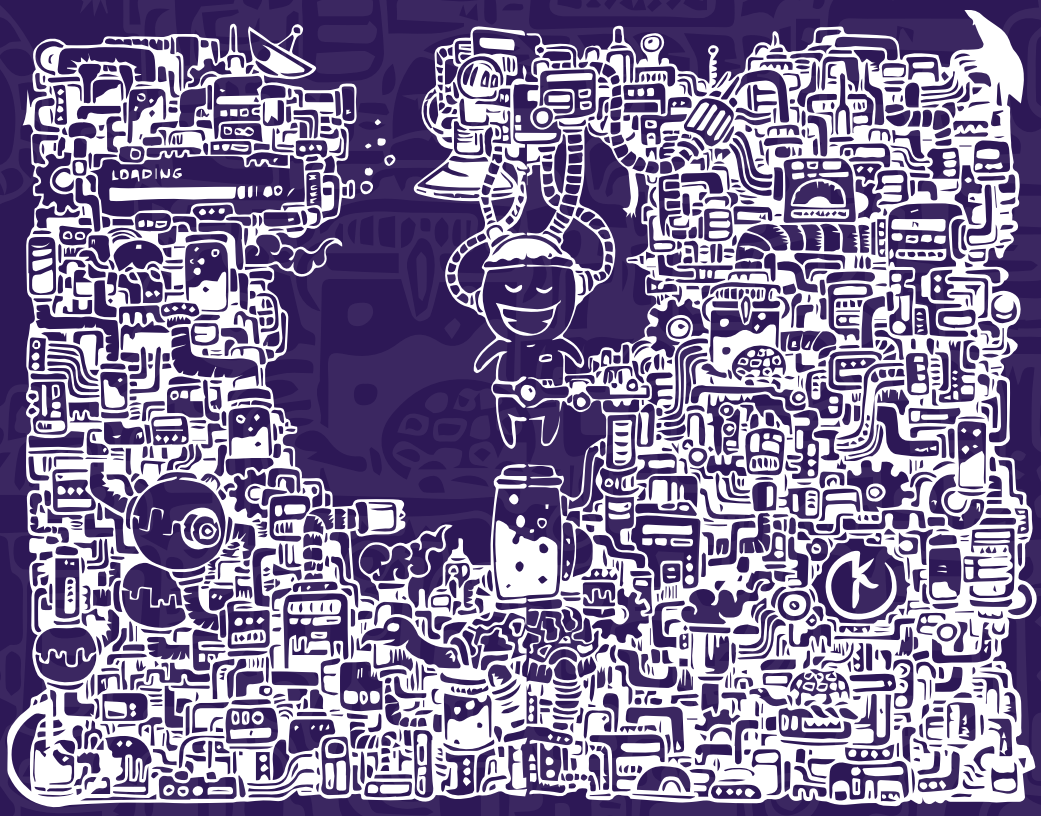
User innovativeness in Living Laboratories

Everyday user improvisations with ICTs as a source of innovation



Sabrina Sauer

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USER INNOVATIVENESS IN LIVING LABORATORIES

EVERYDAY USER IMPROVISATIONS WITH ICTS AS A SOURCE OF INNOVATION

PROEFSCHRIFT

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Prof. dr. N.E.J. Oudshoorn

en de assistent promotor:
Dr. ir. E.C.J. van Oost

"Innovation often is born of looking at things in a fresh and unusual way"

(Coyne, 2010: 89).

Contents

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For as long as I can remember, stories about imagination fascinated me. The most tragic figures in the stories I read as a child were those who lacked imagination such as the scarecrow Trapito, or the characters in the Neverending story who were taken by an ominous "nothing" as imagination died. The most enchanting figure in fiction was, to me, Alice in Wonderland's elusive Cheshire Cat, who tells Alice that if you do not know where you want to go, it does not matter which road you take. You decide where you want to go, make a plan, set out and strive to reach your destination.

But what happens if there is a bump along the road? Or when your goals, ideas and plans change?

You improvise. You travel another road, meet other people, have new experiences and ideas.

I have taken a few different roads so far, studying film, new media and acting, and worked in different fields, from subtitling to software marketing. For me completing this PhD thesis was a little like setting out with a clear goal in mind and finding that the bumps, the obstacles and the unforeseen actually provided the most fascinating insights. However, without having a wonderful group of people around me to help me reflect on the possible different roads to take, on how to deal with the bumps in the road or offering me a hand to climb over obstacles, I do not think I would have been able to put my insights into writing.

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Chapter 1. Innovative co-creation in Living Laboratories

"Innovation is a costly process. Indeed only one out of 3000 product ideas makes it on the market, meaning that there are hundreds of unsuccessful ICT products beyond every success. Even successful products may be far from being user friendly. Surveys show that 75% of all users find their ICT tools more stressing than relaxing. In such a context, user-centric validation can play an important role in speeding up effectively the innovation process through addressing the actual user needs." (European Commission, 2009b)

"The real challenge may lie in involving users in a sociological sense, that is to say, by taking into account the micro-context of their everyday lives" (ISTAG, 2004)

1.1 Introduction

As the European Commission's above statement stipulates, there is an acute need to find and implement valid methods that make technological innovation more efficient and successful. These methods should pay more attention to what users want, instead of lead to the creation of new technologies that are "simply" possible. The gap between supply and demand should be overcome using technology users' insights; users should become more closely involved in innovation practices. Essential in this respect is taking into account the activities of technology users in their daily lives. For this is what the above reference from the ISTAG report suggests; user involvement should take place against a background of daily routine, habitat and life. This entails "user-centric validation", where users are not passive bystanders in the production of ICT innovations, but rather the central focus of such production activities.

Apart from posing a salient concern in a policy setting, the importance of user-centricity is a central topic across scientific disciplines such as product design, business and marketing studies. The recent avowal that users drive innovation in the time of wikinomics, crowdsourcing and social networking seems to have sparked this interest further, leading to both utopian and dystopian views about what consumers can contribute to innovation practices. At times, access to ICTs is equated with increased democracy, as well as with both social and business innovation. Democratizing design practices would offer technology users even more power to make "a difference" while at the same time providing a way for technology producers to make a product more successful on the market. After all, doesn't involving the expected future users in the design process of a new ICT product stimulate the creation of a market for said product? At the same time, critical questions are asked about the "revolution" offered by online (web 2.0) technologies. Scholars question the extent to which "the digital revolution" should be equated with a social revolution and call for critical awareness of the socioeconomic implications of trends such as "co-creation" (Van Dijck & Nieborg, 2009); what interests are at play in these practices and how can these be deconstructed?

In Science and Technology Studies (STS) and Innovation Studies (IS) the role of technology users in the development and dissemination of technologies is closely scrutinised, culminating in studies about how users co-construct technological artefacts (see chapter

2 for a discussion of this literature). These studies counter theories that can be termed technologically deterministic; where technologies are said to "push" economies and societies along, casting users the role of passive recipient.[1] Instead, studies open up technological "black boxes" to deconstruct how adoption is not about "submission" to technologies, but rather about how meanings are attributed to technological artefacts and translated into use. The stream of user studies within STS views how the dynamics of adoption unfold and how users play an active role in initiating innovation, tinker with existing technologies and (co-) develop new technologies.[2]

The statements accompanying this introduction call for sensitivity to users in ICT product processes; to seek user-validation in technology production while keeping in mind the difficulties of involving users "in a sociological sense". These ideas run parallel to research interests of STS and IS. This is interesting in itself, as it shows how research areas and policy issues are closely entwined. Reviewing both statements from an STS-stance, leads to the formulation of two questions: What constitutes user-centricity in innovation practices? What does it mean to involve users in a sociological sense and how can and are user ideas and practices channelled into concrete ICT products and services in practice?

Research into explicating user "needs" – deemed necessary by policymakers to increase knowledge about users and the failure of so many ICT products and services - has been undertaken since the 1970's in the context of user-centered design. However, as scholars Eriksson, Niitamo and Kullkki (2005: 3) note, the practices of conveying "needs" from users to producers has been a process of "trial and error, where the developer responds with concept models or prototypes to solve the needs until the user is sufficiently satisfied". Instead, they argue for methods that can be brought into the innovation process in order to integrate users in the innovation process and "get access to [user] ideas and knowledge". One of these methods is the Living Laboratory-approach.

1.2 Living Laboratories

The idea of a "living laboratory" brings all kinds of associations to mind; the laboratory as a kind of organism, constantly in flux and responsive to its environments; a laboratory that can be lived in; or alternatively, is situated in a living environment. What these associations have in common is their adherence to the idea that "living" adds the dimension of contingency to the "closed" associations that resound with the idea of a scientific laboratory.

Fulgencio and colleagues trace the first uses of term "Living Laboratory" back to the work of Knight in 1749 who describes "conditions in the human body as an environment for experiments" and to 1956, when Dr. Ernst Dichter from the Institute of Motivational Research discussed scientific in-situ research experimentation in his facility in *The Billboard* magazine (Fulgencio, Le Fever, & Katzy, 2012: 4). Følstad (2008: 100) traces the first use of the term Living Laboratory back to Lasher and colleagues (Lasher, Ives, & Jarvenpaa, 1991) who relate it to co-operative partnerships and live field trials in the area of information

1 The idea of "technology push" has been criticised in for example Ruth Schwartz Cowan's work (1987).
2 See chapter 2 for a discussion of this literature.

management systems. Other scholars primarily refer to how the term "Living Laboratory" was coined in 1995 by Professor William Mitchell (MediaLab and School of Architecture and city planning, MIT Boston) when he set up PlaceLab – a home lab where volunteers would live in a "daily" environment and where they were observed as they interacted with new technologies (Eriksson et al., 2005).[3]

Definitions of what constitutes a Living Laboratory or Living Lab primarily underline the broad applicability of the term. For example, the European Commission – which sees the Living Lab-approach as part of its European R&D and Innovation System - defines it as "a successful mixture of ICT-based collaborative environments, open innovation platforms, user [centered] product/service development methods, and Public Private Partnerships" (European Commission, 2009a: 5).[4] The European Network of Living Labs, set up under the auspices of the Finnish EU presidency in 2006, characterises a Living Lab as "both a methodology of user-driven innovation and the organizations that primarily use it".[5] This network, set to stimulate European "co-creation of innovation in public, private and civic partnership" (Ibid), has grown extensively since its conception, to currently include over 300 Living Labs.

Based on the available definitions, I discern three main meanings of the Living Lab: Living Labs as a platform for open innovation, as a user-driven research methodology and as an experimental setting. As an open innovation platform, Living Labs initiate and facilitate public-private-civic partnerships (Feurstein, Hesmer, Hribernik, Thoben, & Schumacher, 2009).[6] These partnerships include all stakeholders (Kusiak, 2007; Ståhlbröst & Bergvall-Kåreborn, 2008a), including users, in order to bridge the gap between development and use of ICTs. Users are positioned as co-producers, "on equal grounds" (Almirall & Wareham, 2009) with the other actors involved in ICT development. Living Labs fulfil the role of intermediary (Howells, 2006)[7] or knowledge broker in these partnerships as they mediate

3 The PlaceLab experiments (2003) are a joint venture by MIT and companies like Motorola, State Farm Insurance, British Telecom, Hewlett-Packard, Samsung and SRP. http://web.mit.edu/newsoffice/2003/lab.html (accessed on 23-4-2010).

4 Living Labs are furthermore described as experimentation platforms, a R&D methodology, a constructed social environment, an eco-system, and as user-oriented innovation models it is seen as an "innovation system and closely related to the so-called quadruple helix-models (Arnkil et al., 2010)" (Schuurman, Lievens, De Marez, & Ballon, 2012: 3).

5 http://www.openlivinglabs.eu/ (accessed on 1-4-2010)

6 "A Living Lab is a public-private-civic partnership and a systemic innovation approach in which all stakeholders in a product, service or application participate directly in the development process (at all stages)" (Schumacher & Niitamo, 2008: 2). These partnerships "of firms, public agencies, universities, institutes and people, all [collaborate in] creation, prototyping, validating and testing of new services, products and systems in real life contexts" (Wills, Parker, & Wills, 2009: 9). At the same time, these partnerships are expected to facilitate complex sociotechnical transitions. For example, in chapter 5, the public-private-civic partnership of Amsterdam Smart City aims to facilitate the transition into a more inclusive, sustainable society through the collective implementation and adoption of "smart technologies".

7 Howells' description of intermediary organization is an organization or body that acts [as] an agent

innovation processes and work to align all parties and articulate product characteristics and user requirements.[8]

As a user-driven methodology, Living Labs aim to blur the boundaries between technology users and producers by including (future) users of technologies from the start of technology development. This is translated into a user-driven research approach that "starts by involving people in the streets and the users and user communities as contributors and co-creators of new innovations".[9] Positioning users as co-creators would reverse traditional "top-down" R&D-processes performed by companies in favour of "bottom-up" innovation, performed by users and grounded in society instead of in corporate research laboratories. This practice is hoped to lead to unexpected insights into user ideas and practices (Almirall, 2008: 43) and lead to the development of more successful ICTs.

To gain unexpected insights, methodologies focus on the inclusion of "real" (end) users in "real daily life contexts". Daily life contexts become experimentation sites, where efforts are made to establish "a structured and constructed social setting that is created with a specific purpose in mind and in which the unpredictable, indeterminate and uncontrollable dynamics of daily life are the principle determinants of innovation" (Van Lieshout, Limonard, & Ballon, 2006). The Living Lab thus also comprises a setting; a setting that affords "experimentation environments in which technology is given shape in real life context and in which (end) users are considered co-producers" (Ballon et al., 2005: 13); "a setting created with specific targets and a clear structure but at the same time dealing with the uncontrollable dynamics of daily life" (Boronowsky, Herzog, Knackfuß, & Lawo, 2006) and "a co-creative environment for human-centric research and innovation on a web 2.0 type platform" (Schumacher & Niitamo, 2008: 133).

These descriptions of Living Labs as a platform, methodology and setting, allow me to articulate three key principles that distinguish the concept or approach. Living Labs can be characterised in terms of *openness*; seeking to open up innovation processes by adherence to an open innovation approach that embraces users; as *user-centric* in its design and development practices and; as focused on a *daily-life orientation* which sees daily life environments as the site to draw ideas from as well as a setting in which to situate ICT development practices.[10] In

or broker in any aspect of the innovation process between two or more parties (Howells, 2006: 720). Intermediaries facilitate, configure or broker. Research into intermediaries moved from linear models to complex interactions between multiple actors (Williams & Edge, 1996). The change was spurred on by ideas about user initiated innovation (Von Hippel, 1986) and continued innovation in use.

8 Mediators allow and facilitate "[processes] of mutual articulation and alignment of product characteristics and user requirements. (…) Mediation as a process of mutual articulation and alignment is influenced not only by the work of producers and users but also by the work of mediators and by the existence of institutional loci and arenas for mediation work. We call such a locus a mediation junction" (Schot & Bruheze, 2003: 230).

9 http://www.openlivinglabs.eu/mission.html (accessed on 1-4-2010).

10 In 2007, Corelabs identified two other characteristics as well: continuity in "cross-border collaboration, which strengthens creativity and innovation" and spontaneity ("to detect, aggregate and analyse the spontaneous users' reactions and ideas over time") (Corelabs, 2007 in Bergvall-Kåreborn & Ståhlbröst, 2009: 359).

the following sections I introduce these principles more fully. This helps express more clearly how – in theory - the "user" and user-centricity figure in the innovation practices of Living Laboratories and how Living Labs aim to embrace user insights.

1.2.1 "Openness": open innovation and co-creation

One of the key terms across Living Lab-literature is Chesbrough's notion of open innovation (Almirall, 2008; Bergvall-Kåreborn, Holst, & Ståhlbröst, 2009; Björgvinsson, Ehn, & Hillgren, 2010; Katzy & Klein, 2008; Kviselius, Edenius, & Andersson, 2007; Nielsen & Nielsen, 2011; Pallot, Trousse, Senach, & Scapin, 2010; Schaffers (Ed.), 2009; Ståhlbröst & Bergvall-Kåreborn, 2008a). Through open innovation, companies, research institutes and public organizations increasingly join efforts to pool knowledge to maintain "an innovative edge" (Sloane, 2011). Chesbrough describes open innovation as "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (Chesbrough, 2003: xxiv). Open innovation thus draws specific attention to the idea that innovative ideas can originate outside companies, and that by combining internal and external ideas and efforts new innovations can be realized.

In Living Laboratories, the principle of open innovation is recognised as offering an open, creative, information sharing and collaboration process between stakeholders (including users) in innovation practices (Ståhlbröst & Bergvall-Kåreborn, 2008a). Bringing together humans, technologies and daily life contexts in an open innovation process, facilitates innovativeness. Figure 1 shows how Ballon and colleagues (2005) position Living Labs as an exemplar of technology development that makes use of open innovation; Living Labs seem to hold a middle ground between in-house R&D and (societal) pilots and the design of prototyping and the testing of new technologies, while at the same time focusing primarily on technologies that are somewhat "half way" developed (in terms of a "level of maturity").

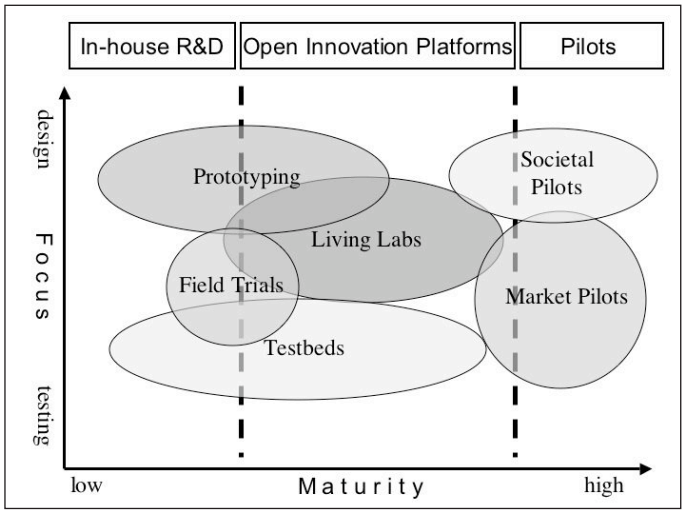


Figure 1: Position of Living Lab as an open innovation platform (Ballon, Pierson, & Delaere, 2005: 3)

Open innovation is executed through methods and practices that are often referred to as co-creative and user-driven – even though these concepts are only partially overlapping (Nystedt & Von Schoultz, 2009). In 2008, human-computer interaction scholar Følstad conducted a literature review and found that although not all Living Laboratories articulate co-creation as a defining feature, it is an underlying goal.[11] More recent studies also note the increasing use of the term "co-creation" in Living Labs (Almirall & Wareham, 2009; Bagalkot, 2009; Ståhlbröst, Sällström, & Holst, 2009). For example, in August 2009 a group of Living Lab-practitioners started writing a Manifesto of Living Lab co-creation[12] and the website of the European Network of Living Labs also refers to the importance of co-creative collaboration: *"One thing is common for all of us; the human-centric involvement and its potential for development of new ICT-based services and products. It is all done by bringing different stakeholders together in a co-creative way"* (The European Network of Living Labs in Følstad, 2008: 108).

Strictly speaking, co-creation is "any act of collective creativity that is shared by two or more people" (Sanders & Stappers, 2008). In 2004, Prahalad and Ramaswamy published *The Future of Competition: Co-Creating Unique Value with Customers* (Prahalad & Ramaswamy, 2004a). They focus on how the contemporary market has completely changed: both in terms of the market as place for the exchange of products and services and as an "aggregation of

11 In a similar way, Mirijamdotter and colleagues note that co-creation is an ambition of many Living Labs (Mirijamdotter, Ståhlbröst, Sällström, Niitamo, & Kulkki, 2006).

12 http://owela.vtt.fi/cocreation/2009/08/27/suggested-principles-of-living-lab-co-creation/ (accessed on 16-9-2009).

consumers" (Ibid, p. 10). In an age where customers/consumers are becoming more well-connected (in online networks) and well-informed, and industries are faced with globalization, deregulation and outsourcing, a new value creation paradigm is necessary. Due to changes in the marketplace, venues of value exchange have also changed. What will bring unique value to consumers in this changed landscape is *experience* (Prahalad & Ramaswamy, 2004b: 9). This experience needs to be co-created by both producers and consumers, which requires a move away from firm-centric thinking; "co-creation puts the spotlight squarely on *consumers-company interaction as the locus of value creation*" (Ibid, p. 10). Companies should work to create experience environments (Prahalad & Ramaswamy, 2003) in which each interaction with the customer provides an opportunity for value exchange. In terms of methodology, the authors maintain that there is a need for tools to understand co-creation experiences, "so that companies can co-shape consumer expectations and experiences along with their customers" (Ibid, p. 11).

If creating valuable experiences for users is a goal of design, a shift from product-focus to purpose-focus is needed (i.e. design for experiencing (Sanders & Stappers, 2008: 7)). In co-creative practices, actors work together to realize this. According to Sanders and Stappers creativity can be divided into four stages: doing, adapting, making and creating. These stages vary in terms of expertise and interest of the group in question. Of course, if users are to become experts of their experiences (Sleeswijk Visser, Stappers, Van der Lugt, & Sanders, 2005), they need the tools to express themselves. In Living Labs, these can be provided by researchers and designers.[13]

1.2.2 User centricity in the daily life context

Co-creation centres on collaboration; sharing knowledge and experience to produce something that is greater than the sum of its parts. In Living Labs users fulfil a central role in co-creative practices, because "only while designing for and with real-users it is possible to drive real innovation" (Mulder et al., 2008: 32). Understanding what drives users and user experiences ultimately allows technology producers a competitive edge to develop more

13 This is also what is proposed in Living Lab-literature; for apart from forming collaborations at the level of partnerships, co-creation also signifies a form of user-centered design that is informed by both Human-computer interaction (HCI) and computer supported cooperative work (CSCW). Both are "system centered approaches". In HCI-practices, machines are developed to cater to human needs; in CSCW machines are developed that aid in the development of human relationships. Both approaches focus on the integration of user needs in design. Co-creative activities in the area of design practices are located within the participatory design research area. Participatory design is a strand of user-centered design. However, the term user-centered design has been criticized as granting a too passive role to users ("users as subject"). Theorists such as Bannon (1991) suggest that the term should change to "user-involved". The term "participatory" would already suggest a more active role for users ("users as partners"). According to Sanders and Stappers (2008), user-centered design is a primarily US-strand of research, whereas participatory design has been developed largely in Europe. Participatory design of the "Scandinavian" kind has been around since the 1970's – focusing on finding user needs and translating these into design.

successful products and services.

However, the role of users in these practices is quite elusive. The overarching goal is to employ "private persons [as] as source of ideas and innovations" (Schumacher & Niitamo, 2008: 12). This involves facilitating and closely scrutinizing sociotechnical interactions in a real daily life setting (as opposed to a more isolated lab-setting) and opening up technological development processes to become more iterative (Ståhlbröst & Bergvall-Kåreborn, 2008b). The expectation is that observing technologies-in-use gives a more realistic view of what users actually do with technologies, instead of relying on what users say they will be doing with a technology. This is important because "people tend to answer differently than they will act" (Mulder et al., 2008: 33), and users find it difficult to express needs as they have a "limited solution space" (Sørensen & Nicolajsen, 2009: 7).

Coupling the goal of making users a source of innovation and the articulation that users find it difficult to express their needs creates an ambiguous image of what is exactly expected of users in co-creative Living Lab-practices. How do users become a source of innovativeness, or contribute to collective creative experiences if they are not expected to be able to actually say what they want? Compare the following two quotations about the role of users in Living Labs;

"[The question is how to] involve users as co-creators on equal grounds with the rest of participants and experimentation in real world settings" (Almirall & Wareham, 2009: 3).

"[We should focus on] experience research, on in-situ research with an emphasis on measuring real-life use, which deals with frequent iterations between development and evaluation, and an open innovation system with research, small and large companies" (Mulder, Verthausz, & Kriens, 2008: 34).[14]

The first quotation proposes to distribute creative agency *equally* among all involved actors, while the second suggests that users are involved in the Living Lab in that they contribute their experiences as these are *being measured*. These are rather different perspectives on user involvement which suggests ambiguity about the actual role of users in co-creative Living Lab-practices. Where certain researchers wish to work towards a methodology where "we can hand over [the] methods and tools to the user and allow them to gather data about their own needs and behaviour" (Ståhlbröst & Bergvall-Kåreborn, 2008b: 73), others instead call for methods that are as "unobtrusive as possible" (Schumacher & Niitamo, 2008: 5). The descriptions of the term "co-creation" suggest a distribution of agency and active contribution of users during technological design and development processes, whereas the idea that real life use is measured suggests a more passive role for the user; inclusion in development is translated into observations about technology use.

Are co-creation and observations of technology-in-use equated? This is an important

14 One of the methods to reach out to the user's experience is to for example prompt him/her with SMS text messages with certain questions in a certain context in a certain time. This is an "experience sampling method".

question to ask, not only because it is worthwhile to investigate what co-creation means in practice, but also because of the more societal promises of Living Labs. Living Labs would instigate the empowerment of technology users; enhance digital literacy and user inclusion during ICT development (CoreLabs, 2007) as well as "encourage local regional growth and connect localities into modern technology and (…) encourage innovation and new ways of using technologies" (Wills, Parker, & Wills, 2009: 9). This empowerment agenda is related to the notion of social innovation. Social innovation looks beyond process or product innovation and aims to "enhance" society (Dawson & Daniel, 2010) by meeting social needs and creating new social relations (Björgvinsson et al., 2010). If user contributions to technology creation and use of technologies are somehow equated, what does realizing social innovation and user empowerment mean here? Are users innovators or guinea pigs?

One answer is that users are both and at the same time more. Consider figure 2, where users are attributed the roles of stakeholder, co-creator, co-tester and adopter of new technologies. By placing users at the centre of all developments, figure 2 reflects the Living Lab aim to "engage the users early into the human-centric and participatory ideation and innovation process" (Lemke, 2009: 2). In the larger picture of the "Living Lab action space" (figure 3), these user roles are played by the various user segments (ranging from technology enthusiasts to mainstream users).

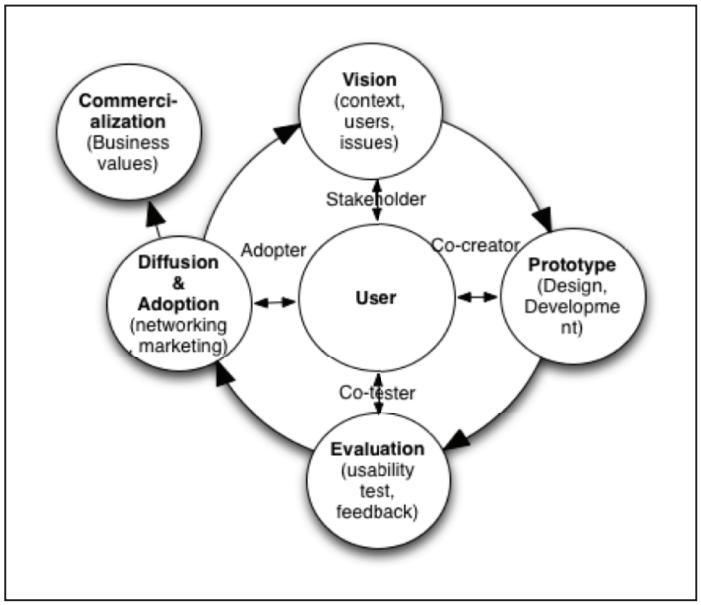


Figure 2: Multiple roles for users in Living Lab innovation constellation and user-centered methodologies (in Tang & Hämäläinen, 2012: 3)

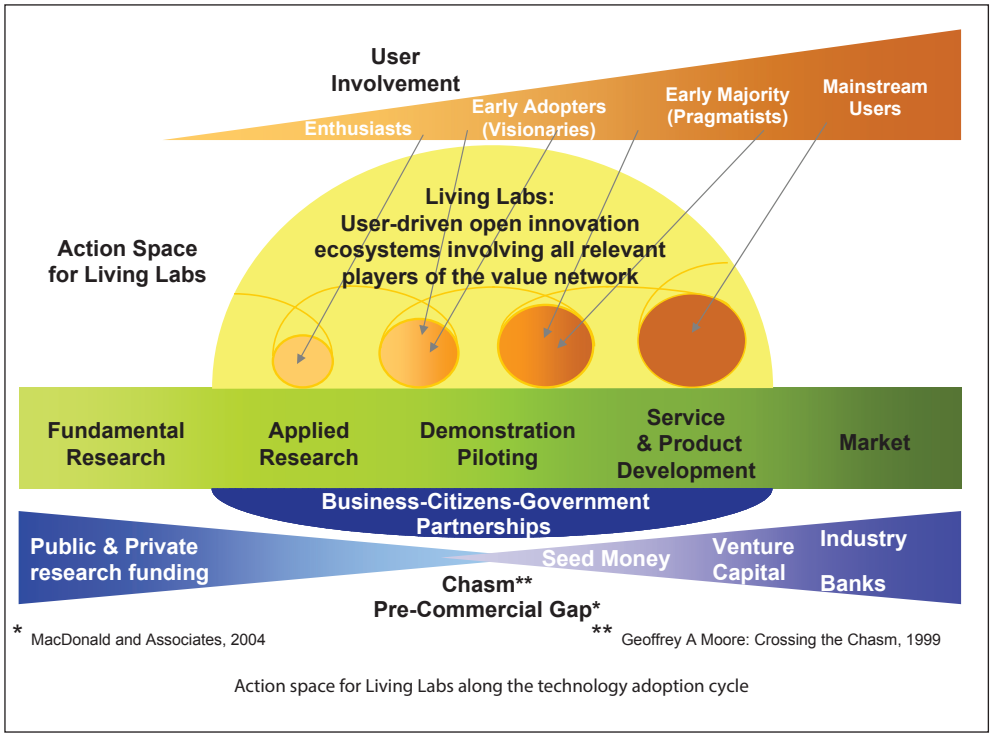


Figure 3: Open innovation approach of Living Laboratories (in Lemke, 2009)

The multiplicity of user-roles in Living Laboratories is also illustrated by the diversity of user involvement methods that are used across Living Laboratories. These include, but are not limited to self-report (e.g. experience sampling, diaries), measurements (e.g. application usage logging, context logging, experience sampling) as well as observation (e.g. ethnography) (Ter Hofte, Jensen, Nurmi, & Froehlich, 2009) and needfinding (Ståhlbröst, 2008). These methods are – in varying degrees - deployed across the various stages of product development: ideation, conceptualisation, development and market launch (Schumacher & Feurstein, 2006). Methods combine a high degree of observation (where ethnographic research is characterised as being "a low degree of observation") with multiple and emergent contexts (as opposed to controlled environments of experimental sciences) (Almirall & Wareham, 2008: 153). In an overview article Pallot and colleagues (2010) present the following picture of methods of user involvement approaches that are currently used in Living Labs;

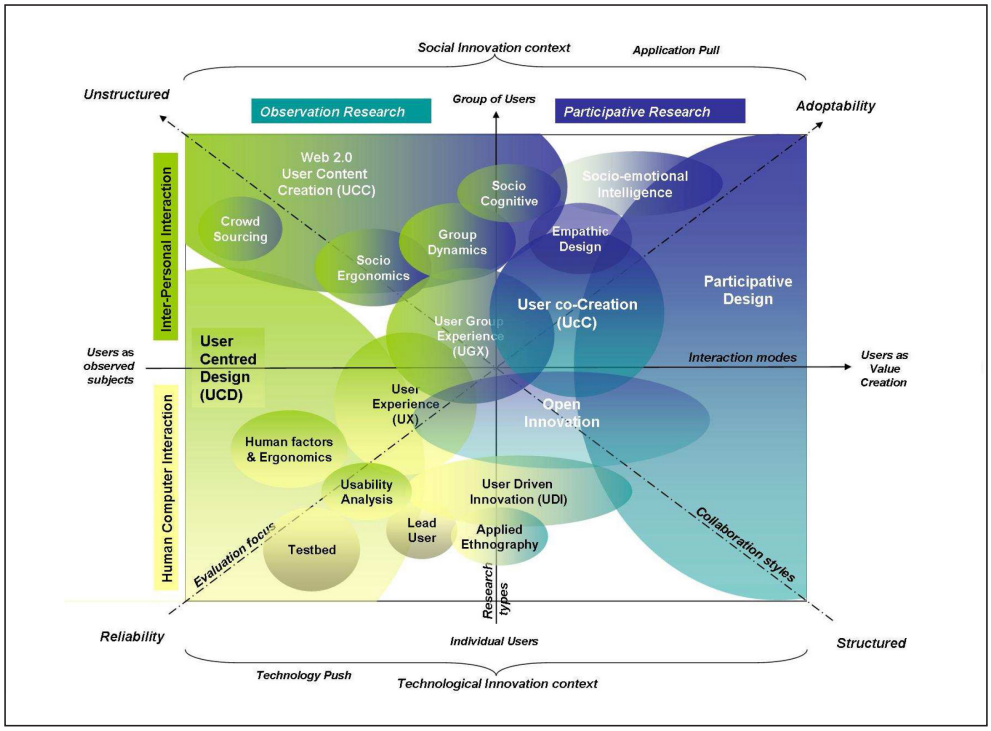


Figure 4: Domain Landscape of the Living Lab Research Map (Pallot et al., 2010: 7)

Figure 4 illustrates that engaging with users takes many forms in Living Laboratories.[15] There is no clear-cut answer as to how users exactly (are to) contribute to innovation process in Living Labs; methods can be used to find individual user needs, to harvest new ideas, to perform testing, etc.

