allowed everyone to take part. However, the communication channels focused on Alby Hill. The possibility to have the image projected along the pathway was considered to be incentive enough to take part in the competition (A. Karlsson, personal communication, June 21, 2016; Federley & Karlsson, 2016). In total, 20 images were submitted among which 18 images were handed in by pupils (Karlsson, Federley, Bonnier, et al., 2016). The ULL partners made a pre-selection based on the realisation of the topic Our Alby and also regarding the ability to project the image on the wall. Six images were then available for competition to elect two winners (Karlsson, Federley, Holopainen, et al., 2016).

E-voting through the ULL website or using a QR-code printed on posters and flyers was employed to engage citizens and the pupils of the school in the decision-making process of selecting the images. Similar to the first information campaign, information about the participation possibilities was distributed through local media, posters all around Alby and on the information boards in the staircases of the neighbouring residential buildings. Digital information could be found on the websites of the housing company, the municipality and the ULL itself, and electronical leaflets were sent to relevant stakeholders (Federley & Karlsson, 2016; Karlsson, Federley, Holopainen, et al., 2016). Furthermore, the organisation Orten skriver (The Writing Neighbourhood) was asked to contribute a poem with the aim to project it during the voting phase in order to provide an example of how the light installations will look like (Karlsson, Federley, Holopainen, et al., 2016). A jury consisting of the ULL partners chose additional four images from the remaining images that were not part of the public competition. These images were planned to be rotated as light installations every couple of weeks (Karlsson, Federley, Holopainen, et al., 2016).

According to Anja Karlsson (personal communication, February 24, 2016), the achieved number of votes exceeded the expectations of the project partners. The selected images were transferred to a plastic film and previewed as light installations. The local newspaper, the TV-news station, the two winners from the competition, ten pupils from the local school, a local politician as well as several representatives of the ULL partners were present during the preview. The following official opening ceremony was attended by the ULL partners, the CEO of Mitt Alby, the head of the municipal executive board, and about 30 residents dropped by to have a look (Karlsson, Federley, Holopainen, et al., 2016).

To conclude, while the municipality's responsibility during the implementation phase was mainly focusing on the technical implementation of the lighting, IVL Swedish Environmental Research Institute was mainly involved in the communication with the residents and the local media, in preparing information materials as well as organising the voting. The citizens and pupils of the local school could participate by contributing images as well as by voting for their favourites (A. Karlsson, personal communication, February 24, 2016). In total, about 130 citizens participated through at least one or more of the above mentioned activities (Karlsson, Federley, Bonnier, et al., 2016).

Evaluation. The ULL *New Light on Alby Hill* was evaluated by IVL Swedish Environmental Research Institute. The evaluation took place throughout and after the project. A variety of evaluation methods was used combining both qualitative and quantitative approaches. The evaluation included oral questionnaire surveys with residents, a quantitative evaluation of the energy efficiency and the reduction in greenhouse gas emissions, as well as a cost effectiveness analysis. Furthermore, meeting minutes, emails, and interviews with key stakeholders were analysed. An evaluation report was published after the end of the project (Karlsson, Federley, Bonnier, et al., 2016).

Both, the sustainability objectives of the municipality as well as the fulfilment of the ULL characteristics were used as evaluation baseline. Oral questionnaires with users of the pathway provided insights into the sense of security and the perceived attractiveness of the area, both, before and after the lighting projects. The questionnaires also included questions regarding the respondents' perception of having the possibility to influence their outdoor environment. The surveys were conducted along the pathway and during different times of the day. This allowed to gain insights into different opinions and views of people with varying schedules and routines including those who did use the pathway when it was dark (Karlsson, Federley, Bonnier, et al., 2016).

According to Anja Karlsson (personal communication, June 21, 2016) an additional survey with the pupils from the local school was conducted. However, with only eight responses, the response rate was quite low so that it was difficult to draw broader conclusions. As a consequence, the survey was excluded from the evaluation report.

Furthermore, representatives of the project partners took part in the evaluation process. Together, they looked into the learning processes within the organisations as well as between the organisations, and discussed what they have learned and what can be done better (A. Karlsson, personal communication, June 21, 2016).

4.2 Nexthamburg

Nexthamburg is a crowdsourcing platform that provides a protected space for citizens to discuss their ideas about the future urban development of Hamburg (Petrin, 2012). It started between 2009 and 2011 as a funded pilot project of the National Urban Development Policy by the Federal Ministry of Transport, Building and Urban Development and is still ongoing

even if in a modified form (Nexthamburg, n.d.). The focus of this case study lies on this first pilot phase of *Nexthamburg*. Even though the term *Urban Living Lab* was not used to describe the project, it fulfils the characteristics of an ULL as will be shown below.

Nexthamburg encouraged citizens to develop and discuss ideas and wishes for the future urban design of Hamburg, including ideas that normally would not be discussed in formal urban planning processes. Thus, by providing a neutral space for discussion, ideas could be specified, challenged and mature. With the aim to develop a citizens' vision for Hamburg, popular ideas were further developed by the citizens but also with the support of the *Nexthamburg* team consisting of urban planners and other experts (S. Landau, personal communication, July 7, 2016; Petrin, 2012; Weninger, Poplin, & Petrin, 2010). The vision was then presented to the city of Hamburg with the intention to influence the urban planning policy of the city. However, the goal was not that the city would implement every single suggestion, but to give the citizens a strong voice in the dialogue about urban planning. A further purpose was to proof that the public participation methods applied can work out and that the outcomes are valuable and useful for the city (S. Landau, personal communication, July 7, 2016; Petrin, 2012).

The main sources for information about *Nexthamburg* were interviews with two *Nexthamburg* team members, Sven Lohmeyer and Stephan Landau, as well as with Daniel Kulus who was part of the *Nexthamburg* evaluation team at the HafenCity University Hamburg. Furthermore, the outcome of the pilot phase – the published citizens' vision "Nexthamburg: Bürgervision für eine Stadt" (Petrin, 2012) –, the website of the project, academic articles as well as other publications about the project were used to inform the case study.

4.2.1 Key Characteristics

Geographical Embeddedness. As the name *Nexthamburg* suggests, the project started in the city of Hamburg, Germany. While the focus hence laid on the future development of Hamburg, the ideas and lessons learned have spread to many other projects and cities mainly in Germany but also abroad (S. Lohmeyer, personal communication, June 15, 2016; Weninger et al., 2010). The initiative to start *Nexthamburg* was a reaction to current planning policies that lacked a long-term perspective, which was perceived to be needed to address the challenges related to the ongoing growth of the city (Petrin, 2012). *Nexthamburg* aimed to address challenges such as housing shortage, a widening gap between rich and poor or increasing traffic volumes. Ideas were aimed to be found in cooperation and dialogue with the citizens of Hamburg.

Leadership and Ownership. The *Nexthamburg* platform was developed and created by the Hamburg based office for participatory urban design, Urbanista, or more specifically by the *Nexthamburg* team. Urbanista has always been on the interface of urban design and communication and developed the *Nexthamburg* platform based on their daily urban design work. The contents of the citizens' vision and the ideas for the future development of Hamburg, however, came from the citizens. Thus, while the organisational frame was provided by the urban planners, the discussion and discourse about a vision for Hamburg was led by the citizens themselves (S. Landau, personal communication, July 7, 2016).

Experimentation and Learning. The project website describes *Nexthamburg* as "Hamburg's citizens City Lab – independent and open to all, who want to shape the future of the city together." (Nexthamburg, n.d.). The aim of *Nexthamburg* was to test new forms of collaboration and public participation in urban development, and to apply the idea of crowdsourcing to the context of urban planning (Petrin, 2012). A project goal of *Nexthamburg* was to test if it was possible to reverse urban planning practices and the involvement of the

citizens. They wanted to address "the conservatism of city authorities, who tend to see public participation as a means of communicating already approved spatial plans rather than a way to actively engage citizens in their development." (EIP-SCC, 2015, p. 53). *Nexthamburg* aimed to instead start the planning process by asking the citizens and using their ideas as the base for urban planning (S. Lohmeyer, personal communication, June 15, 2016). A special focus was to test the use of Web 2.0 in relation to public participation. While online methods nowadays are commonly used during participatory processes, it was seen as something innovative and new when *Nexthamburg* was initiated (S. Landau, personal communication, July 7, 2016; D. Kulus, personal communication, June 24, 2016). The lessons learned have influenced almost all other Urbanista projects and the *Nexthamburg* approach has been copied by other cities since its start (S. Landau, personal communication, July 7, 2016; S. Lohmeyer, personal communication, June 15, 2016).

Evaluation and Refinement. The *Nexthamburg* project had, from the beginning, the HafenCity University Hamburg, also known as University of the Built Environment and Metropolitan Development, as a cooperation partner. The accompanying research evaluated the involvement of the users of *Nexthamburg* with a special focus on online participation. The aim was to evaluate in which ways the users applied different tools, how the tools were perceived and which advantages and disadvantages they had. The goal was to determine which communication tools and methods were most successful in reaching the users and which users were reached through which kinds of methods. Based on the results and the user input, recommendations were developed regarding which ways of communication should be further developed (D. Kulus, personal communication, June 24, 2016; Kulus, Poplin, & Patwardhan, 2012).

Participation and User Involvement. While the inputs for the citizens' vision mainly originated from the citizens themselves, the processes were guided by the *Nexthamburg* team (S. Landau, personal communication, July 7, 2016). The editorial team provided comments and helped to synthesise the citizens' ideas, wishes and visions. Experts supported the further development of the ideas with their technical expertise and comments (Nexthamburg, n.d.). The city was involved by inviting representatives to events and workshops, but also by providing advice and support (D. Kulus, personal communication, June 24, 2016; S. Landau, personal communication, July 7, 2016). The HafenCity University was involved as research partner.

4.2.2 Methods of Involvement and Participation

Design. The initial idea for *Nexthamburg* was developed by a group of citizens and urban planners from Hamburg surrounding the *Nexthamburg* initiator Julian Petrin. They presented their idea during a public discussion with the topic "How can citizens design their city?" initiated by the Körber Foundation in Hamburg. The discussion was attended by 350 people and the idea received very positive feedback from different sides. The feedback encouraged the further development of the idea and soon was the *Nexthamburg* team founded (Petrin, 2012). The team is multidisciplinary and consists of planners, sociologists, political scientists, and media experts. The majority of the team works for the urban design company Urbanista (Beckmann et al., 2010).

At the same time, the Federal Ministry of Transport, Building and Urban Development started a funding initiative under the National Urban Development Policy that asked to look for new ways for civic urban development. The *Nexthamburg* team applied for the funding and received a positive answer in the end of 2008. As a consequence, they received funding for three years to test their ideas and methods. The pilot phase of *Nexthamburg* started in 2009 (Petrin, 2012).

The first year of the pilot phase served to specify the project idea. After this year, a revision and reflection phase took place to discuss and further specify the next steps. The final outcome of the pilot phase, the citizens' vision, can be seen as a result of the second phase, which took place subsequent to the reflection phase (S. Landau, personal communication, July 7, 2016). As the first phase was used to shape the project idea, it is here considered as part of the design phase, even though implementation elements were already present.

In the beginning of the design phase in 2009, the *Nexthamburg* team had a first so called session, a workshop, where they invited citizens to brainstorm ideas for a future development of Hamburg. In total, 120 guests came and gathered, specified and prioritised problems, wishes and ideas for a future development of the city (S. Landau, personal communication, July 7, 2016; Petrin, 2012). At the same time, an online dialogue was started on the *Nexthamburg* website. In this early phase, interaction on the website did not require a login and thus, was available for everyone. Interested citizens could post their ideas focusing on either specific local areas or concerning the whole city. Other citizens had the possibility to comment on the ideas and vote for them. This public discussion helped to specify and reflect upon the ideas (Kulus et al., 2012; Weninger et al., 2010).

An ideas contest was initiated meaning that every month the three ideas with the highest number of votes were selected. These top ideas were then further developed by the *Nexthamburg* team that researched background information, gathered pro- and contra-arguments, developed different stances that were represented by imaginative citizens and visualised the ideas. After half a year, a second workshop-session took place, where the 15 selected top ideas were further enlarged upon (S. Landau, personal communication, July 7, 2016; Weninger et al., 2010). The aim of the second session was to select one topic that would be further developed not only during the next session but also by the *Nexthamburg* team in general. Every participant of the workshop could choose one idea that he or she wanted to further discuss. The discussions then happened in small groups moderated by planning experts. At "topic tables", the citizens discussed the ideas and created a profile for each idea. In the end of the session, the profiles were presented and the participants could vote. The winner of this competition was the topic "More living in the city centre" (S. Landau, personal communication, July 7, 2016). This idea was enlarged upon during the third session. Citizens were invited to work with model making and to experiment with their ideas. The participants worked in small groups and proofed themselves as very creative. Based on the outcomes of this session, the so called Zukunftsstudie (Future Study) was created (S. Landau, personal communication, July 7, 2016).

This Future Study constituted the end of the first phase. It was followed by the revision and reflection phase, during which, the *Nexthamburg* team discussed the following steps and specified the idea to create a citizens' vision (S. Landau, personal communication, July 7, 2016).

It can be summarised that the first phase of *Nexthamburg* was used to gather ideas and to further develop them. The main instruments during this phase were workshops called sessions. To engage as many citizens as possible during these sessions, the *Nexthamburg* team tried to design the workshops as appealing as possible by highlighting the benefits of participation. They communicated the aim of each session clearly so that everyone would know what to work for. Interesting locations, such as the Hamburgmuseum or a famous church, were chosen. This did not only arouse curiosity but also provided the opportunity to invite the already existing communities of these locations. In the beginning of the sessions, the participants could present themselves and their ideas in 90 seconds during a so called speed-dating. Active involvement during the sessions was encouraged by having competitive

elements. Finally, a disk jockey and finger food contributed to a more relaxed atmosphere. As a result, the sessions attracted, besides interested citizens and planning experts, also citizens that would normally not participate in urban planning events (S. Landau, personal communication, July 7, 2016; Petrin, 2012).

Implementation. After reflecting upon the first year of the *Nexthamburg* pilot phase, the implementation phase of the project began. The idea for the citizens' vision was to develop a vision for Hamburg in the year 2030 by gathering a high number of suggestions from the citizens that would be synthesised through several levels of selection and specification to one document published in the end of the pilot phase (Petrin, 2012).

As a consequence, ideas were gathered using both offline and online channels while at the same time providing information about topics related to urban development in Hamburg (D. Kulus, personal communication, June 24, 2016; EIP-SCC, 2015). The online tools included an online-dialogue on the website, a mobile application, newsletters, and social media, such as Facebook, Google+, Twitter, YouTube, and Flickr. While social media were mainly used for discussions and information about urban development in Hamburg as well as upcoming events, the website was focusing on the collection of ideas. The posting, discussion, and voting for ideas on the website worked in a similar way as it did during the first project phase, with the exemption that users had to create a user account and login in order to be able to interact on the website. The mobile application could be used to post problems and ideas as well as photos on the go (D. Kulus, personal communication, June 24, 2016; Petrin, 2012).

The results of the accompanying research showed that voting was, "with 96,1%, the most attractive form of interaction. 2,8% of the users commented on the posted ideas, and only 1% of interactions are [sic] postings of ideas." (Weninger et al., 2010, p. 196). They concluded that if the level of involvement that is needed to interact is high, only few people actively participate. Thus, an increasing level of required involvement results in a decreasing number of people engaged.

Information about the *Nexthamburg* project was spread through media, including newspaper articles and television. In 2010 and 2011 there was a cooperation with a local television breakfast programme reaching 150 000 persons every day that presented one topic of the *Nexthamburg* community every two weeks (Petrin, 2012).

Offline communication channels included sessions and other discussions about specific topics at different places, and a mobile Zukunftscafé (Future Café), an event format that sought places were people usually are to approach them in daily-life situations. In summer 2011, the youth project Nextwilhelmsburg was initiated in cooperation with the International Building Exhibition in Hamburg. The youths were given the opportunity to develop an urban planning concept for a vacant space in Wilhelmsburg, a city district of Hamburg. The concept was later presented to the local planning authority (Petrin, 2012). Furthermore, a so called *Nexthamburg* Saloon was organised to discuss the topic of public participation and the lessons learned regarding how to involve citizens. Even though this event was public, it served more as an expert congress (S. Landau, personal communication, July 7, 2016).

The central element in the process of developing the citizens' vision was the Zukunftscamp (Future Camp), a mix of a transparent office, a workshop and a festival. 600 ideas had been collected so far and the aim of the Future Camp was to select the best ideas that should be part of the citizens' vision. The event took place in an old theatre and during one week almost 2000 guests came to take part in the different activities. Interested citizens could visit the Zukunftsshop (Future Shop) where the different ideas were presented on little cards. They

could choose a challenge that they wanted to address and create their own vision of Hamburg in the future using the already existing or by developing new ideas. Planning experts were present and discussed the ideas together with the citizens during so called expert checks. The event was accompanied by a cultural programme including a movie presentation, an "Urban Poetry Slam", and a party. The number of guests and the inputs they gave exceeded the expectations of the *Nexthamburg* team and the Future Camp was considered as really helpful to finish the citizens' vision (S. Landau, personal communication, July 7, 2016; Petrin, 2012). The Future Camp resulted in the publication of the citizens' vision that at the same time constituted the end of the pilot phase.