This lack of a common methodology is flagged as one of the challenges of the approach (Dutilleul, Birrer, & Mensink, 2010; European Commission, 2009b; Følstad, 2008) and is noted as an obstacle to successfully systematically govern user involvement (Almirall, 2008: 37) and identify best practices of bottom up innovation. Furthermore, according to Dutilleul and colleagues, relatively little attention has been directed at investigating end user engagement (2010: 79), while acquiring the commitment of users and user communities is another noted challenge (Schaffers, 2009). A gap exists between theory and practice; there is an empirical lack of evidence supporting the benefits of user involvement due to the alleged more technology driven focus of current practices (Berte et al., 2008: 4). Moreover, there are the issues of finding users to participate as co-creators[16], the problem of defining the varying

15 Something that Fulgencio and colleagues refer to as a "pastiche" of methods (Fulgencio et al., 2012).
16 "A further challenge with regards to integrating members of the society into Living Lab research and development is to be found in creation of methods and business models for the stimulation of individual

degrees to which users are in the lead of processes (Almirall & Wareham, 2009) and questions of how best to elucidate user needs through co-creation (Ståhlbröst et al., 2009).[17]

One matter that *does* unite the myriad of proposed methods of user involvement is the idea that involvement should take place in daily life contexts (Almirall, 2008; Björgvinsson et al., 2010; Boronowsky et al., 2006; CoreLabs, 2007; Herselman, Marais, & Pitse-Boshomane, 2010; Hess & Ogonowski, 2010; Kviselius et al., 2007; Mulder, 2012; Pallot et al., 2010; Santoro & Conte, 2009; Schumacher & Feurstein, 2006; Schuurman, Lievens, De Marez, & Ballon, 2012; Sørensen & Nicolajsen, 2009; Ståhlbröst, 2008; Tang & Hämäläinen, 2012). Situating the design and testing of technological artefacts in "uncontrollable" daily life settings transforms mundane environments into experimentation areas where the unexpected ideas of users and interactions between users and technological artefacts lead to new ICT products and services (Boronowsky et al., 2006). Keeping in mind the variety of methods used in these environments and the challenges to the approach noted above, an interesting question is how these experimentation areas exactly take shape and how user practices in these daily life contexts inform technological development processes.

1.3 Thesis objective, research questions and outline

The previous section sketches a rather fuzzy image of the role of ICT end-users in Living Lab-practices. While users are on the one hand to become more knowledgeable and empowered through inclusion in Living Labs, they are on the other hand also expected to contribute their unique knowledge about – and practices in - their daily life contexts to Living Lab-practices. One could say that users are treated as a kind of "experts of the mundane". They may be expected to contribute their "sticky" knowledge (Von Hippel, 1994) and local expertise (Stewart, 2007), but not so much in terms of their "warm" technological expertise (in the sense that they can aid befriended novices in using technologies) (Bakardjieva, 2005). Instead they are expected to contribute their ideas and locally-specific uses of technologies to the innovation process. In a sense, they are positioned somewhat as what Davis would call "the perpetual novice"; one who has a kind of tacit knowledge of a technology without having lost the edge that is associated with beginners (Davis, 1997). Drawing users in their daily life setting into ICT innovation practices means drawing in context specific knowledge; local ideas and local uses are interpreted as a kind of expertise. Moreover, this expertise is expected to lead to new unexpected insights that will enhance ICT innovations. Users are thus expected to display a kind of user innovativeness.

However, noting the above-mentioned Living Lab-challenges and general heterogeneity of the approach in terms of methods of user inclusion, facilitating and channelling "user innovativeness" into innovative ICTs does not seem a very straightforward process. Current reviews of Living Lab-practices flag several issues with respect to user inclusion and the

users to participate" (Berte et al., 2008: 12). One of the suggestions to solve the problem of finding more users to join is to create a reward and incentive mechanism.

17 One source also points to the problem of connecting to users in other regions (to move a best practice from one country to another) due to different cultural backgrounds (Bagalkot, 2009).

visibility of best practices in terms of innovative potential. At the same time, the European Commission notes the Living Lab-approach as a priority for European R&D and innovation policy (European Commission, 2009a: 22) as it promotes collaboration, the circulation and dissemination of knowledge and can generate innovation (Ibid, p. 19).

In this thesis, I analyse what user innovativeness means in the Living Lab-context. To do so, I focus on the following research questions: *1) how are processes of user innovativeness shaped and facilitated in Living Lab-practices and 2) what kinds of innovation practices are constituted in Living Labs?* Keeping in mind the importance attributed to unexpectedness and uncontrollable daily dynamics for example, how are unexpected practices translated into innovative ICTs by Living Labs? Are unexpected ideas about technologies or unforeseen uses of technologies by users equated with innovativeness?

To answer these questions, I take the following route. In Chapter 2, I describe the conceptual framework used to open the "black box" of user innovativeness in Living Lab-practices. After introducing what I refer to as the paradox of the Living Laboratory, I move on to present the theoretical tools I use to analyse practices of user innovativeness. This requires me to first of all zoom in on what "innovativeness" means by combining insights from Science and Technology Studies, Innovation Studies and Management Studies. I then connect innovativeness to expectations about the creative and innovative agency of ICT users in Living Laboratories; how Living Laboratories relate innovativeness to unexpected ideas and behaviour. I furthermore argue that analysing user innovativeness demands a conceptual approach that allows for the articulation of the dynamics of emergence; studying technologies-in-the-making as users engage in design and development practices begs a conceptual focus on practices and performances (how users perform as designers for example). I posit that the concept of improvisation offers exactly this; improvisation draws attention to practices as these unfold, also paying attention to routine and unexpected behaviour (e.g. diverging from routines as a new technological artefact becomes part of a daily life situation, or alternatively embracing new technological artefacts into existing routines via improvisations). Improvisation draws on ideas about performativity and practices. I argue that improvisation catches "the unforeseen" in what STS-theorist Andrew Pickering has referred to as the dance of agency (1995); it draws attention to this dance, and enables me to investigate how Living Labs channel user improvisations back into the design of new technological artefacts in terms of human and material agency. The chapter concludes with my research sub-questions, summarised conceptual frame and the presentation of my research methodology as well as case study selection.

In Chapter 3, I present an exploratory analysis of the Living Laboratories that are connected in the European Network of Living Labs. Apart from providing an overview of the European Living Lab-landscape in terms of who users are, what goals and themes drive Living Labs and what kind of methods constitute a "user-centric" approach in Living Labs, this analysis also anchors my interest in user innovativeness to the Living Lab-field. This chapter concludes that while heterogeneity characterises the Living Laboratory-approach, it is possible to identify prevalent "users" and user "roles". However, due to the diffuseness of the approach, it is unclear how users are granted agency in innovation processes; this remains a

black box. I conclude the chapter by selecting three types of user roles that form the basis of my case study selection: user as designers, users as testers and users as co-creators.

Chapter 4, 5 and 6 consist of the three case studies that focus on user innovativeness; what happens when ICT development is opened up to users in daily life settings, where users are granted the explicit agency to influence the further development of ICTs. All three cases are Living Lab-projects that focus on "smartness": smart sensors, smart citizens and smart cities.

Chapter 4 explores how a group of high school students become designers of pollution-measuring prototypes during a "users-as-designers" workshop situated in a public park in Amsterdam. Chapter 5 reflects on the practices of a group of entrepreneurs who adopt a number of sustainable ICTs in their workspaces as they become part of a project that sees their shopping street in Amsterdam become a "Climate street"; a Living Lab for sustainability. Chapter 6 follows the development of a smart community game in Ghent. Here, citizens are positioned as co-creators of the to-be-built game. In Chapter 7, I summarise and compare the three cases and answer the research questions. In my conclusion, I furthermore present a number of suggestions for practitioners that are based on my case study findings.

Chapter 2. Conceptual framework and research methodology

2.1 The paradox of the Living Laboratory

Living Labs situate ICT development practices in daily life settings to gain insights about unexpected uses of technologies. ICT users, in turn, are not only primarily included in their role of "user", but also in guises mostly associated with those involved in the design and development process of ICTs. Coupled, the unexpected knowledge ascertained by changing the site of and the people "in" the laboratory is ultimately to lead to the development of more successful innovative ICT products and services. By transforming mundane environments into experimentation areas, interactions – in this case between users and technologies-in-the-making in this environment - become the subject of enquiry for Living Laboratories. "The unexpected" is expected to be found by investigating user-technology interactions. Living Labs can thus be said to adhere to a promise that is not unlike a tagline of a generic blockbuster film, namely to "expect the unexpected".

But how is the uncovering of "the unexpected" achieved in a Living Laboratory? Previous insights in the "discovery" of knowledge in scientific laboratories show how in these controlled environments messy relationships and processes become stabilised and "purified" into "a textual account of nature, and a set of more of less formulaic statements about method" (Law, 2007: 4). Facts are shown to be constructed; STS scholars such as Latour and Woolgar (1979) trace how sociomaterial interactions in the laboratory become stabilised in accepted facts. Attempting to find unexpected insights in environments that are expressly less controlled and situated in "the living", suggests that Living Labs actively seek out open and messy sociomaterial practices in order to find a kind of knowledge "in the wild" (Hutchins, 1995).

Drawing out the Laboratory-analogy a bit more, the scientific and Living Laboratory can be compared in terms of the notion of the "laboratorization of the world" (Callon, Lascoumes, & Barthe, 2001). Laboratories are microcosms in which the larger world is translated into a micro environment to perform experiments, after which found outcomes are translated back into the larger world. To effectively reproduce findings of the microcosm, the macrocosm has to become a "replica" of the situation in which the laboratory outcome was reached (Ibid, p. 65). To illustrate this, Callon and colleagues refer to the example of how doctors change their practices once a new serum is brought into the profession; doctors need to train themselves in methods and know-how to be able to administer the serum; "the doctors invest, train themselves, transform their office and at the same time themselves" (Ibid, p. 66). This results in a reconfiguration of the doctor's practices; the laboratory is inserted in this particular practice. The "laboratorization of the world" does not refer to changing the world so that it becomes a laboratory, but rather "that at different spots laboratories are implanted that frame and pre-format possible actions" (Ibid, p. 67). The reduction of the macro world into microcosms (where experts are only included), followed by a translation of the findings in the microcosms back into the macro world leads to situations dominated by controversies as the two may mismatch. Including interventions of laypersons could reduce

controversies, as this allows research to shift between the realms of "seclusion" into "the wild".

Reversing the analogy, Living Labs seek the exact opposite of the laboratorization of the world; they aim to "worldize the lab". Living Labs situate their endeavours in daily life settings and include laypersons to discover new insights and translate these into "innovative" new ICT products and services. Living Labs frame the "wild" daily life environment as the "private secluded space" of the laboratory. One could even argue that by making use of "the wild" to create and test new technologies, Living Laboratories can gain insights to limit possible mismatches between products and users; by for instance testing how a technology is adopted by the laypersons in the Living Lab prior to market release. However, one could alternatively argue that in seeking "the unexpected", Living Labs may actually be looking for mismatches as these "[reveal] uncertainties and, as a consequence, new lines of research to be explored" (Ibid, p. 31).

What the situating of a Living Laboratory "in the wild" furthermore suggests, is that these labs seek a kind of "local insights" that may be particular to a certain group of users or pertain to a specific daily life setting. Laboratory studies have shown that even in "traditional" laboratories, insights gained are "strongly dependent upon the practices employed in [their] making" (Golinski, 1990: 495). In Living Laboratories, these insights are expected to be informed by the "uncontrolledness" of daily life; this would somehow produce more innovative insights than if the laboratory would be situated in a more controlled setting. But do Living Laboratories include laypersons as a strategy to reduce mismatches or to actually draw out new ideas for ICT products and services? What is the "labbiness" of the Living Lab? Does the framing of "the living" act as a lab to catch unexpected insights, or does this frame work more in terms of what Suchman would call an "ordering device" (Suchman, 2007: 202) to deal with the messiness of daily life? I will return to these questions and ideas in Chapter 7.

However, first and foremost, I focus on user innovativeness in Living Labs. This involves investigating how Living Labs shape and facilitate user involvement in various stages of ICT development and analysing how user practices in the somewhat paradoxical notion of a "Living" Laboratory are translated into products and services that are deemed *innovative*. What kind of innovativeness of users is elicited "in the wild" and how are "unexpected" insights connected to ICT innovation?

To theoretically approach these topics and work towards answering the main research questions of this dissertation - *how are processes of user innovativeness shaped and facilitated in Living Lab-practices*? And *what kinds of innovation practices are constituted in Living Labs*? – I first focus on the concept of "innovation" and the perceived "innovativeness" of users. In section 2.2, I position how I use these concepts in my analyses. In section 2.3 I zoom in on the user-technology relations and specify how I intend to view and analyse user-technology interactions in Living Laboratories, after which - in section 2.4. - I turn to how *practices* will be studied in the empirical chapters of this dissertation. Section 2.5 consists of an overview of the methodology used, a summary of the conceptual framework, research sub-questions, my case study selection and research limitations.

2.2 Innovation and Innovativeness: creating, adopting and improvising

What does it mean to be innovative? "Innovation" has strong connotations with "new and improved", or something new on the (technological) horizon that –to paraphrase a song title by electronic music duo Daft Punk - will make us work "harder, better, faster, stronger".[1] According to the European Commission's Oslo Manual set to collect and interpret innovation data, an innovation "is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD & Eurostat, 2005: 47). This definition stipulates indeed that to be innovative, a product, process or method needs to be new or improved.[2]

While the centrality of creating or (fast) adapting to "newness" permeates studies of innovations and innovativeness, definitions of both terms abound across scientific disciplines. In an attempt to analyse the cornucopia of definitions, Garcia and Calantone (2002: 113) highlight the role of perception. If the degree of newness is what defines innovativeness, one has to take into account from whose perspective a product or process is new. Sociologist Rogers approaches innovation along similar lines by stating that innovation is characterised as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption. (…) "Newness" of an innovation may be expressed in terms of knowledge, persuasion, or a decision to adopt" (Rogers, 1995: 11).[3]

It is thus important to start an analysis of user innovativeness in Living Labs by investigating how innovation and innovativeness are perceived by (actors organizing) Living Labs. As I stated before, Living Labs seek to innovate starting from two premises: the centrality of users in ICT development processes and the importance of situating these processes in daily life settings. These two premises form the basis of how I initially conceive of what innovativeness means in Living Laboratories; innovativeness is geared at working to combine different sources of knowledge (public-private-civic) and include uncontrollable dynamics of daily life. To illustrate how these premises relate to innovation, Living Labs can

1 The song "Harder, Better, Faster, Stronger" is featured on Daft Punk's 2001 album "Discovery".

2 This runs in parallel to theories in (neo-) Schumpeterian economics, where novelty is equated with innovation and subsequently defined as "the major force propelling economic dynamics" (Hanusch & Pyka, 2007: 276). Schumpeter differentiated between innovations: the introduction of new products, the introduction of new methods of production, the opening of new markets, the development of new sources of supply for raw materials or other inputs and the creation of new market structures in an industry (OECD Oslo Manual, 2005: 29).

3 Apart from perspective, innovation should also be seen in terms of time and timing. In consumer research, the use made of Rogers' notion of "early adopters" illustrates this nicely: innovators are "those members of society prepared to adapt a new product early in diffusion" (Midgley & Dowling, 1978: 234). Innovative firms and consumers are thus ahead of the curve, quick to catch on. Subramanian – in the field of engineering and technical management research – argues that innovativeness should be studied over time, as an enduring trait of firms instead of relating it directly to the speed of adoption of innovations and the number of innovations adopted (Subramanian, 1996).

be said to – in the words of human computer interaction theorist Buxton - "strive for creative insights on how to combine, develop and leverage what is already out there, but hidden, or not understood" instead of "focusing on the invention of the "brand new"" (Buxton, 2005: 52). Innovation is, in this view, more about combining knowledge to extract value than about inventing.

In Chapter 1, I referred to Chesbrough's open innovation paradigm. Within the knowledge economy, open innovation entails opening up technology development and business practices to include as many knowledge sources as possible. Users form one of these sources in Living Labs. In the words of the European Network of Living Labs, users are included as a co-creative force of "active actors and not only passive receivers".[4] This involvement is closely linked to social innovations. Living Labs are about "societal involvement, about promoting innovation on a societal basis (...) in an Open Innovation process that because it happens in real environments has an immediate impact. This is how Living Labs aim to contribute to a new Innovation System where users and citizens become active actors".[5]

In Living Labs users are a source for innovation, as well as contributing actors to a new innovation system. The questions that I ask in this dissertation deal with what user contributions consist of in practice. For example, does user involvement allow users to contribute their knowledge to Living Lab-practices, or is user involvement in itself recognised as innovative? This is an important distinction to make, keeping in mind the fact that innovation, as a concept, is strongly associated with both product and process newness. In this reading, innovativeness could refer to incorporating user knowledge, via user inclusion, to create new ICT products as well as to creating new co-creative ICT development processes.

Apart from a focus on "newness" the above two interpretations of what could constitute innovativeness in Living Labs point to another connotation of innovation, namely that of invention and creation or creativity. According to psychologist Legrenzi, creativity and innovation - two formerly separate areas of research (the former traditionally the domain of psychologists, the latter of economists) - are increasingly brought together and studied in academic fields such as the history of science, art criticism, consultancy and marketing (Legrenzi, 2007: 4). He subsequently wonders "how creativity spreads innovation in the world of business and industries (which is the chicken and which the egg)?" (Ibid, p. 34). Does creativity lead to invention, and invention to innovation? Or does innovation stimulate creativity?

In product development literature, the argument is made that product innovation "originates" in invention: "invention becomes innovation through [iterative] production and marketing tasks" (Garcia & Calantone, 2002: 112). Innovations are furthermore not bound to product development, but should also be seen in terms of diffusion processes – as during the diffusion process, the product may change. In management studies, a similar stance is proposed on the level of ideas instead of products when Amabile (1996) defines innovation as "the successful implementation of creative ideas within an organization" where ideas

4 http://www.openlivinglabs.eu/ (accessed on 1-4-2010).
5 Ibid.

may originate inside and outside organizations (Amabile et al., 1996: 1155). In organization studies, the diffusion or adoption process of something "new" is also stressed; innovation is defined as "the adoption of any device, system, process, problem, program, product or service that is new to the organization" (Pina e Cunha, Vieira da Cunha, & Kamoche, 1999: 311). This is contrasted with creativity, which is viewed as "the creation of a valuable, useful new product, service, idea, procedure or process by individuals working together in a complex social system" (Ibid). Innovation, as a process, is in this view more concerned with adopting the new than with creation and invention of the new.[6]

As these examples from various academics fields illustrate, innovation and creativity interrelate. Like Legrenzi, I wonder how innovation and creativity stand in relation to one another. However, instead of questioning which of the two instigates the other, I want to draw attention to the interrelatedness of the two. To do so, I turn to the concept of improvisation.

2.2.1 Improvisation and innovation

In an attempt to catch how creativity and innovation are connected, cultural anthropologists Hallam and Ingold (2007) propose to use the concept of improvisation.[7] They argue against the direct equation of creativity and innovation, as this bypasses the processes that gave rise to the innovation. Instead, they propose to harness their understanding of creativity to improvisation – concluding that in doing so they do not focus on the innovative products as the result of creative practices, but instead on articulating how practices unfold in time and context.[8]

Literally, improvisation means something that is "unforeseen" (Montuori, 2003; Weick, 1998). Montuori uses the concept of improvisation to describe the way in which people navigate with(in) structures. He states that "life is participation and participation is

6 However, innovation and creativity are similar as both deal with novelty and may both be planned "so that all necessary resources are in place" (Pina e Cunha, Vieira da Cunha, & Kamoche, 1999: 312).

7 The concept of improvisation is not only used in cultural anthropology, but also in organizational and management studies (Crossan, Pina e Cunha, Vera, & Cunha, 2005; Moorman & Miner, 1998; Weick, 1998), art history and language (Landgraf, 2011), philosophy (Peters, 2009) music studies (Sawyer, 1999) and educational studies (Sawyer, 2004) to name but a few fields. Moorman and Miner provide a detailed overview of all the disciplines that refer to improvisation (1998).

8 Hallam and Ingold describe improvisation as generative (creative), relational, temporal and "the way [anthropologists] work". It is generative in the sense that it gives rise to "phenomenal forms of culture as experienced by those who live by them or in accord with them" (Ibid, p. 1). To clarify, they give the example of a building plan or blueprint. It is created by an architect but built in processes that often require improvisations: a plan's execution is contingent to an inconstant world. This also points to the relational aspect of improvisation. Improvisation is "entangled and mutually responsive" (Ibid, p. 7). The temporal characteristic of improvisation is linked to the idea of "newness". The question they ask is why something that is completely new is often deemed creative (like building a new building), while the reproduction of that same new artefact (say, the hundredth building) is no longer perceived as such. They argue instead that even in repetition lies improvisation; it is marked by processes, durations and practices – ongoing. This is also why, in their view, the human sciences "work" by means of improvisation. Processes are analysed not with the aim to predict future states, but to "follow the paths along which projections take shape" (Ibid, p. 15).

creation and improvisation, because life does not occur in a vacuum, it occurs always (…) in a constant play of order, disorder and organization and on-going learning" (Montuori, 2003: 244). We not only react to unforeseen events in daily life, but generate these events as well. In referring to improvisation as "a dance of constraints and possibilities" (Ibid, p. 245), Montuori stresses how thinking in terms of improvisation overcomes thinking in dichotomies of order and disorder. Improvisation is about dialogue; it is performed by someone with his or her own contextual perspectives, in context – and so able to make choices which in turn affect both context and the personal perspective.[9]

Improvisation is thus characterised as a process or practice; as a play with structures.[10] In the context of management studies, Moorman and Miner describe improvisation along similar lines, as "[involving] a semi-ordered activity" (1998: 702). This activity takes the shape of a constant orientation or positioning with respect to situations that are "complex, ambiguous, and ill defined" (Drazin, Glynn, Kazanjian, & Kazanjian, 1999: 287 in Vera & Crossan, 2005: 205). Likewise, Seham (2001, in Vera & Crossan, 2005: 205) refers to this play as a mixture of "making do" and "letting go", thereby drawing attention to both the generative and spontaneous characterizations of the concept. "Making do" suggests that creative action is undertaken in a setting, while "letting go" underlines an acceptance of not being in control, to have to accept spontaneity.[11]

This play with structures also recurs in theories that focus on improvisation in jazz music (Montuori, 2003, 2008; Moorman & Miner, 1998; Pina e Cunha et al., 1999; Sawyer, 2000). Montuori and Sawyer furthermore describe "gradations" of improvisation. They relate "virtuosity" to improvisations exemplified by jazz musicians to provide an alternative reading to definitions that characterise improvisation as "makeshift"; a temporary solution that lies outside of "proper rules" to problems brought on by some unforeseen circumstance.[12]

9 This touches upon what Sawyer refers to as "key question for all of the social sciences of everyday life: How much of everyday life is scripted and structured and how much of it is improvised?" (Sawyer, 2000).

10 In "The Art of Improvisation" Landgraf gives the following description of improvisation: it cannot be seen without structure and repetitions, it is a mode of engaging existing structures and constraints, of staging art that shares properties common to various individual arts and fulfils expectations we have of art and cannot be seen independently from socio cultural context of its articulation (Landgraf, 2011: 11).

11 This is also in line with Pina e Cunha et al., who define improvisation as "intuition guiding action in a spontaneous way" (2002, 29). Improvisation is furthermore seen as creative action unfolding in time; "Composition implies that the improvisational activity involves some degree of innovation, because it goes beyond automatically repeating a pre-existing routine" (Moorman & Miner, 1998: 702). Crossan et al. nuance the positive associations made with spontaneity. In organizations and management it is important to distinguish between what it is and what it means to improvise well. "Spontaneity and creativity are necessary for a process to be considered improvisational, whereas characteristics such as expertise and teamwork skills are prescriptive in the sense that they may affect the effectiveness of the improvisation process but do not define it. As a spontaneous process, improvisation is extemporaneous, unpremeditated, and unplanned. As a creative process, it attempts to develop something new and useful to the situation, although it does not always achieve this." (Crossan et al., 2005: 131).

12 Sawyer discusses how this interpretation of improvisation, one that I refer to as the "makeshift"

One must know how to play an instrument properly if one wants to engage in (group) jazz improvisations. Sawyer argues how, in jazz, improvisation has connotations of musical genius and "conscious internal creativity – in a culture that explicitly values novelty" (Sawyer, 1999: 215).[13]

Interpretations of improvisations thus vary in specific circumstances. Whether an action is makeshift or virtuose seems to hinge on the idea of control. "Makeshift" suggests less control over an artefact than virtuosity.[14] Virtuosity of jazz performances lies in its "improvisational creativity [where] the process is the product" (Sawyer, 2000: 150). While collaborating and interacting, the jazz musicians create something: a performance.

Orlikowski (organization studies) applies the concept of improvisation to understand organizational transformations occurring in response to ICT adoption (Orlikowski, 1996). She studied what happened in an organization where over a period of time significant ICT changes were implemented by focusing on "accommodations to and experiments with the everyday contingencies, breakdowns, exceptions, opportunities and unintended consequences that they encounter" (Orlikowski, 1996: 65). This leads to an account in which flexibility, self-organizing and learning are fore grounded, instead of analysing change in terms of stability, bureaucracy and control. Using improvisation to view technologies-in-practice[15], it becomes possible to look at how "situated innovations" come about "in response to an unexpected opportunity or challenge, such as when a temporary workaround or experiment becomes the preferred practice because it turns out to be more productive or more effective than the original practice" (Orlikowski, 2000: 411).

Improvisation, as a concept, thus stresses the situated emergence of products, processes and practices. The ways in which it has been used across different scientific disciplines shows how it is related to notions of "situations" and "contexts" and to different forms of makeshift and virtuose actions. What needs to be explicated is however that improvisation should also be seen in the light of intentionality. The above described characteristics emphasise emergence and a play with structures in unforeseen ways. This emergence should be anchored to situations where a goal is to be reached, be it realizing a jazz performance or overcoming an unforeseen problem while trying to achieve something.

Improvisation is a useful concept to study practices of user innovativeness in Living Laboratories for several reasons. First of all, it helps articulate the route taken as processes

interpretation, in musicology strongly resonates with Eurocentrist notions that any kind of "unscripted" music is inferior to written music (1999: 215).

13 This is quite an interesting reversal of meaning-attribution; outside the context of jazz music, unscripted music is interpreted as "makeshift" whereas within the context of jazz, improvisation is something that indicates virtuosity.

14 Sawyer, in discussing expertise, defines four understandings to gauge expertise that is necessary to improvise (in classroom situations): deep conceptual understanding, integrated knowledge, adaptive expertise and collaborative skills (Sawyer, 2008: 2).

15 Technologies-in-practice are structures enacted through the use of a technology. They are not embodied within the technology; rather, they emerge from the ongoing and situated interactions users have with the technology at hand (Orlikowski, 2000: 420).

and products emerge – thus showing how this process itself may be seen as a creative unfolding, instead of placing the emphasis on outcomes. In this way, the analysis will not focus on innovations but rather on the process preceding; on what takes place prior to the time that Living Labs refer to an ICT "outcome" as an innovation. Second of all, the fact that improvisation draws attention to "situatedness" and the unforeseen makes it a useful concept to investigate how practices take place in a "daily life setting". Using the work of Orlikowski as an example, the concept of improvisation allows an analytical focus on "situated innovation" where – to refer back to the ideas of Montuori and Sawyer – users may make "virtuose" use of their knowledge of everyday situations to relate and engage with technologies. When "the unforeseen" is anchored to improvisation, it gains meaning in the process leading to the establishment of what Living Labs may refer to as innovations.

Thirdly, what connects improvisation and its situatedness furthermore to the Living Lab-idea of combining knowledge "out there" is the fact that Living Labs seek to explicate local –perhaps "virtuose"- use of knowledge by users that is connected not only to these users, but also to the setting. This local knowledge can be referred to as a kind of "tacit knowledge"[16] that is to become embodied in or made explicit in a material artefact, perhaps as a kind of "third kind of expertise" (Collins, 2004; Collins & Evans, 2002). Collins notes how different levels of expertise[17] require different levels of competence. The interesting case of Living Labs is however, that end users are included seemingly precisely because they do not have explicit expertise in the development of ICTs. Where these users *are* expected to have a level of expertise, is in their daily life environments. In a sense, these users can thus be expected to display situated knowledge (Haraway, 1988) or contingent knowledge (Fleck, 1997). Sole and Edmondson define situated knowledge as "knowledge embedded in a physical site or location" which is based on co-locatedness of people. It is a taken for granted knowledge, and difficult to access "without some intervention to catalyse a process of liberating it" (Sole & Edmondson, 2001: 7). What makes the Living Lab framing of this kind of situated knowledge of users so interesting is the fact that they seek to treat users as a kind of experts of the settings of the Living Labs, thus suggesting that these users make use of or create a kind of "situated expertise".

The concept of improvisation has been used across academic fields to underline emergent practices. Improvisation draws attention to the unforeseen, to practices as they unfold, interpreted as a (virtuose or makeshift) play with structures. I will use the concept to articulate how practices of user innovativeness are shaped in Living Lab-practices. To do so, I expressly focus on how practices emerge in the context of the Living Lab, where technology users – who are to be included across ICT development practices – may use situated expertise. That is, expertise that is bound to a virtuose use of local, contingent knowledge. Living Labs, in seeking to uncover this kind of expertise, would then be observed to facilitate user-technology improvisations.

16 Tacit knowledge is described as practical knowledge, "which actors are able to draw on in action but are unable to express (what is simply done)" (Orlikowski, 1992: 404).

17 No expertise, interactional and contributory expertise (Collins & Evans, 2002).

The analyses presented in this dissertation focus on user practices and "user innovativeness" in Living Laboratories; how improvisations take place and how users construct as well as use their "situated expertise". However, focusing on users in Living Laboratory-practices is only one part of the puzzle. What is still missing from this picture is technology; the agency of technological artefacts. These, as I elaborate in the next section, "do" things as well. Looking at user-technology relations in terms of human and material agency, and connecting notions of (non)human agency to practices of improvisation, takes into account the user, the "setting" and the technological artefact. As will become clear, analysing how these interact - using the conceptual tool of improvisation - allows me to reflect on "user innovativeness" in Living Laboratories.