In total, the *Nexthamburg* pilot phase reached around 10 000 citizens through the different communication and information channels described above (Petrin, 2012). According to the evaluation results, for most of the users, *Nexthamburg* served as an information source rather than that they contributed with own inputs. The website and Facebook were important information channels while other digital media were not used as often. Most users were between 30 and 39 years old, while the age group 40 to 49 was underrepresented and no response was given by persons younger than 18 (Kulus et al., 2012).

The combination of online and offline tools was considered as important as it allowed to reach different groups but also provided different forms of communication that supplemented each other. Online discussions could be intensified during offline events and the results were fed back into the online tools. Especially the inspirational face-to-face meetings were perceived as good tools to keep the discussions going (EIP-SCC, 2015; Kulus et al., 2012; Petrin, 2012).

Throughout the process, the *Nexthamburg* team supported the ideas of the citizens with their expertise. They provided editorial support and coordinated the processes. They helped to further develop and to visualise top ideas. The outcomes were then led back to the public discussion (D. Kulus, personal communication, June 24, 2016; S. Landau, personal communication, July 7, 2016; S. Lohmeyer, personal communication, June 15, 2016). Sven Lohmeyer (personal communication, June 15, 2016) emphasised that this dialogue between the citizens and planning experts was important as it is usually not possible to implement citizens' ideas one-to-one. The ideas contributed by citizens often underrepresent certain urban development areas such as business aspescts so that it is important to also include experts in the dialogues. Stephan Landau (personal communication, July 7, 2016) characterised this "ping-pong-play" between the citizens and the experts as one important element of co-creation.

Besides the citizens, the planning experts, and the *Nexthamburg* team, also the city of Hamburg was involved during the implementation of *Nexthamburg*. Representatives of the city and the city districts were invited to the offline events. They could contribute with ideas and discuss them with the citizens (D. Kulus, personal communication, June 24, 2016). An information exchange took place and the *Nexthamburg* team supported the city in dialogue processes. Furthermore, the *Nexthamburg* team presented the ideas that the citizens had developed to the city and forwarded the citizens' vision. However, not so many projects have been implemented, also because of a lack of interfaces to incorporate these kinds of ideas into urban planning (S. Landau, personal communication, July 7, 2016; S. Lohmeyer, personal communication, June 15, 2016).

To conclude, citizens played a major role during the implementation phase but also other partners from public to private were involved. Partnerships were seen as crucial for citizen

engagement, as they enable "synergies to be created while at the same time guaranteeing independence" (EIP-SCC, 2015, p. 52).

Evaluation. The HafenCity University Hamburg was responsible for the evaluation of the *Nexthamburg* project. The evaluation included surveys with the users, an obervation of the offline events as well as a tracking of the *Nexthamburg* website (D. Kulus, personal communication, June 24, 2016; Kulus et al., 2012).

The software package eTracker gave information about the users of the website and their interaction with the system. Together with the database of the website that provided information about postings, comments, and votes, the researchers could analyse the types and levels of online interaction (Weninger et al., 2010).

A final survey with the users of *Nexthamburg* was conducted in summer 2011. The link to the survey was sent to users via email, it was published on the project website and also advertised through Facebook. An offline survey was provided during the *Nexthamburg* Saloon.
The survey could be answered by every interested person but was mainly addressed to the users of *Nexthamburg*. In total, 114 respondents were counted, which was perceived as quite low number considering a community size of 3 000 persons (Kulus et al., 2012).

4.3 T-City Friedrichshafen

T-City Friedrichshafen was a smart city project initiated by the German telecommunication company Deutsche Telekom. With the aim to test how innovative information and communication technologies (ICT) can contribute to the solution of future urban challenges, Telekom wanted to test its vision of "Connected Life and Work" in a real-life context (S. Söchtig, personal communication, June 29, 2016; Deutsche Telekom, n.d.). In cooperation with the Deutschen Städte- und Gemeindebund (German Association of Towns and Municipalities), Telekom organised a national tender process in 2006 in order to select a suitable partner city. The telecommunication company offered the city with the most innovative and viable overall concept, over the project period of five years, personnel, equipment, and financial resources with a monetary value of up to 115 million Euros. This included the development and expansion of the (at that time) highest level of broadband technology in the whole city region. Medium-sized cities with between 25 000 and 100 000 inhabitants could apply for the *T-City* project and Friedrichshafen was finally selected as the winner of the city contest (Hatzelhoffer et al., 2012).

The project aim was to test new product ideas and solutions involving the entire urban society. In doing that, the project had threefold objectives: (1) improving the quality of life for the citizens; (2) improving the locational advantages for businesses; and (3) increasing the networking between the participating partners in the urban society (Hatzelhoffer et al., 2012; Obermann, 2012).

Between 2007 and the beginning of 2012, more than 40 individual sub-projects had been conducted covering the following six project areas: Learning and Research; Mobility and Transport; Tourism and Culture; Citizens, the City and the State; Business and Work; and Health and Support (Deutsche Telekom, n.d.).

The cooperation between Telekom and the city of Friedrichshafen continued after the official end of the *T-City* project in 2012 with a follow-up project called Telekom-City. However, this cooperation had a clear focus on particular questions and less of an experimental character (M. Lobeck, personal communication, June 27). It is therefore excluded from this case study.

Furthermore, it needs to be emphasised, that this case study does not focus on the individual sub-projects, but the general *T-City* project that provided the frame for the smaller projects.

Information about the smart city test bed *T-City* was mainly gathered through stakeholder interviews. While Jörg Bollow (*T-City* Project Director at Telekom from 2006 to 2009) could provide insights into the project from the Telekom point of view, Thomas Goldschmidt (Manager of City Marketing Friedrichshafen), Jürgen Kaack (Managing Director of the municipal project association of *T-City Friedrichshafen* from 2007 to 2009) and Stefan Söchtig (Managing Director of the municipal project association of *T-City Friedrichshafen* from 2009 on) provided insights from the city's point of view. Michael Lobeck (Director of the *T-City* accompanying research) could contribute with valuable insights into the accompanying research.

Also the resulting publication "Smart City in Practice – Converting Innovative Ideas into Reality" (Hatzelhoffer et al., 2012) was a major source to inform the case study. Finally, information published on the *T-City* website was utilised.

4.3.1 Key Characteristics

Geographical Embeddedness. When the idea for *T-City* was developed, Telekom had not yet decided a location for the test bed. It was only determined that the project partner should be a medium-sized city which was expected to offer good pre-conditions: At that time medium-sized cities often had an insufficient broadband infrastructure but at the same time they were large enough to have research institutions, hospitals and other infrastructural institutions in place (J. Bollow, personal communication, June 24, 2016; T. Goldschmidt, personal communication, June 15, 2016). Especially, the promise of Telekom to develop the broadband infrastructure as part of the *T-City* project raised the interest of many medium-sized cities to take part in the project (J. Kaack, personal communication, June 23, 2016). In 2006, Telekom and the German Association of Towns and Municipalities launched a national *T-City* contest. The city of Friedrichshafen, located next to Lake Constance in Southern Germany, was selected as a winner in 2007 (Deutsche Telekom, n.d.; Hatzelhoffer et al., 2012).

Leadership and Ownership. Deutsche Telekom was the initiator of the *T-City* project. However, as soon as the city of Friedrichshafen was determined as partner city, both actors had a leading role in the project (M. Lobeck, personal communication, June 27, 2016; S. Söchtig, personal communication, June 29 2016; Hatzelhoffer et al., 2012).

Though not as leading partners, Alcatel-Lucent, Samsung, the German Association of Towns and Municipalities, and the University of Bonn have been involved in *T-City* during the whole project phase. Their role was to provide support with their respective expertise (Deutsche Telekom, n.d.).

Other companies joined the *T-City* project as developing partners for the individual sub-projects of *T-City*. Within these sub-projects, they could take over leading roles. However, overall seen, they cannot be considered as leading partners (J. Kaack, personal communication, June 23, 2016).

Experimentation and Learning. The aim of *T-City* was to test how innovative ICT can contribute to the solution of future urban challenges (S. Söchtig, personal communication, June 29, 2016). Telekom wanted to experiment with "innovative, customer-oriented, and user-friendly product developments and services" inviting the entire urban society to participate (Hatzelhoffer et al., 2012, p. 43). During the project period, they tested different products and

project ideas as well as new forms of cooperation between Telekom and a city including the involvement of the urban society. "T-City was not only a pilot project for the corporation itself, but its scale and time frame make it one of the largest Corporate Citizen programs [sic] in the world." (Hatzelhoffer et al., 2012, p. 45). Experts from all over the world came to Friedrichshafen to visit the city and learn from its experiences (S. Söchtig, personal communication, June 29, 2016; Obermann, 2012).

Evaluation and Refinement. From the early beginning, the design of the national *T-City* contest, the *T-City* project was accompanied by research conducted by the University of Bonn. The work group Urbanism and Regional Science at the Geographical Institute assessed if and how the three main objectives of the *T-City* project were achieved. Another aim was to study how digitalisation can contribute to the development of a city and to analyse the governance aspects in relation to the cooperation with Telekom as a large company (M. Lobeck, personal communication, June 27, 2016; Hatzelhoffer et al., 2012). The evaluation resulted in the publication "Smart City in Practice – Converting Innovative Ideas into Reality" (Hatzelhoffer et al., 2012).

Participation and User Involvement. The aim of *T-City* was to achieve a broad participation and to develop solutions involving the entire society. Telekom and the city of Friedrichshafen therefore tried to involve a multitude of stakeholders, including local businesses, citizens, research institutions as well as institutions of public services such as hospitals, schools and kindergartens (Hatzelhoffer et al., 2012).

4.3.2 Methods of Involvement and Participation

Design. The design phase of *T-City* can be separated into three parts. First, Telekom developed the idea for *T-City*; second, cities sent their applications and the winner was selected during the *T-City* contest phase; and third, the city of Friedrichshafen and Telekom started their cooperation and adapted the *T-City* idea to the context of Friedrichshafen.

In 2005, Telekom first had the idea to test if it was possible to make technological innovation visible in a "room", without specifying what this "room" could be like. They discussed their idea with different stakeholders including geographers from different research institutions, but also political actors. Citizens were not involved in this idea development phase. After consulting geographers, Telekom decided on a geographic room in form of a medium-sized city in Germany as a test bed (J. Bollow, personal communication, June 24, 2016).

The three objectives – (1) improving the quality of life for the citizens; (2) improving the locational advantages for businesses; and (3) increasing the networking between the participating partners in the urban society – were formulated and the frame for the project was defined. The University of Bonn, that had been involved in previous projects with Telekom, was asked to support the telecommunication company with the selection of a suitable project partner and to evaluate the project. Telekom determined five years to be a proper project duration as it would not be possible elsewise to evaluate the project, its implementation and effects. The aim was to achieve a broad participation so that all members of society would be involved, including citizens, social establishments, local businesses, scientific and public institutions, administration and politics. With these decisions made and pre-conditions set, Telekom started the selection process (J. Bollow, personal communication, June 24, 2016; M. Lobeck, personal communication, June 27, 2016; Hatzelhoffer et al., 2012).

In 2006, Telekom in cooperation with the German Association of Towns and Municipalities launched a nationwide city contest. Medium-sized cities with between 25 000 and 100 000 inhabitants were encouraged to take part and to send their applications. They were asked to

present their ideas on how the use of modern ICT could help to address the city's particular tasks and challenges while promoting and enhancing a closely networked community. 52 applications from all over Germany were received, out of which a jury selected ten finalists. The jury consisted of both, Telekom representatives and external members who represented different social spheres. Decisions were taken by a majority and based on an evaluation tool that had been previously developed (Hatzelhoffer et al., 2012).

The ten finalists could then further develop their project ideas and specify organisation and implementation procedures. It was a requirement in this second contest phase, to involve the urban society. A project group consisting of Telekom representatives and social scientists from the evaluation team at the University of Bonn visited the ten cities. After discussing the applications, they provided recommendations on how to further improve the applications. In 2007, the jury voted for Friedrichshafen to be the winner of the city contest (Hatzelhoffer et al., 2012).

As part of the application, the city of Friedrichshafen, had developed project ideas that they wanted to implement during the *T-City* project. It was mainly one assistant of the mayor who was in charge of the application and who then engaged other actors for different sub-projects. A consulting company supported the application process (M. Lobeck, personal communication, June 27, 2016).

In this early design phase, citizens were involved mainly by using marketing campaigns. A cooperation with the local volleyball team, which is quite popular in Friedrichshafen, was used to market the project idea. Citizens were encouraged to create short videos where they could state their interest in *T-City*. Local businesses where approached and encouraged to participate (T. Goldschmidt, personal communication, June 15, 2016).

After the competition was won, a dialogue phase followed, during which Telekom and the city of Friedrichshafen defined common objectives, divided the responsibilities and set a framework for a cooperation between these different partners (M. Lobeck, personal communication, June 27, 2016; Hatzelhoffer et al., 2012). A small project management team was founded, consisting of project managers from both *T-City* partners, Telekom and Friedrichshafen (J. Kaack, personal communication, June 23, 2016).

Two completely different ways of working of a large telecommunication company on the one hand and a medium-sized city on the other hand came together and needed to be united. Both partners had already existing working procedures and differing internal structures. Even though they normally pursue different objectives – to maximise profits versus being duty-bound to public welfare – they needed to find a common ground to implement the *T-City* project together (T. Goldschmidt, personal communication, June 15, 2016; Hatzelhoffer et al., 2012).

At this point it became clear that being selected as a city met Friedrichshafen slightly unprepared (J. Kaack, personal communication, June 23, 2016). The city representatives were not supporting the project as homogenously as it had seemed during the application phase, partly also because the mayor of the city was not supported by a political majority (M. Lobeck, personal communication, June 27, 2016). However, there was a learning curve and the two partners learned from each other and found their ways on how to cooperate (T. Goldschmidt, personal communication, June 15, 2016).

At the same time, when the dialogue phase started, Telekom also began to install the new broadband technology so that the high-speed internet was available when the project implementation began (Hatzelhoffer et al., 2012).

Implementation. The framework agreement between Telekom and Friedrichshafen already suggested a thematic organisation of the project so that the next step was to define the topic areas and start to develop the first individual projects. The discussions resulted in the following six project areas: Learning and Research; Mobility and Transport; Tourism and Culture; Citizens, the City and the State; Business and Work; and Health and Support. Responsibilities and tasks were then organised in accordance with these project fields while it was decided on joint decision-making and operational authorities. In summer 2007, the first individual projects were implemented, starting with those that had already been part of the application (Hatzelhoffer et al., 2012).

Workshops with representatives of businesses, policy, churches and other already organised stakeholders were held to brainstorm and develop further ideas (S. Söchtig, personal communication, June 29, 2016). Businesses and citizens were encouraged to contribute with own ideas or to engage by testing the new products and services (M. Lobeck, personal communication, June 27, 2016). Company representatives, the hospital and other businesses showed their clear interest from the beginning (Büchelmeier, 2012). However, the first public awareness campaign "Action?!" did not achieve a high response rate among citizens so that the project partners realised that it would be difficult to actively engage the citizens (Hatzelhoffer et al., 2012). As a consequence, the idea to introduce so called Ambassadors and Futurists came up.

T-City Ambassadors were educated about the different technologies and ongoing projects, and their task was to provide information to and answer questions from citizens, businesses and visitors. The Ambassadors attended city events and fairs and it was furthermore possible to book them for company events. 30 Ambassadors representing different age groups and professions were selected based on their applications (Deutsche Telekom, n.d.). It was assumed that they could, as citizens rather than as representatives of the city or Telekom, better create trust among the remaining population, thus better inform the local population and visitors and make the project ideas more tangible for them (Hatzelhoffer et al., 2012). However, sometimes they were perceived as Telekom advertisers rather than in their role as "normal" citizens (S. Söchtig, personal communication, June 29, 2016).

548 interested citizens applied to become a Futurist with the task to test high-tech equipment in their homes and share their experiences on the *T-City* Facebook page, in the project's magazine as well as during events all over Germany. Initially, five family homes, two student apartments, two single-person households, and a kindergarten were selected (Deutsche Telekom, n.d.). According to Michael Lobeck (personal communication, June 27, 2016), the Futurists helped to promote the project and also to inform the citizens. In contrast to the Ambassadors, they were not perceived as advertisers because they also stated their dissatisfaction with a product.

Further channels of information and user engagement were an information panel in the city, social media, an interactive website, the websites of the project partners, brochures, a project magazine, a radio broadcast, a TV format, leaflets and flyers. Other events were organised such as free Wi-Fi in the summer and a lottery to encourage people to contribute with ideas. Interested citizens could get in contact with the project team through the website but also by visiting the project office (J. Kaack, personal communication, June 23, 2016; Hatzelhoffer et al., 2012). They could provide feedback on the project and in doing this further shape the

project (T. Goldschmidt, personal communication, June 15, 2016). *T-City* received a high media attention, both national as well as international (S. Söchtig, personal communication, June 29, 2016).

However, even though the project aimed for a very broad participation and did not exclude anyone from participating, the overall participation among users was considered as low (J. Kaack, personal communication, June 23, 2016). An increase of the citizens' awareness could be achieved through the sub-projects and the public relations activities throughout the project duration. The share of Friedrichshafen inhabitants who heard of *T-City* rose from 38% in 2007 to 86% in 2012 (Hatzelhoffer et al., 2012). In addition, the project was restructured in 2009 after a new mayor had been selected in Friedrichshafen. As a consequence, there was a larger focus on the city and its needs which also resulted in a higher acceptance (S. Söchtig, personal communication, June 29, 2016).

By the end of the project, more than 40 individual sub-projects were implemented. Already existing networks were used to find cooperation partners, but also businesses that had a project idea could apply to be part of the *T-City* project. All project suggestions coming from businesses or citizens were evaluated by the joint project management and if approved forwarded to the responsible decision-making bodies at Telekom and in the city of Friedrichshafen. Even though the project suggestions coming from the citizens were spare, the citizens were able to engage within the individual sub-projects (T. Goldschmidt, personal communication, June 15, 2016; J. Kaack, personal communication, June 23, 2016).

Evaluation. The University of Bonn evaluated both, the overall project as well as a selection of individual sub-projects. A triangulation of methods was applied. Qualitative and guided interviews were used to assess the impact of the *T-City* project on the quality of life and the locational advantages. Around 20 interview partners were chosen based on their age, sex and nationality. They participated in four interviews at yearly intervals. By having reiterating interviews with the same people, it could be observed, how experiences and perceptions changed over time. In addition, qualitative interviews were also conducted with selected Futurists. These insights from qualitative research methods were supplemented with a representative telephone questionnaire survey. Every year one thousand people living in Friedrichshafen were selected to participate. As a base for comparison, a parallel survey of comparative groups from other German cities with 25 000 to 100 000 inhabitants was conducted (M. Lobeck, personal communication, June 27, 2016; Hatzelhoffer et al., 2012).

To assess the interactions of Telekom and the city of Friedrichshafen and the processes during the *T-City* project, around 250 qualitative interviews were conducted with representatives of the project partners as well as participants from the administration, city council, committees, press, and other experts directly or indirectly involved in the project.

Finally, the University of Bonn also analysed the local press coverage, the minutes of the local council meetings, and the public relations work of the project. They also observed committee meetings and the usage of ICT in the public sphere (Hatzelhoffer et al., 2012). The intention of the evaluation was not to actively influence the project and to give advice. Instead, the evaluation team tried to communicate the findings in an objective manner without judging them. However, as they presented their interim results on a regular basis, a feedback loop was initiated automatically (J. Kaack, personal communication, June 23, 2016; (M. Lobeck, personal communication, June 27, 2016).

4.4 UbiGo

UbiGo was part of the project Go:Smart which aimed to support the citizens in Gothenburg, Sweden, to make their travel smarter and more sustainable. Go:Smart ran between August 2012 and September 2014. It was co-funded by the Swedish Governmental Agency for Innovation Systems (Vinnova) and the Go:Smart project partners themselves. As part of the project, an innovative travel broker service, *UbiGo*, was developed and field tested in the form of a Living Lab (Lindholmen Science Park, n.d.; Mistra Urban Futures, n.d.). With the purpose to reduce the gap between private and public transport, already existing travel solutions and providers were integrated and united in a subscription service, available through a mobile application. The travel services included in *UbiGo* were public transport, car sharing, car rental, bike sharing, as well as a taxi service (Sochor, Strömberg, & Karlsson, 2014, 2015a). The aim was to develop and test a business model that would help to address the negative impacts of urban mobility. By offering customised transport services to the *UbiGo* customers, the objective was to reduce the need for private car ownership, thus decreasing the number of trips with fossil-fuelled vehicles and the resulting emissions while at the same time increasing the use of public transport (Sochor et al., 2015a; Sochor, Strömberg, & Karlsson, 2015b). *UbiGo* intended to demonstrate that it is more expensive and less convenient to own a car compared to other modes of transportation (H. Arby, personal communication, June 16, 2016). It was based on a subscription system meaning that every household payed a monthly fee that was adapted to their individual travel needs. While the fee had to exceed a certain minimum, the average subscription during the field test was around 150% of the minimum subscription value. Unused credit could be rolled over to the next month and was refunded at the end of the field test. If more credit was needed during on month, the credit could be topped up (Sochor, Karlsson, & Strömberg, 2016; Sochor et al., 2015a). A bonus system for eco-friendly travel was implemented (Sochor et al., 2014).

Information about the ULL *UbiGo* was gathered through interviews conducted in person with representatives of *UbiGo* project partners: Hans Arby was a co-developer of *UbiGo* and the commercial leader of the field operational test; Jana Sochor and Helena Strömberg were both part of the evaluation team at Chalmers University of Technology in Gothenburg; and Lena Nilsson was project manager of the Go:Smart sub-project Living Lab. Furthermore, transcripts of interviews with *UbiGo* project partners conducted by Madeleine Brask served as input for this case study. Finally, evaluation reports and other documents and information available on the *UbiGo* website as well as academic articles about the ULL were reviewed.

4.4.1 Key Characteristics

Geographical Embeddedness. *UbiGo* was developed and tested in Gothenburg, Sweden. According to previous studies, Gothenburg had recorded a higher car use than the other two major Swedish cities Stockholm and Malmö so that the city was trying to create a more sustainable solution for transport (Caesarius & Johansson, 2013). Information about the project was spread all over Gothenburg to recruit potential participants. However, the selection criteria predetermined that participants needed to live within a certain geographic area of Gothenburg and that the participants themselves judged the distance between the next car sharing site and their place of living as reasonable (Sochor et al., 2014).

Leadership and Ownership. The Go:Smart project was led and coordinated by CLOSER at Lindholmen Science park. It included several partners from academia, business and society: Chalmers University of Technology; Viktoria Institutet; Lindholmen Science Park; Mistra Urban Futures; Test Site Sweden; Volvo IT / Commute Greener; AB Volvo; Move About; PayEx Finance; Arby Kommunikation; Tyréns; Västtrafik; the Swedish Transport Administration; the Region Västra Götaland; and the City of Gothenburg (Mistra Urban

Futures, n.d.). The leading partners within the *UbiGo* part of the project were Chalmers University of Technology, Viktoria Institutet, Volvo IT and Arby Kommunikation (H. Strömberg, personal communication with J. Sochor & H. Strömberg, June 16, 2016). Furthermore, the providers of the transportation systems were involved as business partners. However, except for Västtrafik, the service providers were no (leading) partners of the project but seen as suppliers for a real project based on business-to-business agreements (H. Arby, personal communication, June 16, 2016).

Experimentation and Learning. The aim of *UbiGo* was to develop and experiment with a new and sustainable business model for urban transport. It was tested if people use this kind of travel broker service, if they are willing to pay for it and if it is possible to build a sustainable business model based on this service. The focus of *UbiGo* was the service design and the viability of the business model rather than the technical side of developing the service and the app (H. Arby, personal communication, June 16, 2016).

The travel broker service was a completely new product (L. Nilsson, personal communication, June 16, 2016). That is also why it was decided to test the product under real-life conditions instead of doing a market research: "We realised that this is not something where you could do a market survey on. You cannot step out on the street and ask: 'Here is something that you do not really understand – how much are you willing to pay for it?'. You have to try it [the travel broker service] for real." (H. Arby, personal communication, June 16, 2016).

The travel broker service was tested during a six-months field operational test under conditions as close to reality as possibly. Real customers in the form of households payed with real money for the real service and tested it (H. Arby, personal communication, June 16, 2016; Strömberg, Rexfelt, Karlsson, & Sochor, 2016). While the project partners wanted to test the service, the participants used the test period to try a new behaviour and to get insights into the convenience of the service (Strömberg et al., 2016). According to the evaluation, the participants seemed to be innovators or early adopters that wanted to try out something new (Sochor et al., 2014, 2015b). The idea behind *UbiGo*, also known as Mobility as a Service (MaaS) has been further spread to other countries and is tested elsewhere (H. Arby, personal communication, June 16, 2016).

Evaluation and Refinement. Chalmers University of Technology was mainly responsible for the evaluation of the ULL *UbiGo*. The evaluation covered several aspects with a special focus on the user perspective. The user behaviour, transportation habits as well as people's attitudes towards private car ownership were analysed considering the time before, during, and after the project. In addition, customer service errands and satisfaction with the service were studied (M. Kuschel, personal communication, April 2, 2015; I. Moen, personal communication, March 26, 2016; J. Sochor & H. Strömberg, personal communication June 16, 2016). Furthermore, the motivations to take part in *UbiGo* were evaluated and observed over time, but also people who did not join the project where asked to find out the deterrents (Sochor et al., 2014). Matches and mismatches in the expectations and experiences among the different stakeholders – users, commercial actors, society – were revealed (Sochor et al., 2015a). The fact that the service was tested under real-life conditions was important for the evaluation and the relevance of the results (M. Kuschel, personal communication, April 2, 2015). Besides the user perspective, Chalmers University of Technology also looked at the collaboration between the different project partners (H. Strömberg, personal communication with J. Sochor & H. Strömberg, June 16, 2016). Finally, the Swedish consulting company Tyréns was involved in the evaluation of environmental aspects such as the savings of CO_2-emissions (M. Kuschel, personal communication, April 2, 2015).

Participation and User Involvement. The ULL *UbiGo* involved several stakeholders including the travel broker *UbiGo* itself, the transport service providers, the users, the service developers (ICT), the research institutes, and the society (represented by the city and the region) (Sochor et al., 2015a).

The companies that provided the transport services were Västtrafik (public transport), Styr & Ställ (bike sharing), Sunfleet (car sharing), Hertz (car rental), and Taxikurir (taxi service) (Sochor et al., 2015a). Users were involved in the design of *UbiGo* but also as customers during the field operational test and they were the main focus of the evaluation.

4.4.2 Methods of Involvement and Participation

Design. The design phase of *UbiGo* started previous to the beginning of the Go:Smart project with a pre-study conducted by Hans Arby and a colleague in 2011 (H. Arby, personal communication, June 16, 2016). It was a business model study that included interviews with different stakeholders in order to identify trends and get insights into the market. With twelve of the stakeholders an email-based workshop was conducted to design the business model according to the Osterwalder Business Model Canvas. All stakeholders were positive towards the idea. However, they did not want to start the business themselves but asked for a third party to be involved. The involved stakeholders were bus operators, a public transport provider, and a taxi company among others. Potential users were not involved in that early stage. Due to a small budget and a limited amount of time, it was rather relied on the understanding and insights from the industry who were assumed to know their customers sufficiently (H. Arby, personal communication, June 16, 2016).

The developed idea that resulted from the pre-study needed to be tested in order to make sure that the travel broker service was commercially viable and would be adopted by the users, a prerequisite for a successful business model (Sochor et al., 2015a). The timing was good as by the completion of the pre-study, the Go:Smart project was in its early phase of gathering project partners and looking for a good project idea to experiment with (H. Arby, personal communication, June 16, 2016).

In early autumn 2012, the business model for the commercial *UbiGo* operator as well as the travel broker service itself were further specified and developed (Caesarius & Johansson, 2013). Workshops were held with the leading project partners in order to identify and analyse potential risks but also to formulate the project goals and agree on a common vision. During the workshops, the different partners from different organisations and with different backgrounds provided their inputs and could supplement each other. Even though the actors had strong opinions and followed their own purposes, all of them agreed on a common vision for the project and wanted to develop a successful business model (L. Nilsson, personal communication, June 16, 2016; M. Kuschel, personal communication, April 2, 2015). According to Lena Nilsson (personal communication, June 16, 2016), this combination of having a shared goal but also individual purposes for the project was a success factor. While the shared goal guaranteed a common direction, the own purpose often served as a driving force.

Jana Sochor (personal communication with J. Sochor & H. Strömberg, June 16, 2016) summarised her impressions with the project as follows: "It takes a lot of extra effort to make collaboration happen. You saw that it was very important to have these very regular project meetings with everyone involved because you had to find a common language and discuss the different perspectives all the time and try to find a common ground. And this is even in a project where everybody has the same goal."

When the service was taking form, the potential users were involved through individual and focus group interviews. The users took part in information meetings, discussed the service and could provide their inputs. Their insights were intended to further shape the service (H. Strömberg, personal communication with J. Sochor & H. Strömberg, June 16, 2016; Caesarius & Johansson, 2013).

The focus group meetings revealed that people had different expectations and needs regarding the travel broker service, and that an individual subscription model rather than a simple package model would be more suitable to meet these differences. As a consequence, the further development of the service focussed on such a subscription model (H. Arby, personal communication, June 16, 2016). The work happened on four levels: (1) the development of the IT-solutions and the technical integration; (2) agreements with the suppliers of transportation; (3) marketing and sales; and (4) the set-up of the Living Lab (H. Arby, personal communication, June 16, 2016; Caesarius & Johansson, 2013).

At this stage, the providers of the transport played an emerging role as the provision of integrated travel solutions required cooperation between public and private actors in order to combine the different infrastructures of public transport, car sharing, bike sharing, and taxi, and make them as easily accessible as possible. *UbiGo* as a travel broker acted as a business customer of the transport suppliers and could often negotiate lower prices because of the high volumes of transport services purchased (Sochor et al., 2015b).

After this design phase, the service was tested during a first one-month pilot phase with ten adults. They tested the service, the app, and also the evaluation questionnaires and provided their feedback. This pilot phase was used to identify the flaws and to further improve the service before the six-months field operational test started (L. Nilsson, personal communication, June 16, 2016; J. Sochor & H. Strömberg, personal communication, June 16, 2016 Sochor et al., 2014).

To conclude, all partners, from the leading project partners to the providers of transport, were really eager to be part of the project. The real-life context and the living lab approach were perceived as adding value and also the fact that the project was only temporary was helpful to get people involved. All actors were willing to take the risk and try something new (H. Arby, personal communication, June 16, 2016; J. Sochor, personal communication with J. Sochor & H. Strömberg, June 16, 2016). However, according to Jana Sochor (personal communication with J. Sochor & H. Strömberg, June 16, 2016), this test character of the project also affected how the involved actors thought about the project and consequently influenced the results. Many actors did not believe in a success of the service and were overchallenged when the project turned out to be successful and was aimed to be continued after the test period. Challenges, especially legal problems with regard to the public transport, occurred that no one had really considered, before. As a result, *UbiGo* could not be continued after the project phase.

Implementation. The implementation phase of *UbiGo* was constituted of the field operational six-months test. Advertisement for the recruitment of test participants happened on radio and in local newspapers, through postal advertisements, social media, internal communication to employees of the project partners, as well as booths at local events (Sochor et al., 2014).

For subscribing to the service additional benefits were granted including a travel guarantee in case of delayed public transport, a public transport zone system that was more generous than the usual one, as well as a bonus system for environmentally friendly travel. Also, a

compensation up to a fixed limit was provided to private car owners who refrained from using their car (Sochor et al., 2014). Interested citizens could apply for being a participant of the field test by providing some basic information about themselves. Based on pre-defined selection criteria, suitable participants were then contacted and invited to evening information meetings. The selection criteria included that the participants lived in a certain geographic area which was later broadened to enable more participants to join. Furthermore, the participants themselves were required to judge the distance between the next car sharing site and their place of living as reasonable and they had to at least sometimes use a car and not only the public transport system (Sochor et al., 2014).

Out of 400 individual persons or households who applied, 138 attended the information meetings. Students were recruited to help the households after the meetings to define their mobility needs and design the subscription during one-on-one discussions. Finally, 83 customer subscriptions were registered covering 195 persons in total. Except for two adults who dropped out completely and two adults who became passive participants, all participants completed the field test (H. Arby, personal communication, June 16, 2016; Sochor et al., 2014). Most of the subscriptions were families, others were taking part as a group of friends. In addition, individual participants that really wanted to try out the service but did not have a group were grouped together so that they could share an account (J. Sochor, personal communication with J. Sochor & H. Strömberg, June 16, 2016).

The result of the analysis of the participant group was that the participants did not fully represent the average traveller of Gothenburg as they used more public transport than the average and fewer of them walked. The car use, however, was average (Sochor et al., 2015b). Initially, the major motive for the participants to join the project was curiosity. Convenience and flexibility, economic reasons such as more control over and reduction of travel costs, environmental reasons, or the wish to test out living without a car were also mentioned as motivation factors (Sochor et al., 2015a).

After the recruitment phase, the field operational test started. The participating households had to pay their individual subscription fee based on their travel needs. The currency for the bookings was days, hours, and in some cases fixed trips (Caesarius & Johansson, 2013; Sochor et al., 2015b). Unused credit could be rolled over to the next month and was refunded after the test, if necessary. The participants could use the mobile application to purchase tickets or book trips, to access already activated tickets, to check their account information including the balance, bonus and trip history, and also to get customer support. Furthermore, there was a twenty-four-seven telephone support available if help was needed (Sochor et al., 2015b).

During the implementation phase, the leading project partners had steering group and project group meetings on a regular basis to discuss what was happening and to deal with issues. In addition, they had meetings whenever a problem needed to be solved quickly (H. Arby, personal communication, June 16, 2016).