2.3 User-technology relations

In Chapter 1, I stated that end users of technologies have traditionally been viewed as passive recipients of technological developments. Striving to counter the technologically deterministic perception that new technologies have "an impact" on society, the field of Science and Technology Studies (STS) provides insights in how technologies and users are co-constructed; there is no arbitrary distinction between "the social" and "the technological". The construction metaphor (Sismondo, 2008) offers different means to investigate how society and users play a key role in the development and adaption of technologies.

Oudshoorn and Pinch (2003; 2008) trace the interest in the active role of the user in technological appropriation and development processes to the mid-1980's when feminist historians of technology put "users" on the agenda. Ruth Schwartz Cowan's (1987) notion of the consumption junction draws attention to the space in which consumers decide between competing technologies. A focus on users enriches the history of technology by showing how technologies can have "unintended consequences in the hands of users" (Oudshoorn & Pinch, 2008: 545). "Following the user" would provide insights in the success or failure of technologies. In an influential STS study, Cockburn and Ormrod subsequently argue how users are heterogeneous; not all users have the same position in relation to technologies (Cockburn & Ormrod, 1993). They call attention to how these different positions can be related to different power relations.

The idea that users are active "agents of technological change" (Bijker, 1995) is further developed in the social construction of technology and society (SCOT) approach (Bijker, Hughes, & Pinch, 1987; Bijker & Law, 1994). SCOT provides the conceptual tools to trace how the dominant meaning and use of a technology (its interpretative flexibility) "stabilise" over a period of time as different social groups attribute different meanings and uses to particular technologies. Technologies are not "finished" once they are developed. Applying concepts from the related field of cultural and media studies, scholars describe how technologies continue to gain different meanings and uses in use; users "tame" technologies in a process of domestication (Silverstone & Haddon, 1996). User studies follow how technologies are used and by whom; how users create and attribute (alternative) meanings to and uses for

technologies and how they develop new technologies themselves.[18]

To understand how users initiate technological developments and innovation, STS scholars focus on user-technology dynamics. For example, in a recent study, Van Oost, Verhaegh and Oudshoorn (2008; Verhaegh, 2010) analyse the development of a wireless network infrastructure by focusing on the alignment work performed to create both a user community as well as the technological infrastructure. To do so, they extend certain concepts used in the more economically-oriented academic field of Innovation Studies, such as the notion of the "lead user" and the innovation community (Von Hippel, 1986; 2005). "Lead users" of technologies are - due to their particular interest in and knowledge about a technology or product - often the ones who first develop new goods and share their insights in innovation communities (Hyysalo, 2007; Von Hippel, 1986; Von Hippel, 2005). Lead users are ahead of the majority of users in a particular market and are expected to gain relatively high benefits from a solution (Von Hippel, 2005: 66). An innovation community is defined as an organized cooperation in the development, testing, and diffusion of user-initiated innovations (Van Oost et al., 2008: 6). Reversing the idea of the innovation community into community innovation, Van Oost and colleagues draw attention to and analyse practices of collective innovation and how these are constructed in practice.

STS reflections about the role of users in technological development and appropriation processes demonstrate the diversity of "the user category" and at the same time problematize this category. Stewart and Williams for instance question the presumption that the primary solution to meeting user needs is to build ever more extensive knowledge about the specific context and purposes of users into technology design (Stewart & Williams, 2005: 44).[19] User-oriented analyses that focus on the notion of and the actual inclusion of users in technological development processes effectively work to open up "black boxes" of both technologies and users to gain insight in subjects such as development and adoption dynamics. Meanwhile, it is clear that the emancipation of the user is also questioned within the field. In a turn to view the limits of user innovativeness, Hoogma and Schot (2001) question whether or not consumers could become lead users as these would lack the collective resources and incentives to become innovators.

2.3.1 The agency of technological artefacts

In a move to describe how sociotechnical relations are performed in practice, proponents of actor network theory propose a semiotic approach; elements of the natural and social world form webs of relations in which the material and the meaningful are entwined in actor

18 See Oudshoorn and Pinch (2003 and 2008) for a more detailed discussion of the STS studies on user-technology relations.

19 For, how much information about users is needed to create new technologies? Should technologies be adaptable to environments or rather be developed to attend to the needs of a specific group of future users? And how is more knowledge translated into needs and in subsequent design? Stewart and Williams instead argue for a more evolutionary understanding of ICT design and development that pays attention to processes of social learning over the lifecycle of technology design and appropriation.

networks (Callon, 1986; Latour, 1992; Law, 2007). These networks consist of human and nonhuman (e.g. technological) actors that are treated symmetrically. That is, the agency of humans and nonhumans is enacted within actor networks and does not "exist" a priori to the enrolment within these networks. On the contrary, it is the capacity to act that is discovered when studying how worlds become constructed in a certain way" (Cooren, Taylor, & Van Every, 2006: 11 in Orlikowski, 2007: 1438).

Central concepts in the semiotic approach to user-technology relations are the idea of "configuring the user" (Woolgar, 1991) and the notion of "script" (Akrich, 1992). Woolgar likens machines to text; how users "read" technologies is constrained by how designers "configure" or position users to use a technology by defining and delimiting users' possible actions with that technology (Lægran & Stewart, 2003: 360).[20] Akrich introduced script to conceptualise the assumptions designers can be said to "inscribe" in technological artefacts; assumptions about the world in which their object is inserted, and about the possible users of the artefact. Akrich refers to the outcome of this inscribing as a script or scenario (Akrich, 1992: 208).[21] Confronted with the artefact, the user "reads" the script and may accept and act in accordance with prescribed actions (action-program) or reject prescribed actions (in an anti-program). The notion of "de-scription" refers to the inventory and analysis of the mechanisms that "allow the relation between a form and a meaning constituted by and constitutive of the technical object to come into being" (Ibid, p. 209). In order to describe technical artefacts that are still in development, Akrich proposes that one should move between designers and users to trace user representations and actual uses of technological artefacts. Akrich refers to the moving between designers and users as "the world inscribed in the object and the world described by its displacement" (Ibid, p. 209).

In design theory, Fallan applies the script concept (Fallan, 2008) to the idea that "design *for* use is design *of* use" (Ibid, p. 63). He stresses that scripts "operate" on both the physical and sociotechnical level. Script analysis can aid in describing what happens between the "sphere of production and sphere of consumption" (Ibid, p. 71). Parallel to this idea is Jelsma's argument that technological artefacts contain "design logic" and a "use logic". Design logic is the story that tells you why an artefact is as it is from the designers' point of view. It can be reconstructed by interviewing designers or by recording their deliberations. Use logic is often black boxed in routines. Observing how users deal with technologies in the context of use will enable one to open up the black box of technology. By comparing the two logics, you will be able to trace asymmetries and a tool for product development can be devised (Jelsma,

20 In response to this, Mackay and colleagues argued how not only users, but also producers are configured as well; the boundaries between users and producers are more "fluid" and less rigid (Mackay, Carne, Beynon-Davies, & Tudhope, 2000).

21 Akrich (1992) points out the limitations of both technological determinism and social constructivism; while the former theories draws on ideas that technologies "impact" society, forcing society to adapt accordingly, the latter invests too much in the influence of society on the development of technologies. She critiques both streams and suggests that in order to explore the relationship between technology and society, one has to constantly move between the two, also on the level of the artefact.

2006: 69). Scripts provide insights into prescribed and actual uses.[22]

Technological artefacts are thus seen as agents in terms of scripts that contain prescribed uses and a "logic". Living Labs, in their efforts to make users part of design processes, can be argued to seek to short-circuit design and use logic; making the latter part of the former. Relating this back to the previous section on innovation and improvisation, viewing how in practice use logic unfolds in situations in Living Labs and how this logic is treated as a kind of situated expertise to create "innovative" ICTs, it becomes possible to see how technological artefacts and user practices co-emerge in a co-constructive way. Analysing user innovativeness in Living Lab-practices therefore involves not analysing either user or technological agency, but rather how these emerge together. It entails not a script analysis, but an analysis of emerging agency and improvisational practices. This is why I now turn to a conceptualization of practices.

2.4 Studying improvisational practices of users in a daily life setting as a dance of agency

My objective is to trace practices of user innovativeness by studying how people improvise; how they "play" with structures in response to new materialities and contingencies of daily life. This entails studying *emergence*; how users become part of Living Lab-practices, engage with technological artefacts and produce something "innovative". The vocabulary I use to view emerging practices of users is based on studies that look at *interplays* between users and technologies. I look at how users and technologies (humans and nonhumans) engage, to see (a) how the interplay between the two takes place in the daily life setting that is the "laboratory floor" and (b) how the framing of daily life as a laboratory influences how this interplay is perceived by the Living Lab. This is relevant, especially keeping in mind previously mentioned laboratory studies that show how insights gained in the laboratory depend on practices in the setting (Golinski, 1990). One could say that Living Labs translate practices of users with

22 The idea that roles and actions are inscribed by designers in technological artefacts has met criticism. Although Akrich maintains that scripts need not be adhered to by users, theorists such as Oudshoorn stress that compared to domestication theory for instance, the concept of scripts gives too much weight to designers and technological objects (Oudshoorn & Pinch, 2003: 11). Verbeek (2005) also criticizes the concept as "tricking" one into starting to identify a technological object with its script, whereas he argues, the technological objects should be seen as a mediating actor between users and their world. Verbeek approaches the question how "artefacts act" from a post phenomenological stance. Referring to Idhe's "multistability", he argues that artefacts mediate the intentionality of humans and their world. The role technological artefacts play depends on the meaning that users ascribe to the artefact; this makes them multistable. When this mediating role becomes a characteristic of the artefact, asymmetry between users and artefacts occurs (Verbeek, 2005: 189). This argument is also made in terms of how technology is "valenced" which is "a bias or "charge" analogous to that of atoms that have lost or gained electrons through ionization. A particular technological system, even an individual tool, has a tendency to interact in similar situations in identifiable and predictable ways. In other words, particular tools or technologies tend to be favored in certain situations, tend to perform in a predictable manner in these situations, and tend to bend other interactions to them. Valence tends to seek out or fit in with certain social norms and to ignore or disturb others" (Bush, 1983: 155).

technologies in a real life setting into insights.

Practices are central to a conceptualization of user innovativeness in Living Labs. In practice theory, the relationship between social structures and everyday actions are theorised (Feldman & Orlikowski, 2011; Schatzki, Cetina, & Von Savigny, 2001). Proponents argue that everyday actions are consequential in producing the structural contours of social life. It rejects dualist assumptions of the inherent relationship between elements that have often been treated dichotomously and instead regards these relationships as mutually constituted. It seeks to understand how actions form outcomes (Feldman & Orlikowski, 2011: 17) not in terms of studying design and use of technologies in a separate social context, but by focusing on how "sociomaterial practices (...) perform social and material relations together" (Ibid, p. 16). Referring to the notion of sociomateriality to describe the entanglement of social and material agencies, Orlikowsi draws attention to how meanings and materialities are enacted together in everyday practices. To study the entanglements of the social and material, attention should be paid to the performance of sociomaterial configurations in practice.

Drawing attention to the material agency constitutive of practices, STS theorist Pickering argues for analyses of scientific practices in terms of their performative - as opposed to representational- character.[23] By perceiving science in terms of a performative rather than a representational idiom, theorists take a "decentered perspective that is concerned with agency – doing things in the world" (Pickering, 2002: 414). Thinking along similar lines as actor network theory, he proposes that humans and nonhumans exist in a field of human and nonhuman agency. However, whereas Latour sees this agency as divided symmetrically, Pickering sees agency as primarily performative. That is, while it is semiotically possible to level agencies of humans and nonhumans, in *practice* this is not tenable. Pickering instead argues for a conception of agency that is temporally emergent in practices. Concretely this stipulates that when a person works with or on a technological artefact, the latter's agency becomes apparent. This material agency then begs a response from the person working with the artefact. The two are *mangled* and intertwined in a "dialectic of resistance and accommodation", "where resistance denotes the failure to achieve an intended capture of human agency in practice, and accommodation an active human strategy of response to resistance, which can include revisions to goals and intentions as well as to the material form of the machine in question and to the human frame of gestures and social relations that surround it" (Pickering, 1995: 22).[24] The emerging agency of the artefact triggers a response from the person that engages

23 Performance theory gained strength in the 1980's and 1990's (Barber, 2007) and suggests that "performativity is located at the creative, improvisatory edge of practice in the moment it is carried out" (Schieffelin, 1998: 198-99). Performativity was initially related to performative utterances or speech acts (i.e. an utterance as an act (Austin, 1962)) and also adopted in gender studies (Butler, 1990) to argue how gender is enacted in practice, rather than pre-given.

24 Pickering stresses that resistance should not be seen as constraint: Constraint lies within the human realm. Also, it is non-emergent, at least on the time scale of human practice. Resistance is different as it is used by Pickering to describe the real-time analysis of practice; "one has to see resistance as genuinely emergent in time, as a block arising in practice to this or that passage of goal-oriented practice" (Pickering, 1995: 65).

with the artefact; he or she then adapts intentions, or the use or the shape of the artefact.

Pickering uses the metaphor of the dance of agency to characterise this dialectic of human and nonhuman agencies.[25] The dance of agency implies a move away from dualist distinction between humans and nonhuman towards a perception of human-machine relations that are "inextricably entangled" (Ibid, p. 26). This is a move towards posthumanist theory, where human subjects are decentered and agency is an emergent process. Agency is no longer concerned with "the liberal humanist ethical position that humans, not machines, must be in control" (Hayles, 2002: 376), but instead views agency as distributed and subjectivity as temporally emergent in practice.

The dance of agency occurs via "tuning"[26], which refers to how human goals and intentions transform as scientists are confronted with materials in practice.[27] As such, Pickering regards goals as situated and inherently "vague".[28] The outcomes of the dance of agency are not predetermined and cannot be foreseen (Pickering, 1995: 57); it "cannot be decisively known in advance what problems are going to arise in attempts to manage material agency, nor can the ways in which human agency will be shaped by technology be foreseen" (Rose & Jones, 2005: 26). This contingency allows Pickering to pose the idea that some things "just happen".[29]

25 The dance of agency is performative in the sense that "to understand scientific practice (...) start by thinking about (a) the performance of scientists—what scientists *do*; (b) the performance of the material world—what things *do* in the lab; and (c) how those performances are interlaced with one another" (Pickering, 2012: 1-2). The emergence of agency points to the idea that by acting with technologies, these are adapted and given meaning. Material agency is temporally emergent in practices.

26 "Tuning" is related to Knorr-Cetina's idea of tinkering (Knorr-Cetina, 1981).

27 This notion has been criticized by (Gingras, 1999) who finds that Pickering's take on agency suggests that the latter is not an outcome of interactions, but presented more as a struggle (as Pickering uses terms such as resistance and accommodation).

28 This is also clearly put forward by Suchman, albeit not in terms of agency. She notes how "behavior can only be understood in its relations with real-world situations" (Suchman, 2007: 19). In these situations, the user is vaguely figured and the artefact deeply ambiguous (Ibid, p. 193). Courses of action "[depend] in essential ways on (...) material and social circumstances" (Ibid, p. 70). It follows that when technological artefacts are developed in environments of their intended use, "their appropriability into those environments (...) becomes a central criterion of adequacy for their design" (Suchman, 1994: 34). Suchman makes clear that plans are a form of ordering device but that, as ethnomethodologist Garfinkel argues, life exceeds enframing moves. The question is how people align between ordering devices and the heterogeneity of "intrinsically indefinite events" (Suchman, 2007: 193). Ethnomethodologists do not study this alignment in terms of order or chaos, but "bracket" these distinctions and to treat the differences between the two as an effect of the practices rather than as a resource for analysis. To trace procedures of action then, it is important to analyse the meanings that are assigned to local activities – or how rules come into being through action. Suchman stresses that ordering devices such as plans and scripts "are woven intrinsically and powerfully into the fabric of everyday activity" (Ibid, p. 205).

29 Although there is thus no "comforting causality", he does argue that the dialectic of resistance and accommodation offers a means or model to try and explain how contingency is interwoven into patterns that we can understand (Pickering, 1995: 24). At moments of frozen "interactive stabilization", it does become possible to recognize "a relatively fixed cultural *choreography*, encompassing, on the one side, captures and framings of material agency, and, on the other, regularized, routinized, standardized

The dance of agency has been applied to analyse a multitude of practices: agile software development (Marick, 2008), police-perpetrator interactions in cases of domestic violence (Guzik, 2008) and the confinement of livestock (Coppin, 2008) to name but a few.[30] In the field of organisation studies, Orlikowski calls for an application of the ideas of Pickering to investigate the "everyday materiality of organizing" and the "intermingling of materiality within practice" (Orlikowski, 2007: 1446) to move beyond studies that separate human actions and technological artefacts. She argues that by black boxing technologies, too little attention is paid to the multiple, emergent, and shifting sociomaterial assemblages and configurations that constitute organizations (Orlikowski, 2009).[31] The same sentiment is put forward in the work of Rose and Jones (2005) in which they focus on the interplay between human and material agency to understand the relationship between IT and organizations.

In the context of this dissertation, the concept of the dance of agency is relevant to regard user innovativeness. First of all, it allows the articulation of how the intertwined relations between users and technological artefacts (in various stages of development) are performed; how the dialectic of resistance and accommodation occurs. Secondly, it helps explain what this dialectic implies when related to an overarching Living Lab-goal of translating the interactive stabilization that is the outcome of the Living Lab-project into an "innovative" ICT product or service. I use the concept of the dance of agency on both the level of human-nonhuman entanglements in the sociomaterial configuration of the Living Lab and the subsequent framing of (the outcome or rather performance of) this dance by Living Laboratories as innovative. However, I do not only use the dance of agency to describe these practices, but also relate these to the concept of improvisation.

There are parallels between the dance of agency and improvisation; both emphasise the emergence of "the unforeseen" in practice, both stress a tension between goals and "obstacles"

disciplined human practices" (Pickering, 1995: 102). "Practices", he goes on, are not to be confused with "in practice"; practices (in situations) become stabilized in practice (in processes). Pickering goes on to posit that what in STS has been labeled "tacit knowledge" is a slippery concept. He views this knowledge not in terms of "enabling" one to act (build a machine), but more in terms of "a fortunate passage through the mangle" (Pickering, 1995: 102-3, footnote 28).

30 Pickering's posthuman dance of agency has also been criticized in STS-literature. Gingras for example, on reviewing The Mangle of Practice, questions – among many other points of critique- what kind of material agency is at work if only "resistances" define material agency (Gingras, 1999: 312; Gingras, 1997). Furthermore, he highlights Pickering's recurring statement that "some things just happen" (e.g. Pickering, 1995: 24) and draws the conclusion that in Pickering's view, contingency is only limited by resistance. In a review of "The Mangle in Practice" Sayers (Sayers, 2010) criticises the "slippery" use of the concept of agency in Pickering's work and questions how the mangle could account for "normativity and exclusion as it privileges performance and difference" (Ibid, p. 309). On a more general level, Bijker, Hughes and Pinch critique the posthuman turn in STS by stressing that "there is no ontology without epistemology. As soon as one talks about nonhuman one is representing nonhuman entities" (Bijker et al., 2012: xxv).

31 Although Orlikowski calls, in an earlier text, to speak not of human and material agency, but rather human agency and material performativity to avoid too many parallels between Pickering's ideas and those of actor network theory (Orlikowski, 2005: 185).

to reach these goals. However, where the dance of agency views practices in terms of an emerging dialectic of resistance and accommodation of agency, improvisation stresses a play with(in) structures. By relating these two concepts it becomes possible to articulate how first of all, the dance of agency between users and technological artefacts can be viewed as generating new ideas and ICT products and services. Tying improvisation to the dance of agency emphasises the performative, emergent character of sociomaterial configurations, while at the same time paying close attention to how these interactions are deemed "innovative". By referring to improvisation in terms of the dance I explicitly draw out how these interactions create something new.

Secondly, connecting the dance of agency to improvisation also makes it possible to describe how the changing of goals of users while engaging with materials/technologies leads to something innovative. It offers a way to catch the "unexpectedness" Living Labs associate with their approach by drawing out improvisations with(in) everyday contingencies, by highlighting situatedness of interactions and finding how users act as experts of "the everyday".

Thirdly, taking into account the idea that improvisation offers a conceptual tool to describe how situated innovation and the situated expertise of users is performed in Living Lab-settings, relating improvisation to the dance of agency offers a means to regard improvisations in terms of the performance of human and material agency – something that is currently missing from literature about improvisation. I therefore couple the concepts to analyse how users are facilitated in Living Labs to exercise agency and contribute their situated expertise. The idea of facilitation by Living Labs points to a last important point; improvisation practices do not only take place on the micro level of the user-artefact. As practices "unfold" in the daily life Living Lab setting, it also becomes possible to see how on the meso level of the Living Lab improvisation practices take place; the goals of the Living Lab may change in response to or in accordance with the practices taking place within the lab. This should be taken into account; after all, the actors that are part of the Living Lab decide when an idea, artefact or practice is innovative.

2.5 Methods

In this section I summarise my conceptual framework, the subsequent sub-questions flowing from the application of this framework to the main research questions and the research methodology, case study selection and research limitations.

2.5.1 Conceptual framework

Improvisation practices, user agency and innovativeness are central concepts in the following empirical chapters. To answer the questions of how processes of user innovativeness are shaped and facilitated in Living Lab-practices and what this means in terms of thinking about the kind of innovation practices constituted in Living Labs, the previous sections provided an overview of ideas about the innovativeness of technology users, coupled with the notions of improvisation and the dance of agency which draw attention to the emergent practices associated with innovation and innovativeness. Here, I translate these ideas into a number of conceptualizations to specify how I view processes of user innovativeness in Living Lab-

practices:

- Living Laboratories can be considered as sites and organizations that work to produce innovative ICT products and services by configuring end users of technologies as contributors to the innovation process and by configuring "uncontrollable" daily life environments – the living - as the laboratory.
- Innovation is both about processes of creating and adopting new technologies that are new from a specific perspective.
- To understand user innovativeness in Living Labs I conceptualise the relations between users, technological artefacts and daily life settings in terms of a dance of agency; where agencies are performed in practice through a dialectic of resistance and accommodation.
- I connect improvisation to this dance of agency. Improvisation is the unforeseen play with structures (goals, materials) in response to new materialities and contingencies of daily life. This means that I look at how in practice the entanglement of agencies leads to unforeseen practices.
- I further relate improvisation and the agency of users to user innovativeness by noting how Living Lab actors regard user improvisations as instances of "situated expertise". That is, how users are treated as experts within the Living Lab-setting. This means that I analyse how user practices are recognised as displays of situated expertise by the Living Lab actors.
- Improvisations can be studied at the level of daily life user-technology interactions and at the level of the Living Lab. Users may express unforeseen ideas and practices as they become part of Living Lab-practices in the daily life setting. These ideas and practices become innovative once they are recognised as such by the actors at the level of the Living Labs.

2.5.2 Research sub-questions

Applying the conceptual frame to the main research questions *How are processes of user innovativeness shaped and facilitated in Living Lab-practices and what kinds of innovation practices are constituted in Living Labs*, the following four sub-questions can be formulated:

1. How is user agency configured in Living Lab-practices?
2. How do users improvise (with) new technological artefacts in Living Lab-practices?
3. Are user improvisations recognised as situated expertise and as such facilitated in Living Lab-settings?
4. Are practices of user innovativeness perceived as innovative by Living Lab-initiators?

The first sub-question draws attention to the agency of users; answering this question helps to understand how users are positioned as actors within Living Lab-practices, keeping in mind the sociomaterial configuration of the Living Lab that is situated in the "uncontrollable" daily life setting. It questions how user agency is shaped in practice. Questioning how

users improvise within Living Lab-practices (the second sub-question) draws attention to how agencies "mangle" in practice, while at the same time drawing attention to how these improvisations may be "unforeseen". The third question connects these improvisations to the situated expertise of users. Question four reflects on whether practices of user innovativeness are perceived as innovative by Living Laboratories. Ultimately, these questions help draw conclusions about how user innovativeness is shaped and what kind of innovation practices are constituted in Living Lab-practices.

2.5.3 Data collection: multiple case study research strategy guided by preliminary exploratory analysis

The research strategy chosen for data collection is a multiple-case study research approach. This choice was made for two main reasons. The first was to provide fined-grained and in-depth insights in how user innovativeness is actually shaped in Living Lab-practices.[32] Secondly, this approach was chosen because the case study, generally, is identified as an empirical enquiry which works best to investigate a phenomenon in its real-life context when the boundary between the phenomenon and the context is not sharp, and contextual conditions are potentially important (Yin, 2002: 186). It is precisely this boundary, or rather the interconnectedness between the phenomenon (the Living Lab-project) and its daily life setting that is part of the object of study here. More specifically, the analyses deal with how this relationship was translated by the involved actors in each case; what kind of meaning is attributed to user involvement by the other Living Lab-actors, and to user-technology practices in the daily life setting? The case study approach is therefore used to "understand the dynamics present within [the] setting" (Eisenhardt, 1989: 534) which requires an on-going interpretation of data from multiple sources. In addition to this, conducting case study research requires a kind of flexibility on the part of the researcher to "be thoroughly prepared to concentrate on a few things yet ready for unanticipated happenings that reveal the nature of the case" (Stake, 1995: 55). As unanticipated happenings are both important to be able to articulate improvisation practices and one of the reasons d'être for Living Labs as such, this strategy also seemed very fitting.

The strategy of a *multiple* case study is furthermore appropriate to analyse Living Lab-practices. As Chapter 1 stipulates, the range of ways in which users are involved across Living Labs is very broad; there is not one way in which users are included. Therefore, in order to

32 Reflections about practices of user involvement are a noted gap in Living Lab-literature. Berte and colleagues for example argue that there is an empirical lack of evidence supporting the benefits of user involvement due to the more technology driven focus of current Living Labs-practices (Berte et al., 2008: 4). Følstad meanwhile, calls attention to the ideas put forward by Mirijamdotter et al. (2006) and Niitamo et al. (2006) that "users are seen more as "*sources of (predefined) technology use*", rather than "*sources of innovation*" (…) which suggests that, at least in some Living Labs, co-creation is an ambition rather than a realized approach" (Følstad, 2008: 108). At the same time, Følstad concludes that "the Living Lab trend towards a sharper focus on early-phase innovation activities such as context-of-use research and co-creation seems promising as a way of improving user involvement in ICT innovation processes and thereby realising the innovative potential of the users" (Ibid, p. 122).

be as elaborate as possible within the limitations of this research project, the choice is made to investigate a range of Living Lab-user involvement practices. More specifically, three user engagement "roles" are investigated; a case where users are involved as designers of new ICTs, a case where users are involved as testers within a Living Lab-project and a case where users as involved as co-creators of new ICTs. These three "types" of users were chosen based on the exploratory analysis of the European Network of Living Labs that is presented in Chapter 3. I undertake this exploratory analysis to (1) create a clearer view of who the users in Living Labs are, how these are referred to and how they are included; and to (2) inform my case study selection. I focus on three different Living Lab-projects in which users are positioned and included in different guises. I aim to conclude how differences in user agency, improvisations of users with technological artefacts are translated by Living Laboratories into innovative ICT products and services. In line with this, I also compare and contrast "user innovativeness" in three different Living Lab-practices.

That is not to say that the three cases are equated; as all focus on different kinds – albeit related- forms of ICTs, it is not my intention to prove a point of which form of involvement "works best" to stimulate user innovativeness. Instead I paint a diverse picture of the different routes taken towards this innovativeness. I turn to three Living Lab-cases where users are included in different ways and where thus perhaps different forms of user innovativeness may be observed.

2.5.4 Case study selection: users designing, testing and co-creating smart technologies

In the empirical chapters that follow, I analyse three cases where users are included in three different "roles" in Living Lab-projects that are set in three different environments. The exploratory analysis of the European Network of Living Labs, that I present in Chapter 3, will illustrate that there is no "one user" who is involved in Living Lab-practices of technology development; involved users of technologies are very heterogeneous in character, as are the means and methods through which these users are included. To explore a range of roles that users have in specific Living Lab-practices, I therefore choose to focus on three different user roles: that of the user as designer, of the user as tester and of the user as co-creator of new ICTs.

Examining a range of roles that users have in specific Living Lab-practices grants insight in the diversity of ways in which user innovativeness is constructed in these practices. Users may be seen to improvise in various manners as they design, test and co-create technologies; performing practices which lead to differently recognised forms of innovativeness. Material creations may be deemed innovative as users become designers, while uses of technologies can be recognised as innovative in the case where users are testers. Where users are co-creators, they are not only included in the beginning of design practices, or solely at the end, but included across development practices, which could open up new ways in which users are seen as innovative in their ideas related to and uses of ICTs.

What connects the three cases "in technological terms" is the type of technology developed or tested. In all three cases, I focus on user inclusion during the development of

so-called "smart" technologies in different urban environments. Smart technologies ensure, by means of pervasive computing - embedded devices and connected sensors and actuators (Klein & Kaefer, 2008) - the establishment of smart environments. The technologies in smart environments are mobile, embedded in existing infrastructures, invisible, localised (i.e. context-aware) and able to "mask" uneven conditions between smart and "dumb" spaces (Satyanarayanan, 2001). In line with notions of the Internet of Things, where relationships between humans and objects becomes reformulated as the latter may both be analogously and digitally approached and objects communicate to each other via RFID tags[33], smart technologies collect data to enhance "standards of living".[34]

In the face of large scale urbanization, technology developers and policymakers use the concept of the "smart city" as a future vision of how ICT can enhance urban living environments.[35] According to Weening (2006), the central overarching characteristic of the smart city is the key relationship between telecommunication technologies and the city (Weening, 2006: 3). The discourse surrounding this relationship is one of utopian technological determinism, where technologies have a positive "impact" on societies. These technologies furthermore focus on two types of technological developments: ICT developments to enhance social capital (e.g. providing cities with digital portals where citizens can access services and interact) and ICT infrastructure developments, focused on the wired city that engage commercial parties and initiate public-private partnerships for business and employment opportunities (Weening, 2006: 3-5).[36]

Labelling technologies, cities and communities as smart creates specific expectations. "Smartness" carries very strong overtones of an ideal type of future city where citizens engage in "a wise management of natural resources" through participatory governance (Caragliu, Bo, & Nijkamp, 2009) by means of investments in social capital, coupled with technological developments (ICTs). This reference to a future city that is "smart" at the same time suggests that contemporary cities, technologies and communities are still somewhat not-smart or "dumb" and that becoming smart requires the use of technologies that collect data to enhance living in urban surroundings, and that form the interface through which citizens partake in

33 http://www.theinternetofthings.eu/internet-of-things-what-is-it%3F (accessed on 23-5-2013).

34 Previous work in STS investigated the use of pervasive technologies such as ambient intelligence in relation to for example representations of elderly users (Neven, 2011). This thesis focuses on the connection between pervasive technologies and urban dwellers or citizens.

35 The concept is one in a long line of metaphors, employed since the 1980's to envision "the future city". These include "the invisible city" (Batty, 1989) and the "informational city" (Castells, 1989) and the "telecity" (Fathy, 1991 all in Weening, 2006).