The transport suppliers were responsible to provide the transport and sometimes involved in managing associated issues. Aside from that, most of them did not engage much during the implementation phase while others joined some discussions (H. Strömberg, personal communication with J. Sochor & H. Strömberg, June 16, 2016).

Even though the provision of travel services, especially the car rentals, sometimes caused troubles, the *UbiGo* users were patient and understanding as they knew it was a test (I. Moen, personal communication, March 26, 2016). Lena Nilsson (personal communication, June 16, 2016), highlighted that it was therefore very important that the project leaders had clearly

communicated the aim and the content of the field test to the participants in the beginning so that they knew what they got involved with and what they were testing. According to Jana Sochor (personal communication with J. Sochor & H. Strömberg, June 16, 2016), the participants were very engaged in testing *UbiGo* and giving feedback: "They [the participants] saw commitment from the project side so that they were more willing to bring in commitment form their side."

Evaluation. Chalmers University of Technology was mainly responsible for the evaluation of *UbiGo*. Their focus was on the user perspective and they applied several approaches to involve users in the evaluation process. Data from the participating households was collected via questionnaires, travel diaries, individual and household interviews, focus groups, workshops, the logging of questions to and problems addressed by the customer service (Sochor et al., 2014, 2015a).

The questionnaire surveys were conducted before, during, and after the field operational test. Even though, all participants agreed before joining the project, to fill out the project questionnaires, not everyone complied. In total, 151 adults completed all three surveys (J. Sochor, personal communication with J. Sochor & H. Strömberg, June 16, 2016; Sochor et al., 2014, 2015b). Helena Strömberg (personal communication with J. Sochor & H. Strömberg, June 16, 2016) concluded that those individuals with a stronger interest in the project or opinion about the project were more involved during the evaluation than others.

Fourteen individual participants were interviewed after the field operational test and three interviews were conducted with households consisting each of two adults. The interviews were designed as in-depth interviews and took 60 to 90 minutes each (Sochor et al., 2014).

The focus group interviews with the users were also conducted after the test period. They were looking at specific user groups with specific needs including large families, car owners, and households living in suburbs. It was also aimed to conduct a focus group with teenagers, however, they were not interested to participate (J. Sochor, personal communication with J. Sochor & H. Strömberg, June 16, 2016; Sochor et al., 2014).

A selected group of participants wrote one-week travel diaries before and during the field test, in total 40 and 36 participants, respectively (H. Strömberg, personal communication with J. Sochor & H. Strömberg, June 16, 2016; Sochor et al., 2014).

With the aim to evaluate the user perspective, questionnaire surveys and interviews were also conducted with non-participating households that showed interest but did not become users (J. Sochor & H. Strömberg, personal communication, June 16, 2016). Those who had provided an email or postal address, 316 in total, were contacted and asked to fill out the questionnaire. About the half responded. 24 in-depth interviews were conducted to get insights into their intital interest in *UbiGo*, their travel needs and the reasons why they decided not to join the field test (Sochor et al., 2014).

Data for evaluation was further obtained by observing and participating in meetings and discussions of the project partners and through participation in the customer service (Sochor et al., 2015a).

The evaluation team at Chalmers University of Technology summarised their intermediate results throughout the field test in short reports and presented it to the other project partners who were very interested in the results. However, during the field operational tests, the evaluation insights were only marginally implemented into changes (J. Sochor, personal

communication with J. Sochor & H. Strömberg, June 16, 2016). Hans Arby (personal communication, June 16, 2016) explained that they "wanted to provide something stable and reliable so that they did not want to change too much during the project phase". Other reasons were the limited time and budget so that it was planned to make changes after the project phase when *UbiGo* would be continued commercially (J. Sochor & H. Strömberg, personal communication, June 16, 2016). However, Helena Strömberg (personal communication with J. Sochor & H. Strömberg, June 16, 2016) had the impression that all users were quite satisfied and felt really involved. Changes in the service might have caused a decrease in satisfaction.

The final evaluation results were published in academic publications and can also be found on the *UbiGo*-website.

5 Discussion

In this chapter the user involvement in the four selected Urban Livings Labs is discussed applying the analytical framework presented in Chapter 3.2 and summarised in Figure 3-2. The discussion thus seeks to determine the level of user involvement achieved in the ULLs. Based on the case study analysis (Chapter 4), Table 5-1 summarises the modes of user involvement identified in the ULLs throughout the stages of design, implementation and evaluation. The table furthermore includes a broad categorisation of the levels of user involvement. The discussion is structured using these three stages. For each stage, the modes of user involvement are analysed using the categories *no participation, information, consultation,* and *co-creation*.

Table 5-1. Modes of User Involvement and Broad Categorisation of Levels

	Design	Implementation	Evaluation
New Light on Alby Hill	• Surveys and safety walks (to identify the initial idea). ***Consultation.*** • Presentation of ideas to residents' council. ***Information.*** • Discussions with the project partners and the residents' council. ***Co-Creation.*** • Consulting schools and youth clubs. ***Consultation.*** • Distribution of information through schools and youth clubs. ***Information.*** • Questionnaires (to understand the perceived sense of security and the people's needs). ***Consultation.***	• Test lighting with the residents' council. (All participants could provide their opinions and give suggestions). ***Co-Creation.*** • Distribution of information about the image competition. ***Information.*** • Comment function on ULL website. ***Consultation.*** • Contributing images to competition. ***Co-Creation.*** • Information about possibility to vote. ***Information.*** • Voting for an image out of a pre-selection. ***Co-Creation.*** • Preview of light installations and official opening ceremony. ***Information.***	• Oral questionnaires (conducted on the pathway; before and after the lighting project). ***Consultation.*** • Survey with pupils from the school. ***Consultation.***
Nexthamburg	• Discussion about the initial project idea. ***Information/ Consultation.*** • Informing about Nexthamburg. ***Information.*** • Ideas brainstorming workshop. ***Co-Creation.*** • Online dialogue: ideas contribution and comments function. ***Co-Creation.*** • Ideas contest: voting on ideas. ***Co-Creation.*** • Workshop to further develop ideas and to select one topic. ***Co-Creation.*** • Workshop: enlarging upon the selected topic. ***Co-Creation.***	• Idea gathering (online). ***Consultation / Co-Creation.*** • Idea gathering and developing (offline methods). ***Consultation / Co-Creation.*** • Posting, discussing and voting for ideas on the website. ***Co-Creation.*** • Distribution of information. ***Information.*** • Future Camp (selection of the best ideas and creating the citizens' visions). ***Co-Creation.***	• Surveys (both offline and online). ***Consultation.*** • Observation of the offline events. ***Consultation.*** • Tracking of the website. ***Consultation.***

T-City	• Marketing campaigns. ***Information.*** • Videos where people could state their interest in T-City. ***Information.***	• Contribution with own ideas for sub-projects. ***Co-Creation.*** • Testing of new products and services. ***Consultation.*** • Public awareness campaigns. ***Information.*** • Ambassadors were educated with the task to provide information and consult citizens. ***Information / Consultation.*** • Futurists: testing of high-tech equipment and their homes. Contributing with feedback and experiences. ***Consultation / Co-Creation.*** • Engagement within the sub-projects. ***Different levels.***	• Interviews (reiterating, with the same people). ***Consultation.*** • Telephone questionnaire survey. ***Consultation.*** • Observation of the usage of technology of ICT. ***Consultation.***
UbiGo	• Individual and focus group interviews. ***Consultation / Co-Creation.*** • Information meetings including a discussion of the service and provision of citizen input. ***Information / Consultation.*** • Ten adults were part of the one-month pilot phase. ***Co-Creation.***	• Information / Recruitment of participants. ***Information.*** • Participating in the field operational test and giving feedback. ***Consultation / Co-Creation.***	• Participants of the pilot phase tested the evaluation questionnaires. ***Co-Creation.*** • Questionnaires with users (before, during, and after the field operational test). ***Consultation.*** • Travel diaries. ***Consultation.*** • Individual and household interviews. ***Consultation.*** • Focus groups (with specific user groups). ***Consultation.*** • Workshops. ***Consultation.*** • Logging of questions and problems. ***Consultation.*** • Questionnaires with non-participants. ***Consultation.***

5.1 Design

The literature highlights the importance of user involvement already in the early stage of designing a LL (Bergvall-Kåreborn & Ståhlbröst, 2009; Devaney et al., 2014; JPI Urban Europe, 2013; Salter & White, 2013). Authors like Devaney et al. (2014) or Salter and White (2013) point out that including users in this early phase helps to identify the needs of the citizens and users. It ensures that all stakeholders follow a common goal or vision. The design of an ULL does not only determine who is involved throughout the process but can also have influences on the impacts of the ULL (Voytenko et al., 2016). The design phase therefore constitutes the possibility for the strongest contribution allowing users to "actually set[…] the direction for the design rather than mainly responding to (half finished [sic]) prototypes" (Bergvall-Kåreborn & Ståhlbröst, 2009, p. 362).

With regard to the design phase of the four selected ULLs it can be summarised that the level of participation varies between and within the different cases. The higher levels of user

involvement were not always achieved. All cases have in common that the users were not actively involved in developing the first initial idea but, with the exception of *T-City*, users were still involved in shaping this initial idea and the ULL design to varying extents. The SubUrbanLab-Evaluation report explains the need to make some initial decisions before involving the citizens by the reason that certain decision-making structures of a municipality need to be considered and followed. The ULL design needs to ensure the acceptance of the (municipal) decision-makers which might require a certain maturity of the project idea and certain decisions are needed from the early start (for example regarding budget allocations) (Karlsson, Federley, Bonnier, et al., 2016). The described reasons can explain why in the case studies, the first initial ideas were developed by an already organised stakeholder, such as a municipality or a company.

In the case of *New Light on Alby Hill* the development of the initial idea was based on previous citizen consultation including surveys and safety walks. In the other three cases, the initial idea was informed by expert knowledge and experiences. It was then presented to the citizens, which constitutes user involvement on the level of information. Hans Arby (personal communication, June 16, 2016) explained the involvement of users at a later stage in the case of *UbiGo* with the limited time and budget, and the expertise present in industry: "[When having a] small budget and limited time [it] is [good] to use the understanding and insights from the industry because they have customers. And they [the industry representatives] can speculate what they [the customers] would think." While not explicitly stated, it can be assumed that the other ULLs had similar reasons for having an already organised stakeholder who develops the initial idea.

The steps that followed this initial idea development differ between the cases and are therefore presented case by case. The subsequent user participation in *T-City* was restricted to making short videos where citizens could state their interest in *T-City*. These videos were part of Friedrichshafen's application process for the *T-City* competition aiming to somehow involve citizens in the application. Citizens could be engaged by creating their own videos. However, the main purpose was not to provide the citizens with the possibility to contribute with their suggestions and ideas for the *T-City* project, the videos were rather part of the marketing campaign with the aim to raise awareness. It can therefore be questioned that the level of user participation exceeded the level of information. Even though, the statements made in the videos might have indirectly influenced certain developments within the *T-City* project after Friedrichshafen was selected as a winner of the competition, this was not the original purpose of the campaign.

It can furthermore be questioned that the video campaign and the other marketing and information campaigns of *T-City* achieved to effectively raise the awareness and inform a majority of the citizens about the project. Michael Lobeck (personal communication, June 27, 2016) summarises as a conclusion of the accompanying research that the citizens did not understand the project as a whole. According to him, the citizens knew about some of the sub-projects and had a general idea of the *T-City* project dealing with broadband internet but they did not see the connections between the development of the broadband infrastructure and the *T-City* sub-projects, nor did they understand the project as a whole. This lack of understanding can be explained by the abstractness of the technologies but also by the dominant role of the Telekom as a commercial actor (Hatzelhoffer et al., 2012). "In many respects, the interviewees did not perceive *T-City* as a joint project between the city and Telekom. For many citizens, the project had a commercial nature, which undermined its validity as a joint project." (Hatzelhoffer et al., 2012, p. 161). Lobeck (personal communication, June 27, 2016) furthermore explains that "it was expected that all actors would behave in a different way than they normally do. The Telekom employees were […]

asked to develop projects on a par with citizens, assemblies, small businesses, and the city administration, [while] normally, Telekom sells standardised products to about 80 million Germans […]". Also Stefan Söchtig (personal communication, June 29 2016) points out that Telekom had difficulties to understand the city and its needs in the beginning of the project.

As a consequence, it can be concluded that the user involvement in the early design phase was quite low. Even though the project partners in theory aimed to inform the population with the purpose of a broad involvement of citizens, the methods of involvement partly failed to reach the targeted citizens. In practice, the level of involvement is therefore considered as very low, ranging from information to partly even no participation. In contrast, the citizens in the ULLs *New Light on Alby Hill*, *Nexthamburg* and *UbiGo* had the possibility to influence the ULL-design and the further processes. However, the power to influence or the level of involvement varied also in these projects.

During the design phase, the project partners of *New Light on Alby Hill* contacted different already organised civic stakeholders including schools, youth clubs and the residents' council. While the schools and youth clubs were only consulted, the involvement of the representatives of the residents' council in *New Light on Alby Hill* can be considered as containing elements of co-creation. Before taking final decisions, the representatives were invited to discuss the project and provide their comments and suggestions. Even though the main project partners had the final decision power, the aim of the discussions was to allow the representatives of the residents' council to shape the project and to implement their suggestions and comments. However, as stated in Chapter 4.1.2, the residents' council represents the residents of Alby Hill only to some extent which narrowed the possibility to effectively engage all citizens in co-creation.

A broader involvement of the citizens, in terms of numbers, can be seen in the questionnaires used to understand the perceived sense of security and the people's needs. However, these questionnaires did not achieve the level of co-creation, their aim was rather to consult the citizens in order to get further information. That this information was later used by the project partners to shape the further processes, does not qualify the questionnaires as co-creative methods because the project partners could freely decide how to use this information and how to feed it into the further processes. The decision-making could thus happen with or without taking into account the users' input. In summary, the level of user involvement in *New Light on Alby Hill* is considered as consultation with having elements of co-creation.

The initial idea for *Nexthamburg* was further developed after a public discussion with citizens. This discussion served not only as information but can also be considered as consultation. During the first year of the pilot phase, the project idea was further specified through methods and events that actively involved citizens. The workshops, the online dialogue, and the ideas contest gave the citizens the possibility to actively contribute to the process with ideas and comments. The citizens had the power to influence which ideas would be further developed and the *Nexthamburg* team played more of a supporting background role. Even though the *Nexthamburg* project was open to all citizens and aimed for a broad participation, it needs to be pointed out that only a small portion of Hamburg's population was actually involved in the project. While especially information measures using channels such as TV, radio and the internet, were able to reach a broader part of the population, a significant smaller circle of citizens actively engaged in the processes of creating ideas and writing comments. The *Nexthamburg* experience was that certain citizen groups were more difficult to reach than others. It was tried to address this issue by choosing interesting locations and going to places where people already were instead of waiting for citizens to come to events. In doing this,

more citizens could be reached so that the *Nexthamburg* team considered the citizens' involvement as satisfying (S. Landau, personal communication, July 7, 2016).

The possible level of involvement that *Nexthamburg* allowed and aimed for was indeed very high. Those citizens who wanted to take part had the possibility to shape and co-create the *Nexthamburg* project. However, *Nexthamburg*, similarly to other public participation projects, faced the difficulty to involve a representative citizen group that mirrors the population of the city. According to Daniel Kulus (personal communication, June 24, 2016), "[…] you do not reach everyone. You have to admit that." But Kulus still considers *Nexthamburg* as a valuable contribution that brought Hamburg's citizens including those who are usually not as involved nearer to urban development processes. In summary, the *Nexthamburg* project to a large extent effectively engaged citizens in co-creative activities.

In the case of *UbiGo*, information meetings, discussions, individual and focus group interviews were used to further develop the project idea. Potential users were consulted and could provide their input. The aim of the interviews and discussions was mainly to get a better understanding of the potential users (consultation). However, the findings from the interviews were also from the beginning intended to further shape the service, so that some co-creative elements can be found in this consultation.

The ten people who tested the service during the pilot phase, had the possibility to actively influence the following field operational test by testing the app and the service and by providing their feedback. Their involvement can therefore be considered as achieving co-creation, even though the final decision power was still with the leading project partners. However, compared to *Nexthamburg*, the level of user involvement is slightly lower in *UbiGo* as the decision making power is not equally distributed between the users and the remaining project partners. Furthermore, similarly to *New Light on Alby Hill*, only a few users were selected to take part in these co-creation methods, which poses questions about stakeholder selection and representativeness.

In summary of the analysis of all four cases, it can be stated that the user involvement during the design phase covered all four participation levels ranging from no participation up to co-creation. However, only in the case of the user-driven ULL *Nexthamburg* final decision-making power was transferred to the citizens. In all other cases, final decisions were made by the leading project partners. This leading role is also represented by the fact that the initial ideas did not originate from the citizens but from already organised stakeholders. These partners were not only mostly driving the ULLs but also seemed to keep their leading role as project initiator throughout the design phase. As a consequence, the most dominant levels of the design phase that this discussion identifies are information and consultation with only elements of co-creation.

5.2 Implementation

The concept of ULLs aims for a high level of participation throughout all stages – design, implementation and evaluation. With regard to participatory processes in general and not related to LLs in particular, Reed (2008) points out that public participation typically happens during the implementation phase of a project cycle and not in the early beginning of a project. The case study analysis indicates a similar observation, showing that the overall level of user engagement in the four cases is higher during the implementation phase than during the design phase. However, while co-creative methods are more prevalent during this later phase, differences in the level of participation can still be found.

In all cases, there was at least a smaller group of citizens that was effectively engaged in co-creative activities, such as the Futurists in *T-City* or the participants of the Future Camp in *Nexthamburg*. While some methods of involvement were open to every interested citizen (for example the idea competition in *Nexthamburg* or the image competition in *New Light on Alby Hill*), others were restricted to a certain selected group of citizens (such as the participants of the *UbiGo* field operational test or the Futurists of *T-City*).

By looking at the cases individually, it can be observed that the user involvement in the ULL *New Light on Alby Hill* during the implementation was extended from only engaging the residents' council to inviting every interested resident to be part of the image competition, thus to co-create the new lighting on Alby Hill.

Only the test lighting and the selection of an appropriate LED technology were limited to the ULL project partners and the representatives of the residents' council. However, only inviting the residents' council allowed for a manageable number of participants for the test lighting to ensure that all participants, including the representatives of the residents' council, could discuss the different lighting solutions. Similar to the involvement of the residents' council during the design phase, the test lighting contained co-creative elements by providing the possibility to contribute with opinions and give suggestions. However, final decisions were made by the project partners which again limited the residents' council's power to influence and thus the co-creation potentials.

The image competition, in contrast, was open to everyone interested. The information about the possibility to contribute with images as well as at a later point, the information about the voting for images were spread using a variety of channels with the aim to reach as many citizens as possible. The level of information can therefore be considered to be very high. The possibility to contribute with an image and to later vote for an image that will be projected on the pathway, gave the citizens the power to influence how the pathway would look like and to co-create their environment. However, the ability to co-create was slightly constrained as the ULL partners made a pre-selection of the images (based on the realisation of the topic Our Alby and also regarding the ability to project the image on the wall) before they invited the citizens to vote for their favourites.

The citizens had furthermore the possibility to use the *New Light on Alby Hill* website to write comments about the ULL and the image competition. This provided a room for discussions and helped the project partners to better understand the opinions and needs of the residents without necessarily influencing the project implementation. The comment function can therefore be categorised as consultation.

Presenting the new ambient lighting and the light installations during the official opening ceremony informed the citizens about the co-creation results. Langlet (2013) highlights this form of feedback as important because it makes the citizens' influence visible and thus rewards their participation. The official opening ceremony therefore constituted a good completion of the project.

The user involvement in the ULL *Nexthamburg* is comparable to *New Light on Alby Hill*. Information was spread to raise awareness and inform the citizens about the different ways to contribute to the project. Furthermore, the citizens were informed about urban development news in Hamburg. Using different distribution channels a high level of information could be achieved. Interested citizens had furthermore the possibility to co-create a vision for Hamburg by using online methods as well as by participating in workshops and the Future Camp. As in the design phase, the project partners only had a supporting background role so that the

citizens were empowered to create their own visions and select the ideas that would be part in the final output of the project, the citizens' vision. Herein, the highest level of user involvement, co-creation can be seen. However, it needs again to be highlighted that out of the approximately 10 000 citizens who were reached through the different communication and information channels, most of the users, saw *Nexthamburg* as information source rather than as a possibility to contribute with own inputs (Kulus et al., 2012). This results in a small number of citizens who in practice took part in co-creative activities. A possible reason can be the additional effort and time required in order to contribute with own ideas.

Also the ULL *UbiGo* mainly engaged a smaller group of citizens during the implementation phase, namely the participants of the field operational test. After informing about the project and the possibility to take part in the field operational test on a broad level, participants were recruited. All interested citizens who fulfilled the project requirements (see Chapter 4.4.2) could be part of the field test. In the following, the business model and the travel services were tested by the participants of the field operational test. They could define their travel needs and thus decide how their subscription would look like. On this small scale they could thus co-create their own mobility service. On the larger scale, namely the development of the business model behind *UbiGo*, they could test the service and provide their feedback. However, due to the limited time and budget, the users' suggestions were not implemented during the field operational test (H. Strömberg, personal communication with J. Sochor & H. Strömberg, June 16, 2016). The aim was instead to use this feedback and the experience made during the field test to further shape the mobility service after the field operational test and before launching the new business. The purpose was therefore, to give the participants the possibility to co-create the final service. However, as *UbiGo* was not continued after the field operational test, the feedback of the participants could not be implemented so that in practice, the co-creational elements of *UbiGo* were limited.

The ULL *T-City* aimed for broad user participation during the implementation phase, too. Public awareness campaigns were used to inform the citizens about the project. Citizens were invited to contribute with their own ideas for sub-projects and to test and give feedback on new products and services. Lessons were learned from the difficulties to involve the citizens and new forms of communication and engagement were tested. Users could become Ambassadors and inform other citizens about *T-City* projects. While they hereby mainly served as informants, they also consulted the other citizens about their wishes regarding the *T-City* project but also the development of ICT. Citizens who became Futurists could test high-tech equipment in their homes and contributed to its development with their feedback and experiences. Interested citizens could thus influence the further product development to some extent. The level of engagement can therefore be considered as consultation with elements of co-creation. The introduction of Ambassadors and Futurists furthermore helped to increase the awareness about *T-City* among the citizens of Friedrichshafen.

Even though *T-City* intended to achieve a broad involvement of citizens allowing for a high level of participation, they partly failed to raise the interest and actually engage the citizens. "The project didn't succeed in being 'taken over' by the people with their own initiatives and project ideas." (Kaack, 2012, p. 119). Several reasons for the difficulties to engage more residents were mentioned during the interviews. One reason was that the smart city topic was not tangible enough for the citizens so that it was difficult to raise their interest. Thomas Goldschmidt (personal communication, June 15, 2016) therefore concluded that it was easier to convince expert circles than convincing the own citizens. This is in line with Josef Büchelmeier's (Mayor of Friedrichshafen from 2001 to 2009) impression that the *T-City* project was seen as positive by the citizens whenever applications were concrete and tangible, for example in the areas of medicine and the smart metering project within the field of energy.

However, the information provided did not succeed to engage the average citizen (Büchelmeier, 2012).

Another reason mentioned was related to Telekom as a project partner. The experts of Telekom who were responsible for the development and implementation of the project stayed in Bonn for most of the time and were rarely present in the city, except for the Telekom project manager who had his office in Friedrichshafen. Thus, they had a lack of deeper knowledge of the city and personal contacts that could have contributed to increased mutual trust (Hatzelhoffer et al., 2012). Stefan Söchtig (personal communication, June 29, 2016) concluded that Telekom had not really understood the city and how it worked from the beginning. In addition, many citizens did not perceive Telekom and Friedrichshafen as joint project partners but perceived the project as having a commercial nature (Hatzelhoffer et al., 2012). "Despite the invitation to citizens to participate in the shaping of T-City – after all, it was a project that concerned the whole of urban society – those who put forward ideas or project suggestions had the feeling that they weren't [sic] welcome." (Hatzelhoffer et al., 2012, p. 161).

To conclude, the level of citizen involvement during the implementation phase of *T-City* was lower than intended. However, the project experienced a learning curve so that the involvement of citizens increased over time. Co-creation could be predominantly achieved within certain sub-projects but also the framing *T-City* project allowed for co-creational elements. Consultation was, however, the most dominant form of user involvement during the implementation phase.

Looking at the implementation phase of all four cases, it can be concluded that the level of user involvement was higher than during the design phase. A possible reason is that all ULLs put an emphasis on a high level of user involvement during the implementation phase as it somehow constitutes the core of and makes up the project. User involvement during the design phase was therefore maybe not considered as important as during the implementation phase. Furthermore, decisions made during the design phase, narrowed down the possible topics or methods for user involvement that were later used during the implementation phase. The design phase thus structured user involvement by setting the frame. However, while all cases aimed for co-creation, some were more successful than others in actually engaging citizens in co-creative activities. It can be seen that it is easier to involve a smaller group of citizens in co-creation than actively engaging a broader part of the citizens.

5.3 Evaluation

Evaluation is not only a time-wise phase of an ULL but also an important characteristic. By evaluating an ULL a feedback loop is introduced that feeds back lessons learned and results into the ULL processes. In doing this, evaluation "facilitate[s] explicit learning amongst the participants and allows for the refinement of ULL goals, visions and methods, and their better alignment with user needs." (Voytenko et al., 2016, p. 51). As a result, the triangle of experimentation, evaluation, and learning enhances innovation and the development of new products and services (Budweg et al., 2011).

Due to this special role of evaluation, the evaluation phase cannot be clearly distinguished from the other two phases. While evaluation reports are usually published after the implementation phase of an ULL, evaluation processes often happen in parallel with the other phases so that the results and implications of the evaluation can be fed back to the ULL processes.

In terms of user involvement, different aspects can be studied with regard to the evaluation phase. First, it can be analysed if the users of the ULL have the possibility to co-create the evaluation process, i.e. determining the subjects of evaluation and the evaluation methods. Second, the ways of evaluation and the methods to involve citizens during the evaluation can vary. The third aspect to look at, is the extent to which the evaluation results are fed back into the implementation or even design of the ULL. This third aspect characterises the distinct role of the evaluation phase and makes it difficult to draw a clear line between evaluation and the other two phases of an ULL. At the same time, the third aspect is intertwined with the second aspect as the evaluation methods used determine if the given feedback can be considered as co-creation or rather only consultation.

With the exception of *UbiGo*, the citizens in the analysed cases did not have the possibility to influence the evaluation process, they rather served as sources of information during the evaluation. In contrast, the ten adults who took part in the one-month pilot phase of *UbiGo* had the possibility to test the evaluation questionnaires and to provide their feedback. Hereby, they were able to influence the later evaluation process of the field operational test. However, the influence was limited to the question design and maybe the content of the questions and did not allow the participants to suggest another evaluation method. Their contribution can therefore be considered as limited co-creation.

The evaluation methods used in all four analysed ULLs were similar. They used surveys, combined with other methods such as interviews, observation, or the tracking of a website. Compared to close-ended survey questionnaires, open-ended interview questions and oral questionnaires provide citizens the possibility to give more flexible and individual answers. If the evaluation results are intended to be fed back to the implementation of the ULL, open-ended questions therefore give the citizens more possibilities to influence the processes as they do not have to stick to pre-defined answers. Co-creative elements are therefore likelier to be found the more open the questions are.

While all four ULLs allowed for some influence during the evaluation process, *UbiGo* had the most open process. Combining different methods, including questionnaires, travel diaries, interviews, and workshops, did not only allow to reach different groups of citizens but also to yield different types of information, including both quantitative and qualitative data. The evaluation of *T-City* used a combination of interviews, telephone questionnaires and observation. With one thousand participants for the survey, the evaluation was compared to the other cases most comprehensive in quantitative terms. Reiterating interviews with the same citizens allowed to explore changes over time.

Also, *New Light on Alby Hill* used questionnaires before and after the lighting project in order to investigate if the Alby Hill residents' perception of the pathway had changed. However, the oral questionnaires were conducted with random users of the pathway without purposely asking the same people reiteratively. Conclusions about trends that follow from comparing the before and the after questionnaire results therefore need to be dealt with carefully. *Nexthamburg* is the only ULL analysed that did not use interviews as part of the evaluation. The assessment was rather based on surveys and observation. With regard to the second aspect of evaluation, the ways of evaluation, it can be concluded that consultation is the predominant level of involvement throughout all ULLs.

The third aspect of evaluation relates to the extent to which the evaluation results are fed back into the implementation or even design of the ULL. *T-City* is the only example where the purpose of the accompanying research was to be separate from the implementation of the project. However, as the interim results were presented on a regular basis, a feedback loop was

initiated automatically, so that in practice, the implementation phase was influenced, too. The other three cases, in contrast, aimed from the beginning to feed back the evaluation results into the implementation phase. For further details, regarding this third aspect of evaluation, it can be referred to the Sections 5.1 (Design) and 5.2 (Implementation).

In conclusion, the analysis of user involvement in the evaluation phase is complex. The main purpose of user involvement during the evaluation of the four cases was to gain information about the citizens' perspectives, opinions or insights (consultation). While co-creation of the evaluation process by users was not, or as in the case of *UbiGo* only to a limited extent, present, the intended feedback loops of the evaluation processes partly allowed for co-creative elements influencing the implementation and design of the ULLs. The dominance of consultation as level of involvement during the evaluation phase can be explained by the reason that the evaluations were conducted with a certain aim and focus in mind. This focus was probably also influenced by the funding schemes that provided funding for particular project fields. Having a pre-defined focus limits the range for co-creation with users during the evaluation process and at the same time a lower level of user involvement might enhance that the evaluation results contribute to the aim of the evaluation.

6 Reflections and Conclusion

This chapter reflects upon the analysis and the discussion of the cases and presents concluding remarks. Reflections upon the level of user involvement achieved in the ULLs and the question if users can be considered as co-creators can be found in Section 6.1. The following Section 6.2 summarises the most important challenges that the analysed ULLs faced when involving users and presents lessons learned as well as recommendations for ULL practitioners. Section 6.3 reflects upon the research methodology. The key conclusions are presented in Section 6.4. Finally, suggestions for further research are presented in Section 6.5.

6.1 Users as Co-Creators?

The analysis and discussion of the cases show that the level of user involvement varies between and within the different ULLs. Elements of co-creation were present in all cases and most dominant in the user-driven ULL *Nexthamburg*. However, the case analysis and discussion also showed that the level of co-creation was only prevalent during the implementation phase of the ULLs while it was less present during the design and the evaluation phases.

Besides the co-creation elements, lower levels of user involvement, especially information and consultation, were present in all stages of the ULLs. Indicators for no participation could only be found in the design phase of *T-City*.

As a result, it can be summarised that user involvement in the analysed cases achieved at least the level of information, apart from one exception. However, due to a lack of decision-making power, co-creation with users could often not be facilitated in the ULLs *New Light on Alby Hill, T-City,* and *UbiGo*.

These conclusions are in line with the study by Nyström et al. (2014) that analyses the different network actors in LLs (see Chapter 2.3). After distinguishing four different user roles – informant, tester, contributor and co-creator – the study concludes that among the analysed cases of the study, contributor is the most common user role, followed by informant and tester. Co-creator is the less frequently adopted role. Also, the case analysis by Veeckman et al. (2013) (see Chapter 2.3) indicates that users often have the role of informants rather than co-creators and that co-creation is rarely happening.

There might be different reasons that explain why co-creation was not the most dominant mode of user involvement in the analysed ULLs. It can be explained by the fact that the initial ideas were developed by already organised stakeholders and either failed to be taken over by citizens or were not intended to do so. As a result, the stakeholders who developed the initial ideas, also drove the ULLs and kept the final decision-making power.

The different levels of citizen involvement could also be influenced by the type of driver that was behind the ULLs. According to the framework for analysing innovation mechanisms in LLs developed by Leminen (2013) (see Chapter 2.3), the different types of LLs can be linked to different coordination and participation approaches (see Figure 6-1).

A participation approach can be "exhalation-dominated" or "inhalation-dominated". Inhalation-dominated means that the driving party initiates the LL in order to fulfil his or her own needs, exhalation-dominated approaches on the other hand aim for fulfilling the needs and requirements of other stakeholders. The coordination approach of an innovation mechanism is according to Leminen (2013) either "top-down" or "bottom-up".

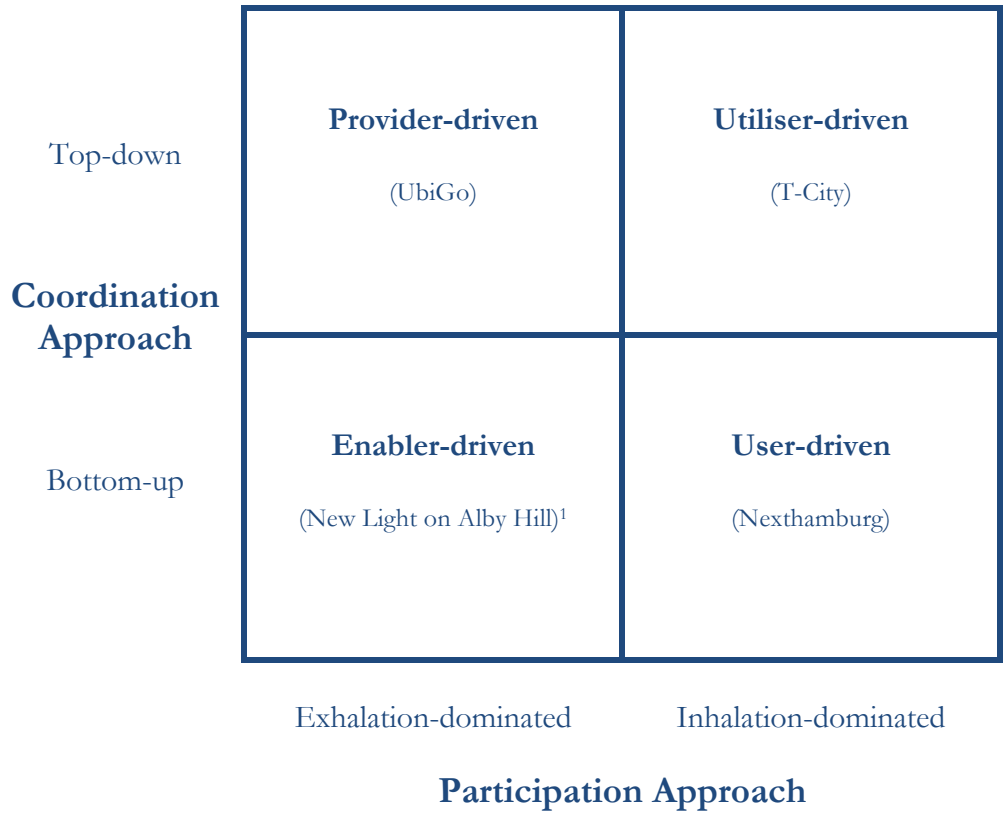

Figure 6-1. Innovation Mechanisms in Living Lab Networks

Source: Leminen, 2013

Regarding the involvement of users, bottom-up approaches rather than top-down approaches are more likely to produce higher levels of involvement. Bottom-up, also sometimes referred to as grassroots, by definition means that decisions are not taken by one single actor or a smaller group of actors but by a larger amount of people that jointly take a decision.