36 Hollands (2008) summarises the concept of the smart city by highlighting a number of characteristics. These include (1) the use of networked infrastructures to "improve economic and political efficiency and enable social cultural and urban development" (Komninos, 2002; Eger, 1997 in Hollands, 2008: 307); (2) the emphasis on business-led urban development; (3) the changing role and function of urban governance; (4) a concern with digital media, the arts and cultural industries more generally; (5) the relationship with smart communities which stress social learning and social capital and (6) "a concern with both social and environmental sustainability" (Hollands, 2008: 308-310).

and at the same time shape governance processes.[37]

In Living Laboratories, users (citizens in various roles in this case) are included in processes set to democratise design. Smart cities, in turn, invite a democratization of governance through the use of ICTs. Combining efforts of Living Labs with those of smart cities and smart technologies seems a step in the direction of making people part of the creation of new sociotechnical configurations, thus drawing attention to the social dimension of the sociotechnical system. It seems that the promise is that inviting citizens to shape the technologies will not only make their living environments smarter, but at the same time make users more tech-savvy as they engage in creating their own "smart technologies of the future". Indeed, involving citizens in this way would create smart citizens, who are engaged in the development of technologies that serve them and the cities they dwell in.

The three case studies focus on three different "smart" technologies. These technologies are, in turn, developed or implemented in different real life settings and applied to different domains. In the first case study, a public park in the centre of Amsterdam is the stage of the Lab where technologies are developed in the educational domain; to teach high school students to build prototypes as designers using smart sensors that measure pollution. In the second case study, a busy shopping street in Amsterdam becomes the setting of the Living Laboratory where entrepreneurs test sustainable ICTs that measure energy use. In the third case study, the Lab consists of two neighbourhoods in the city of Ghent. Here, citizens are invited to co-create a community game set to increase social cohesion.

At a first glance, these domains may not be related. What does connect these cases – apart from the fact that all three are Living Lab-projects that focus on "smart" technologies - is the fact that the Living Lab-settings are urban environments, where users are engaged not only to be involved in developing new ICTs, but also of relating to their urban environments in new ways. Connecting these to the notion of a smart city and the ideas stipulated about smart technologies and cities, their relatedness becomes much clearer; all three cases seek out a different dimension of what it means to be a smart city as all use technologies to somehow increase the "smartness" of the city and its citizens.

37 The relation between telecommunications and the future cities is critically reviewed by Graham (1997, 2004), who articulates five myths about this relationship – the myth of technological determinism, urban dissolution, universal access, substitution of transportation by telecommunication and the myth that assumes local powerlessness of people (Graham, 1997). He furthermore describes how "new media" transitioned from being perceived as a "dazzling light" on the urban horizon, to a situation where these are seen as interwoven into the fabric of everyday life. As a consequence, these new media are no longer experienced as "new", but part of an invisible system that is miniaturised, socially normalised and where attention is no longer directed at the areas that are covered by technologies but instead toward areas that are not. Therein lays, according to Graham, a paradox; "For at this time, the sociotechnical configurations of politics, representation, spatiality and power that tend to be embodied by, and perpetuated through them, tend to be even harder to unearth and analyse. The […] final key research challenge, then, is to be acutely conscious of the growing invisibility of sociotechnical power in contemporary societies" (Graham, 2004: 23).

SensorLab: users as designers

The first case study focuses on a project connected to Amsterdam Living Lab. Amsterdam Living Lab was set up in 2008 to – in its own words - "establish the European Center for design and development of products and services in the area of ICT and new media. This is done by a strong focus on tools, methodologies and knowledge on measuring and understanding behaviour and experience".[38] The partners of Amsterdam Living Lab, the University of Amsterdam, Waag Society[39], knowledge-center Novay[40] and the Amsterdam Innovation Motor[41] work together to gather and share knowledge about user experience in order to be able to develop new products and services. Amsterdam Living Lab's projects cover a number of themes, such as mobility, new media, co-creative design, environmental durability, e-health, social cohesion and tourism. Its approach is summarised as "experimentation and co-creation with real users in real life environments, where users together with researchers, firms and public institutions look together for new solutions, new products, new services or new business models".[42] Per project, different commercial and civic partners are sought.

The project I selected as case study where users are included as designers is the SensorLab. In the SensorLab, high-school students of five different secondary schools are enrolled as designers of pollution-measuring prototypes (on the 22nd of September 2010). Working collectively and together with sensor-experts, they build and test "outrageous" prototypes which not only measure pollution levels but also alert citizens in a public park to this pollution. These students are not only learning about design and about sensor-technology, but also educating people in the park about pollution (and the importance of sustainability). The data they collect using their prototypes, is also set to be shared with environmental scientists – in the context of Al Gore's Globe program. In becoming - in the context of the SensorLab - designers for a day, these students effectively engage in citizen science.

Data collection in this case included observing and recording the activities of the students within the setting of the SensorLab. Specifically, the group discussions that took place on the 22nd of September were recorded, transcribed and subsequently analysed. In addition to this, I attended one team meeting (on the 14th of September 2010) hosted by Waag Society prior to the SensorLab where the involved experts (from Waag Society and Hogeschool van Amsterdam) met and was given access to SensorLab-related documentation which was also used in the analysis.

The Climate street: users as testers

As the first case study, the second case study also focused on a project connected to Amsterdam Living Lab: the Climate street. As "pioneers" of the holistic concept of a sustainable shopping

38 http://www.openlivinglabs.eu/sites/enoll.org/files/amsterdam-living-lab.pdf (accessed on 23-5-2013).
39 http://waag.org/en (accessed on 12-2-2012).
40 http://www.novay.nl/about-novay/22 (accessed on 12-2-2012).
41 http://www.aimsterdam.nl/ (accessed on 12-2-2012).
42 http://waag.org/en/project/amsterdam-living-lab (accessed on 23-5-2013).

street, 40 entrepreneurs of a shopping street in Amsterdam were enrolled as testers to work to reduce their energy consumption using smart technologies such as smart meters, plugs and display. While learning how to use these technologies, the idea is that they become "smarter" users of technologies while at the same time promoting the use of sustainable technologies to other entrepreneurs (Amsterdam Smart City, 2011d).

While in the previous case, data was collected while a technological artefact was being developed, here I needed to reconstruct the case; the entrepreneurs in the shopping street had, over the course of two years (2009-2011), tested technologies. I attended several events that were organized about the project (between 2009 and 2011) and I interviewed seven entrepreneurs that participated as testers: retailers, service providers and food and beverage companies. The interviews were semi-structured and took place in October and November 2011. In addition to this, I interviewed the shopping street manager of the street and the Climate street's project leader. The interviews were transcribed, labelled and analysed. My insights were shared and discussed with the organization who oversaw the project during a "dialogue session" that was organized in January 2012. The analysis was furthermore informed by published materials about the project, as well as project-related reports, newsletters and online sources.

SMARTiP's Swarm: users as co-creators

The third case study focuses on a Living Lab-project that was part of Ghent Living Lab and at the same time part of an overarching European project, SMARTiP (Smart Metropolitan Areas Realized Through Innovation and People) which ran between 2010 and 2013. The Living Lab is coordinated by the City of Ghent, with research partners iMinds, Digipolis, Ghent University, the University Colleges Hogeschool Gent, Arteveldehogeschool and KaHo Sint-Lieven. Ghent Living Lab focuses on e-inclusion, e-government and e-participation, digital innovation through the development of ICTs for smart cities, and smart energy.[43]

Its approach is to employ methods of co-creation to create a platform where citizens, experts and researchers are brought together with entrepreneurs to develop and enhance innovations. Users are included from the beginning of developments, to aid the analysis of user needs and ideas. User panels are furthermore included to develop ideas and to test prototypes. The users is included and treated as an equal co-creator.[44]

Within the context of the European SMARTiP project, citizens became co-creators of the community game, "Swarm". This involved development processes where citizens of Ghent were not only involved in developing a game, but in doing so and in playing the game were also expected to contribute to overcoming the digital divide and increase social capital or social cohesion within their neighbourhoods. To achieve these goals a pervasive game was developed, playable via RFID-cards, mobile smart phones, different physical artefacts in the neighbourhood and online via PCs.

For this case, where citizens are included during the development phases of the ICTs,

43 http://www.openlivinglabs.eu/livinglab/ghent-living-lab (accessed on 23-5-2013).
44 http://www.ghentlivinglab.be/en/node/6 (accessed on 23-5-2013).

I combined primary and secondary document analysis, observations and transcriptions of discussions during one co-design and two focus group sessions (in March 2012 and September 2012) and five team meetings (between January and September 2012), as well as conducted two short interviews with people who were part of the testing phase of development (July 2012). The primary documents that I analysed were: (1) the data collected by the team during the first step of development, namely the crowdsourced ideas of citizens that were collected on a website (2) the European project description and vision reports written by the SMARTiP team (3) technical documents provided by the team and (4) the responses provided by testers of the game to an online questionnaire. Secondary documents included: (1) publications and presentations about the project by the team (2) reports about the co-design sessions written by students of the University of Ghent's communication Bachelor.

In all three cases qualitative research methods were used to gain insight into how these users improvised with new smart technological artefacts (level of the artefact) and how the Living Lab subsequently recognised these improvisations as innovative. Questions of agency are thus related to sociomaterial improvisation processes at both the level of the artefact and at the level of the Living Lab to ultimately be able to compare improvisation practices in Living Labs within the area of smart technologies.

2.5.5 Research limitations

The multiple case study approach has its limitations. While the multiple case study strategy grants in-depth insight into phenomena in their context, it does not lend itself to draw grand conclusions and generalise findings statistically about an entire field of practice as a lack of control over variables of the case limit the "internal validity of any conclusions" (Cavaye, 1996: 229). The analysis presented in this dissertation uses methods such as document analysis, observations and (semi-structured) interviews to trace how user innovativeness is shaped and facilitated in Living Lab-practices, without aiming to draw conclusions about Living Lab-practices *as such*. The qualitative insights gained through the three case studies, in their particular complexities of user-technology dynamics, may however point to ambiguities that are also apparent – and perhaps recognised – in other Living Lab-projects.

The analyses presented in the empirical chapters of this dissertation are limited in the following ways. In Chapter 3, the exploratory analysis of the European Network of Living Labs focuses on the 130 Living Labs that were part of the network as it was presented on the ENoLL website between September 2009 and January 2010. Between 2010 and 2013, 188 new Living Labs joined the network. Needless to say, this analysis is thus not "complete". There are several reasons why I made the decision to limit this analysis to 130 Living Labs. First of all, the analysis does no aim to formulate "the definitive" overview of Living Labs, due to the fact that the Living Lab-approach is a moving target and the European Network of Living Labs is constantly changing. Rather, this exploratory analysis should thus be seen as a more general overview of the Living Lab-landscape. Furthermore, keeping in mind the challenges to the approach presented in literature after 2010, the question is also whether the landscape changed to a great extent between 2010 and 2013. Secondly, this analysis should be seen in time; it formed the starting point for my research and case study selection. By

exploring the broadness of the Living Lab-phenomenon as it was presented in 2010, I was able to delineate certain overarching characteristics of users, user representations and methods of user inclusion which formed the basis of my thesis.

Chapter 4 is limited to observations made during one "users as designers" workshop. This would arguably offer limited insights in the dynamics of improvisations and user innovativeness. However, the SensorLab offers an in-depth view of how these dynamics take place in practice. Chapter 5 is also limited in scope in terms of 1) the number of entrepreneurs interviewed and 2) actor involvement analysis; access to interviews with more entrepreneurs and the companies supplying the sustainable ICTs was not granted. In Chapter 6, I was allowed to follow the development processes and user inclusion practices in SMARTiP. However, due to time constraints, I was not able to observe the implementation phase of the project and view how the co-created technological artefacts were used by citizens in practice. The limitations did not result in insurmountable issues; triangulating the documents, collected observation and interview data was deemed rich enough to grant insights in how the users are included, configured and facilitated to engage in bottom up innovation.

Chapter 3. Exploratory analysis: Living Labs' users across the European Network of Living Labs

As an object of analysis, Living Laboratories are a "moving target". The relative newness of the approach, coupled with the proliferation of definitions, user inclusion methodologies and promises shows they are not set in their ways. To zoom in on the role of users in this approach, I begin with an analysis of Living Laboratories that are connected to the European Network of Living Labs. In the next section I briefly introduce this network. The objective of the subsequent analysis is to articulate who actual Living Lab-users are, how users are referred to and what kinds of methods of user-inclusion are used. In the concluding section, I discuss how Living Labs position the (end) user as part of the Living Lab-approach and explain how this positioning informs my case study selection.

3.1 The European Network of Living Labs

The European Network of Living Labs (ENoLL) was set up under the auspices of the Finnish EU presidency in 2006 and the related Helsinki Manifesto.[1] The main goal of ENoLL is to:

"Establish a European platform for collaborative and co-creative innovation, where the users are involved in and contribute to the innovation process. This approach should ensure that common methodologies and tools are developed across Europe that support, stimulate and accelerate the innovation process" (Helsinki Manifesto, 2006: 4).

Collaborating parties promote a "human centric" (Schumacher & Niitamo, 2008) way of turning the Lisbon Strategy[2] into a living reality. Together with the i2010[3] policy proposal

1 The seven points of the Manifesto are:
Opening EU-wide procurement of R&D for innovation within public Services
Creation of EU-wide standardised and harmonised banking and financial eServices
European Network of Living Labs as a way to enhance European Innovativeness
Increasing interoperability and creating EU-wide standards and eServices
Setting up a Strategic Task Force over the Presidencies in 2007-2008
The horizontal programme within the 7th framework programme for EU-wide knowledge-intensive service society development
Enabling working environment
Source: http://elivinglab.org/files/Helsinki_Manifesto_201106.pdf (accessed on 17-7-2009).

2 The Lisbon strategy (2000) was set by the European Council to transform the EU into a competitive and dynamic knowledge-based economy, capable of sustainable economic growth. Together with the European Research Policy implemented in 1984, it focuses on achieving these goals by investing in knowledge and R&D efforts. Framework programmes for Research and Technological Development (FP's) are the key instrument of the European Research Policy. FP's are managed by the Directorate-General for Research. http://ec.europe.eu/dgs/research/index_en.html (accessed on 6-12-2009).

3 Follow up of eEurope 2005 adopted at the Sevilla Council in 2002 and itself the successor to the eEurope 2002 action plan launched in 2000. It has a clear focus on stimulating standardization, job

adopted by the European member states and the European Programme for Competitiveness and Innovation (CIP), a "revitalised" Lisbon Strategy (2000) should give Europe "strengthen[ed] European global competitiveness and innovation" (Helsinki Manifesto, 2006).

In 2006, 19 Living Labs joined the network. Partners were not only the Living Labs, but also organizing and coordinating bodies such as the European "TELL ME" network[4], the Living Lab Open Community, CLOCK, CoreLabs[5] (and later CO-LLABS[6]). Academic institutes and large industrial players, such as Nokia, were also part of the network.[7] Over time, more Living Labs joined the network[8]. It even expanded to include non-European countries to foster the development of and connections with Living Labs networks outside Europe (in for instance China and Brazil in 2011).[9] Currently, 320 Living Labs are connected and there is a call to join the seventh wave of Living Labs.

The European commission is a central actor in the network. Since 1986, different European frameworks have stimulated international cooperation on the level of ICT

creation and the establishment on collaborative platforms.

4 The main objective of Tell-Me is to "democratize Living Labs and the innovation processes in Europe. It tries to expand the European-wide service infrastructure for the adjustment, implementation and maintenance of Living Labs in the areas of e-government, e-democracy and e-services". http://old.e.toscana.it/linea3/documenti/TELLME/tell-me.pdf and http://www.tellmeproject.eu/ (accessed on 6-12-2009).

5 "The overall objective of the CoreLabs is to achieve a coordination of activities towards the establishment of co-creative Living Labs as the foundation of a Common European Innovation Infrastructure concept on several levels". Project duration of CoreLabs: 03/2006 – 02/2008 http://cordis.europa.eu/search/index.cfm?fuseaction=proj.document&PJ_LANG=EN&PJ_RCN=8507982&pid=9&q=C3C6F34951BBE16A8A490B7BE681DDD5&type=sim (accessed on 14-5-2013).

6 The overall objective of CO-LLABS is to achieve a "European-wide adoption of ICT-based Living Lab services and practices to allow SME's to improve their innovation capabilities and processes and become part of "open innovation" environments. It will support the interaction with policy makers at the regional, national and European level to establish consensus. Project duration: 4/2008 – 7/2010 http://www.livinglab-vorarlberg.at/cms/index.php?page=co-llabs&hl=en_US (accessed on 13-7-2009) and http://www.ami-communities.eu/wiki/CO-LLABS (accessed on 13-7-2009).

7 In policy context, these are based on the ICT-PSP – CIP program coordinated by ESoCE-NET. The ESoCE-NET, European Society of Concurrent Enterprising Network, is a non-profit Organization bringing together academics, researchers and industry practitioners to stimulate the exchange of ideas, views, practices and latest research and developments in the field of Concurrent Enterprising. http://www.esoce.net/ (accessed on 21-7-2009).

8 During the Portuguese EU presidency (2007), the second wave of Living Labs was launched (adding 32 new Living Labs to the network). In the spring of 2008, the third wave -headed by the Slovenian presidency- allowed a further 68 new Living Labs to join the network. Subsequent waves saw the joining of 93 (wave 4), 62 (wave 5) and 46 (wave 6) labs. http://www.slideshare.net/openlivinglabs/european-network-of-living-labs-enoll-general-presentation (accessed 27-5-2013) and http://www.openlivinglabs.eu/news/official-announcement-6th-wave-new-enoll-members (accessed 27-5-2013).

9 This move is referred to as the globalization of the network to stimulate open collaboration. See for example slide 21 on http://www.slideshare.net/openlivinglabs/evolution-of-the-european-network-of-living-labs-alvaro-oliveira (accessed 24-10-2011).

development. The start-up of ENoLL was part of the 6th and 7th Frameworks[10], overseen by the Directorate-General Information Society and Media and the Directorate-General for Research. The DG's work to "detect" Living Lab initiatives to enlarge the network and stimulate the growth of the network via findings (which involves adapting Living Lab-plans to EU guidelines).[11]

3.2 Methodology

In Living Labs, innovation takes the shape of human-centric design that sets out to involve the daily life contexts and practices of ICT users. At least, this is one of the promises. Below, I explore the diversity of Living Labs in the European Network by reviewing who users are and how users are represented and included via various co-creative methods. In addition to this, I also focus on the goals and research themes that Living Labs focus on to gain insight in the context of user involvement.

I used a number of primary and secondary sources to complete my analysis. First of all, I performed a text analysis of the documentation each of the 130 respective Living Labs that were member of the European network in 2009 shared on the network's website, supplemented with information found on individual Living Lab-websites (where available). Data analysis consisted of coding the documentation by hand by the author; coding who the users of the Living Labs are according to the Labs, how users are referred to and what methods of user inclusion are described in the documentation. The Living Lab-data was accessed between September 2009 and January 2010 (lastly accessed on January 7th 2010).[12] The data was collected, coded and translated into a number of graphs and tables using Microsoft Excel 2010.

The text analysis' focus on Living Lab users and methods of user inclusion works to explore and delineate the multifaceted character of the Living Lab-concept and approach. For example, a Living Lab can refer to its practices as "co-creative", while referring to the involved users as testers and using test beds to test and further develop technologies. Or alternatively, a Living Lab may characterise its users as students who design and build prototypes and refer

10 FP7 is in line with i2010, which is divided into three pillars; (1) Creating a single information space (this includes revising regulations, supporting content creation and broadband as well as security issues; (2) Increasing EU investment in ICT research by 80% (including trans-European demonstrator projects and actions for SMEs); (3) Promoting an inclusive European information society (including better public services and quality of life actions with three flagship initiatives).

11 The relationship between the DG's and ENoLL is furthermore overseen by CORDIS http://cordis.europa.eu/home_en.html CORDIS, the Community Research and Development Information Service for Science, Research and Development, is the official source of information on the seventh framework programme (FP7) calls for proposals; it offers interactive web facilities that links together researchers, policymakers, managers and key players in the field of research. Source: http://cordis.europa.eu/guidance/helpdesk/faq_en.html The CORDIS-website also functions as a repository for project-outcomes. In parallel to this, the i2010 policy is overseen and advices by the ISTAG (an advisory body of the European Commission in the field of ICT) (accessed on 21-7-2009).

12 Appendix 1, chapter 3 provides an overview of the sources and documents that informed this analysis.

to user inclusion as "co-design". Performing this analysis does not lead to a definitive view of what co-creation means in the Living Lab-context. Rather, the exploratory analysis results in a description of the Living Lab-landscape that offers me a starting point for further in-depth analysis of user involvement and user innovativeness and informs my case study selection.

I present my findings in a series of figures and tables to illustrate the diversity of the Living Labs associated with ENoLL. At the same time, these figures allow me to draw a number of tentative conclusions about user inclusion in Living Laboratories. To place my findings in context and to test them, I use a number of secondary sources, such as a literature review and reports by one of the large stakeholders in the European Network, the European Commission as well as reports by the evaluative bodies of the European Commission such as CoreLabs and CO-LLABS.

3.3 Living Laboratory users, themes, goals and methods of inclusion

In this analysis I look at who is defined as a Living Laboratory-user by the 130 Living Labs themselves, followed by overviews of the themes and goals of the Living Labs. In subsequent sections methods of user involvement are reviewed, as are the representations that are attributed to users. In section 3.4 I draw my tentative conclusions.

3.3.1 Living Laboratory users

What type of users do Living Laboratories foreground as their users? After analysing the Living Lab-descriptions presented on the European Network of Living Labs-platform and individual Living Lab-websites, a number of distinctions can be made.

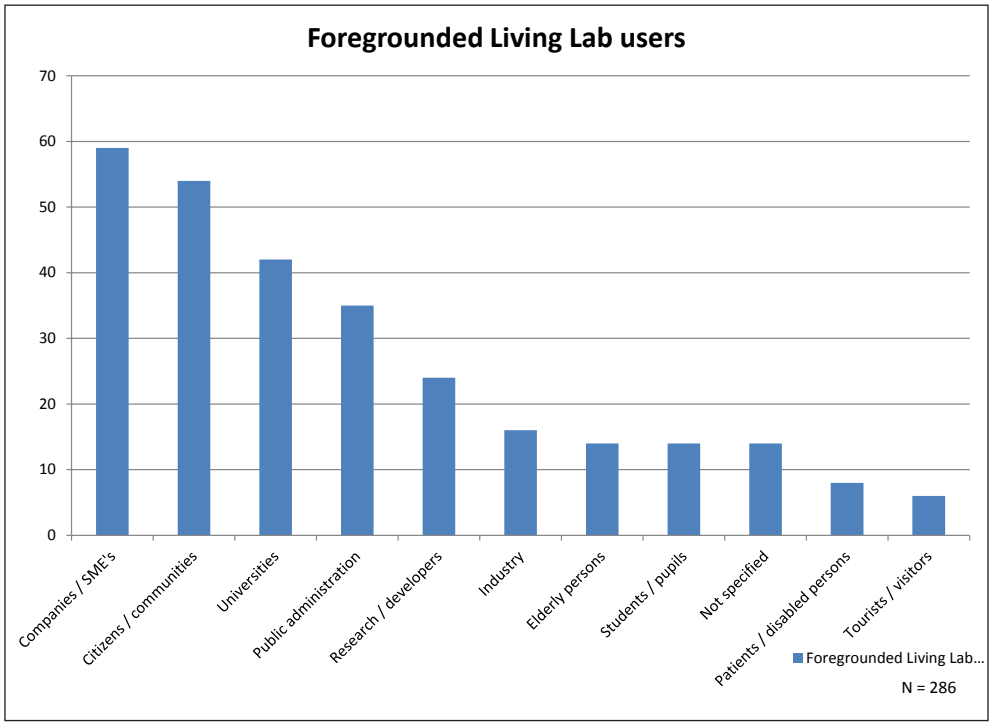


Figure 1: Lab users of Living Labs

First of all, noting the N = 286 total of users described by the 130 Living Labs, it is clear that individual Living Labs mention more than 1 or 2 types of users; Living Labs focus on multiple users. Secondly, a large part of the user group is represented by the "companies/ SME's" (small and medium-sized enterprises) category. The reference to these organizations, as well as to "industry", "public administration" and "universities" shows a clear focus on the open innovation-aspect of Living Laboratories; public and private parties are "users" of the public-private partnership that is facilitated by the Living Laboratory. Keeping in mind the relative newness of the Living Lab-concept, the repeated references to these types of users could suggest that currently, Living Labs have not (yet) specified the (demographic) user groups that their endeavors focus on as they are working on attracting sufficient organizations to help form public-private partnerships.[13]

13 This point is also made by Schaffers in the EU evaluation of Living Labs in ENoLL (Schaffers, 2009). He notes that there are ample opportunities for start-ups to become involved in Living Labs, but that

At the same time, the fact that these type of "users" are mentioned so often, could change the meaning of the Living Lab-goal of realizing "user-driven innovation". Are these users the users of the Living Laboratory (e.g. making use of the services offered by the Laboratory), or are these technology users (e.g. the ones alluded to when Living Labs describe their goals are working to realize "human-centric design")?

A third observation that can be made is that the "human category" of users is largely represented by "citizens and communities". The fact that this group is referred to extensively suggests that *locality* is important in Living Lab-research; Living Labs operate on the premise that they work to involve a local level – to produce and create ICT products and services that cater to local needs.[14] Textbox 1 illustrates how Living Labs refer to their different users.

Living Labs have not found their way to reach this market segment.

14 This is interesting, as one of the priorities of the entire network is to strengthen Europe as an innovation community. That would entail that local Living Lab practices should work to share their knowledge on a more regional or global scale.

TEXTBOX 1: Examples of Living Lab user descriptions (users of the Lab and users of technologies)

CITIZENS: RENER Living Lab, Lisbon, Portugal – "A key element is the involvement of the local community. The local population will be encouraged to get involved as users of new technologies and take advantage of it, playing an important role in the development, testing and acceptance of new emerging technologies. (…) At the same time it's expected that new jobs will be created in the community, reinforcing the commitment and the acceptance towards the project, as it will involve Portuguese companies and R&D institutes that typically face many obstacles to reach the market / commercial stages."
SME's: S. JOÃO DA MADEIRA INDUSTRIAL LIVING LAB (SJM-ILL) – "The target end users of the SJM-ILL are the local SMEs of the shoe and automotive clusters and their customers. The SJM-ILL is a co-creative space for innovation focused on giving empowerment to the local business, industrial community end users, by providing them with a user-driven Living Lab environment supported by stronger technological, innovation capacity and user involvement."

Public Administration: "LL EuroMedITI is a Malta-Government owned, not-for-profit limited liability company and the shareholders are: the University of Malta; Malta Enterprise; Malta Council for Science and Technology; and the Malta Federation of Industry. LL EuroMedITI provides: regional intelligence; project management expertise; infrastructure and support; and its core expertise is supplemented by its network of experts. Primary stakeholders include: local and regional, formal and informal clusters; academic institutions; government entities; SMEs; NGOs."

Textbox 1 shows a rich diversity of Living Laboratory users; users may make use of the Living Laboratory - for example, SME's – to develop something, but users can also be those "end users" of technologies (in the case of citizens). Living Labs use different manners to bring their users to the fore- or background. In the case of RENER Living Lab for example, the more social imperative of involving local citizens is brought to the fore, whilst this lab also notes Portuguese companies and R&D institutes as part of the partnerships. A Living Lab like S. Joao Da Madeira Industrial Living Lab meanwhile specifically targets local SME's in the shoe and automotive industry and their customers as lab users. Here, market organizations are foregrounded as lab users. These different presentations of users are closely related to both the thematics and the goals of the Living Labs.

3.3.2 Living Laboratory themes and goals

Figure 2 shows how Living Laboratories work in different thematic fields.

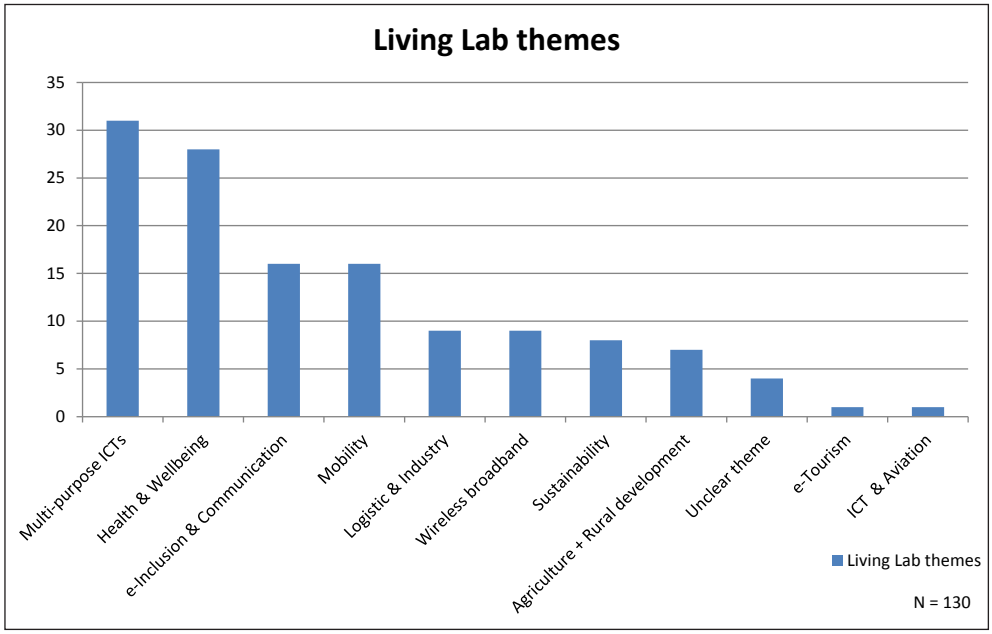


Figure 2: Themes of Living Labs

The most often mentioned theme is that of "multi-purpose ICTs". This refers to Living Labs that focus on the development, deployment or adoption of ICTs that are more generally applicable. The area of Health and Wellbeing is the most often noted specific theme, followed at some distance by e-Inclusion & Communication and Mobility. However, when comparing this information with the user-information in figure 1, users such as patients, disabled persons and hospitals are not one of the largest categories of users. Clearly, the Health & Wellbeing theme is directed at other users as well. What kinds of goals are related to these themes and to user inclusion?

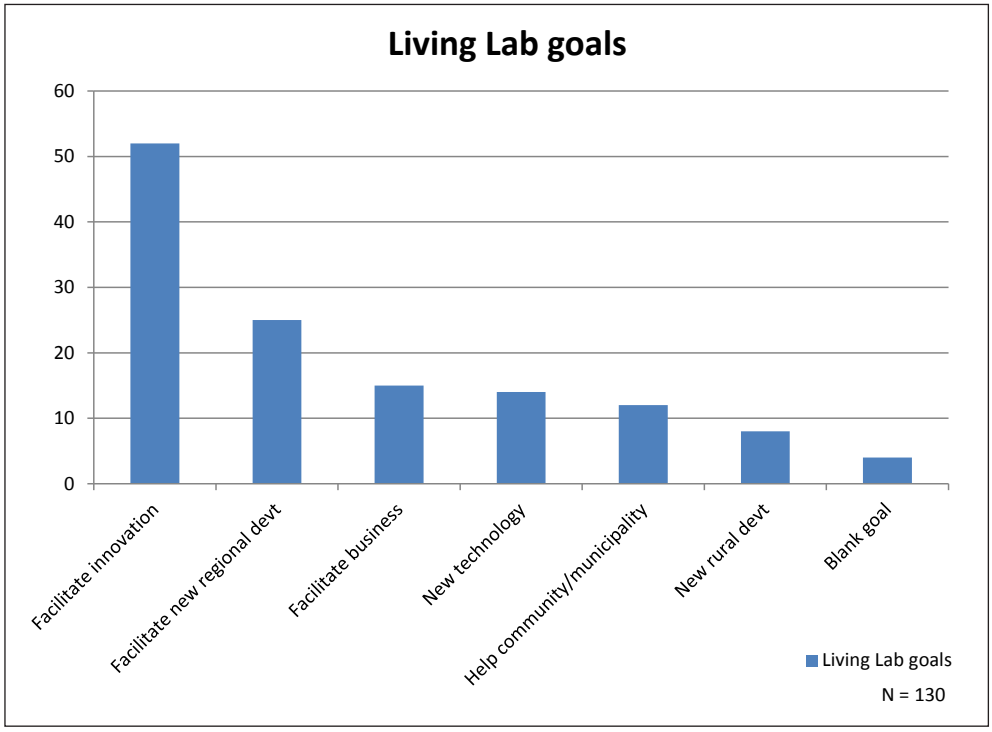


Figure 3: Goals of Living Labs

Connecting these goals to the above-mentioned themes, the large Health & Wellbeing theme could be related to the goal of facilitating innovation, which in turn would imply that Living Labs in that case would facilitate the development of new Health & Wellbeing-technologies (perhaps in the shape of an R&D space, or "homelab"). While "facilitating innovation", "new regional development" and to a lesser extent "facilitating business" are by far the most often noted goals, figure 3 also shows both a more technologically oriented goal ("new technology") as well as a societal goal ("help community/municipality"). The goals reflect a mix of business, R&D development and societal goals. Living Labs seem to have economic, research and societal orientations. Figure 4 illustrates how – in the sources - these three underlying orientations are presented in the documentation.