Besides the coordination approach, also the participation approach might have an influence on the level of user involvement: As exhalation-dominated participation approaches do not only focus on the driver's needs but aim at fulfilling the requirements and wishes of other stakeholders, including citizens, they are likely to involve users in order to identify their needs and potentially also to determine the best methods to fulfil these needs. To which level user involvement can be achieved in inhalation-dominated ULLs, is depending on their driver. User-driven ULLs have the purpose to fulfil the user's own needs. Thus, a high level of user involvement is very likely. In contrast, utiliser-driven ULLs focus on the needs of the company that drives the ULL. The companies often already have pre-defined ideas of the project that they do not want to open up to citizens. A high level of user involvement is therefore less likely.

In summary and based on the analysis and discussion of the four cases it appears that user-driven ULLs following an inhalation-dominated bottom-up approach are more likely to allow for co-creation as they focus on the users' needs and are driven by the users themselves.

[1] The ULL *New Light on Alby Hill* is partly also provider-driven.

Utiliser-driven ULLs, in contrast, are less likely to allow for high levels of user involvement because they do not only follow a top-down approach but also mostly only focus on the company's own needs. Enabler- and provider-driven ULLs following an exhalation-dominated approach, are located in the middle.

This proposition is supported by the case studies of this research as the user-driven ULL *Nexthamburg* achieved a very high level of user involvement throughout its life time while *T-City* as a utiliser-driven ULL failed to successfully engage the citizens in co-creation. The other two analysed cases can be located in the middle. However, further research is required in order to validate this assumption that the driving force of a LL influences the level of user involvement achieved.

Another reason for the varying levels of user involvement could be that allowing for co-creation is easier in certain projects than in others. An ideas contest for city development (*Nexthamburg*) or an image competition (*New Light on Alby Hill*) might be more tangible and thus easier to get involved in for citizens than a travel broker service (*UbiGo*) or even smart city technologies (*T-City*). One reason mentioned for the challenges in involving the citizens in *T-City* was the intangibility of the project. Josef Büchelmeier (2012) concluded that the *T-City* project was seen as positive by the citizens when applications were concrete and tangible, for example in the areas of medicine and the smart metering project within the field of energy. In other areas, it was challenging to engage the average citizen. Also T. Goldschmidt (personal communication, June 15, 2016) emphasised the intangibility of the project as a reason for the difficulties in raising the citizens' awareness. "It is often easier to convince experts than citizens. I think that the external image of *T-City* was better than its internal image." (T. Goldschmidt, personal communication, June 15, 2016).

Participating in *Nexthamburg*, to give a contrasting example, did not require any previous knowledge in city planning and citizens could contribute with ideas on every level. Possible suggestions could range from coming up with the idea to plant a tree in one particular street up to developing a completely new biking concept for the whole city. Every idea was welcome and if other citizens liked the idea, it was further developed together with citizens and experts. "That is also a lesson that we learned: Those co-creation processes are about having a ping-pong-play between participation [involving the citizens] and expert work." (S. Landau, personal communication, July 7, 2016). This "ping-pong-play" probably helped to bring the citizens closer to a topic that many of them were not or less interested in before.

Instead of stopping at this point with the conclusion that users cannot necessarily be considered as co-creators of ULLs, the question arises if co-creation should be the single one level of user involvement that ULLs should aim for or if rather a combination of different levels of involvement might be more appropriate in order to achieve successful and impactful ULLs.

The case studies showed that the distinction between the different levels is often not clear and that some user involvement methods can be interpreted as a mix of two different levels. It could also be observed that co-creation was often only applied to a smaller group of citizens while consultation and information reached a larger group. This could suggest that ULLs can be characterised by a combination of different levels that supplement each other. Information as one-way communication is often referred to as basic participation right, which is necessary as it enables higher levels of participation (Ebbesson et al., 2014). Consultation and co-creation on the other hand both allow for a two-way communication between the citizens and other stakeholder groups and give the citizens a possibility to exert influence.

As presented in Chapter 3.2, there are two strands of literature on participation – one seeing the different levels of user involvement as a clear hierarchy and the other one looking at the different levels as being appropriate in different situations. Authors like Davidson (1998), Fung (2006) or Hage et al. (2010) point out that the "the more participation, the better" principle (Hage et al., 2010, p. 262) does not always hold true in terms of participation. "There may indeed be contexts in which public empowerment is highly desirable, but there are certainly others in which a consultative role is more appropriate […]" (Fung, 2006, p. 67). It is recommended to not only define the effort to communicate in relation to the importance of the questions but also to the scope of the issue to be discussed. While a broader issue calls for a smaller group to be involved in discussions, the more focused an issue is, the larger the number of participants can be (Friedrich et al., 2013; Langlet, 2013).

According to Davidson (1998), a wheel of participation is a more appropriate metaphor compared to a ladder as it "promotes the appropriate level of community involvement to achieve clear objectives, without suggesting that the aim is always to climb to the top of the ladder" (p. 14). Similarly, Juujärvi and Lund (2016) suggest a mix of bottom-up and top-down approaches for ULLs as this combination allows for identifying needs and ideas on the one hand and a validation of the needs and the provision of a formal structure on the other hand. In conclusion, co-creation might not be the single level of user engagement, an ULL should aim for in all cases. It is rather the combination of different levels, which fit the goals and vision of the particular ULL, that enhances the outcomes of the ULL.

6.2 Challenges, Lessons and Recommendations

Several lessons can be learned from the cases about the challenges they faced when involving users. While some are case-specific, others emerge from more than one case and are more generalisable. In the following, the key lessons from the cases are presented. Not only the representatives of the ULLs under analysis but ULL practitioners in general can learn from these lessons. The following therefore provides recommendations for practitioners who set up and run ULLs.

The case study analysis supports the importance of user involvement already in the early stage of designing a LL, highlighted in the literature (Bergvall-Kåreborn & Ståhlbröst, 2009; Devaney et al., 2014; JPI Urban Europe, 2013; Salter & White, 2013). ULLs that are not driven by the citizens themselves but by an already organised stakeholder, often face the challenge "to select actions for an ULL where some necessary decisions have already been committed to, but are not yet too fixed to motivate participation and to be open for new or alternative ideas from users and stakeholders during the whole process." (Karlsson, Federley, Bonnier, et al., 2016, p. 82).

Nexthamburg and *T-City* are two outstanding examples that indicate the importance of user involvement during the design phase. While *Nexthamburg* involved citizens already when designing the project to a high extent and carried on with co-creation during the implementation phase, *T-City* did not achieve a high level of user involvement in the beginning. Though the level of participation during the implementation phase increased in *T-City*, it was still low compared to the other cases under analysis. Jürgen Kaack (personal communication, June 23, 2016) ascribed the difficulties to involve citizens during the implementation phase to the low level of involvement during the design phase.

Another important lesson from the cases is that engaging citizens can be challenging and time-consuming. It is important that you know the citizens well and have an understanding of how to best approach them. A common experience is that you cannot wait for citizens to come to an event but you have to go to the places where people already are and meet them there.

Furthermore, "[…] you have to have kind of an image of what you want so that you can convey this so that they [the citizens] understand what it is that you want to have opinions about. If it [the topic] is too open, it [citizen involvement] is too difficult." (L. Nilsson, personal communication, June 16, 2016). Projects should be created in a way that makes them as tangible as possible for the citizens in order to minimise the obstacles to participate.

The case study analysis also highlights the importance to have common goals and a shared vision among the involved stakeholders. This common goal can be supplemented by smaller individual goals. Motivation to be involved might be even enhanced if the stakeholders at the same time follow their individual goals with their project. However, individual goals should not be too dominating as this could lead to the project not any longer being perceived as a joint project (as it was partly the case with *T-City*). In conclusion, it can be learned from the cases that even though the involvement of users can be challenging and not always linear, it is inspiring and yields interesting results that might not be possible without citizen engagement. Citizens should be involved as early as possible and it needs to be ensured that all stakeholders share a common goal.

6.3 Research Methodology

This thesis sought to get a better understanding of user participation in ULLs and to test if ULLs effectively engage in participatory methodology that facilitates co-creation with users. Qualitative data collection methods were employed. Data was collected through a literature review, semi-structured interviews and participation in conferences.

Interviews conducted with partners who were involved in designing and setting up the respective ULLs constituted the backbone of the case studies, complemented by a review of both academic as well as grey literature on the ULLs. The data collection faced limitations due to the availability of data and interview respondents. Furthermore, peer reviewed and academic literature about ULLs is still limited. However, both, the interviews as well as the literature review, yielded valuable information that was enlightening and useful. The amount of data available as well as the level of detail were deemed to be appropriate for the purpose of this research.

The selection of a case study design including four ULLs constrained the analysis of data. Due to the small number of cases, the insights gained are at risk to be particularistic. This as well as the high diversity of the cases might have sacrificed the generalisability of the results and conclusions (6 & Bellamy, 2012). However, while a quantitative study including a larger number of ULLs could probably deliver more generalisable and representative data, it would not provide the in-depth insights needed to analytically investigate the stakeholder involvement. At the same time, the analysis allowed to draw lessons learned from the case studies that are of general value.

The case studies were predominantly informed by interview partners who were involved in designing and setting up the respective ULLs. As the interview partners were part of the ULLs there might be a small risk that they were biased and evaluated the user involvement slightly more positive than it happened in practice. This possible bias was addressed by interviewing different kinds of stakeholders in order to get insights into the ULLs from different perspectives. However, as pointed out in the methods for data collection (Chapter 3.1.2) interviews were not conducted with citizens so that their direct insights are missing. This research is therefore based on the insights of other stakeholders involved and the results of the accompanying researches. Even though including more interviews with other stakeholders and especially with citizens would have enriched this research with further perspectives, for the scope of this thesis, the collected data was deemed to be appropriate.

The case study discussion was guided by the analytical framework presented in Chapter 3.2. The framework defined four different levels of user involvement with co-creation being the highest. As every categorisation, these levels are a simplification of the reality. They are broad categories which can partly overlap. This sometimes resulted in difficulties to clearly assign a level of involvement to a certain activity. However, the framework facilitated a better understanding of user involvement in the analysed cases and yielded valuable results.

Finally, the definitions used for the different levels in the framework influenced the results. Especially, co-creation is a broad term that is understood in different ways. It was here understood as involving citizens in decision-making processes with at least equal decision-making power compared to the other stakeholders involved. Despite the fact that the term co-creation is used in much LL literature (cf. Almirall et al., 2012; Baccarne et al., 2014; Dell'Era & Landoni, 2014; Franz, 2015; JPI Urban Europe, 2013; Juujärvi & Pesso, 2013; McCormick & Schliwa, 2016; Westerlund & Leminen, 2011), it is not clear if the literature consistently refers to this or a similar definition. While co-creation is often understood as different stakeholders coming together and discussing a certain topic, Sophia Schuff (personal communication, July 26, 2016) suggests a different way to understand co-creation. She furthermore emphasises that different situations and communities require different co-creation approaches as not every approach works with everyone. According to her, co-creation with citizens can also mean to study the citizens' behaviour or to observe how and where people move. In doing this, you allow for co-creation "because you are allowing their [the citizens'] everyday choices and everyday mobility decisions to inform the final design [or decision]" (S. Schuff, personal communication, July 26, 2016).

6.4 Key Conclusions

The aim of this research was to analyse user involvement and participation in Urban Living Labs. The involvement of different stakeholders, including citizens or users, is one key characteristic of ULLs. Users are not only considered as informants but as project partners that help to create and shape the ULL outcomes. The high level of involvement is often emphasised in literature.

However, at the same time, user involvement constitutes a practical challenge for many ULLs. And despite the importance of user involvement, little ULL research has been conducted focusing on user participation. Only a few sources analyse the level of participation and the methods employed to involve the users. This research therefore had the aim to explore and analyse if Urban Living Labs effectively engage in participatory methodology that facilitates co-creation with users.

Applying a multiple case study approach, two main research questions guided the study:

1. How are users involved during the design, implementation and evaluation phase of the analysed Urban Living Labs?
2. Which level of participation is achieved in the Urban Living Labs?

The following four Urban Living Labs were selected to be part of the case study analysis: *New Light on Alby Hill* in Stockholm, Sweden; *Nexthamburg* in Hamburg, Germany; *T-City Friedrichshafen* in Friedrichshafen, Germany; and *UbiGo* in Gothenburg, Sweden.

Each case was presented and the methods of user involvement during the design, implementation, and evaluation phases were analysed. Key methods of user involvement that were employed across the cases were interviews, surveys and questionnaires, discussions,

workshops, information meetings and presentations, and the use of social media and interactive websites.

In a next step, the level of user involvement was discussed, employing an analytical framework that distinguishes between four different levels of involvement: *No Participation*; *Information*; *Consultation*; and *Co-Creation*. Looking at the phases design, implementation, and evaluation, it was discussed, which levels of participation were achieved by the different involvement methods that were used in the four selected cases.

In summary, the discussion of the cases found that the level of user involvement varied between and within the different ULLs.

Despite the importance of involving citizens already in the early stage of designing an ULL, the level of participation achieved during this phase was comparatively low. A mix of all four participation levels could be found, ranging from no participation up to co-creation. A common theme between all the cases is that the users were not actively involved in developing the first initial idea. However, with the exception of *T-City*, users were still – to varying extents – involved in shaping the initial idea as well as the ULL design. The involvement of users during the design phase was lowest in *T-City* and did not go beyond the level of information. Only the user-driven ULL *Nexthamburg* provided citizens with final decision-making power and allowed for co-creation. In the two remaining ULLs, *New Light on Alby Hill* and *UbiGo*, final decisions were made by the leading project partners. However, also they involved citizens in their decisions so that co-creational elements could be found.

The overall level of user involvement increased in the implementation phase compared to the design phase. This supports the public participation literature according to which participation typically happens during the implementation phase of a project cycle. The achieved levels of participation varied between information, consultation, and co-creation. It was found that in all cases two or more levels of participation were combined with each other. Information often served as a method to inform and facilitate the two higher levels of participation – consultation and co-creation. While all cases aimed for co-creation, some were more successful than others in actually engaging citizens in co-creative activities. The increase in the level of participation during the implementation phase compared to the design phase can be explained by different possible reasons. It can be influenced by the project partners who might have considered user involvement during this core phase of the ULLs as more important. Or it might have been easier to involve users in this phase because decisions made during the design phase narrowed down the possible topics and methods for user involvement.

The evaluation phase of ULLs is of special importance as it feeds back the lessons learned and the results into the ULL processes facilitating learning and improvements. As a result, the evaluation phase has a distinct and special role because it cannot be clearly distinguished from the other phases. While evaluation reports are usually published after the implementation of an ULL, evaluation processes often happen in parallel with the other phases to allow feedback loops. For the discussion of the level of participation during the evaluation, three aspects were distinguished: (1) the possibility to co-create the evaluation process; (2) the methods to involve citizens during the evaluation; and (3) the extent to which the evaluation results were fed back into the ULL processes. The case discussion found that, with the exception of *UbiGo*, the users in the analysed cases did not have the possibility to influence the evaluation process (first aspect). However, in all four cases the evaluation results had impacts on the design or implementation phases of the ULLs (third aspect). While this was not the original purpose of the accompanying research of *T-City*, the other cases aimed for this feedback loop from the beginning. The main purpose of user involvement during the evaluation of the four cases was

to gain information about the citizens' perspectives, opinions, or insights. The different ULLs used different methods to involve the citizens including questionnaires, interviews, and observation. Even though some methods allowed for a higher level of influence and more flexible answers, all belong to the level of consultation (second aspect). The dominance of consultation as level of involvement during the evaluation phase can be explained by evaluations being conducted with a certain aim and focus in mind. Having a pre-defined focus limits the range for co-creation with users during the evaluation process. At the same time, a lower level of user involvement might enhance that the evaluation results contribute to the aim of the evaluation.

It can be summarised that even though elements of co-creation were present in all cases, it needs to be highlighted that co-creation as the highest level of participation was only prevalent during the implementation phase of the ULLs. It was less present during the design and the evaluation phases. Lower levels of user involvement, especially information and consultation, were often dominating these phases. The ULL *Nexthamburg* is the only case that was clearly dominated by the level of co-creation. However, also in this case, lower levels of participation could be found.

One key conclusion of the case study analysis is therefore that the ULLs indeed strive for a high level of involvement, but they do not always effectively engage in participatory methodology that facilitates co-creation with users. Even though this result is in line with other case studies analysing the role of users in living labs, it is not consistent with the ULL literature that emphasises the importance of co-creation and a high level of user involvement in general.

There are different possible reasons that can explain why users do often not have the role as co-creators. One explanation can be that the initial project ideas were developed by already organised stakeholders and not taken over by the citizens in the further development. The organised stakeholders thus drove the ULLs and kept the final decision-making power. The level of involvement achieved could also be influenced by the type of driver and accordingly by the different coordination and participation approaches applied. Another reason for different participation levels among the analysed ULLs could be that some types of project ideas were more appropriate for co-creation with citizens than others. Different factors can play a role herein, including the tangibility of a project or the number of targeted citizens.

Instead of stopping with the conclusion that users cannot necessarily be considered as co-creators of ULLs, this thesis suggests to question if co-creation should be the single one level of user involvement that ULLs should aim for, or if rather a combination of different levels of involvement might be more appropriate in order to achieve successful and impactful ULLs. This question is also discussed in participation literature: While one strand argues for a hierarchy of participation levels with the objective to always achieve the highest possible level, the other strand considers different levels of participation as alternatives that supplement each other. The case studies support the second strand of literature. It was found that the ULLs employed different levels of participation and combined them with each other. Co-creation took often part with only a smaller group of citizens while information and consultation were applied to a larger number of people. This suggests that the different levels can supplement each other and that certain methods of involvement might be more appropriate in some situations than others.

To achieve a high number of citizens that actively engage in projects, the experiences from the cases demonstrate that it is important to involve them in the early stage of designing the ULL.

That helps the citizens to identify with and take over the project. It is furthermore advantageous to know the citizens and the best ways to approach them. Different groups usually need to be addressed using different methods. Time and effort should be spent in order to get a better understanding of the citizens and successfully select involvement methods. Finally, it is important, that all stakeholders, including the users of the ULL, have a common goal and a shared vision.

To conclude, ULLs are seen as drivers for innovation in sustainable urban development, particularly because of the possibility to experiment in a real-life environment with citizens. In order to fully utilise this potential, it is vital to better understand the role of users and their participation. In analysing user involvement in ULLs and discussing the different levels of participation, this research provides a more cogent understanding of user involvement in ULLs. However, this is only a starting point. More research is necessary in order to fully understand the practicalities and importance of user involvement in ULLs and to drive the urban sustainability transition.

6.5 Further Research

Urban Living Labs are still a relatively new concept that is not yet comprehensively studied. There are still many unanswered questions with regard to the concept of ULLs in general and the involvement of users in particular.

This research yielded that co-creation was not always achieved in the ULLs and provided some possible explanations. However, the findings of this multiple case study are based on only four cases so that a more quantitative case study can help to further validate the findings and give more generalisable recommendations.

Further research is needed in order to identify what constitutes successful user involvement. It was not part of this study to investigate if it is always beneficial to allow users for co-creation throughout all stages of an ULL or if other levels of participation might be more appropriate under certain circumstances or during certain stages of the ULL. A clear understanding of user involvement is therefore required. This also includes as consistent definition of co-creation.

With a consistent understanding of user involvement at hand, the different methods and the ways how to best engage a variety of citizen groups need to be analysed in order to identify success factors. This includes involving users in the study and directly talking to them about their involvement and how they perceived it. Finally, indicators that define successful results or impacts of an ULL need to be identified and established.

Bibliography

6, P., & Bellamy, C. (2012). *Principles of Methodology: Research Design in Social Science*. Los Angeles; London: SAGE Publications Ltd.

Alam, I. (2002). An Exploratory Investigation of User Involvement in New Service Development. *Journal of the Academy of Marketing Science*, *30*(3), 250–261.

Almirall, E., Lee, M., & Wareham, J. (2012). Mapping Living Labs in the Landscape of Innovation Methodologies. *Technology Innovation Management Review*, (September 2012), 12–18.

Arnstein, S. R. (1969). A Ladder of Citizen Participation. *Journal of the American Institute of Planners*, *35*(4), 216–224. https://doi.org/10.1080/01944366908977225

Baccarne, B., Logghe, S., Schuurman, D., & De Marez, L. (2016). Governing Quintuple Helix Innovation: Urban Living Labs and Socio-Ecological Entrepreneurship. *Technology Innovation Management Review*, *6*(3), 22–30.

Baccarne, B., Schuurman, D., Mechant, P., & De Marez, L. (2014). The role of Urban Living Labs in a Smart City. In *The XXV ISPIM Conference - Innovation for Sustainable Economy & Society*. Dublin.

Beckmann, S., Ciglasch, K., Chojnowski, K., Fricke, L., Heller, J., Manderbach, Y., … Zamzow, M. (2010). *P2 Projekt Nexthamburg - Eine Vision von Hamburg 2050*. Hafencity University Hamburg, Hamburg. Retrieved from https://www.hcu-hamburg.de/fileadmin/documents/Professoren_und_Mitarbeiter/Alenka_Poplin/bericht_abgabe.pdf

Bergvall-Kåreborn, B., & Ståhlbröst, A. (2009). Living lab: an open and citizen-centric approach for innovation. *International Journal of Innovation and Regional Development*, *1*(4), 356–370.

Brask, M. (2015). *The Role of Urban Living Labs in Fostering Sustainable Cities - Insights from Sweden*. Centre for Environmental and Climate Research (CEC), Lund University.

Bryman, A. (2012). *Social research methods* (4th ed.). Oxford: Oxford University Press.

Büchelmeier, J. (2012). T-City review - the roles of citizens and businesses. In *Smart City in Practice - Converting Innovative Ideas into Reality* (pp. 113–115). Berlin: Jovis.

Budweg, S., Schaffers, H., Ruland, R., Kristensen, K., & Prinz, W. (2011). Enhancing collaboration in communities of professionals using a Living Lab approach. *Production Planning and Control*, *22*(5), 594–609. https://doi.org/10.1080/09537287.2010.536630

Buhr, K., Federley, M., & Karlsson, A. (2016). Urban Living Labs for Sustainability in Suburbs in Need of Modernization and Social Uplift. *Technology Innovation Management Review*, *6*(1), 27–34.

Bulkeley, H. (2015, December 3). Climate Changed Cities? *The Huffington Post*. Retrieved from http://www.huffingtonpost.com/harriet-bulkeley/climate-changed-cities_b_8706616.html

Bulkeley, H., Breitfuss, M., Coenen, L., Frantzeskaki, N., Fuenfschilling, L., Grillitsch, M., … Voytenko, Y. (2015, September). Theoretical Framework - Working Paper on Urban Living Labs and Urban Sustainability Transitions. Governance of Urban Sustainability Transitions (GUST). Retrieved from https://drive.google.com/a/student.lu.se/file/d/0BxnHQBC0SIPBV01NaTNmS1JaTGc/view

Bush, I. G., Gillson, A., Hamilton, M., & Perrin, M. (2005). Public Participation - Drawing the Boundaries. *Water and Environment Journal*, *19*(3), 181–188.

Caesarius, L. M., & Johansson, N. E. (2013). Developing Innovative Services Based on Big Data - The Case of Go:Smart. In E. Wästlund, B. Edvardsson, A. Gustafsson, M. J. Bitner, & R. Verma (Eds.), *Proceedings of the QUIS13 International Research Symposium on Service Excellence in Management, June 10-13 2013, Karlstad Sweden*. Karlstad: CTF, Service Research Center, Karlstad University, Sweden. Retrieved from http://www.diva-portal.org/smash/get/diva2:689304/FULLTEXT01.pdf#page=175

Curtis, S. (2015, September). *Innovation and the Triple Bottom Line - Investigating Funding Mechanisms and Social Equity Issues of Living Labs for Sustainability*. International Institute for Industrial Environmental Economics (IIIEE), Lund University.

Davidson, S. (1998). Spinning the wheel of empowerment. *Planning*, (3), 14–15.

Dell'Era, C., & Landoni, P. (2014). Living Lab: A Methodology between User-Centred Design and Participatory Design. *Creativity And Innovation Management*, *23*(2), 137–154. https://doi.org/10.1111/caim.12061

Deutsche Telekom. (n.d.). T-City Friedrichshafen. Retrieved from http://www.t-city.de/en/timeline.html

Devaney, L., Doyle, R., & Davies, A. R. (2014). Consensus Briefing Note 1: Change Labs - Sites of Experimentation for Sustainable Living. Consensus. Retrieved from http://www.consensus.ie/wp/wp-content/uploads/2014/10/CONSENSUS-Change-Labs-Report_F01_interactive.pdf

Disterheft, A., Ferreira da Silva Caeiro, S. S., Ramos, M. R., & de Miranda Azeiteiro, U. M. (2012). Environmental Management Systems (EMS) implementation processes and practices in European higher education institutions – Top-down versus participatory approaches. *Journal of Cleaner Production*, *31*, 80–90. https://doi.org/10.1016/j.jclepro.2012.02.034

Ebbesson, J., Gaugitsch, H., Jendroska, J., Marshall, F., & Stec, S. (2014). *The Aarhus Convention: An implementation guide* (2nd ed.). New York: United Nations.

EIP-SCC. (2015). Principles and enablers for citizen engagement: the experience from the European Innovation Partnership on Smart Cities and Communities - Action Cluster: Citizen Focus 21st May 2015. European Innovation Partnership on Smart Cities and Communities. Retrieved from https://eu-smartcities.eu/sites/all/files/CitizenFocus%20FINAL%20DOC%20(2)_0.pdf

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, *14*(4), 532–550. https://doi.org/10.5465/AMR.1989.4308385

ENoLL. (n.d.). About Us. Retrieved July 25, 2016, from http://www.openlivinglabs.eu/aboutus

Eskelinen, J., Muente Kunigami, A., Marsh, J. B., Robles, A. G., & Lindy, I. (Eds.). (2015). Citizen-driven innovation - A guidebook for city mayors and public administrators. World Bank and ENoLL. Retrieved from http://documents.worldbank.org/curated/en/2015/05/24541725/citizen-driven-innovation-guidebook-city-mayors-public-administrators

Evans, J., & Karvonen, A. (2010). Living laboratories for sustainability - Exploring the politics and epistemology of urban transition. In H. Bulkeley, V. Castán Broto, M. Hodson, & S. Marvin (Eds.), *Cities and Low Carbon Transitions* (pp. 126–141). Florence: Taylor & Francis.

Evans, J., & Karvonen, A. (2014). "Give Me a Laboratory and I Will Lower Your Carbon Footprint!" - Urban Laboratories and the Governance of Low-Carbon Futures. *International Journal of Urban and Regional Research*, *38*(2), 413–430. https://doi.org/10.1111/1468-2427.12077

Federley, M., & Karlsson, A. (2016, March 18). Deliverable 2.2 - Assessment of the suitability of different Urban Living Labs methods for modernisation and social upgrading actions. Retrieved from http://suburbanlab.eu/wp-content/uploads/2013/10/SubUrbanLab-report_Assessment-of-suitability-of-different-ULL-methods.pdf

Feurstein, K., Hesmer, A., Hribernik, K. A., Thoben, K.-D., & Schumacher, J. (2008). Living Labs: A New Development Strategy. In J. Schumacher & V. P. Niitamo (Eds.), *European Living Labs – A New Approach for Human Centric Regional Innovation* (pp. 1–14). Berlin: Wissenschaftlicher Verlag.

Frantzeskaki, N., & Kabisch, N. (in press). Designing a knowledge co-production operating space for urban environmental governance - Lessons from Rotterdam, Netherlands and Berlin, Germany. *Environmental Science and Policy*. https://doi.org/10.1016/j.envsci.2016.01.010

Franz, Y. (2014). Chances and Challenges for Social Urban Living Labs in Urban Research. In *ENoLL OpenLivingLab Days 2014 - Conference Proceedings*. Amsterdam.

Franz, Y. (2015). Designing social living labs in urban research. *Info*, *17*(4), 53–66. https://doi.org/10.1108/info-01-2015-0008

Franz, Y., Tausz, K., & Thiel, S.-K. (2015). Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison of Living Lab Concepts in Urban Research. *Technology Innovation Management Review*, *5*(12), 48–55.

Friedrich, P., Karlsson, A., & Federley, M. (2013, September 10). Report 2.1 - Boundary conditions for successful Urban Living Labs. SubUrbanLab. Retrieved from http://suburbanlab.eu/wp-content/uploads/2013/10/SubUrbanLab_ULL_Boundary_Conditions_public_updated-Jan14.pdf

Fung, A. (2006). Varieties of Participation in Complex Governance. *Public Administration Review*, 66–75.

Gramberger, M. (2001). *Citizens as Partners - OECD Handbook on Information, Consultation and Public Participation in Policy-Making*. Paris: Organisation for Economic Co-operation and Development (OECD). Retrieved from http://www.oecd-ilibrary.org/governance/citizens-as-partners_9789264195561-en

Hage, M., Leroy, P., & Petersen, A. C. (2010). Stakeholder participation in environmental knowledge production. *Futures*, *42*, 254–264. https://doi.org/10.1016/j.futures.2009.11.011

Hatzelhoffer, L., Humboldt, K., Lobeck, M., & Wiegandt, C.-C. (Eds.). (2012). *Smart City in Practice - Converting Innovative Ideas into Reality*. Berlin: Jovis.

Hsieh, H.-F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Ingrid Mulder. (2012). Living Labbing the Rotterdam Way: Co-Creation as an Enabler for Urban Innovation. *Technology Innovation Management Review*, (September 2012), 39–43.

International Association for Public Participation. (2007). Spectrum of Public Participation. Retrieved from http://c.ymcdn.com/sites/www.iap2.org/resource/resmgr/imported/IAP2%20Spectrum_vertical.pdf

IVL Svenska Miljöinstitutet. (2014, November 19). Nytt ljus skapas på Albyberget tillsammans med boende [Pressrelease]. Retrieved June 21, 2016, from http://www.mynewsdesk.com/se/ivl_svenska_miljoinstitutet_ab__/pressreleases/nytt-ljus-skapas-paa-albyberget-tillsammans-med-boende-1085877

JPI Urban Europe. (2013). Urban Europe - creating attractive, sustainable and economically viable urban areas. Joint Call for Proposals 2013. Retrieved from http://jpi-urbaneurope.eu/jpi-urban-europe-pilot-call-2013/

Juujärvi, S., & Lund, V. (2016). Enhancing Early Innovation in an Urban Living Lab: Lessons from Espoo, Finland. *Technology Innovation Management Review*, *6*(1), 17–26.

Juujärvi, S., & Pesso, K. (2013). Actor Roles in an Urban Living Lab: What Can We Learn from Suurpelto, Finland? *Technology Innovation Management Review*, (November 2013), 22–27.

Kaack, J. (2012). T-City - success and failure. In *Smart City in Practice - Converting Innovative Ideas into Reality* (pp. 118–120). Berlin: Jovis.

Karlsson, A., Federley, M., Bonnier, E., Holopainen, R., Buhr, K., & Tuominen, P. (2016, April 29). Evaluation of the Urban Living Labs in Alby and Peltosaari. Retrieved from http://suburbanlab.eu/wp-content/uploads/2013/10/SubUrbanLab_Evaluation-of-the-Urban-Living-Labs_20160429.pdf

Karlsson, A., Federley, M., Holopainen, R., & Seitsonen, I. (2016, January 26). Deliverable D 3.3 - Establishment and implementation of Urban Living Labs in Alby and Peltosaari. SubUrbanLab. Retrieved from http://suburbanlab.eu/wp-content/uploads/2013/10/SubUrbanLab_Establishment-and-implementation-of-Urban-Living-Labs_public-report-2016.pdf

Karlsson, A., Seitsonen, I., Thörn, P., Federley, M., Holopainen, R., & Sepponen, M. (2015, February 16). Deliverable D 3.1 & D 3.2 - Selection of Urban Living Labs in Alby and Peltosaari. Retrieved from http://suburbanlab.eu/wp-content/uploads/2013/10/SubUrbanLab_Selection-of-ULL-in-Alby-and-Peltosaari_public.pdf

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

Kulus, D., Poplin, A., & Patwardhan, R. (2012). Aufbau einer partizipativen Planungscommunity am Beispiel von Nexthamburg. In M. Schrenk, V. V. Popovich, P. Zeile, & P. Elisei (Eds.), *Proceedings REAL CORP 2012 Tagungsband*. Retrieved from http://conference.corp.at/archive/CORP2012_165.pdf

Langlet, L. (2013). *Medborgardialog som del i styrprocessen*. (Sveriges Kommuner och Landsting, Ed.). Retrieved from http://webbutik.skl.se/sv/artiklar/medborgardialog-som-del-i-styrprocessen-2.html

Leminen, S. (2013). Coordination and Participation in Living Lab Networks. *Technology Innovation Management Review*, (November 2013), 5–14.