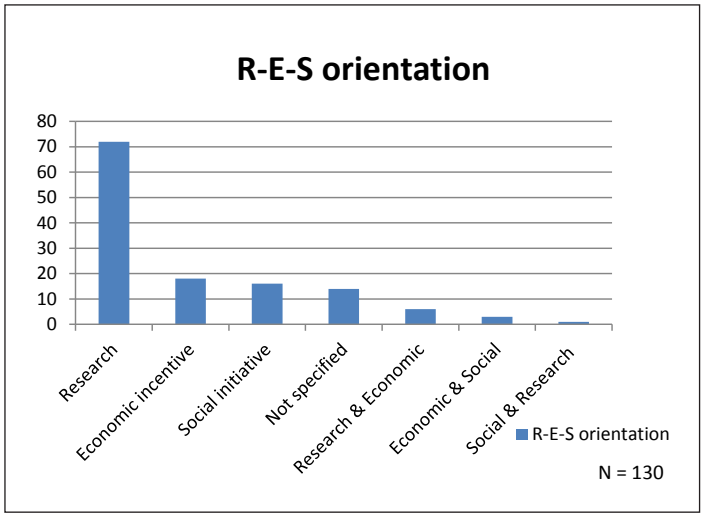


Figure 4: Orientation of Living Labs (research, economic or social)

The "research" motivator (comprising R&D research, as well as policy research) is the largest of the three, which is in line with the idea that innovation is central to Living Labs. However, as figure 3 suggests the largest amount of Living Labs work to facilitate this innovation and are not the primary developers of innovation. In other words, it seems that Living Labs provide the space (physical or as a virtual platform) to do research. The economic incentive and social initiative that are to be stimulated follow the research motivator. The second-largest goal, to "facilitate new regional development" suggests another dimension to the facilitating role; Labs wish to aid or function as a tool to allow countries to "put themselves on the map" of Europe, as an innovative country/region.

TEXTBOX 2: Examples of the research orientation of Living Labs

Amsterdam Living Lab, The Netherlands: "is the approach to establish the European Center for design and development of products and services in the area of ICT and new media. This is done by a strong focus on tools, methodologies and knowledge on measuring and understanding behavior and experience. And by creating processes with a strong link between design and understanding real life behavior of users. By creating this knowledge and test infrastructure Amsterdam can increase its position as the place to be for design and development of the experience. Understanding users and connecting to designers."

Airport Living Lab, Stockholm, Sweden: - "The Airport Living Lab project has two main objectives: • To perform high-quality research on open innovation and Living Labs concepts and adapting these to an airport environment. • To establish a self-sustaining Airport Living Lab at Stockholm-Arlanda Airport."

Botnia Living Lab, Sweden: "The main mission of Botnia LL is to serve as a facility for research, development and innovation - ***RDI***, for creation and refinement of ICT based services. Botnia's objectives include generation of new knowledge, methods and tools, for open user-centric research and innovation. Real products and services are experimentally developed in real-life contexts with real users." http://www.cdt.ltu.se/projectweb/472b900fc973a/LL_Botnia[1].html (accessed on 8-1-2010).

Textbox 2 illustrates the Research-orientation of Living Laboratories. It is not to say that Labs such as Amsterdam Living Lab, the Airport Living Lab in Stockholm and Botnia Living Lab do not have a social or societal goal. In their Lab descriptions however, the focus is on the R&D-element of the Living Lab. In the case of Amsterdam Living Lab, the development of new technologies will provide a strong position – with as ultimate goal becoming a European Center for design and development. Similarly, the airport Living Lab's focus on R&D in a specific setting points to a wish strengthen a position, to be unique even. Indeed, the chief mission of the Airport Living Lab is summarised as "making Stockholm-Arlanda Airport one of the world's most innovative and user-friendly airports"[15] (website European Network of Living Labs). The Botnia Living Lab's description is perhaps the clearest example of an R&D-focused Living Lab. Its main mission is to research Living Lab-methodologies in the process of developing new products and services, to enhance methodologies and tools.

15 http://www.openlivinglabs.eu/node/131 (accessed on 20-10-2009).

TEXTBOX 3: Examples of the social orientation of Living Labs

Living Lab Milton Keynes: "The concept of ConnectMK – the Living Lab for Milton Keynes – is to develop an open innovation platform, promoting social cohesion through the reduction and ultimate elimination of digital exclusion within the city."

Living Lab LEVIER (Laboratoire d'Expérimentation et Valorisation Images Et Réseaux): "There is also a wide diversity of users in LEVIER. One of the main specificit[ies] of LEVIER is to see the technology as a mean[s] to serve the use[r] and to develop services to the whole population on the territory: [it] advances users with high speed connection[s] and new services (ex: virtual reality), but also rural or maritime population which do not have access to broadband (…)."

Living Lab Cudillero Rural, Spain: "Nowadays the promotion of the new technologies support has been considered as a great opportunity to improve the coastal regions development and the fishermen profitability, diversifying local economies and finding new market niches. In that sense Cudillero Council has been chosen to research on collaborative technologies to provide people involved in the fishing sector in Cudillero with tools to innovate in their commercial processes, giving greater visibility to their products and to optimize the resources exploitation contributing to the sustainable fishing sector development through collaboration on board – on shore."

Textbox 3 provides examples of the more social orientations of certain Living Labs. These examples illustrate that some Labs want to help bridge a digital gap by providing a platform (Milton Keynes) or the technology or tools that are deemed necessary (LEVIER and Cudillero). In the case of Living Lab Cudillero Rural Spain, this entails that a specific group (fishermen) be empowered which suggests that this Living Lab has both a social and economic goal.

TEXTBOX 4: Examples of the business orientation of Living Labs

Suupohja Living Lab, Finland: - "[Our] mission is to strengthen the vitality and competitiveness of Kauhajoki Region and to increase the social capital. Living Lab activities started in Kauhajoki region in 2007 and they are closely connected to the Regional Centre Development Program of Kauhajoki. The program is divided into four different main strategic themes: 1) Developing new business and new business operating models. 2) Creating dynamic networks of competency and innovation and strengthening competency capital with growth pilots in potential growth fields. 3) Developing an attractive environment for operations and innovative activity. 4) Promoting international cooperation and networking in every strategic theme."

Living Lab Malta: "is to extend the research and innovation of the cleaner technologies and low-carbon-emission energy at European level, and create a common environmental benefit, where the overall economic focus is more local and regional/city-based than global, with low-to-medium economic growth."

ICT technology network, Slovenia: "During the four years of its existence and activities, ICT Technology Network has proven that it is by far the most propulsive technology network in Slovenia with the greatest potential of know-how and capital, the most renowned researchers as well as the applicative and industrial projects. In 2005 the companies and institutions which are members of ICT Technology Network generated income of EUR 1.8 billion and with their prevailingly complex technological products achieved a more than 20% share of Slovenian export. In total the network members employed 13.500 persons of which almost 9.000 in companies. Members of ICT Technology Network create approximately 4,6 % of Slovenian GDP. The development potential of the network is best reflected in more than 1.000 researchers employed in its member companies and institutions."

The Suupohja Living Lab illustrates the goal of facilitating new regional development, so as to increase business viability of Suupohja. The Living Lab Malta couples this with a "niche theme" (sustainability) to place local economic development in a certain market. The ICT Technology Network in Slovenia's uses economic rhetoric to stress the importance of the consortium for the country. What these labs also illustrate are the mixed goals and orientations of Living Laboratories; economic innovation is at times connected to social goals, and the realization of social capital. Living Labs' research, social and economic orientations seem intertwined. Keeping these orientations in mind, how are the roles of users envisioned?

3.3.3 Living Laboratory representations of users

The examples presented in the textboxes illustrate that Living Lab goals are very diverse and that Living Labs use different tones in describing their own work, projects and visions. Zooming in further on "the user", figure 5 shows how Living Labs refer to their users, or what role they attribute to users.

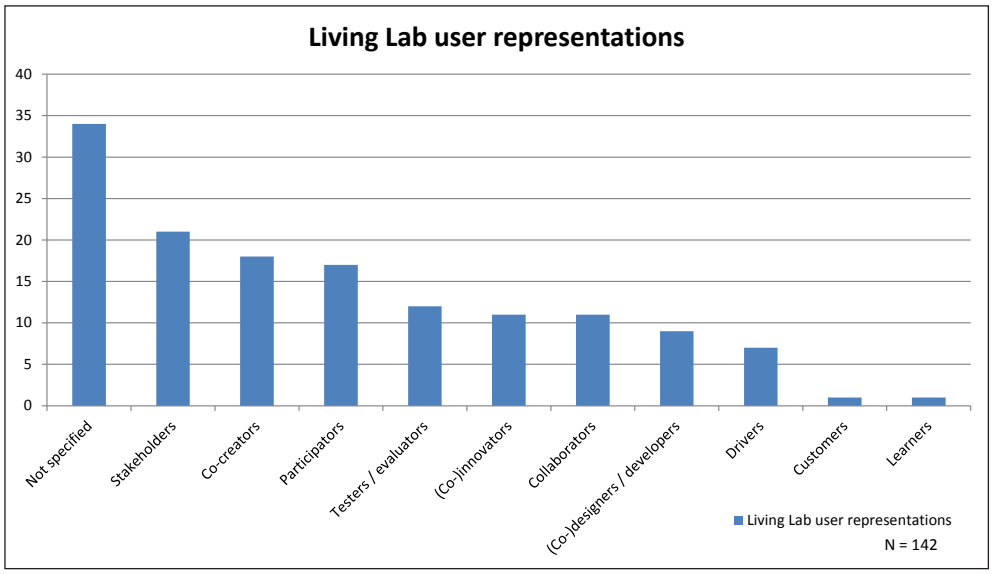


Figure 5: Representations of users in Living Labs

What becomes apparent is that many Living Labs do not specify a role for the user, or did not provide this information on the ENoLL-website or on their own websites.[16] This is interesting, especially given the Living Lab-focus on user-centricity. Secondly, the most often used term is that of the stakeholder. This is a rather broad role that can allude to both interest in the Living Lab-partnership, as well as interest in the activities of the Living Laboratory (e.g. developing a new ICT). It seems that this latter interest is more related to the representations that are characterised by the term "co" (co-creator, co-innovator, co-designer and co-developer); suggesting that users join in collaborations to develop a new technology. Interestingly, some Living Labs choose to refer to "collaborators" instead, which brings me to question what the difference is between collaborating and co-creating? Intuitively, the answer would be that the role of "co-creator" suggests creating something (a product, a service) new together, whereas collaborating suggests that actors work together in more of an intellectual endeavour.[17] The

16 Important to take into account is that 4 of the Living Labs did not provide a description of their focus on the European Network of Living Labs' website and did not provide a website with more information, which made further data analysis impossible for me.

17 See also http://www.thefreedictionary.com/collaborator (accessed on 28-2-2013).

same could be said of the "participator" role. Comparing this for example to the role of "driver", participation suggests joining in on something, while driving suggests taking charge.

The largest group of users can thus be characterised as joining in the Living Lab – as a co-creator, collaborator, participant or stakeholder. The role of "driver" is comparatively less large. The role of tester / evaluator is also quite explicit. What figure 5 on the whole expresses, is that while users are deemed essential to Living Labs (they are referred to in many different roles that each suggest that users contribute to the Living Lab in a certain way), their roles are not always clear (e.g. many labs do not specify a role for the user).

Looking back at the promises of Living Labs that I posited in Chapter 1, this indicates that (end) users – suggested to be central to the "human-centric" approach of Living Labs – have a participatory role to fulfil in these labs. Referring back to figure 1, these (end) users would be those who are part of the groups of "citizens / communities" (referred to 54 times), "elderly persons" (referred to 14 times), "patients / disabled persons" (referred to 9 times), "students" (referred to 13 times) and "tourists / visitors" (referred to 6 times). Briefly focusing more on what these (end) users are positioned as, the following table can be created;

	Citizens / Communities	*Elderly persons*	*Patients / disabled persons*	*Students / pupils*	*Tourists / visitors*
Co-creators	9	2	1	2	1
(Co-)designers / developers	3	1	-	1	-
(Co-)innovators	6	1	-	2	-
Collaborators	2	1	-	2	-
Customers	-	-	-	-	1
Drivers	3	-	-	1	1
Learners	1	-	-	-	-
Not specified	8	2	3	4	1
Participators	4	3	1	1	1
Stakeholders	11	2	2	-	-
Testers / evaluators	7	2	2	-	1

Table 1: The representations used to describe the role of end users in Living Labs[18]

As in figure 5, the table indicates that mostly, the role of these end users is not always specified. For example, of the 13 times students/pupils are noted as end users, 4 times their actual role

18 These representations are alphabetically ordered.

is not yet defined. Citizens are most often referred to as stakeholders and co-creators. Elderly persons are mostly described as participators, co-creators, stakeholders and testers/evaluators. Patients and disabled persons are mostly seen as stakeholders and testers/evaluators. Students/pupils are seen as co-creators, co-innovators and collaborators. For tourists/visitors, the representations are divided evenly over 5 user representations (plus one "not specified").

The representations that are most often connected to these users are that of the co-creator, and stakeholder, followed by their characterization as a tester/evaluator. Striking is that the role of "driver" of innovation is attributed to all except to elderly persons and to patients/disabled persons while (co-)innovators *are* to be found in the elderly persons-category (as well as in the citizen/community and students-group).

The division of the various representations shows how certain "labels" are more often used than others, as is the case for the representation of the co-creator. However, what does co-creation entail in these labs? What methods of inclusion does co-creation involve and how are users granted the roles describes in table 1?

3.3.4 Living Laboratory methods of user inclusion

Living Lab-methods can focus on the establishment of public-private-civic partnerships, or on design practices where users are included. I am interested in the latter. Are for example companies included in a "co-creative" fashion and citizens included as testers? Or how are users "harvested" to engage in Living Lab-practices? Investigating the different methods also helps to paint a picture of how Living Labs' methods facilitate "human-centric" innovation practices. The third dimension of interest when reviewing Living Lab-methods is the inclusion of a real life context (central to the Living Lab-methodology). Do individual Living Labs place a strong emphasis on design in context?

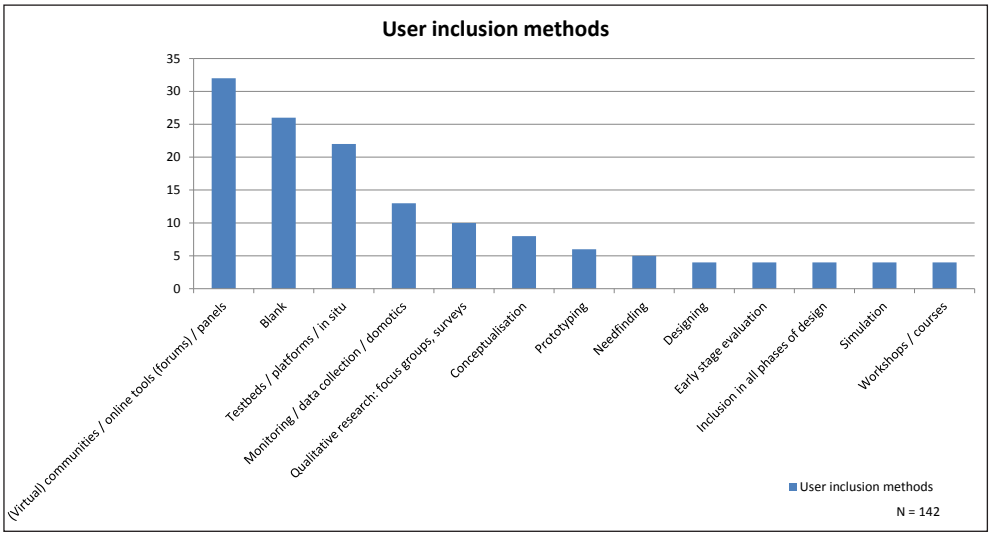


Figure 6: Inclusion of users in Living Lab-methodologies

Figure 6 gives an overview of the variety of user inclusion methods described by the Living Labs. The most often noted methods are those of using online tools and communities, test beds[19] and the monitoring of use (monitoring/data collection/domotics). Other methods, such as designing, prototyping, conceptualisation, inclusion in "all phases of design"[20] and simulation point to direct product-oriented user involvement in the development of new ICTs, as does "needfinding" which is a concrete design approach (Ståhlbröst, 2008).

The method that is referred to most often is that of (virtual) communities and online tools.[21] The importance of communities was already stressed earlier – citizens and communities are noted as important users of Living Labs. The questions is how "real" and virtual communities play a role in actual Living Laboratory-practices; how are (end) users involved in communities?

3.4 Conclusions

3.4.1 Diversity as a challenge or opportunity to study user innovativeness?

My exploratory research into the Living Labs connected to the overarching European Network of Living Labs underlines the complexity and multifaceted character of "the Living Lab-user". Other studies draw similar conclusions; Følstad (2008) argues how there is a lack of common understanding of how Living Labs can be used for ICT innovation and development. My study expands on this. There is also a lack of common understanding of *who* should be included (there are diverse groups of end users) and *how* end users should be included (diverse methods). In terms of methodologies used, Følstad describes how use is made of logs/behavioural data, ethnographic research, questionnaires and focus groups.

In 2009 the European Commission published an evaluative report (European Commission, 2009b) about the European Network of Living Labs. In this report, the large variety of Living Lab-goals, practices and definitions is noted as in need of harmonisation, whereas the drive to include citizens, organizations and businesses is applauded as showing great potential. While the report notes how a "unified" Living Lab approach that is "valid at every corner of Europe" would not make sense, networking experiences might "contribute to the reduction of some idiosyncrasies" (Ibid, p. 17). Instead of calling this diversity somehow "regrettable", I argue that the "diffuseness" may have other implications; if different Living Labs in different locations work with specific methods, themes and end users, does this not

19 A test bed is "understood as a delimited environment to test software and services outside production environments" (Følstad, 2008).

20 When referring to "all phases of development", I refer to the stages as defined by Reichart (in Feurstein, Hesmer, Hribernik, Thoben, & Schumacher, 2009: 4): product/service idea, product/service concept, product/service development and market launch.

21 Turunen stresses how online (Web 2.0) tools provide opportunities for the Living Lab-approach to enhance people's commitment "to create social capital, social innovation capital and social innovations" (Turunen, 2008: 137).

imply that they are catering to a local "need"? And that a large-scale network looking for innovative ICT products and services is in need of locally-applied and evaluated initiatives? In other words, does not the space created by this exact diffuseness of practices stimulate the local creativity of actors involved in processes of design? This is a relevant issue to address when I investigate the agency of users in my Living Lab-case studies.

Another finding of the European Commission is that the European Living Lab-approach can be characterised as "co-creative, user centered innovation" (Ibid, p. 6) admittedly hampered by ambiguity across the network in terms of the different interpretations of the concept of the Living Lab, the necessity to adapt the approach to different cultural contexts, the types of technological infrastructures available, the variety of priorities and the nature of the role of stakeholders.[22] While all these aspects make the creation of a clear-cut picture difficult, the report does note that most Living Labs "offer product and service testing and co-design services" (Ibid, p. 24). However, there is a lack of descriptions as to how user communities connect to these testing and co-design practices.

In my overview of methods used to include users in these practices, I have come across a broad range of methodologies. In line with the conclusions drawn in the report by the European Commission, I was not able to discern *how* and *why* end users are invited to join the practices. If citizens are included via a test bed for new wireless technology for example, do they join because they are technology enthusiasts and perhaps lead users, or because their cable operator has "made" them part of a pilot?[23] In other words, what the motivations are for end users to join is not transparent. This requires further study (especially as this "user inclusion" is described as one of the bottlenecks of the practice).[24]

The variety of user representations is also foregrounded by the CO-LLABS report. The report gives the examples of "targeting key user groups" (in the case of Living Lab Aboland), "early movers and give them the role of trusted influencers" (Homokhati Living Lab (Hungary), Aboland (Finland)), "create a strong local stakeholder base" (Living Lab Cudillero (Spain), Aboland) or "use modern collaboration tools yourself to set examples" (Frascati, Italy) (Schaffers (Ed.), 2009: 18). My description of the range of user representations

22 The report describes Living Labs as open, academic or non-profit driven, while for 38% of the labs the main source of money is private companies, followed by research consortia and public administrations. According to the report, this indicates a business need, the possibility to use Living Laboratories as policy test beds that it may lower costs for research companies and that start-ups do not "find" Living Labs.

23 As is the case in one of the projects I came across at the Amsterdam Living Lab, where an energy provider is installing smart meters in urban dwellings under the auspices of "urban innovation".

24 As an ECOSPACE newsletter exemplifies, when it states that: "The real challenge is in acquiring the commitment of user communities. It is important to be able to create a strong level of commitment from the side of stakeholders. Being able to establish "forerunner" groups of advanced users is definitely a good strategy, and it will work better if here is a clear value added of the collaboration tools to be experimented and used."
http://www.ami-communities.eu/wiki/ECOSPACE_Newsletter_No_11#Assessing_the_Living_Labs_Approach (accessed on 6-12-2009).

is even more diverse; from co-designer, co-creator, and stakeholder to developer. These user representations are also connected to user groups, such as "citizens", "patients", "elderly persons" and "students".

In order to become part of Living Lab-practices, a user must adopt a certain identity or role (as a citizen, or as an elderly person). In other words, by representing users in a specific way, a Living Lab sets certain affordances; people are required to become specific "users" to become involved in a "user driven" design process. The question then becomes, how is the creativity of these users, cast in a certain role, appealed to? Are users expected to go about their daily lives as – for example - patients, and co-produce as they go along? Or are they asked to step out of one role (as again say a patient) and step into another (as tester, for example)? Questions such as these are further complicated when different types of agencies are investigated. The assumption that testers, for instance, are primarily included via test beds, does not hold when Living Labs are analysed on the website-level.

If users are positioned as part of the public-private-civic partnership that is the Living Lab, and also part of the Living Lab-promise to realize user-centric innovation, what does this mean for users in practice? In the next three empirical chapters, I move on to my case studies that focus on three user representations: users as designers, testers and co-creators.

3.4.2 Case study selection

As shortly mentioned in the previous chapter, I turn my attention to three "kinds" of users in this dissertation: users as designers, co-creators and testers. The choice to focus on these three user roles is first of all based on the Living Lab-promise - sketched in Chapter 1 - to involve end users in design practices and so make more innovative ICT products and services. Analysing and comparing user involvement practices where users are positioned in different roles will grant insight in how the attribution of these roles by Living Labs and the performances of users in these roles inform the alleged "innovativeness" of the Living Laboratory-practice as well as the resulting ICT products and services. By tracing the diversity of how users perform roles that are associated with different kinds of agency (power to make changes to ICTs for example) I aim to see how user agency affects Living Lab-practices and the perceived innovativeness of users. The choice to investigate user involvement and user innovativeness of three user "roles" is thus made to on the one hand focus on specific practices of user involvement, and on the other hand to be able to compare and contrast different user involvement practices across Living Lab-projects.

This interest in the diversity of user roles is not only based on the findings of the exploratory analysis I present in this chapter, but is also theoretically informed. In chapter 2, I introduced Science and Technology studies (STS), and specifically the stream of user studies in STS. Users have been considered important actors in the diffusion and development of new technologies. They have been studied in a sociological sense, and in actor network theory in a semiotic sense – to investigate how designers inscribe ideas about users and uses into technological artefacts when they design a new technology. Users therefore not only become "involved" in design once a new technology enters the market. In use, users appropriate the technological artefact, or create "anti-programs" (or alternative uses) for a technology.

Users have creative agency in these processes.[25] In terms of user inclusion during the design of new technologies, studies show how the distinction between users and producers is blurring; users become "prosumers" (Toffler, 1980 in Oudshoorn & Pinch, 2008: 545), innovation users or designer-users. Especially relevant in this respect is work on user-centered design (Oudshoorn, Rommes, & Stienstra, 2004) that asserts that user centricity is not "given" in user-centered design practices and which questions the celebration of user agency in these processes.

Oudshoorn (1999) also calls attention to how a focus on testing is important to understand the dynamics of technological development – something that seems to be restricted to the domain of scientific experts. She furthermore articulates that user representations also "do" something; how "explicit user representation techniques more often function as tools to legitimate the design process so that designers can claim that they have taken the needs of users into account as tools to guide technological decisions" (Oudshoorn et al., 2004: 43). In a similar vein, Ganzevles (2007) argues how test practices have an ambiguous function; they stimulate future use or a technology while at the same time influencing technology use.

I pay close attention to how users are configured in Living Lab-practices as designer, co-creators and testers to not only be able to draw conclusions about user-centered Living Lab-practices, but also in a dialogue with the above STS insights. In what ways are users involved in ICT development practices? And are these users included to legitimate a certain design process, to find needs or to grant users more agency in design processes?

Interesting in this respect is that scholars writing about Living Lab-practices draw on STS-literature to argue for a user-centered Living Lab-approach. Pierson and Lievens for example, refer to STS user insights to argue why a focus on users allows developers to move from a "product-oriented model to a socio-technical model of research" (Pierson & Lievens, 2005: 123); they underline that people-centered innovation depends on the user participation that is made possible in the experimental (daily life) setting.

Apart from this theoretical interest in "user roles", my three-pronged focus is secondly the result of the implications of the exploratory analysis of the Living Labs connected through the European Network of Living Labs that I presented in the current chapter. In this chapter, figures 5-6 and table 1 brought some small insight in the variety of user representations that are attributed to end users. Apart from showing that Living Labs are not always transparent about the foreseen end users in their practices (i.e. the "Not specified" column in figure 5), the representations that are used suggest a connection to the design and development process of ICT products and services. The roles of (co-)designer, co-creator and tester caught my particular interest; the co-creatorly role is often related to end users, while that of designer and tester less so. This is however not reflected in the literature about Living Labs, where users are placed at the centre of everything – where there is literally a call for human-centric design.

25 However, the exact involvement of users has hitherto been primarily studied in relation to user involvement in consumption, instead of production processes. Even when the user is taken as a point of departure in technological development processes, theorists call to include users but "to be tapped, consulted, motivated, but not to control design processes" (Jelsma, 2003: 104).

Similarly, figures 5-6 and table 1 show how although the user representation of the "tester" is not often noted in the documentation and on websites (see figure 5), the method of the "test bed / in situ" is popular (see figure 6). Developing and testing in context is one of the pillars of the Living Lab-concept. The users who are involved in these in situ testing situations are however not referred to as "testers". They are positioned as "participators", "co-creators" or "(co)-innovators"- part of the creative process in an active role. It will prove interesting to see, in a case study, what these terms mean. Has the term "tester" gained a negative or passive connotation, one that does not fit comfortably in the "ideology" of Living Labs? Or can it be said that Living Labs have a vision that sees users in a role (that of a (co)-innovator for example) that does not represent actual practices? These questions run parallel to my earlier questions about what user inclusion in Living Laboratory-practices means as such; what it exactly means to enrol users in Living Lab-practices?

In figure 7 – an adapted version of figure 5 – the three user roles I select for the case study analysis are highlighted; the red square highlights users as designers, the purple square highlights users as co-creators and the green square highlights as testers. In textboxes 5, 6 and 7, these three categories are illustrated.

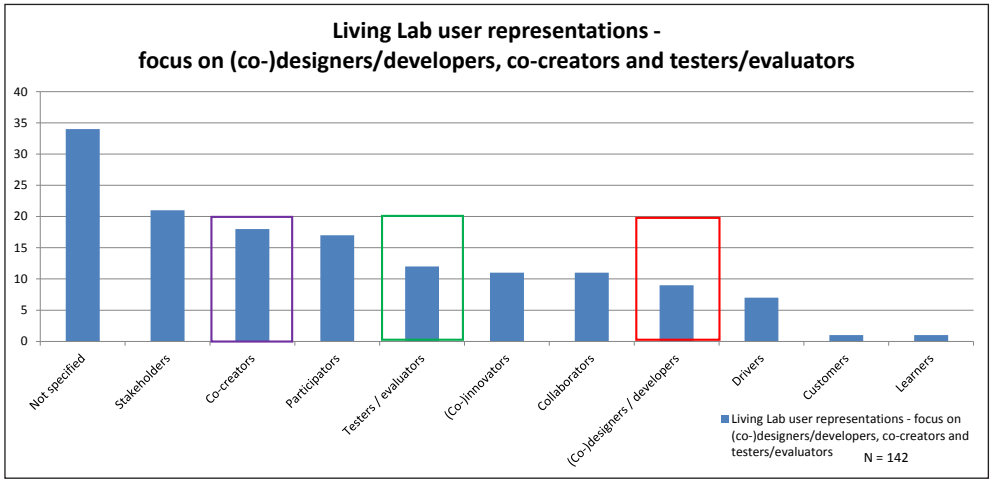


Figure 7: Living Lab representations: focus on users as (co-)designers/developers, co-creators and as testers/evaluators

TEXTBOX 5: Users as designers

Laurea Living Lab: - "The basis for R&D is a holistic view of well being which provides sustainable direction for businesses and for the development of the entire service system. End users are developers during the whole R&D process. Students are developers and creators of new professional knowledge together with other actors. (…) The LbD [Learn by Doing]–model with Laurea's 8000 students is an essential R&D resource which enables rich interaction with end users. It also makes us less dependent on project financing."

Owela (Open Web Lab): "Owela is an online lab for open innovation and participatory design. It supports communication and codesign with end users, companies and researchers throughout the innovation process."

TEXTBOX 6: User as testers

Living Lab RENER – "RENER LL's mission is to induce the appropriate context, in a local community, to allow the research and development, the test, implementation and validation of new energy technologies and solutions. In order to achieve this mission, RENER LL will act both as a test bed and a demo site, putting a special emphasis in the smart grid concept as a way of fostering the development and integrating multiple technologies. A key element (…) is the involvement of the local community. The local population will be encouraged to get involved as users of new technologies and take advantage of it, playing an important role in the development, testing and acceptance of new emerging technologies."

"eHealth Living Lab in Granada, Spain, means real public health environments (remote elderly care, home hospitalization and technologies for hospitals), in which technology will be deployed to be used by Scientifics, Technicians and Students to test new developments, reconfigure and reshape them or merely observe the behaviour and interaction of the different stakeholders (doctors, patients, nurses, etc...) with the monitorized environment."

TEXTBOX 7: Users as co-creators

New Media Living Lab Malmö, Sweden: - "The pilot project "Malmö New Media Living Lab" was a small scale living lab where new media services and products were co-created with a particular focus on audience participation and user-generated content. Visitors at the media and performance center INKONST, which houses activities that include, film, performance, theater, concerts, and clubs, was engaged in developing, experimenting with and evaluating new media formats, services and products, together with researchers, students, artists and professional new media producers. The project was ranging from short student assignment to longer activities involving several professional and non-professional partners. The method for developing new media experiences and practices focused on engaging grassroots enthusiast, building upon their needs and trying out concepts developed in a real setting." http://www.malmolivinglab.se/MNMLL_english.htm (accessed on 8-1-2010).