Leminen, S., Westerlund, M., & Nyström, A.-G. (2012). Living Labs as Open-Innovation Networks. *Technology Innovation Management Review*, (September 2012), 6–11.

Lindholmen Science Park. (n.d.). Innovative travel services for sustainable travelling in urban areas. Retrieved July 13, 2016, from http://closer.lindholmen.se/en/about-closer/gosmart

Luyet, V., Schlaepfer, R., Parlange, M. B., & Buttler, A. (2012). A framework to implement Stakeholder participation in environmental projects. *Journal of Environmental Management*, *111*, 213–219. https://doi.org/10.1016/j.jenvman.2012.06.026

Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J. K., Thaarup, R. K., … Kotternik, B. (2014). Mapping Smart Cities in the EU. (Policy Department A: Economic and Scientific Policy, Ed.). Retrieved from http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf

McCormick, K., & Schliwa, G. (2016). Living labs - users, citizens and transitions. In J. Evans, A. Karvonen, & R. Raven (Eds.), *The Experimental City* (pp. 163–178). Abingdon, New York: Routledge.

McCormick, K., Voytenko, Y., Kronsell, A., Coenen, L., van Steenbergen, F., Sauer, A., … Breitfuss, M. (2015, November). Lund Infra-lab Report. Governance of Urban Sustainability Transitions (GUST). Retrieved from https://drive.google.com/a/student.lu.se/file/d/0BxnHQBC0SIPBN1kzQjhVQ0hfdk0/view

Mistra Urban Futures. (n.d.). GO:SMART. Retrieved July 13, 2016, from http://www.mistraurbanfutures.org/en/project/gosmart

Nexthamburg. (n.d.). What is Nexthamburg? Retrieved from http://www.nexthamburg.de/en/what-is-nexthamburg/

Nyström, A.-G., Leminen, S., Westerlund, M., & Kortelainen, M. (2014). Actor roles and role patterns influencing innovation in living labs. *Industrial Marketing Management*, *43*, 483–495. https://doi.org/10.1016/j.indmarman.2013.12.016

Obermann, R. (2012). Citizens become pioneers. In *Smart City in Practice - Converting Innovative Ideas into Reality* (pp. 53–54). Berlin: Jovis.

Ommen, N. O., Blut, M., Backhaus, C., & Woisetschläger, D. M. (2016). Toward a better understanding of stakeholder participation in the service innovation process: More than one path to success. *Journal of Business Research*, *69*(7), 2409–2416. https://doi.org/10.1016/j.jbusres.2016.01.010

Petrin, J. (2012). *Nexthamburg: Bürgervisionen für eine neue Stadt*. Hamburg: edition Körber-Stiftung.

Reed, M. S. (2008). Review: Stakeholder participation for environmental management: A literature review. *Biological Conservation*, *141*, 2417–2431. https://doi.org/10.1016/j.biocon.2008.07.014

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., … Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management*, *90*, 1933–1949. https://doi.org/10.1016/j.jenvman.2009.01.001

Salter, R., & White, S. (2013). Collaborative research in the real world - Review of Living Laboratories. CRC for Low Carbon Living Ltd. Retrieved from http://www.lowcarbonlivingcrc.com.au/sites/all/files/publications_file_attachments/rp3005_crclcl_living_labs_review_final.pdf

Schliwa, G. I. (2013, September). *Exploring Living Labs through Transition Management - Challenges and Opportunities for Sustainable Urban Transitions*. International Institute for Industrial Environmental Economics (IIIEE), Lund University.

Schuurman, D., & De Marez, L. (2012). Structuring User Involvement in Panel-Based Living Labs. *Technology Innovation Management Review*, (September 2012), 31–38.

Schuurman, D., De Marez, L., & Ballon, P. (2015). Living Labs: a systematic literature review. Presented at the Open Living Lab Days 2015, Proceedings. Retrieved from http://hdl.handle.net/1854/LU-7026155

Sochor, J., Karlsson, I. C. M., & Strömberg, H. (2016). Trying out Mobility as a Service: Experiences from a Field Trial and Implications for Understanding Demand. Presented at the Proceedings of the 95th Annual Meeting of the Transportation Research Board, Washington, D.C. January 10-14, 2016. Retrieved from http://publications.lib.chalmers.se/publication/225941-trying-out-mobility-as-a-service-experiences-from-a-field-trial-and-implications-for-understanding-d

Sochor, J., Strömberg, H., & Karlsson, M. (2014). Travelers' Motives for Adopting a New, Innovative Travel Service: Insights from the UbiGo Field Operational Test in Gothenburg, Sweden. Presented at the 21st World Congress on Intelligent Transport Systems, Detroit, September 7-11, 2014. Retrieved from http://publications.lib.chalmers.se/publication/204386-travelers-motives-for-adopting-a-new-innovative-travel-service-insights-from-the-ubigo-field-operati

Sochor, J., Strömberg, H., & Karlsson, M. (2015a). Implementing Mobility as a Service - Challenges in Integrating User, Commercial, and Societal Perspectives. *Transportation Research Record*, *2536*, 1–9. https://doi.org/10.3141/2536-01

Sochor, J., Strömberg, H., & Karlsson, M. I. C. (2015b). An innovative mobility service to facilitate changes in travel behavior and mode choice. Presented at the 22nd World Congress on Intelligent Transportation Systems, Bordeaux, October 5-9, 2015. Retrieved from http://publications.lib.chalmers.se/publication/215086-an-innovative-mobility-service-to-facilitate-changes-in-travel-behavior-and-mode-choice

Ståhlbröst, A., & Holst, M. (2013). The Living Lab Methodology Handbook. Luleå University of Technology and CDT – Centre for Distance-spanning Technology, Sweden. Retrieved from http://www.ltu.se/cms_fs/1.101555!/file/LivingLabsMethodologyBook_web.pdf

Strömberg, H., Rexfelt, O., Karlsson, I. C. M., & Sochor, J. (2016). Trying on change – Trialability as a change moderator for sustainable travel behaviour. *Travel Behaviour and Society*, *4*, 60–68. https://doi.org/10.1016/j.tbs.2016.01.002

United Nations Department of Economic and Social Affairs. (2014, July 10). World's population increasingly urban with more than half living in urban areas. Retrieved February 2, 2016, from https://www.un.org/development/desa/en/news/population/world-urbanization-prospects.html

Veeckman, C., Schuurman, D., Leminen, S., & Westerlund, M. (2013). Linking Living Lab Characteristics and Their Outcomes: Towards a Conceptual Framework. *Technology Innovation Management Review*, (December 2013), 6–15.

Veeckman, C., & van der Graaf, S. (2015). City as Living Laboratory: Empowering Citizens with the Citadel Toolkit. *Technology Innovation Management Review*, (March 2015), 6–17.

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2016). Urban living labs for sustainability and low carbon cities in Europe: towards a research agenda. *Journal of Cleaner Production*, *123*, 45–54. https://doi.org/10.1016/j.jclepro.2015.08.053

Walliman, N. (2006). *Social Research Methods*. London; Thousand Oaks; New Delhi: SAGE Publications Ltd.

Weninger, B., Poplin, A. K., & Petrin, J. (2010). Developing a Typology of Public Participation 2.0 Users: an Example of Nexthamburg.de. In M. Schrenk, V. V. Popovich, & P. Zeile (Eds.), *REAL CORP 2010 Proceedings/Tagungsband Vienna, 18-20 May 2010*. Retrieved from http://conference.corp.at/archive/CORP2010_103.pdf

Westerlund, M., & Leminen, S. (2011). Managing the Challenges of Becoming an Open Innovation Company: Experiences from Living Labs. *Technology Innovation Management Review*, (October 2011), 19–25.

Wittmayer, J., Roorda, C., & van Steenbergen, F. (2014). Governing Urban Sustainability Transitions - Inspriring examples. Retrieved from https://www.drift.eur.nl/wp-content/uploads/2011/12/Governing-Urban-Sustainability-Transitions_DRIFT.pdf

Yin, R. K. (2014). *Case Study Research - Design and Methods* (5. ed.). London: SAGE Publications, Inc.

Appendix I. Levels of Stakeholder Involvement

Levels *(on a continuum of decreasing stakeholder involvement)*	Short Explanations	Author(s)
• Degrees of Citizen Power: o Citizen Control o Delegated Power o Partnership	Citizens are given decision-making power.	**(Arnstein, 1969)**
• Degrees of Tokenism: o Placation o Consultation o Informing	Citizens are given a voice.	
• Non-participation: o Therapy o Manipulation	No genuine participation.	
• Empowerment: o Entrusted Control o Independent Control o Delegated Control	Delegation of decision-making power to citizens.	**(Davidson, 1998)[2]**
• Participation: o Limited Decentralised Decision Making o Partnership o Effective Advisory Board	Participation ranging from the possibility to draw up proposals, over solving problems in partnerships, to giving citizens decision-making power on some issues.	
• Consultation: o Genuine Consultation o Customer Care o Limited Consultation	Citizens are provided with information so that they can provide feedback / take part in discussions.	
• Information: o Good Quality Information o Limited Information o Minimal Communication	Citizens are provided with information.	

[2] Davidson (1998) does not use the metaphor of a ladder but a "Wheel of Empowerment".

Levels *(on a continuum of decreasing stakeholder involvement)*	Short Explanations	Author (s)
• Active Participation	Citizens are actively engaged in decision-making and policy-making (advanced two-way relation).	**(Gramberger, 2001)**
• Consultation	Citizens have the possibility to give feedback (limited two-way relationship).	
• Information	Information flows in one direction either demanded or not demanded by the citizens.	
• Representation	The users are part of the decision-making team.	**(Alam, 2002)**
• Extensive Consultation with Users	The users are invited to give their inputs.	
• Information and Feedback on Specific Issues	The service developers ask the users for feedback.	
• Passive Acquisition of Input	The users' input results from their initiative.	
• Direct Authority	The second level of empowerment. Participatory bodies (or citizens) exercise direct authority over decisions.	**(Fung, 2006)**
• Co-Governance	The first level of empowerment. Citizens make decisions together with officials.	
• Advise and Consult	Citizens can provide their input and advice.	
• Communicative Influence	Public opinion is mobilised in order to indirectly influence decision-making.	
• Personal Benefits	The citizens' intention to participate is to derive personal benefits rather than influencing policy or action.	
• Empower	Citizens are provided with final decision-making power.	**(Disterheft et al., 2012; International Association for Public Participation, 2007)**
• Collaborate	To partner with the citizens throughout the project.	
• Involve	To work with the citizens throughout the project and make sure that their concerns and wishes are understood and considered.	
• Consult	The citizens are asked for their feedback.	
• Inform	The citizens are provided with balanced and objective information.	

Levels *(on a continuum of decreasing stakeholder involvement)*	Short Explanations	Author (s)
• Co-Decide	The citizens take part in decision-making.	**(Hage et al., 2010)**
• Co-Produce	Use of participatory methods to allow for co-production.	
• Take Advice / Consult	Citizens are consulted using interactive methods.	
• Non-Interactive / Listen	Citizens can provide their feedback.	
• Study	Information is collected about the citizens.	
• Inform	The citizens are provided with information, e.g. by using presentations.	
• No Participation	No participation.	
• Empowerment	Decision-making power is delegated to the citizens.	**(Luyet et al., 2012)**
• Co-Decision	Cooperation with the citizens towards an agreement.	
• Collaboration	Providing information and giving the citizens the possibility to contribute with suggestions, that are taken into account when making the decision.	
• Consultation	Citizens are provided with information and then asked for their input. Decision-making may or may not take the suggestions into account.	
• Information	Information is provided.	
• Co-Decisions	Decision-making responsibility is delegated to the citizens as group or to individual persons.	**(Langlet, 2013)**
• Influence	Citizens are involved during a longer period of time and have the possibility to influence a topic from the identification of the needs, over developing suggestions, to formulating an idea for the implementation.	
• Dialogue	Citizens get the opportunity to have a dialogue about different questions and topics. Everyone should be able to state an opinion. Opinions and views are considered in the political processes.	
• Consultation	Citizens are asked for their views, opinions, and concerns.	
• Information	Providing easily accessible and objective information.	

Appendix II. Personal Communications

Interviews with relevant stakeholders of the Urban Living Labs

Interviewee	ULL Connection	Form of Interview	Date	Interviewer
New Light on Alby Hill				
Thomas Dottman	Lighting expert at Botkyrka municipality; Technical coordinator of New Light on Alby Hill	Telephone	June 20th 2016	Mascha Menny
Anja Karlsson	Researcher at IVL Swedish Environmental Research Institute; Project manager for the Swedish SubUrbanLab-ULLs and the coordinator of New Light on Alby Hill	Skype	June 21st 2016	Mascha Menny
Anja Karlsson	Researcher at IVL Swedish Environmental Research Institute; Project manager for the Swedish SubUrbanLab-ULLs and the coordinator of New Light on Alby Hill	Skype	February 24th 2016	Oana Arseni, Giulia Mariani, and Mascha Menny
Nexthamburg				
Daniel Kulus	Researcher at HafenCity University Hamburg; Accompanying research of Nexthamburg	Telephone	June 24th 2016	Mascha Menny
Stephan Landau	Project management Urbanista; Nexthamburg team member and chairman of the registered association	Telephone	July 7th 2016	Mascha Menny

Sven Lohmeyer	Project management Urbanista; Nexthamburg team member since 2012	In Person	June 15th 2016	Mascha Menny
T-City Friedrichshafen				
Jörg Bollow	T-City Project Director at Deutsche Telekom from 2006 to 2009	Telephone	June 24th 2016	Mascha Menny
Thomas Goldschmidt	Manager of City Marketing Friedrichshafen; Project manager for the T-City field Tourism	Telephone	June 15th 2016	Mascha Menny
Jürgen Kaack	Managing Director of the municipal project association of T-City Friedrichshafen from 2007 to 2009	Skype	June 23rd 2016	Mascha Menny
Michael Lobeck	Researcher at University of Bonn; Director of the T-City accompanying research	Skype	June 27th 2016	Mascha Menny
Stefan Söchtig	Managing Director of the municipal project association of T-City Friedrichshafen from 2009 on	Telephone	June 29th 2016	Mascha Menny
UbiGo				
Hans Arby	Co-Developer of UbiGo and Commercial Leader of the Field Operational Test	In Person	June 16th 2016	Mascha Menny
Ingemar Moen	Project leader, Lindholmen Science Park; Project leader of UbiGo and Go:Smart	Telephone	March 26th 2015	Madeleine Brask
Jana Sochor & Helena Strömberg	Researchers at Chalmers University of Technology; Accompanying research of UbiGo	In Person	June 16th 2016	Mascha Menny

Lena Nilsson	Consultant at Koucky & Partners; Project manager of Go:Smart sub-project Living Lab	In Person	June 16th 2016	Mascha Menny
Magnus Kuschel	Managing Director, Commute Greener; Project manager of The Rewarded Traveler, a pre-study for UbiGo.	Telephone	April 2nd 2015	Madeleine Brask
MariAnne Karlsson	Professor and Head of division of Design & Human Factors, Product and Production Development at Chalmers University of Technology; Accompanying research of UbiGo	Telephone	March 21st 2015	Madeleine Brask

Other interviews and informal discussions

Interviewee	Position	Form of Interview	Date	Interviewer
Colette Bos	Management Board New Instruments, JPI Urban Europe	Skype	June 14th 2016	Mascha Menny
Sophia Schuff	Urban Anthropologist & Head Researcher; Managing Director CITITEK	Skype	July 26th 2016	Mascha Menny

Appendix III. Interview Guide (English Version) for Semi-Structured Interviews with Urban Living Lab Stakeholders

Introduction

1. If you had to describe the Urban Living Lab [name of the Urban Living Lab] in only a few sentences, what would you say?

2. What was your role in the Urban Living Lab [name of the Urban Living Lab]?

Stakeholder Involvement in General

3. Can you shortly describe which actors (e.g. from businesses, academia, public partners, different groups of citizens) have been involved and how the collaboration started?

    - How have these stakeholders been identified?

4. In which ways were the different partners involved during the *design*, *implementation* and *evaluation* of the Urban Living Lab?

    - How have the multiple stakeholders that were involved collaborated with each other?
    - What kind of techniques have been used to reach out and engage with them?
    - What have been the major challenges in terms of stakeholder involvement?

5. How do you define success in an Urban Living Lab in general?

6. How do you define a successful Urban Living Lab in terms of stakeholder involvement?

    - Following your definition of a successful stakeholder involvement, has the Urban Living Lab [name of the Urban Living Lab] been a success?
    - Are you satisfied with the amount and level of participation that has happened?

7. Are there any stakeholders that have not been involved throughout the process but should have been involved?

Your Involvement

8. What was your contribution to the project and have you got any benefits in return?

    - How satisfied are you about your own involvement?

Conclusion

9. Has there been a common goal / vision among the involved stakeholders? How has it been developed?

10. What is the most important lesson you have learned during the project?

Appendix IV. Participation in Conferences

Conference Name	Location	Date
Ett nationellt Strategiskt innovationsprogram för Smarta Hållbara Städer (A national strategic innovation programme for smart sustainable cities)	Malmö, Sweden	June 09, 2016
EU-SPRI 2016 (European Forum for Studies of Policies for Research and Innovation)	Lund, Sweden	June 08 - June 10, 2016