Living Lab Taiwan: - "Living Lab Taiwan sets up experimental platforms in Minsheng community in Taipei, in order to work with local habitants and community groups to test the living lab applications and promote open innovation activities. The Living Lab Show Case, launched in November 2008, is to [provide] facilities and space which enables rich interaction with service providers and end users to co-create new service models. It is a studio for demo the applications and scenarios for innovative use of technology and new services."

Reflecting on these Living Lab examples, the example of the Laurea Living Lab (textbox 5) portrays students as designers of new products and services. However, the statement that students are creators together with other actors suggests that this is an example of co-design or even co-creation. The same is suggested in the example of Owela (Open Web Lab); end users are part of codesign practices undertaken together with companies and researchers.

The users as testers example of Living Lab RENER (textbox 6) highlights that the local population will be encouraged to act as users to test, implement and validate technologies in test bed and demo site setting. At the same time, their activities are not only framed as "testing", but also referred to in terms of "development" and "acceptance". Similarly, the example of eHealth Living Lab in Granada shows a diversity in (user and) user activities. Users here are scientists, technicians and students, who test, "reconfigure and reshape" technologies or are observed as they interact with technologies.

The examples of co-creation (textbox 7) also show a rather broad application of the term. In Malmö new products and services are co-created using user-generated content and in Taiwan, co-creation is a process that is facilitated. It seems that co-creation takes place on different levels: the local (Malmö) and on a market level (leading to new services models and

technologies for market providers in Taiwan).

These examples of the different roles of users in Living Labs trigger the question of where to draw the line between users as designers, co-creators and testers? Perhaps coupling these user roles with methods of user involvement will clarify the categories. For instance, when methods of user inclusion that are employed when users are referred to as "testers" are compared, a very diverse characterisation becomes apparent; methods include test beds, qualitative research, monitoring, needfinding, ethnographic research and involvement via online communities. When users are designers (developers) methods include: early stage testing, monitoring, prototyping, designing, ethnographic research, needfinding, courses, online platforms, panels, simulations, usability testing, test beds and forums. The list becomes even longer when users as "co-" innovators, creators or conceptors are analysed.

In this dissertation, I untangle the role of users in three specific Living Lab-projects. Important to note is that I focus not on three Living Labs (as organizations), but on three different projects that are part of specific Living Labs. This allows me to zoom in on how users are included in practice, how their role as designer, co-creator or tester in shaped and what constitutes their "user innovativeness". In the next chapter I start with a case where users are configured as designers.

Chapter 4. Tinker, tailor, solder, try: high school students designing smart sensor prototypes in the SensorLab

"Instead of trying to interest kids in science as received knowledge, it's possible to equip them to *do* science, giving them both the knowledge and the tools to discover it" (Gerschenfeld, 2005: 14).

4.1 Introduction

On a sunny day in September, a diverse group of people gathered in a large tent in a public park in Amsterdam. They were there to take part in the SensorLab workshop; to learn about sensor technology, develop smart sensor prototypes, and measure pollution levels in an urban setting. The largest part of the group consisted of high school students, who were to become designers for a day. Their assignment was to build smart sensor pollution-measuring prototypes together with their teachers and sensor experts. Working collectively, the groups would make use of different materials, sensor technologies and a number of machines to develop their prototypes and subsequently test the prototypes in a public park in Amsterdam.

The SensorLab was a one day event that took place during multi-media festival PICNIC's PICNIC YOUNG program in 2010. PICNIC is a festival that seeks to bring together creative and innovative people to build new collaborations that lead to "unexpected but useful ideas which lead to a better world".[1] Apart from offering activities for creative professionals, between 2007 and 2011 the festival also offered workshops for students and youngsters via the PICNIC YOUNG program.

One of the organizing actors of PICNIC and the SensorLab was Waag Society, a Dutch institute for art, science and technology. Waag Society's overarching innovation agenda is to stimulate social innovation where users are perceived as designers and research is "disruptive, practice-based, iterative and intuitive in its approach and open in terms of its results" (Van Dijk, Kresin, Reitenbach, Rennen, & Wildevuur, 2011: 10). The organization uses methods such as emphatic conversations, exploratory play and context mapping to involve users in new ways in the design process, and let users and designers collaborate by letting them both take on multiple roles throughout the design process (Ibid).

Waag Society is also one of the initiators and main partners of the Amsterdam Living Lab.[2] Waag Society's educational department[3] organized activities for the PICNIC YOUNG program with a focus on developing new ways of creatively using technology in teaching

1 PICNIC is a leading European platform for innovation and creativity. [It functions] as an incubator and accelerator for game changing ideas, concepts, products and services. Through (…) activities, [it addresses] the mega trends of our time and [explores] how to creatively apply technology in order to meet business, social and environmental challenges. http://www.picnicnetwork.org/about-us (accessed on 11-4-2012).

2 Amsterdam Living Lab is described more extensively in section 2.5.4.

3 Creative Learning Lab.

and learning processes (Waag Society, 2012: 2). In line with this, PICNIC YOUNG set out to provide an innovative program around new uses of digital media and technology in educational contexts, with seminars for teachers and interactive workshops for students. The main research areas of Waag Society's educational department are citizen science and embodied learning. This means that youngsters, as non-scientists, contribute to science via digital and mobile technologies and that learning takes the shape of experiential instead of theoretical learning (e.g. by using technologies such as the game console Kinect) so that technologies are non-intrusive (Ibid, p. 4) and support learning experiences that involve more than only cognitive competences.

The SensorLab unites Waag Society's goals of stimulating thinking through making, using so-called FabLab-facilities and citizen science performed by students.[4] The premise of FabLabs (Fabrication Laboratories) is that after the digital communication revolution, it is now time for the personal fabrication revolution. According to FabLab-founder Neil Gerschenfeld, FabLabs provide access to tools to build "almost anything" (Gerschenfeld, 2005). Using laser cutters, 3D printers, milling machines, vinyl cutters and embroidery machines, people can translate their ideas into physical artefacts. Every developed artefact has a blueprint, which is shared with the Fab community, so that ideas are accessible to everyone.

Seeking to engage people in "exploratory play" (Ibid, p. 28), Waag Society's approach to citizen science is described as follows:

> "With the advent of digital and mobile technologies scientific knowledge production has changed profoundly. As interactive, affordable, networked and ubiquitous technologies they invite people to engage with, alter and probe scientific "facts". Play is essential to think about this new kind of engagement with science. It offers citizens powerful ways to become involved with and knowledgeable about scientific practices and offers subversive and exciting possibilities to actively contribute to and transform them".[5]

4 Various projects of Waag Society are also part of Amsterdam Living Lab, such as the FabLab (Fabrication Laboratory). FabLabs aim to reconceptualise the role of ICT development in overcoming the digital divide, for: "At the heart of this idea is the belief that the most sustainable way to bring the deepest results of the digital revolution to developing communities is to enable them to participate in creating their own technological tools for finding solutions to their own problems" (Mikhak et al., 2002). FabLabs, in short, provide means to empower users via access to and use of technological tools. Framing this idea of empowerment slightly differently, it is possible to say that by learning how to work with the tools of the FabLab people can find solutions to problems they encounter in their daily lives; the FabLab is a kind of learning-by-doing and solving-by-creating environment. It seeks to encourage "thinking through making" as it allows users to express their ideas in physical ways "which makes it much easier to identify their underlying, latent needs – the needs behind the needs – and wishes" (Van Dijk et al., 2011: 32). The FabLab at Waag Society can be used by individuals, businesses (provided that commercial activities do not conflict with other uses), communities and schools. This last point is specified in the FabCharter http://fab.cba.mit.edu/about/charter (accessed on 11-4-2012).

5 http://www.citizenscience.nl/ (accessed on 11-4-2012).

Playing with technologies to engage in science, Waag Society's take on citizen science fits into a broader view on citizen science, that specifies that citizens become part of scientific data collection to manage and monitor their surroundings (Lakshminarayanan, 2007). Citizen science is also referred to as community-based monitoring (Conrad & Hilchey, 2011) and is associated with citizen empowerment. It is however not uncontested. Brossard, Lewenstein and Bonney argue that while the "need of encouraging public understanding of science is rarely contested" (2005: 1099), direct statistical proof of changes in participants' understanding of scientific processes and attitude towards science is hardly visible after participation, whereas participants' knowledge – about in their case cavity-nesting birds – does increase. They suggest that in order to facilitate a change in attitude towards science, participants should be made aware of the scientific processes underlying their involvement (Ibid, p. 1117).[6]

Taking into account the overarching topic and questions of this dissertation, this chapter investigates the involvement and innovativeness of users when these become designers in a Living Lab-setting; what happens when people who are usually framed as technology users, in this case high school students, become designers. The guiding questions of this chapter are *1) how are user involvement and user innovativeness shaped and facilitated in the sociomaterial setting of the SensorLab and 2) what kinds of innovation practices are constituted in the SensorLab?* Related sub-questions that focus on the involvement of the students in this setting are:

1. How are the students configured as designers?
2. How do they perform as designers in practice?
3. How can their practices be understood in terms of improvisation?
4. Are the students' improvisations recognised as situated expertise and as such facilitated in the SensorLab?
5. Are practices of user innovativeness perceived as innovative in the SensorLab?

Answering these questions is relevant in the light of the overarching research goal of this dissertation, as these questions zoom in on the dynamics that are involved when users who are configured as designers engage in design activities in practice. Using the concept of improvisation to guide the analysis of the practices unfolding in the SensorLab, I trace the sociomaterial practices that shape the students' performance of the designer role as well as

6 The SensorLab seeks to engage students in citizen science via hands-on sensor education. The SensorLab should be seen in relation to Waag Society's other efforts to engage citizens in citizen science by means of sensor technologies. The SensorLab was initially a first test for its Green Sensing project. In their proposal for this project, Waag Society envisioned equipping 300 citizens with a watch with sensors to measure ozone and noise levels in different cities (Amsterdam, Paris and Manchester). In the preparatory phases of the project, citizens would be invited to co-design this watch. The SensorLab was set to be part of the preparatory phase of the Green Sensing project. Eventually, Green Sensing would research how data/measurements were collected, how the experiences of citizens of their surroundings changed and whether or not behavioural patterns would change due to the available data dissemination. The funding for the Green Sensing project was however not granted.

the development of a number of smart sensor prototypes. An analysis of the improvisation practices of these users in terms of a "mangling" of agency makes it possible to draw conclusions about the characteristics of the enacted sociomaterial relations that help shape their performance in this setting. While the analysis thus grants insight in this specific case study, it also is of more general interest; which are the "ingredients" that facilitate the students' involvement as designers in this Living Lab-setting? I intend to see how improvisations take place in the SensorLab; how the groups engage in messy processes and produce something new and of course, how these students "do" science with the tools handed to them in the SensorLab. Ultimately, the analysis shows how the students' situated expertise is facilitated in the SensorLab and how "the innovativeness of users" is shaped in this case.

The chapter is divided in 5 sections. In section 4.2, I provide the theoretical frame and research methodology after which I zoom in on the sociomaterial configuration of the SensorLab in section 4.3; how are the students configured in the setting as designers, specifically in relation to the SensorLab's overarching goals of stimulating citizen science and the empowerment of users. Section 4.4 comprises the analysis of how the students' design practices in the SensorLab; how they engaged with the given tasks in the SensorLab and how they designed their prototypes. In the concluding section, I discuss the improvisation practices taking place in the SensorLab and what these findings stipulate in terms of the situated expertise of the students, user innovativeness and innovation practices.

4.2 Theoretical frame and research methodology

In this case study, I look at how high school students become designers in the context of the SensorLab. In literature about "users as designers", authors often refer to participatory design to characterise approaches where users become part of the different development phases of technology design. As an approach, participatory design originated in Scandinavia and covers theories, practices, and studies where end users are treated as participants in software and hardware computer products design (Muller, 2002). Participatory design ideals grew out of a movement that sought to realize "democracy at work" using techniques such as "mock-ups, prototypes and scenarios" (Björgvinsson, Ehn, & Hillgren, 2010: 41). Steen argues how in participatory design "users are treated as experts, and it is attempted to bring their (tacit) knowledge and skills to the research and design process. The goal is to let users, researchers and designers work together to create a tool that will enable the user to do his or her work better" (Steen, 2008: 36). In the context of Living Lab-research, participatory design is noted as one of the methodologies to realize user-centered design that can be used to include end users from the start of design practices (Feurstein, Hesmer, Hribernik, Thoben, & Schumacher, 2009: 7).

Björgvinsson, Ehn and Hillgren criticise the manner in which participatory design methods are applied within Living Lab-practices, deeming these too focused on "eliciting user needs" and "product-centric" instead of focusing on sociomaterial working relations (Björgvinsson et al., 2010: 42). In order to realize social innovation, they propose to create collaborative learning environments where user collaboration is foregrounded. I noted in the introduction that Waag Society also aims to realize social innovation by means of its

collaborative "users as designers" approach. In the context of the SensorLab, this approach combines embodied learning foreseen by combining learning-through-making offered by the FabLab and citizen science approach.

My conceptual frame, described in chapter 2, focuses on investigating user involvement and user innovativeness by analysing how user agency is performed in practice in Living Lab-projects. I relate the question of user agency to Andrew Pickering's concept of "the mangle" of agencies, where meaning follows from interactions between human and non-human actors set in time. Agency and meaning are *emergent* through a "dance of agency", or a "mangle" (Pickering, 1995); a process in which knowledge turns into embodied performance. Material agency is temporally emergent in practices. The "mangling" is a process of resistance and accommodation, where resistance denotes the failure to achieve an intended capture of agency in practice and accommodation an active human strategy of response to resistance (Ibid, p. 22). This active strategy can take the shape of a revision of plans, strategies, materiality and to the "human frame of gestures and social relations that surround it" (Ibid). In other words, the designer role performance emerges from this "dance of agency".

The mangle is contingent to situations; outcomes are not predetermined (Ibid, p. 57). In fact, Pickering argues that throughout the struggle with material agency, some things *just happen*; when studying real-time practice, sometimes no explanation can be given as "the world of the mangle lacks the comforting causality of traditional physics or engineering, or of sociology for that matter, with its traditional repertoire of enduring causes (interests) and constraints" (Ibid, p. 24).

Sometimes things *just happen*. Looking for patterns[7] will cast a light on the dance of agency, on the performance and shaping of, in this case, the role of designer in a specific setting. As I argued earlier in chapter 2, I view matters that "just happen" in terms of improvisation practices. That is, I use the concept of improvisation to describe what I see happen in the mangle as agencies resist and accommodate each other. In other words, improvisation serves as a concept to catch emergent and unforeseen performances, something that is exactly at stake in the SensorLab setting where actors work together, or are mangled, and produce two matters: a designer role performance and a physical artefact.

The relatively short SensorLab workshop offers an opportunity to take a close look at what happens "in the mangle"; how sociomaterial relations are performed, what kind of routes are taken, how different agencies resist and accommodate one another and how these culminate in a technologies artefact. The case allows me to zoom in on "the mangle" and trace what improvisation exactly entails in practice. By analysing how sociomaterial practices perform social and material relations together I work towards answering the research questions in this chapter.

An analysis of the sociomaterial practices that shape how students become designers

7 "However, I must add] (…) that brute contingency is constitutively interwoven into *a pattern that we can grasp* and understand, and which (…) [explains] what is going on. That explanation is what my analysis of goal formation as modeling, the dance of agency, and the dialectic of resistance and accommodation is intended to accomplish" (Pickering, 1995: 24).

also gives insight in how – to refer back to Steen – these users become "experts" in this setting. How these students are granted the agency to exercise what I refer to as their situated expertise: expertise that is bound to a virtuose use of local, contingent knowledge. How is this situated expertise configured within this specific sociomaterial setting and what does this imply in terms of the students' innovativeness?

Research outcomes are based on document analysis and data gathered through an ethnographic study of interactions between different actors in the SensorLab during design activities which took place on the 22nd of September 2010. Documents that were analysed were publications by the organizing actor, Waag Society about their educational department and about their "users as designer approach". In addition to this, available documentation about their citizen science project proposal to set up a sensor network together with citizens in Amsterdam was analysed to place the SensorLab within the context of Waag Society's citizen science agenda. During the SensorLab workshop, voice and video data was collected. This data was transcribed and subsequently coded using a grounded theory approach; labels were added to segments of data to sort it and to provide handles to compare different segments (Charmaz, 2006: 3).[8]

To analyse how agencies resist and accommodate each other in the mangle, I first focus the analysis on artificially separating different actors in the setting, after which I assess how they are, in practice, mangled together in the design process. This means that I analyse how the students engage with the assignment in the SensorLab setting (their "design challenge" so to speak), with the other human actors in the setting (the "sensor experts" and teachers onsite), with the available materials that are used to build their sensor prototypes and with the environment of the public park as they test their prototypes. These actors and agencies in the setting emerged as I coded my collected data.

In the end, to understand how user involvement and user innovativeness are shaped and performed, the focus is directed at the interplay between the students and the available elements in the setting. I characterise this interplay as an improvisational practice. Important to note is that this reference to improvisational practice is not used in the analysis to "black box" this messy mangling. I argue instead that improvisation as a concept works to help understand and pull into focus messy practices; by tracing and working to understand the socio-material practices unfolding in the SensorLab in terms of "improvisation", it becomes possible to investigate how the designer role performance is shaped in this specific setting. Insights in these practices can further an understanding of what it means to perform a role – such as that of "the designer" in the context of Living Laboratory-practices.

4.3 The SensorLab's sociomaterial configuration

While the SensorLab was organized by Waag Society, it also involved several partner organizations. One of the other actors that were involved in the organization of the SensorLab workshop also has the aim of realizing citizen science. The Dutch branch of Al Gore's GLOBE

8 Due to the fact that all the collected data was in Dutch, any quotations that are presented in the text are translated into English by the author. This is also applicable in chapters 5 and 6.

(Global Learning and Observations to Benefit the Environment)[9] Network was involved; the groups of students that joined in on the SensorLab workshop were from 5 schools that are connected to the GLOBE network. The GLOBE network seeks to educate high school children about their environments and to empower students by allowing them to work together with scientists or other experts to collect and interpret environmental data. It realizes these goals by providing a "worldwide hands-on, primary and secondary school-based science and education program" where students, teachers and scientists collaborate on "inquiry-based investigations of the environment".[10] Both Waag Society and the GLOBE Network thus work to realize a form of citizen science and embodied learning.

In addition to GLOBE, three other actors were involved during the workshop: the NME (Nature and Environmental Education)[11] organization, the Hogeschool van Amsterdam (University of Applied Sciences, the HvA) and research organization TNO. The NME seeks ways to bring together partners and share knowledge to contribute to a more environmentally sustainable future. From the HvA and TNO a number of sensor technology experts were present during the SensorLab workshop to offer their insights about sensor technology to the students and also learn about educational usage of sensors themselves.

The goal of the SensorLab workshop was two-pronged; to firstly educate students by allowing them to work together with scientists or other experts to collect and interpret environmental data with self-built "smart" sensor prototypes and secondly to alert people (walking around the festival park) to the quality of their living environments.[12] Apart from teaching the students about technology, the workshop should thus raise environmental consciousness of both the students and the people onsite.

Designing sensor prototypes and learning about sensor technology were not the only objectives of the organizing parties. As a format, the SensorLab workshop itself was presented to the participating students and experts as a "test case". Expectations were not yet clear (hence the slogan of the day: "join in and become pleasantly puzzled") and the atmosphere was one of tentative curiosity; what would the students do? The students were therefore included in two different roles: as designers of new smart sensor prototypes and also as "guinea pigs" to test a new workshop format.

During the workshop, five groups of in total twenty-one high school students from schools connected to the GLOBE Network created working smart prototypes to measure pollutants in the air, earth or water. The students worked around their own group table, supported by a supervising teacher (from their own school) and an allocated sensor expert from TNO, Waag Society or Hogeschool van Amsterdam.

During the introduction the assignment was explained to the students; they should

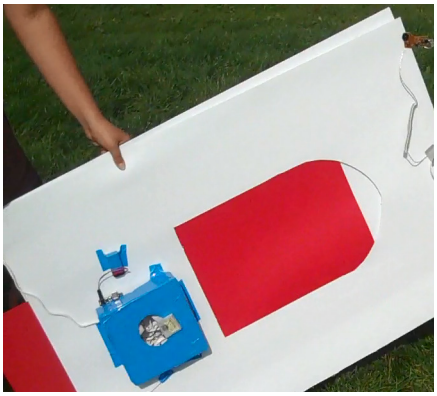
9 http://www.globenederland.nl/ (accessed on 11-4-2012).
10 http://globe.gov/about (accessed on 11-4-2012).
11 http://www.nme.nl/content/sensortechniek-biedt-kansen-voor-nme (accessed on 11-4-2012) provides an NME report of the day.
12 "Sensor technology allows insight into the effect of actions, so that these actions can be reflected upon" (Hordijk & Post, 2010: 14).

build a working smart sensor machine that would draw the attention of people passing by. In effect, the students had to design a prototype, keeping in mind an explicit future user (they themselves[13]) and a more implicit audience (the people walking by). The students need not consider the prototype's reproducibility; the artefacts would serve as input for following SensorLabs.

Materials to build with were provided on a table at the back of the tent. These materials ranged from balloons, toy cars, duct tape, plastic shovels, toy parachutes, cardboard, coloured paper to an inflatable seal and tools to work with such as Stanley knives, scissors and soldering equipment. The sensors that the students needed to incorporate into their prototypes were also presented on the table; these were pre-programmed by Waag Society and set to measure pollutants in the air (humidity, polluting gas levels and magnetic fields), water (light strength to measure oxygen) and earth (salt levels to measure amount of fertiliser and sea water in the earth). The sensors were complemented with short functional descriptions.

The workshop was situated inside the tent, and in the main hall of the PICNIC festival where a mobile FabLab had been set up. This mobile FabLab offered students the possibility to work with tools such as a 3D laser cutter and a 3D printer as well more materials to build with such as rope, extra cardboard and tape. By the end of the SensorLab, the students had discussed many ideas and built five prototypes. Figure 1 introduces the groups and describes how they developed their prototypes;

13 In a sense, the students are thus asked employ a kind of "I-methodology" (Akrich, 1995; Oudshoorn & Pinch, 2003), where they use their own ideas about future use to build a technological artefact.



Group 1 consists of four students, three boys and one girl, a male teacher, a sensor expert from TNO and one technical expert (in hard- and software) from Waag Society. The group spends quite some time discussing what they want their prototype to trigger in the people passing by and what they want their prototype to draw attention to; the realization that pollution is everywhere. To reach this goal, certain means of drawing attention to pollution are discussed and noted down, e.g. the beeping sound of the sensor, walking around with a laptop that displays graphs or a red colour, red and green balloons and red paint. Related to their aim to draw attention are the ideas for the shape of their prototype. The first idea is to build a digging mole (pollution in the earth); followed by the idea of a seal that measures water quality, and a nose on wheels (air pollution). In the end, they settle on the idea of building a kind of "thermometer" that shows – in real time- how "good" or "bad" the air quality is. The prototype is built inside the festival main hall, at the FabLab using cardboard, duct tape, scissors and sensors.

In **group 2**, five students, three boys and two girls, a male teacher, a sensor expert from TNO and one freelance graphic designer (formerly a student of the Hogeschool van Amsterdam) set out to create their prototype. The group of students start by asking the experts about the available sensors and split up into two groups; one discusses the ideas and the other looks for materials. They settle on measuring air quality and air moisture. Ideas of building a paper aeroplane, a kite, a parachute, an airborne football using plastic bags and balloons are ultimately discarded in favour of creating a car with balloons that allows for two measurements to be taken (air moisture at the level of the car, air quality higher up in the air). The way in which the construction should be built is discussed at great lengths mainly while they are building their prototype. They discuss how balloons symbolise air and that balloons should be used to draw the attention of the public. The tools in the FabLab are used to cut a hole in the roof of the toy car that forms the basis of the prototype (to fit the sensor in the car) and the 3D printer is used to create stickers to make the prototype stand out even more. (*photo: Marco Baiwir for Waag Society)*

Four students, three boys and one girl, one male teacher, one sensor expert from the Hogeschool van Amsterdam and one sensor expert from Waag Society work together in **group 3**. In addition to this, one extra sensor expert from Waag Society occasionally joins in the discussion. The students argue that drawing attention is to be the main focus of their design. To achieve this, they want to use balloons, a paper aeroplane or the inflatable seal. When one of the sensor experts questions the link between the look of the prototype and the functionality, ideas shift towards creating a floating ear that measures sounds. When this does not seem possible in terms of sensors, the idea changes into creating a floating nose that measures air quality. To draw extra attention to the nose, a moustache is added. Materials are collected to build a flying nose. However, as there is not enough wind outside to make the nose fly, they decide to carry the prototype around or make it so that it can be stuck into the ground. The nose design is drawn in different ways on the piece of "brainstorm paper" and built in the FabLab. They call it "Snuffelneus" ("Snifflenose"). (*photo: Marco Baiwir for Waag Society)*

Group 4 consists of three students, two girls and one boy, a female teacher, one sensor expert from Waag Society and one sensor expert from TNO. While discussing what a main indicator of pollution is – using the brainstorm paper to jot down all ideas - the group comes up with air quality. In order to build something that grabs the attention of people passing by, they want to create a prototype that shows the air quality at two different heights; that of a child and of an adult. The claim is that air pollution is worse close to the ground, which makes the environment of a city more damaging to children than to adults. As they look around the tent, they spot toy cars and balloons. Using the materials in the tent, they attach the first sensor to the car. The second sensor is attached to the balloons. To show people the quality of the air, the group builds an automatically operating set of traffic lights; where a red light indicates bad air quality. To make the prototype more "girly", they create flower stickers in the FabLab. A windmill is furthermore attached to the car. The car is steered with a remote control.

In **group 5**, five students, four boys and one girl, one male teacher, one sensor expert from Waag Society join to create their sensor prototype. The students have many ideas, ranging from a worm that measures air quality to equipping a car with light sensors or measuring the salt in the pizzas that are available on the festival terrain. Once the teacher steers the group towards the goal of the assignment, they want to draw attention to pollution with a bird or dragonfly made of aluminium foil and balloons. They decide that both an air and water quality sensor should be included; this leads to the idea to create an amphibian creature. Once they see the inflatable seal, the group immediately starts to build (the brainstorm paper is only used to draw their "seal idea"); attaching the air quality sensor to the seal's nose and the water sensor to its back. To make the seal mobile, they attach it to a toy car. The FabLab is used to print texts on stickers ("No animals were harmed in this project" and a name, "Mario/Luigi"), to draw more attention to the prototype.

Figure 1: Description of the 5 groups and their prototypes [14]

4.3.1 User configurations

The students are configured, as stated above, as designers of prototypes, but also on the level of the concept of the workshop as testers of an educational format. In addition to this, the setting of PICNIC itself – inviting creative and innovative people – configures these students as part of this public; the students are expected to be creative and innovative in this setting. Asking the students to work with materials and machines of the mobile FabLab furthermore demands or invites the students to be or become able to express their ideas in physical forms (as designers); they are to become empowered to design, to collect environmental data and reflect on their measurements. Empowerment, in the light of the GLOBE program, is also connected to collaboration. The workshop should offer the students the possibility to collaborate with scientists.

At the same time, the students are there to learn; they attend the workshop for educational purposes. Another role they are attributed in the context of the workshop is that of informer: the students should – via their prototypes – inform and alert the surrounding public about pollution levels that their prototypes measure. The students are thus configured as designers and referred to as collaborators, informers and at the same time as learners and as testers. Becoming designers in this context thus means that they engage in the practices

14 All images are taken by the author, except where specified otherwise.

associated with these activities; they should collaborate, inform, learn and test.

4.4 Students designing in practice: improvisation practices in the SensorLab

To trace how user involvement and user innovativeness are shaped and facilitated in the sociomaterial setting of the SensorLab in practice, I deconstruct the "mangling" of agencies within this setting. The concept of improvisation is used to catch and articulate unforeseen practices. Improvisation is furthermore coupled with the situated expertise of the students; how the students' improvisation practices are recognised as situated expertise. Investigating how in practice students create sensor prototypes allows me to draw conclusion about the agency of the students as designers, and about how the emerged sociomaterial relations can be connected to ideas about improvisation, situated expertise and ultimately about the kind of user innovativeness that can be observed here.

Analysing the interactions in the SensorLab starts with an analysis of the framing of the student designers. In the introduction I already provided the views on users as designers of Waag Society and in the previous section I reflected on how the students were configured as designers in the sociomaterial configuration of the SensorLab. Here, I analyse in detail how the students became designers in practice by first looking at how the students were introduced to the idea of them becoming designers for the day. After this, I view the interactions of the students with the presented "sensor experts" in the setting as well as the engagements of the groups with the materials available in the setting. Their collective efforts lead to five sensor prototypes, which the students test on the festival terrain. By adding their reflections about their experiences in the SensorLab, I catch how they themselves perceived their designer role.

4.4.1 The assignment: configuring the setting

The workshop assignment provides the goal and the structure - the *how* and the *what* - of the workshop. The organizing actors give strict design specifications: the prototypes should draw attention by being "outrageous" in their design and need to measure and collect pollution levels. The whole workshop should be executed within a clear time structure and in different design phases: ideation, conceptualization, building and testing.

During the introduction to the SensorLab for the students, three people provide explanations of what is to happen. First, a spokesperson for GLOBE explains that GLOBE would like to learn more about how students develop sensors; what do they see as important? He explains how this way of educating students about sensors and pollution is new. The spokesperson for Waag Society furthermore explains how the groups will be guided in their endeavours to design their prototypes by design and sensor experts and that they should work keeping in mind a number of guiding questions: what does the prototype need to look like, which sensor will you use and how will you draw attention to your prototype? To give a more concrete idea of what the students could develop, she gives the students two examples

of Natalie Jeremijenko's Health Clinic[15]: a robot dog and swan that measure pollutants in the air and water respectively. She furthermore explains that by creating something "outrageous", people passing by will start to question what the students are doing. Apart from measuring pollution levels, the prototypes should also instigate public discussion. After this, a third person – also from Waag Society - gives information about the available sensors.

The assignment given to the students frames their design activities and encourages them to behave as designers and to learn how to think as designers with a specific design problem. Much like a traditional design process (Eger, Bonnema, Lutters, & Van der Voort, 2004: 49), the workshop is divided into set phases; an introduction (15 minutes), a group brainstorm (ideation and conceptualization phase of 60 minutes), a building phase (90 minutes), testing/measuring time (45 minutes) and closing presentations (30 minutes). The specific assignment furthermore forces the students to keep an explicit future user (they themselves) and a more implicit audience (the people walking by) in mind. The students need not consider the prototype's reproducibility; the artefacts would serve as input for following SensorLabs.

The groups are given an overview of what is expected in the design stages, what questions they should answer in their role as designers and what is available to them: experts, materials and sensors. They are also "guided" in possible ways to comply with the assignment, as they are given two illustrations of what they could design. They are also guided by a fixed workshop format and process and aided by "professionals". These combined observations create a rather constricted image of the SensorLab. The students need to work fast to design an "answer" to the design problem and test a functioning prototype with a limited availability of time and other resources.

At the same time, the students are in charge of the design of the prototypes. In other words, the setting is set up to facilitate their designer performance. It is possible to say that in the SensorLab, the initial idea is to start off with a certain set of constraints that limit the possibilities of the prototype designs: there are limited sensors available, limited materials available to build something new and there is a limited amount of time allotted to the students' efforts. The assignment and the available materials set the stage and the boundaries for the students; by engaging with the materials, the students both perform their version of the designer role while they at the same time create their prototypes. And although the students are guided by these boundaries, they are not limited in their interpretations of the assignment, or in their use of the available materials. The available tools – also in the mobile FabLab - allow them to alter the materials. So how did the students "make sense" of the assignment and the sensors?

Group discussions of the assignment: Resisting and accommodating ideas

The robot dog and swan that were presented during the introduction had an immediate effect on the start of the student group discussions. Almost all groups start their brainstorm session

15 http://www.environmentalhealthclinic.net/environmental-health-clinic/ (accessed on 11-4-2012).

by referring to animals; the groups generate ideas to build a dragonfly (group 5), octopus (group 4) and mole (group 1) or start by questioning whether they want to build an animal similar to Jeremijenko's examples (group 2).[16] They translate the given examples into possible ideas that would fit their surroundings. These ideas are also materially informed; on the table with materials, an inflatable seal is in plain view. Groups 1 and 2 immediately refer to the seal when they discuss their first ideas.

However, after these initial ideas, discussions shift to the subject of the location; how to connect the assignment into something that can be used in this specific location? Furthermore, they wonder how they can make their prototypes "outrageous" in this location. Locations are referred to in terms of how these accommodate the assignment; the possibilities they offer to measure pollutants (group 4 remarks how they should measure the pollution in the water nearby); locations are regarded in terms of expected contrasting levels of pollution (i.e. to show how air may be better in the park than alongside the road, as group 1 discusses); and references are made to the different locations to come up with ideas for the prototypes (group 5 wants to build a car like the Tesla on display outside). At the same time, locations are also seen as resisting the assignment; for example, the plan to build a kite to measure air pollution is cast aside once it becomes clear that the weather conditions will not allow them to fly a kite.

A clear motif in all group discussion during the ideation phase is how the prototype, in this location, should draw the attention to what it is measuring of people passing-by. For example, students exclaim: "if we build it close to the ground, no one will see it" (group 3) and "we need something to trigger an alarm when the pollution is too high (…) to trigger people" (group 1). To accommodate the design assignment specification that the prototypes should draw attention, the students envisage prototypes that have both visual and aural triggers.

Both a clear design problem posed by the assignment and the set phasing of the design assignment are presented to the students. In practice, none of the groups adhere strictly to the pre-given structuration of the phases; one group spends a considerable amount of time on brainstorming and drawing ideas (group 1), whereas others either split the group in two (one delegation brainstorms while the other looks for materials, as occurred in group 2), or focus on the materials or sensors to come up with ideas (group 5 specifically). The students resist the pre-set structure of the workshop; they are accommodated by the setting to decide when to do what and in this way re-shape the design practice. By playing with the pre-set structure, they show how they interpret the assignment. The workshop may have been conceived as structured, but the groups do not strictly adhere to this.

On the whole, the groups follow the *what* of the assignment more closely than the *how*. The pre-structured assignment may guide their practice, but also allows the students to make choices in terms of what parts of the assignment they resist and accommodate. In this mangle, the groups are facilitated to improvise; they are granted agency to shape how they will build their prototypes, as long as they adhere to the *what* of the assignment. What they do with this

16 Group 3 also discuss the idea to use the shape of an animal. However, they do this at a later stage when referring to the inflatable seal. This idea is more materially informed.

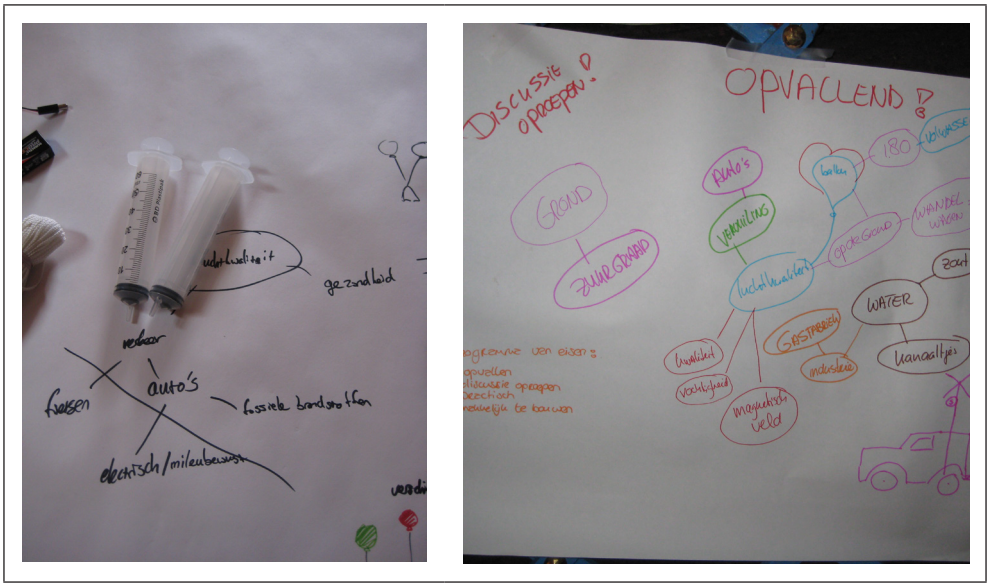
choice is what grants the groups creative agency.

4.4.2 Resisting and accommodating the agency of "experts" and teachers

During the introduction the sensor-experts are presented as *guides*, available to answer questions and help with the design process. This role unfolds differently per group, although it is possible to articulate specific "uses" the students make of the experts. These can be described in terms of (1) the empowerment of the students as designers; (2) inspiring ideation and (3) the contribution of knowledge about materials. Effectively, the experts thus work as coaches, brainstorm facilitators and as knowledge providers.

First I turn the experts' role as coaches. Within each group, different interaction dynamics are observed; some students take "charge" while other sit back more (i.e. in group 5, one girl takes the lead). The teacher at each table subsequently draws the others more into the discussion or distribution of tasks. The teachers are thus also "guides" in this case. When the expert enters the group, a repositioning takes place; the students and teachers listen to the expert and respond to the questions he asks; what kind of environmental issue do they want to tackle? What kind of sensor would work best to do this? Asking these questions at once draws students further into the design assignment and seems to boost the students' confidence as well. For example, when one expert suggests that it *is* possible for group 3 to build their initial idea of a flying ear, the group decides to think along this line and comes up with the idea of building a flying nose. At other times, when the students seem too reliant on the ideas of the expert, he notes how they are in charge; the expert underlines their role of designer and asks what they want him to do. The experts thus, in this role, work to accommodate the students' role as designer, stimulating them to actively generate ideas and to execute their plans. The teachers meanwhile also listen to the experts' ideas and questions and become more part of their groups as team members than as guiding actors as the discussion and building activities start. The roles of the experts and teachers are therefore flexible; they both inform and steer, after which they become part of the building teams.

Design inspiration is provided in different ways throughout the workshop. Illustrations of existing prototypes (from Jeremijenko's Health Clinic) are used during the introduction and the experts stimulate the flow of ideas by asking the groups questions. For example, when group 1 is seemingly stuck in their ideation process, the expert asks: "You could also look at the gas factory (…) where would you like to draw attention to in this location?" These triggering questions work to inspire the group to think of new ideas. Moreover, as facilitators the experts "force" the students to use the available pens and paper to create mind-maps and draw up plans for their prototypes. They encourage this mapping exercise to start a discussion about the different ideas in the group. In this way, the experts draw the students into contemplating, on paper, how they want to proceed.



Images: Mind-maps of groups 1 and 4

The experts' knowledge of materials also comes to the foreground. While the students are in the process of making the choice of which sensor to use in the prototypes, the experts provide information about the restrictions of certain sensors (e.g. the magnetic field sensor is described by two experts as unstable. This immediately makes these groups drop this sensor and instead opt for a more "stable" one). Knowledge of material characteristics is voiced when for example students want to combine certain materials; group 5 begins to glue a toy car to the inflatable seal when the expert exclaims that the glue will dissolve the plastic of the seal. The expert's advice to try and find an alternative way of combining the car and seal is attentively listened to and the students find another way to attach the two by using gaffer tape and rope. In this case the agency of the experts is accommodated and translated into a different approach by the students. The experts are thus trusted as knowledgeable sources of information.

As the workshop progresses, the experts also become more involved in the building process in two ways. Firstly, the experts do design suggestions ("why don't you make a pyramid construction to gain height") which are then either resisted ("we don't have the materials to build a pyramid") or accommodated ("why not make a kind of pyramid here?") by the students. Secondly, the experts become involved in building the prototype; one expert is asked to solder the materials that will shape the group's design of a traffic light (group 4). At first he tries to urge the students to solder themselves. The students, in turn, exclaim that "they have never soldered before" and as time is running out, the expert concedes while the students complete the other parts of the prototype. The expert's knowledge of materials is used by the students to complete their work.

But while the students make use of the experts' coaching, facilitation and knowledge, they also draw up their own plans. The questions asked and ideas provided by the experts are

engaged with and used by the students to better inform themselves. New information aids the groups in terms of ideation and once they start building. And while knowledge offered is not automatically taken up, actual help in building the prototype is readily accepted. In effect, as the workshop progresses the experts become part of the design team. The experts thus allow the students to learn (about prototyping, about technology) and give them the opportunity to test their ideas. This means that apart from positioning the students as "in charge" designers, the experts (and teachers) also configure the students as "learners".

Once building commences, the initial coaching and *knowledgeable* position of the experts and teachers is replaced by one where they become team members; the perhaps presumed hierarchy in knowledge is partially dissolved as the students take charge. Together, they play with the pre-determined roles and in doing so redefine the role of the experts. The experts' fulfilment of different roles within the setting of the SensorLab all work towards allowing students more agency in the design and development process.

There is a gap between the more specialised knowledge of the experts and the more general knowledge of the students (about for example the design process, the sensors and materials). This gap at once stresses the *lay-ness* of the students, but at the same time works to stimulate the forming of new ideas; the expert accommodates and facilitates ideas and grants the students space to formulate and reflect on their own ideas. The only group where the expert plays a larger role, central to the design process, is in group 4. The students listen to his design suggestions and follow his instructions, as he helps them build their idea of creating a pink car. The experts mostly remain in the background, as supporting agents. They do this not so much because they are resisted by the students, but respond to the goals of the SensorLab itself by stepping out of their "expert role".

The sociomaterial configuration of the SensorLab grants the students the agency to make decisions; the experts respond to this by "stepping out" of their role as experts, and becoming team members. Important in this process is the experts' openness to this change in role. While they adapt to the ideas and respond to questions of the students, the experts accommodate the students' role as designers. By granting the students more agency (to voice ideas, to enrol them in the building of the prototypes), the students are stimulated to learn-by-engaging with them and learn-by-building using the materials in the setting. In effect, the roles of the experts, teachers and the students continuously mangle.

4.4.3 Mangling material agency

The list of available materials is long and includes laptops, sensors, markers, paper, cardboard, glue guns, shovels, balloons, a kite, inflatable seal, toy cars and mills, a parachute, sewing kits, pipettes, rope and duct tape. Although all groups are oriented towards the materials, they do so in very different ways.


Images: The table with available materials (with the available sensors on the bench) before and after the SensorLab

The starting point for each group is the choice in sensor to measure pollution. The sensors, based on arduino open hard- and software[17], cannot be tinkered with as they were pre-programmed prior to the workshop and not open to change.[18] As such, they are presented as "black boxes" to the students. Consequently, apart from primarily choosing a sensor based on what the sensor measures, the students also see and use the sensors as a *raw material* to work with alongside materials such as balloons and duct tape. Group 2 for example uses the weight of the sensor to balance out their prototype to keep it from falling over.

It is interesting that in terms of the choice of sensor, all groups end up building something that they associate with what their specific sensors measure. The second group for example, starts collecting as many balloons as possible immediately after they choose to

17 "Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple micro-controller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs." http://www.arduino.cc/en/Guide/Introduction (accessed on 23-11-2012).

18 Philippe Ross refers to this type of "user-as-designer" perspective, where users are presented with "technologies that already exist (as prototypes or as configurable software)" (Ross, 2011: 254) as neglecting the ideation phase of innovation. Students in this empirical case would, if this view is adhered to, not be designers. However, they do design and create prototypes, using the technology of the sensor as part of the artefact.

measure air quality; balloons are what they associate with air. This immediately leads to issues for the other groups. Because there are not enough balloons to allow their sensor to float, group 3 first turns to the idea of using a kite to fly their sensor. When it becomes clear that there is not enough wind to fly a kite, they instead start working on creating a nose (also associated with air). In other words, due to material and contextual resistances they need to generate new ideas using the materials in order to accommodate the design assignment.

Associations are also related to a more technologically oriented interpretation of the assignment. The third group for example wants to use as many "technical" materials to communicate that their prototype is "technological". To this end, many wires are visibly incorporated. This is more of a functional interpretation of the assignment, translated via the materials used. Group 4 even builds a traffic light and attaches this to their car-prototype to suggest that cars and traffic flows pollute the air (once the pollution levels become higher, the red light flashes on). The materials thus help to communicate certain associations had with concepts such as "pollution" and "technology". These interpretations are thus accommodated by the available materials.

Due to the different strategies used by the groups in terms of design phases, each group works with the materials in a different time order. The first group for instance, spends a considerable time discussing what they want their prototype to communicate to the people walking by. Consequently, once they arrive at the table with the materials, they have less choice in materials; the other groups have taken most of the balloons for example. While this apparent scarcity might suggest that they are resisted to realize their ideas – as this limits their options – in practice this material scarcity only causes the group to accommodate their strategy to the changed availability of materials; they still create a prototype that draws attention due to its large size and beeping sounds.

Another way in which the mangle works on the level of materials within the design process can be observed in the fifth group. This group starts out with many ideas, ranging from building a digging mole to an air quality measuring dragonfly. Alignment within the group occurs once they find a large inflatable seal. Almost in "snowball-like fashion", the group comes together in the idea of making a vehicle that will drive and float, like an amphibian creature. Rapidly, air and water quality measuring sensors are attached to the seal's nose and back. Here, the material of the inflatable seal forms a catalysing factor in the design; the students use the seal as the centrepiece of their prototype and fit the sensors to their vision of a seal as a pollution-sniffing animal.

Some materials are more readily accommodated than others. One student exclaims that "using balloons is just something practical; it is easy to make something that draws attention with balloons" (group 4). The balloons have multiple functions: to draw attention and to attach sensors to (i.e. group 4 measured air quality at different heights). Other materials seem more difficult to work with – the best example of this are probably the sensors themselves, as these are not alterable. Some materials thus accommodate the ideas of the students, while other seem more "opaque" and trigger more ideas in terms of their functionality (sensors) than in terms of their materiality (e.g. the sensors cannot be altered).

The groups thus use the materials in different ways: to complete, trigger or find alternative ideas. What is interesting is the design choice all groups make to make representational use of the materials: all prototypes are designed to communicate what they are measuring. In other words, the students attribute a symbolic meaning to some materials (for example, of a car as a symbol for "polluting"); this meaning is important for the completion of each design. The materials in this case guide the functionality of the artefact to be designed. Materials are also reshaped to communicate certain measurements in a symbolic manner; a thermometer to note the level of pollution, a traffic light that turns red when higher pollution levels are measured. The other prototypes use their shape to communicate what they measure: a nose and a car to "refer" to air pollution. The seal itself becomes more of a "general" symbol for "environmentalism".

The meaning that the prototypes communicate is directly related to the assignment and to the location in which this prototype should work; certain materials will "not work" (for example, a kite) in the location (as there is no wind), so these are either reshaped or discarded. The physical prototype becomes an answer to the design problem given to the students via the assignment. The fact that they subsequently work with the materials to create something of a symbol says something about the role of materials in the design practice; materials trigger associated meanings. By playing with (meanings of) materials, and recombining materials to create (new) meanings for the materials the students create their prototype.

Making use of the machines in the FabLab helps the students (re)shape the available materials. Group 2, for example, uses the tools to cut a hole in the roof of the toy car they chose as the basis for their prototype, so that they can insert the sensor there. Alternatively, the groups also use the tools to create their prototype out of more "generic" materials such as cardboard (to build a thermometer) or foam rubber (to build a nose). Apart from this, the FabLab-machines are also used to create additions to the prototype. Group 5 for example prints a set of self-designed sunglasses (which they refer to as "3D glasses" as these were printed with a 3D printer) for their seal and print out texts on stickers that they stick onto the seal ("No animals were harmed in this project"). The tools in the FabLab are therefore used to adapt the functionality of materials (e.g. the hole in the roof of the car, or the addition of a moustache to clarify that they developed a sniffing nose) or to inscribe the "identity" of the group into the prototype by personalising existing materials (e.g. adding texts to prototypes using printed stickers, or adding a self-developed set of sunglasses to the seal prototype). Especially these additions are brought in by the students to draw more attention to their designs. One could argue that these additions represent the students' I-methodology (Akrich, 1995); they consider themselves as representatives of the implicit users of the prototypes, the people passing by and add matters to their prototypes that they feel will draw their attention.

Overall, the interactions leading up to the development of the prototypes do not follow a certain "design logic" apart from the before-mentioned adherence of the groups to the "what" of the assignment: the design question posed by the assignment and the set design phasing of the workshop. Looking at the activities of the students in the SensorLab in terms of their engagement with the assignment, the expertise on offer and the materials available in the setting alone cannot explain how they work to create their prototypes. New meanings, ideas

and actions are brought into the setting by the students. As they engage in group-creation of their prototypes, the students use their own knowledge to interpret the assignment and integrate materials into a working prototype. Each group uses the materials and machines in the setting to build their rendition of the design assignment. They do so by improvising with the materials; extending the apparently existing meanings suggested by the materials (e.g. using a toy car as a symbol for traffic and exhaust fumes) or imbuing the materials with new meanings (e.g. reshaping foam rubber into the shape of a nose) or giving materials a "new" function (e.g. using balloons to carry the sensors). These improvisations take the shape of what Seham (2001) refers to as "making do" and "letting go" of certain materials, of a reshaping and a play with forms and meanings.

Images: Working together in the FabLab and printing "3D glasses" using the 3D printer

4.4.4 Resisting and accommodating agencies: testing in the park

After finishing building the prototypes, the students set out to test these on the PICNIC festival grounds in a public park in Amsterdam. Inside the festival hall they measure the air quality in public restrooms, inside coffeepots and inside garbage bins. They also venture outside to measure the air quality in the park; holding their prototypes close to a burning barbecue, exhaust pipes of cars waiting for the traffic lights to change, and in the water of the canal running alongside the park's edge. Every time a measurement is taken, the groups note down the exact time on a notepad in order to be able to afterwards trace which reading corresponds to each situation. At times, people approach the teams and ask them what they are doing and what their machines are used for. Some of these people are the owners of the motor vehicles being measured by the students, while others are visitors of the park or festival. The students explain the use of their prototypes and then proceeded to collect measurements.

The prototypes did not always work as the students had intended. For instance, one

of the cars kept falling over due to a balancing issue and the cardboard thermometer could not communicate measured pollution levels as these were not easily read off the measuring-device. In a discussion with a passing pedestrian, one group could not give insight into the pollution levels at that particular location as they thought the differences across locations were too small to be truly perceptible. This is also discussed when, at the end of the workshop, each group presents the results they ascertained while testing to the PICNIC-audience. Apart from explaining their prototypes, the groups also discuss the use of sensors in their prototypes. The sensors did not seem calibrated properly, or not sensitive enough to really generate pollution-level insights of specific locations. They are all surprised that most of the measurements seem to suggest that everything is quite clean in the park and on the festival terrain. The sensors only responded noticeably when held close to "strong triggers" such as a burning cigarette or acetone solution.

The environment of the park and the festival terrain accommodated the testing of the prototypes. In terms of drawing attention, the prototypes were also readily accommodated; people took notice and actively asked questions about the prototypes. However, the environment also resisted testing; obstacles onsite reduced the mobility of some prototypes, or caused the students to change their approach (picking up the prototype to walk to different locations when it kept falling over for example). Most notable was the resistance of the sensor technology itself; it resisted completion of the design assignment, by not being sensitive to small changes in pollution. To take measurements, the students needed to improvise, by holding the sensor very close to an expected source of pollution, and by writing down where they had been when a specific measurement was taken.

When the students are asked by a member of the audience whether or not they feel that their prototypes could be re-used or extended in design, the students agree that they see possibilities of extending the designs. Group 4 for example would want to make their car wind-driven; as there is already a windmill attached to the car, the prototype can be redesigned to run on wind energy instead of on batteries – thus saving more energy. Overall, the students' response to the workshop is very enthusiastic. However, they would have liked to have more time to really get to know how the sensors worked and try and program these themselves.

Image: Measuring air pollution close to the ground (attached to the car) and higher up in the air (attached to balloons)

4.4.5 Student improvisations and situated expertise

In the previous section I analysed how the groups engaged with the assignment, experts, materials and the test environment of the park. How they "dance" with these elements yields insights in the dynamics that shape the students' design practices. Here I reflect on the improvisations that were the result of the dynamics of the mangle, of the resistances and accommodations of agencies. This means looking at how improvisations result in and from this mangle. As this section will show, these improvisations are furthermore connected to how the students are facilitated to use their situated expertise.

The students interpret the design assignment and the phases of the design process in various ways. First of all, they use their own ideas and knowledge about designing and "building" to start thinking about *how* to create their prototypes; one student refers to her knowledge of technical Lego to explain her idea. The students' own ideas about how to design the prototypes are however always related to their interpretation of the pre-set phases of the assignment. The assignment sets certain phases of development, to which the students respond by either resisting or accommodating this phasing. Some adhere to what they are told a design process *should* look like to complete the assignment. For example, one student wants to stop the building process to sit down and create a mind map together (an interpretation

of the ideation and conceptualization phase). As they build their prototypes, the groups question whether or not they *need* to first draw their prototype before they can start building. These are choices they negotiate in the setting, based on their ideas of what it means to build a prototype.

Secondly, they use the assignment, the given examples and their physical surroundings to think about *what* to design. One student for example relates the assignment to the location; he refers to objects he has seen on location such as a Tesla-car ("let's draw attention to ourselves by standing next to the car") and an onsite pizza-place. He wants the prototype to be on wheels and to refer to pizzas. In the end, this is also what happens; wheels are attached to the plastic seal while the names "Mario" and "Luigi" are stuck on its back as a reference to Nintendo's pizza-loving game characters. While negotiating the process (*how*) and the content (*what*) of their prototypes, the students make use of different cultural references, for example their technical knowledge of Lego and references to popular culture triggered by their surroundings.[19]

In terms of the dance of agency, the assignment configures the students as it resists and accommodates students' ideas and interpretations as well as the executing of their ideas in practice. As they generate ideas based on the assignment, the students are accommodated to contribute their ideas by making cultural references, by personally interpreting the assignment and by freely associating ideas based on the available materials and location. The students are positioned as "in charge", and are granted the agency to take "meaningful action and see the results of [their] decisions and choices" (as Murray defines agency, in Murray, 2000: 126). This is also what gives them the space to improvise; they can interpret the phasing of the assignment and the design assignment as they see fit.

The same can be said of how the students relate to the knowledge provided by the experts; the students decide which input is to be incorporated in the prototype. Furthermore, while the groups develop their ideas and engage with the materials, the role of the experts changes; the experts become part of the team and involved in the practicalities of building a prototype. The experts thus accommodate the students' designer role by becoming part of the team and discarding the given role of "expert". At times, this move is resisted by the students; in group 4, for example, the expert is asked to solder for the team, as the students feel they lack this technical expertise. In the mangle, the students decide when experts are related to as "experts" and when they are "team members".

The students "dance" with the materials as well. They test and play with materials; how to navigate the electric car, will the bumper come off easily, can the seal be inflated and glued onto the car? The materials are investigated, reshaped and tested to see how and in what shape they can be integrated into the prototype. As they investigate and use the materials, these

19 These two examples mirror the two dimensions of tacit knowledge Polanyi identifies: "the technical dimension, which encompasses the kind of informal personal skills of crafts often referred to as 'know-how' [and the] cognitive dimension [which] consists of beliefs, ideals, values, schemata and mental models which are deeply ingrained in us and which we often take for granted" (Nonaka & Konno, 1998: 42).

perform their agency as well – the balloons and inflatable seal for example draw immediate attention as these are seen as most readily accommodating the design assignment. The *functional* use of a particular material is used to come up with new ideas; a parachute can work to keep a sensor afloat that is thrown into the air, which might allow the students to measure air quality higher up in the air. Alternatively, *symbolic* uses of materials also come to the fore; (toy) cars become a carrier for sensors measuring air quality, the inflatable seal becomes a pollution smelling technological artefact when sensors are attached to its nose and tail. In this case, the group makes the choice to attach the "air quality sensor" to the nose of the seal – thereby reinforcing the idea of nose that sniffs out pollution.

The knowledge some students have of these materials is indispensable. When a toy car is thought of as broken, one of the students knows how to manipulate the car in such a way that it will work again (switching channels so that the remote control can communicate with the car). What characterises their engagement with materiality is the way in which they combine their knowledge about the functional and symbolic uses of materials to create their prototypes. While they combine these uses, they can be said to improvise – they combine uses of materials to create something new.

Improvisation also takes the shape of using knowledge about each other to create their prototypes. For example, when a sensor needs to be placed at 1.9 meters height, one student knows that another student in the group is 1.8 meters tall; using the height of the student, they manage to deduce the required height where the sensor should be placed. The student's length, in this case, becomes part of the references used to build. Another group simply works with the length of one of their peers: she supports the floating sensor at a certain height during the testing phase to make sure it does not accidentally fall to the ground.

What draws their ideas into the design process is the way in which the students anchor the meaning their prototypes should translate to the public to cultural references. Ideas are related to the examples of the robot dog and swan, to cultural references in the setting (e.g. traffic lights and cars) and to associations made to pollution-themes or the measuring of pollution (in the case of the built thermometer). The best example of this is the idea of the "sniffing nose" (built by group 3). To draw attention to what the prototype measures, the shape of a nose is chosen. However, because the group is not sure that the nose will be recognizable as a nose, they come up with the idea to attach a large moustache to it. Adding this signifier will make the design understandable to their audience; this is how the group perceives the assignment. To make it even more clear what their prototype measures, the student carrying the prototype while testing it in the park also carries a message on his t-shirt, reading "do you also smell something?" Other groups use cultural references to communicate the functionality of their prototype. These references have been mentioned before (traffic lights which change colour depending on measurements taken, and the colour red on the thermometer), but need to be underlined as they show how the prototypes are the result of the application of their knowledge to the materials at hand.

In chapter 2, I referred to virtuose and makeshift improvisations to draw attention to how in some academic fields distinctions are made between improvisations that are the result of "virtuose" knowledge or improvisations that come about in response to unforeseen

circumstances. In the SensorLab, the students can be said to display both variants. When they use the materials to build the prototypes for example, they use their (virtuose) knowledge about Lego and cultural symbols to generate ideas about (the building of) their prototypes. When they need to measure height, they use a "makeshift" solution; they use their knowledge of each other's length to calculate this height.

However, while this combining of virtuose and makeshift improvisations is in itself interesting because it shows how within the SensorLab setting the dynamics of different forms of improvisation unfold, I want to draw attention to how in this setting both these kinds of improvisation are recognised as virtuose and treated as instances of situated expertise. The sociomaterial setting of the SensorLab accommodates the students to improvise and in addition to this, works to accommodate the students' knowledge (of for example materials, building processes, the location and cultural references) as situated expertise. This form of expertise takes the shape of a use of local, contingent knowledge that is recognised by the different actors as a type of expertise. For example, as the students (re)combine and shape materials, they engage in an improvisational "making do" and "letting go" (Seham, 2001), that is accommodated and recognised by the other actors in this setting as *guiding* the design process. Also, although the design of the SensorLab specifies a set route, the students are relatively "free" to interpret these phases as they see fit. The students are also accommodated to control how the experts influence the final prototypes. Even the shape of the available materials (toys, balloons, cardboard) seems to invite the students as experts; these are no alien objects, and readily recognizable. These materials can thus also be said to accommodate their agency as experts in this setting; they can apply their knowledge of these materials to collectively build the prototypes. To realize their prototypes, they reshape the materials using tools that are known (e.g. scissors) and new to them (e.g. the 3D printer) and as they build, they improvise together; the result of which is both a prototype and a collective experience of what it is to become designers in the SensorLab.

An actual interrogation of the sensor technology by the students is however resisted. The students are given time to create a prototype, but not investigate the technology they should incorporate into their designs. The only time they can delve any deeper into sensor technology as such is when they create their ideas of what their prototype should measure. Still, these ideas stay very close to the actual use of the sensors (e.g. designing a nose and using an air quality sensor in the design). Actual learning about the sensors and sensor measurements occurs when the students start using their prototypes, to test the functionality of the prototypes and whether or not the public in the park responds to their prototypes. It turns out that although both these goals are accommodated, the sensor technology itself ultimately resists the readily measuring of pollution levels. Even though the students improvise, by holding the sensors close to sources of expected pollution, the technological artefact resists the students' agency as designers by remaining "black boxed".

Image: Messiness of design practices in the SensorLab

4.5 Conclusion: user improvisation practices as an innovative product

The research questions of this chapter were *1) how are user involvement and user innovativeness shaped and facilitated in the sociomaterial setting of the SensorLab and 2) what kinds of innovation practices are constituted in the SensorLab?* Using the conceptual framework of the mangle, I analysed how in practice the SensorLab shaped the involvement of students as designers in the setting and the technological artefacts that were the result of their collective endeavours. The assignment, expert knowledge, materials offered in the SensorLab, and the testing environment of the public park are elements that the students work with to create and test their prototypes. By engaging with these elements, they shape their eventual prototypes and designer performance. This engagement is what I refer to as an improvisational practice; as they interact and perform the design role, things that "just happen" are incorporated in this performance and in their physical artefacts. Indeed, the students create their own "semi-structured activity" (Moorman & Miner, 1998). The assignment is re-structured (in terms of the design phases), experts and teachers are enrolled as team members and materials are used to create technological artefacts that work to represent cultural references related to the students' interpretation of concepts such as "pollution" and "sensors". The SensorLab offers a setting that frames and invites interactions that both resist and accommodate the formation and execution of design ideas.

To answer this chapter's main research questions, the analysis suggests that the students' involvement as designers hinges on how they are facilitated to improvise with the other actors in the setting (e.g. the assignment, the availability of experts and the functional and symbolic agencies of the materials) and with the setting as such (e.g. the opportunity to

test their prototypes in a public park). These actors and settings accommodate and resist as well as shape the agency of the students as designers; the students' performance can thus be characterised in terms of a constant repositioning in relation to the other actors. In order to perform this repositioning practice, "making sense" of the other actors in the setting, and dealing with resistances and accommodations, the students continuously relate and interact with these by making use of their situated expertise. The students thus shape their actual designs by using their knowledge to make sense of (and an artefact in) the SensorLab.

Knowledge and situated expertise are of course slippery terms, especially in relation to the earlier voiced ideas about the importance of practices; knowledge should be seen as embodied practice and as performance. Where does that leave the analysis of the students' activities in the SensorLab? Do they perhaps display a kind of enacted tacit knowledge and can a deduction of this knowledge help conclude what it means to include "users as designers" in Living Lab-practices?

The notion of tacit knowledge, previously discussed in chapter 2, suggests that knowledge is separable into different types, such as mundane knowledge and expert knowledge. De Certeau (1984) even described "daily knowledge" which is characterised as unconscious, repetitive and used in a tactical way to circumvent larger social structures (strategies). This resonates with the ideas of Schutz on the *well-informed citizen* (1964). Schutz connects ideas about socially distributed knowledge to democracy; arguing that there are different entry points of knowledge and that by informing him- or herself, the citizen can overcome the knowledge of "the man in the street" to help create a "better" democracy. He talks of a "zone of things taken for granted" (Ibid, p. 477) based on "the sediments of previous acts of experiencing" (Ibid) which somehow forms the starting point of inquiry. This seemingly unconscious knowledge would be observable by viewing, in the case of the SensorLab, how the students position themselves with respect to the assignment, expertise and materials and vice versa.

However, I have characterised this type of knowledge not in terms of its tacit or mundane character, but rather in terms of situated expertise. The students improvise by making use of the pre-given structure of the workshop, the materials and expert knowledge. Their improvisations mirror theatrical improvisations such as these are described by Seham (2001) when she argues that improvisation is a mixture of "making do" and "letting go" (in Vera & Crossan, 2005: 205). And it is in this combining of accommodating (making do) and resisting (letting go) that I locate their situated expertise. The students are positioned as designers, both prior to the SensorLab (in the set-up of the workshop) and during its unfolding; everything is geared at granting the students the agency to ideate, conceptualise, build and test their own prototypes. They are configured as experts in this particular situation.

Their situated expertise takes the shape of a collective kind of improvisation. The activities of the students are undertaken as collectives. Sawyer relates ideas of collective improvisation to collaborative emergence; "emergent because the outcome cannot be predicted in advance, and they are collaborative because no single participant can control what emerges; the outcome is collectively determined by all participants" (Sawyer, 2004: 13). As the analysis of the students' designer performance shows, in the SensorLab the collective is not only made

up of the groups of students; the elements that characterise this setting (the assignment, the experts and the materials) are also part of this process of collective emergence. This makes this collective improvisation hybrid: enacted by human and non-human actors.

The students become designers in the sense that they create their own meaning and use for the prototypes (according to Dourish (2003) the focus of design). While facilitated by the SensorLab to improvise collectively, they can be said to engage in a kind of interactional creativity (Sawyer, 2000: 184) that is, in turn, characterised by the accommodation of their situated expertise. By being enabled to exercise this situated expertise, the students are accommodated in their performance of the role of designer. The explicitly articulated designation of the students' role as designers, prior to and throughout the workshop, reinforces their designer role performance. The students are recognised as designers, which effectively turns their contributions into a form of expertise and their activities into a designer role performance. In short, the students are framed as designers. Their actions are seen in the light of one of the overarching goals of the SensorLab: to empower users to become designers. Granting users this role and the agency associated with this role in practice, is an important part of the emancipation of these users. The SensorLab facilitates the performance of this role.

What adds another dimension to the students' performance is the triple role they played. As stated before, the students are positioned as designers but also as testers of the educational workshop that is the SensorLab. While they designed and tested their prototypes, Waag Society was testing the workshop-format: the students were thus, to use STS-scholar Pinch's (1993) words, "tested as users" of the workshop format.[20] The test was to see whether or not the workshop would work: would the students behave as was expected with the technologies and would they act as designers, as was the purpose of the test/workshop? The third role the students play is that of "learners". As students, they are invited to learn about sensor technology and about what it means to be a designer. The experts and teachers in the setting reinforce this role even more; they are there to coach and help the students learn.

This can be related to the question of what kind of user innovativeness and innovation practices can be seen in the SensorLab. As described in chapter 2, innovativeness is concerned with "newness" from a certain perspective. The concept of improvisation aids in reflecting on innovativeness in Living Lab-practices, because it allows for an analytic focus on situated innovations where people's knowledge of everyday situations and environments can be seen to inform "unforeseen" uses of technologies. The students in the SensorLab perform the role of designer and as they improvise, their actions are also reflected on from the perspective that they are testing the workshop as such.

The students are facilitated to create "unforeseen" artefacts, within the pre-set constraints of the SensorLab as such (the set assignment and materials to be used). The designs are the outcome of a process of sociomaterial interactions which are mangled in

20 In his work on "testing the user", STS-scholar Pinch (1993) views the role of testers not in terms of new products being tested for use, but rather in the light of seeing how people perform the role of users as they test something new. Do people behave as they are expected to with a new artefact? I discuss this subject further in chapter 5.

practise. The outcomes of their efforts seem, however, less important for the organizing actors than realizing the workshop in the first place. Indeed, the actors introducing the SensorLab talk of being excited about testing this workshop-format, and not so much about their expectations to realize exciting new technological artefacts. In the end, it is the workshop that is regarded as innovative, educational and inspirational. The students themselves reflected that they wanted more information and more time to figure out how the sensors themselves worked. Bearing in mind the educational context in which the workshop took place, it is still possible to see the SensorLab in terms of what Brossard and colleagues have criticised citizen science project of: citizens become more knowledgeable about a subject, but not about the underlying scientific processes. Here the same can be concluded. The students learn how to – by collectively improvising - design and develop a smart sensor prototype, but are not educated about the sensor technologies that are part of their prototypes.

Connecting this back to the quotation that accompanied the introduction to this chapter, the SensorLab integrated the FabLab-idea of equipping students with tools to do science. The organizing actors saw the realization of the design workshop as the educational innovation. In a sense, the SensorLab seems to focus on sociomaterial working relations, instead of taking a "product-centric" approach that Björgvinsson, Ehn and Hillgren (2010) criticise Living Labs of; in fact, the collaborative learning environment of the SensorLab *is* the product here. Equipping the students will realize embodied learning and help transform these students into citizen scientists. The SensorLab, in other words, placed great emphasis on sociomaterial interactions to reach its goal of sensor education. The actual technological smart sensor prototypes were a product of the workshop, but the emphasis lay on teaching students to work with "sensorkits", to become "sensorkids" (to paraphrase De Vries and colleagues (De Vries, Pathuis, Vonder, & Van der Waaij, 2010)).

What does a case like this stipulate for other Living Lab-practices in terms of involving these kinds of "users as designers" in design practices? As the students' work within this semi-structured practice of the SensorLab illustrates, their situated expertise can be said to lie at the basis of practices of this "type" of designer. Indeed, the inclusion or reliance on this type of knowledge makes the Living Lab-practice different from "conventional" design practices. Situating design in this particular setting works to trigger associations specific to this setting, and including "users as designers" does the same; the students refer to their experiences and ideas in relation to pollution, materials, on how to draw attention and how to do this thing that is "designing". The "ingredients" that are important to create this designer performance are the fact that the students are provided with a clear goal and motivation, have access to enough materials to interact with, the opportunity to engage with experts and the tools to transform the materials. Essential for the design practice is however that all the actors in the setting interact in a communicative and "open" manner; this allows for space where user innovativeness can take its mangled form.

Chapter 5. Entrepreneurs testing sustainable ICTs as they go about their business in the Climate street[1]

"The challenge is to involve users – in this case the entrepreneurs – in the implementation of innovative technologies and to get them to actively utilize the technologies and the proposed measures. The entrepreneur in fact still has his or her own business to run." (Amsterdam Smart City, 2011d: 100)

5.1 Introduction

What makes a Living Lab "alive" is the use of daily life settings as a context to develop new technologies. Situating the laboratory in daily life opens up ideas about and uses of technologies to the presupposed contingencies of daily life. These new ideas and uses furthermore originate, is the Living Lab-proposition, in the intended future users and uses of technological artefacts. User inclusion gives developers direct insights about use while indirectly providing information about user inclusion as such and the framing of "the living" as "the laboratory"; how people behave as technology users when a familiar setting becomes framed as a laboratory.

The objective of this chapter is to investigate user involvement and user innovativeness in a Living Lab-case where users are positioned as *testers* of new sustainable ICTs in their daily life environment. The case is a "smart city" Living Lab-project: Amsterdam Smart City's Climate street. During this project, a number of public-private partner organizations joined efforts to realize and test a "sustainable shopping street" in the centre of Amsterdam. The entrepreneurs, with businesses in the shopping street, were the testers of both the concept of a smart street and a range of sustainable ICTs in their respective workspaces.

Testing involves trialling. As a practice, testing is closely connected to the observation and realisation of certain goals or expectations (Pinch, 1993); to test whether or not a new technology works the way in which designers intended it to. Acting as a tester then signifies acting with a new technology so that designers or developers may see whether or not a technology is used as expected.

This means, in the context of this Living Lab-case study, that users test ICTs while they go about their daily life business in environments that are familiar to them.

However, while openness to daily life contingencies is heralded as one of the innovative aspects of the Living Lab-approach, the above quotation – taken from a review of the Climate street project – makes clear that the inclusion of users in their daily life setting is regarded with some ambivalence. The quotation namely pinpoints two important matters. First of all, it formulates user inclusion as a *challenge* as opposed to an *opportunity*. Getting users (in this case entrepreneurs) to actively use technologies is experienced as problematic, due to the fact

1 This chapter is based on an article published by the author in the *Journal of Theoretical and Applied Electronic Commerce* (Sauer, 2012).

– and this is related to the second important point – that users "still have businesses to run". Daily life realities seem to infringe on the opportunities offered by the Living Lab-approach, because daily life is "getting in the way" of active user involvement. But if daily life becomes an obstacle to successful testing, what then is the added value of testing in a daily life setting?

This observation becomes more poignant when the context of the case is reviewed; the Climate street project is a so-called "smart city" project. The concept of the smart city is defined by Caragliu, Bo and Nijkamp as a city where "investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance" (Caragliu et al., 2009: 50). This definition stresses the importance of investments in ICTs and ICT infrastructures to enhance the quality of life and competitive capabilities of cities, as well as the recognition that in order to achieve this "smartness", investments in social capital are necessary. To become "smart", cities thus need to innovate both *socially* and *technologically*, also by making use of the smart, innovative potentials of its citizens. The fact that in the above quotation user involvement is described as a challenge, suggests that realising the smart, innovative potential of citizens is not so straightforward and that existing practices in cities may to some extent hamper transformations into smart cities.

In chapter 2 (section 2.5.4), I briefly discussed the parallels between the smart city and Living Lab-concept. Both underline the social and technical dimensions of sociotechnical innovation. Living Labs stress product and social innovation through the involvement of technology users and daily life contexts during design practices. Smart cities reserve a central role for ICTs in efforts to enhance the economic and political position of cities while also underlining social, cultural and (business-led) urban development (Tranos & Gertner, 2012). As Tranos and Gerner state: "Smart in this case is more than the mere deployment of technology, but rather about preparing one's community to meet the challenges of a global, knowledge economy (Smart Communities, 2011). A smart city is a city whose community has to learn, adapt and innovate (Coe et al., 2001)" (Ibid, p. 177-178). Both the smart city and the Living Lab concept carry connotations of empowerment and transformation, realized by means of user/citizen inclusion during ICT development or through ICT use.

There are also similarities between smart city and Living Lab challenges. For instance, one of the challenges of smart cities is that these tend to focus on "innovation" and the "promotion of services", rather than "application" – supporting the market instead of the community (Allwinkle & Cruickshank, 2011: 9). This is interesting, especially as it is recognised that ICTs do not automatically create smart communities, but that these play a role in empowering people to become "smarter" (Hollands, 2008: 315). A similar challenge is voiced in Living Lab-literature, where scholars argue that relatively little attention has been directed at investigating end user engagement, while acquiring the commitment of users and user communities is a noted challenge (Dutilleul, Birrer, & Mensink, 2010: 79; Schaffers, 2009).

This chapter focuses on the involvement and innovativeness of users as testers during Amsterdam Smart City's Climate street project, keeping these challenges in mind. The main

research questions of this chapter are *1) how are user involvement and user innovativeness shaped and facilitated in the sociomaterial setting of the Climate street and 2) what kinds of innovation practices are constituted in the Climate street?*

To answer these questions, I analyse the interplay between users and technologies within the Living Lab-context; in this case a group of entrepreneurs testing a number of sustainable ICTs in their daily work environment. This analysis provides both empirical and theoretical insights about user involvement in Living Lab-practices, which is especially relevant in the light of recognised challenges to involve users effectively in both Living Labs and smart cities. The following sub-questions guide the analysis:

1. How are the entrepreneurs configured as testers in the Climate street?
2. How do they perform as testers in practice?
3. How can their practices be understood in terms of improvisation?
4. Are the entrepreneurs' improvisations recognised as situated expertise and as such facilitated in the Climate street?
5. Are the practices of user innovativeness perceived as innovative in the Climate street?

Answering these research questions gives insight in how the innovative agency of users is shaped in practice and what dynamics are involved in the entrepreneurs' innovation practices in their daily life (workplace) setting.

The chapter consists of 5 sections. After the introduction, the theoretical framing is presented in section 5.2 which enables an analysis of the user as tester by juxtaposing how the entrepreneurs are on paper configured by the pilot's project description and their actual use practices as testers. This is followed by the presentation of the qualitative research methodology that was used for the analysis. After giving an overview of the Climate street's sociomaterial configuration in section 5.3, section 5.4 consists of the analysis of how entrepreneurs resisted and accommodated the goals Amsterdam Smart City's hoped to realize with the Climate street as well as how the entrepreneurs resisted and accommodated the ICTs that were part of the project in practice. In this analysis, I draw attention to certain improvisations with ICTs that became apparent in this dance of agency. This leads to the articulation of a number of ambiguities between how the entrepreneurs were configured as testers on paper and how they performed as testers in practice. These ambiguities help explain how and in what ways the situated expertise and the innovativeness of these particular testers was constructed in practice and furthermore allow me to draw conclusions about the kind of innovation practices that were shaped and facilitated in this particular Living Lab-project.

5.2 Theoretical frame and research methodology

I presented this thesis' overarching theoretical approach to study user innovativeness in Living Lab-practices in chapter 2. In this chapter I focus on how users are configured as testers in a specific Living Lab-project and how users' tester practices are considered as innovative. I therefore briefly revisit my theoretical approach in this section to position and specify my

analysis of test practices. This is followed by the methodological approach used to collect the data for this analysis.

The displacement of the laboratory into a daily life setting in Living Labs effectively makes the use of technologies in everyday environments the object of study. What becomes of interest in a case where users are involved as testers of new technologies in their daily life settings is how people act with technologies and fit these to their daily routines. This informs developers how a technology is (and perhaps will be in future) used in practice.

In his before mentioned reflections about and analysis of testing practices, Pinch (1993) argues that general testing practices involve projection, where one may assume that a technology will function in a certain way in the future after the test.[2] This projection is based on assumptions that testing results will be similar in real life settings as they were in experimental settings. In the case of Living Labs, the experimental setting is of course the real life setting. This means that somehow projections about test results in the laboratory overlap with the assumptions of what using the technology in real life will lead to, or alternatively – and this is one of the Living Lab-propositions - that this real life test environment expressly offers "unforeseen" insights by opening up testing to real life contingencies. The same holds true of assumptions about the tester in this environment. Pinch draws attention to the idea that in testing technologies it is in fact the user who is tested (does the user perform with the technology as was foreseen?). In a Living Lab-setting, the person testing the technologies is tested to see whether or not he or she behaves as a technology user. By that rationale, this would imply that Living Labs not only test real life use when they situate the laboratory in a real life setting, but that they are also in fact testing to what extent "ordinary people" can become the future users of their technologies.

In this chapter, I analyse how user involvement and user innovativeness are shaped and facilitated in a Living Lab-project where users are configured as testers. To do so, I review certain assumptions and projections about testing in a real life setting (a shopping street) and about the role of the testers in this street by analysing how users are configured as testers in this particular project. I also focus on how the entrepreneurs in the shopping street act as users/testers and what their practices imply in terms of user innovativeness. To do so, I analyse how the entrepreneurs perform agency in practice and how certain unforeseen user ideas and practices (improvisations) are recognised as innovative by the organizing Living Lab-actors. Agency in this case refers to "the capacity to act that is discovered when studying how worlds become constructed in a certain way" (Cooren et al., 2006: 11, in Orlikowski, 2007: 1438). I

2 Pinch distinguishes three forms of technology testing: prospective, current and retrospective testing. Testing new technologies in a Living Lab involves in this case both prospective and current testing. Prospective testing focuses on testing a technology before it is introduced. In this case, technologies were developed, but not introduced as part of a holistic smart street concept before. Current testing takes place once a technology is introduced. The latter "[assesses] performance, to make improvements, to compare it with rivals, for legal and safety reasons (…) or to ascertain any special operational difficulties" (Pinch, 1993: 27). Current testing also takes place when a technology is put to local use (as in this Living Lab case where technologies were specifically tested in a shopping street).

focus on the performance of agency in terms of a dance of agency, after Pickering.[3]

As I argued in chapter 2, the dance of agency not only enables an articulation of the emergent, situated routes taken as (material) agencies are shaped, but moreover allows for the articulation of how the agential interplay is exactly that: a play or dance of agency, where situated innovations come about in response to unexpected opportunities and challenges (Orlikowski, 2000). I use Pickering' concept of the dance of agency to draw attention to how the resisting and accommodation of agency culminates in unforeseen uses of technologies. In addition to this, I also extend the concept of the dance of agency to include how users accommodate and resist the different goals of the Climate street concept as a whole. By doing so, I draw attention to how the performed agency of the users as testers is also "entangled" in the sociomaterial configuration that constitutes the project; I describe how the entrepreneurs "dance" with the different goals of the project to show how their performance as testers not only centres on how they use new technological artefacts, but also on how they attribute meaning and uses to the project as a whole. This is an important point to make, especially keeping in mind the Living Lab-proposition that users should become empowered through inclusion in ICT development processes; I show how the entrepreneurs are enabled to resist and accommodate the goals of the project and reflect on what this means in terms of their inclusion as users/testers. I make use of the concept of improvisation to connect unforeseen ideas about the project goals and uses of technologies to user innovativeness, to highlight how actors engage with "the unforeseen" in practice and how the latter practices become recognised as "innovative".

What makes this specific case study interesting from the angle of situated innovation and improvisation is the fact that the Living Lab-project uses a test bed in a daily life setting (a public street in the city of Amsterdam) and the inclusion of entrepreneurs who go about their daily life work as testers. These "testers" can be argued to be "experts" of this daily life setting (their work spaces) and can thus be expected to have situated expertise; characterised as a kind of situated knowledge that is "embedded in [their] physical site or location" (Sole & Edmondson, 2001: 7). The entrepreneurs, as testers, would therefore be expected to use this knowledge to improvise with the new technologies in their daily life setting. Situated knowledge is often "taken for granted" and cannot be accessed "without some intervention to catalyse a process of liberating it" (Ibid). The research questions posed in this chapter, geared at unearthing the shaping of user innovativeness in the Climate street, delve into how the Living Lab-actors "liberate" this knowledge and use it to reach their goals.

In the Climate street, a group of entrepreneurs are configured as testers in a Living Lab-pilot. The first step in the analysis of the innovative agency of the entrepreneurs requires investigating how the entrepreneurs were configured in their user role; how they were positioned as users and testers by the Living Lab-consortium. Then, the analysis focuses on how the entrepreneurs became a part of the sociomaterial configuration in practice; how they resisted and accommodated certain agencies and how they gave meaning to the pilot

3 See section 2.4 for an elaborate description of Pickering's concept of the dance of agency.

and the involved technologies by fitting or refusing to fit these into their daily life practices and routines. Once the entrepreneurs became part of this configuration in practice, the configuration changed. This led to tensions between their configuration on paper and in practice. By analysing the mangle, certain ambiguities can be articulated. These provide insight in the dynamics of how user involvement and user innovativeness are shaped in this Living Lab-project.

This chapter focuses on user-technology practices in the private space of the 40 entrepreneurs – of the 120 entrepreneurs in the street - who joined the pilot. Between October 2011 and December 2011, in-depth interviews were conducted with 7 entrepreneurs (in addition to this, one entrepreneur – retailer Enzo - provided information via a written questionnaire). Interviewees were selected based on two criteria. First of all, they were part of the frontrunner group so as to ensure they had an intimate knowledge of the pilot process and ICTs. Secondly, they represented a cross-section of the shopping street entrepreneurs - three retail stores (retailers Mead, Ravel and Winter), two food and beverage shops (Food & Beverage entrepreneurs Cross and Lyndon), one restaurant (restaurateur Ava) and one service provider (Strong). In addition to this, two other actors were interviewed namely the shopping street manager, who worked as a communicator between the entrepreneurs and other actors and as a spokesperson for the entrepreneurs and the director of the company managing and executing the pilot (the project manager). Interviewing members of the project team placed the pilot within a project context and gave insight into how the entrepreneurial role was conceived.

Interviews were conducted in line with an interview guide that was devised based on primary and secondary document analysis, as well as observations made while attending several Amsterdam Smart City events between 2009 and 2012. The interview focus was on entrepreneurs' experiences during the preparatory, implementation and test phases of the pilot. Interviews were made anonymous and coded using ATLAS.ti software with the aim of identifying common themes and patterns of use after which labels were connected to theoretical notions of resistances and accommodations of agencies and improvisations in the sociomaterial setting. Combining the collected data provided a rather complete and varied image of the role and experiences of the entrepreneurs. After initial insights were gained from the interviews, observation notes and document analysis, findings were shared with Amsterdam Smart City during a "dialogue session" about "connecting the community" (January 2012).

Using methods such as interviews, observations and document analysis, the analysis presented in this chapter seeks to answer how users become and perform as testers in a Living Lab-project set in a daily life setting, what kind of innovation practices can be observed here and identify possible explanations as to why user engagement in Living Lab-projects is a challenge. The fundamental qualitative insights gained about this pilot, may point to ambiguities that are also apparent – although perhaps in different guises – in other Living Lab-projects.

5.3 Sociomaterial configuration: sustainable technologies, sustainable behaviour

The Climate street was one of the projects of the cooperative association Amsterdam Smart City. Amsterdam Smart City itself is one of the six projects of Amsterdam Living Lab.[4] Amsterdam Smart City aims to make Amsterdam a more sustainable city by working along two principles: 1) it wants to "enable partners to apply innovative technologies" and 2) "stimulate behavioural change with end users" (Amsterdam Smart City, 2009). Amsterdam Smart City describes itself as "a platform for sustainable products and innovations in an inner city environment" (Amsterdam Smart City, 2011d). One of its overarching goals is to help Amsterdam reach its climate goals (i.e. to reduce CO2 emission by 40% by 2025 compared to 1990-levels and to make the municipal organizations of Amsterdam climate-impact neutral by 2015). Concrete focus areas are sustainable living, working, mobility and public space. Its central actors are Liander (a large energy distributor in The Netherlands) and the Amsterdam Innovation Motor.[5] In the context of Amsterdam Smart City, both organizations aim to bridge the gap between municipal organizations and businesses to stimulate innovations in the region in the area of Smart Energy (Energieraad, 2009). Initially, Amsterdam Smart City was to run from 2009 until 2011, starting 15 pilot projects with 71 partner organizations. However, due to its perceived success (it won the EU City Star Award 2011) it will be continued, supported by the EU's Smart Cities and Communities initiatives (Amsterdam Smart City, 2011a), the city of Amsterdam and new financial partner KPN.

5.3.1 The Climate Street (2009-2011)

The Climate street became one of Amsterdam Smart City's pilots in June 2009. Prior to that date, the popular shopping street - the Utrechtsestraat - had already initiated a first venture into testing a new technology: in 2008, waste collecting company Van Gansewinkel selected the street to test electrically-powered waste collection vehicles. The company had sought to test these cars in a "typical Amsterdam street" (interview project manager, 28-11-2011). To set up that test, Van Gansewinkel contacted the shopping street manager and the entrepreneurial association of the Utrechtsestraat. This association was just established, in response to the municipality's plans to renovate the street's public space. Once Van Gansewinkel completed the first tests, its director contacted the Amsterdam Innovation Motor. When Amsterdam Smart City took up the project, the Climate street pilot was born. Apart from Van Gansewinkel, various other companies "joined forces in one street" (interview project manager, 28-11-2011) and joined the pilot; Vodafone, JCDecaux, Philips, Plugwise, TNT, L.A.J. Duncker BV, Tauw, Eneco, Ziut and Home Automation Europe. A new organization, Club of 30, directed by the prior commercial director of Van Gansewinkel, was contacted by Amsterdam Smart City to coordinate the project management of the pilot for Amsterdam Smart City.

The goals of the pilot were to reduce CO_2 emissions and reduce energy consumption

4 Amsterdam Living Lab is described more extensively in section 2.5.4.

5 http://www.aimsterdam.nl/ (accessed on 12-2-2012).

in the street by initiating sustainable initiatives and changes in user behaviour. These goals were translated into the following sub-goals 1) to create a sustainable platform in a city centre environment, 2) to record user insights, as well as 3) insights into collaboration and implementation processes and 4) to stimulate sustainable entrepreneurship amongst small and medium enterprises (SMEs) (Amsterdam Smart City, 2011d: 94). A number of technologies were introduced in the street over a period of two years. In the workspaces of the entrepreneurs, smart meters, energy displays and smart plugs were installed. In some cases, LED-lighting was implemented. As the Climate street was a "holistic concept" (Ibid) to make an inner city shopping street more sustainable, changes were also foreseen in the public space and in the street's logistic processes. In the public space, street lighting was dimmed at night to save energy, electrically-powered waste removal vehicles continued to collect waste and piezoelectric technology was to be implemented in the street's speed bumps. In addition to this, the project envisioned tram stops with lighting powered on solar energy and equipped with reverse osmosis water (cleaned collected rain water) to clean the stops without using extra water. Furthermore, public space would be enlivened with flowerbeds, a public water tap, energy-saving bins (compressing waste using solar power) and two electric vehicle-powering units.

During the "closing party" of the project - an open house event on the street - the energy reduction results of the Climate street were presented. CO_2 emissions were reduced by 8% (energy saving) and 10% (saved by switching to green energy) respectively. The pilot's brochure – the front page depicted below (image 1) - illustrated on-going efforts to make the street more sustainable, as well as a number of learnings: some technologies still required implementation, logistics needed optimisation and entrepreneurs should become more energy aware. Identified as essential to these processes was an increase in the stimulation of collective action (Ondernemersvereniging Utrechtsestraat et al., 2011: 11). The general statement by the organizing actors was that to further the success of the pilot, entrepreneurs should "take back" the responsibility for the implementation of the sustainable technologies. After two years, the entrepreneurs would have to become owners of the Climate street. This suggests that their role was perhaps more complex than that of piloting new technologies or that over the course of the pilot's runtime, this role evolved. The entrepreneurs were seemingly seen as partners, or even as owners of the pilot.

Image 1: The front cover of the Climate street brochure that was presented at the end of the pilot during an open house event (24th of September 2011). The text reads: "On the road towards the shopping street of the 21st century – Utrechtsestraat's Climate street will save 60.000 trees! Unique collaboration between entrepreneurs results in 20 sustainable solutions" (Ondernemersvereniging Utrechtsestraat et al., 2011).

5.3.2 User configurations

As a holistic concept, the Climate street was tested with the ultimate goal of eventually exporting the street concept to other cities. The entrepreneurs involved in this pilot were thus not merely testing new technologies, but moreover involved in testing the concept of the Climate Street as such. In a sense, one could say they were "double testers". To become part of the pilot, interested entrepreneurs joined the frontrunner group. This group of 40 entrepreneurs - selected by the Climate street project team consisting of members of the

entrepreneurial association, the shopping street manager and the project management team - was to function as a "test team" or "sounding board". They would test ICTs to see what kind of added value these offered in terms of making the street as a whole more sustainable. Amsterdam Smart City stressed that "the needs of the entrepreneurs [were] taken into account in the sustainable solutions in the street" (Amsterdam Smart City, 2011b). The project team organized a number of sounding board sessions to "help make an inventory of the needs and wishes of the entrepreneurs" (Ibid).

Apart from finding needs, Amsterdam Smart City explicitly articulated that interactions with entrepreneurs were essential to make the Climate street successful, because the street needed to be reshaped into a sustainable shopping street *together* with the entrepreneurs.[6] The entrepreneurs were not expected to passively observe the changes to their street, but to actively work together to make their street more sustainable. According to Amsterdam Smart City, the entrepreneurs were active, "enthusiastic" (Amsterdam Smart City, 2011c), "frontrunners" (Amsterdam Smart City, 2011b), "collaborators" in working together to realize "20 sustainable solutions" (see Image 1) and "pioneers" who "[formed] the cornerstone" of the pilot (Amsterdam Smart City, 2011d: 95) because they "[needed] to adopt the available technologies" (Ibid).

In hindsight, the project manager described a different image of the frontrunner group in the interview (28-11-2011). He concluded that the enthusiasm of the group waned over time. He saw several reasons for this; e.g. the municipality's changes to the public space were delayed and the communication with and connection to the group of entrepreneurs was not strong enough. The process "[needed to] be explained to the entrepreneurs in a clear manner. It was important for the entrepreneur to be able to understand clearly what the benefits were for the business" (Amsterdam Smart City, 2011d: 97). In interviews, the project manager and the shopping street manager both saw actively involving the entrepreneurs in the project as a challenge, because apart from being part of the frontrunner group, "the entrepreneurs had businesses to run" (interview shopping street manager, 17-10-2011).

The entrepreneurs were thus seen as "pioneers", to whom how to make the most of the concept of the Climate street and the technologies that were implemented still needed to be explained. This seems contradictory; were they leading the way into new and unknown ventures as pioneers, or were they more passive and in need of instruction? It seems that they were pioneers because they joined a sustainable pilot and were willing to invest time and – in some cases - money to make their workspace and street more sustainable. This does not however clarify how and to what extent their pioneering was expected to affect the shaping of both the tested pilot and the ICTs. Joining the pilot meant changing some existing routines: they needed to sort their waste differently, learn to use the energy display, reduce logistic movements in the street and take the time to talk about their needs in sessions. And apart from doing this on an individual basis, they also needed to reach joint decisions. To realize this, the entrepreneurs needed to become enthusiastic about the concept and the sustainable

6 http://amsterdamsmartcity.nl/#/en (accessed on 30-3-2012).

technologies of the Climate street; to make them feel like pioneers. But how did the members of this group do this in practice: how did they accommodate and resist the concept of the Climate street and the sustainable ICTs in practice?

5.4 User involvement and innovativeness: testing in practice

In this section, I analyse how the entrepreneurs performed as testers by viewing how the entrepreneurs gave meaning to the pilot and used the sustainable technologies in practice. This analysis consists of discerning how they performed the tester role as they resisted and accommodated the Climate street goals and the related ICTs in practice.

5.4.1 Users accommodating and resisting the Climate street-concept: becoming testers

Amsterdam Smart City, the shopping street manager and the project manager had to work to connect the Climate street concept and the entrepreneurs, because without entrepreneurs acting as testers none of the Climate street goals would be realizable (without users, there are no user insights). According to the shopping street manager, this was not easily achieved; most entrepreneurs simply did not have the time to think about the environment. The project manager also observed that there was a "doubleness" in the role of the entrepreneurs; they needed to be part of the solution that would make the shopping street more sustainable, while at the same time everything "must be explained in a clear manner". The shopping street manager expressed that there were three ways to convince the entrepreneurs to join the pilot: 1) by ensuring that ICT implementations and use would be worry-free, 2) by convincing them that saving energy would save money and 3) that joining the effort helped save the environment (interview shopping street manager, 17-10-2011).

When interviewed, the entrepreneurs expressed reasons why they joined the pilot that were in line with the pilot's primary objectives of reducing energy consumption and CO_2 emissions, but also clarified that they attributed other goals to the pilot. Two main goals came to the fore: to "save" (time, money and the environment) and to enhance the identity of the street. These goals seem in line with the goals of Amsterdam Smart City. However, when zooming in on what ought to be "saved" and what kind of identity the entrepreneurs wanted to communicate, discrepancies appear.

Saving time, money and the environment

As the popular proverb stipulates, "time is money". To the entrepreneurs, the fact that Amsterdam Smart City would organize and bring all sorts of companies into the street to offer different technologies made them enthusiastic about the pilot as this would aid the entrepreneur in more quickly choosing the proper technologies to implement in their workspaces. One entrepreneur for instance said that:

> "it would help to know who does what for what price with sustainable [technologies]. So that you can gain something out of it; you don't have to search the entire internet to find what you need" (interview retailer Mead, 25-10-2011).

In their perception, these companies would not only supply them with sustainable technologies and "instant access to knowledge" (retailer Mead), but would also implement these – effectively making the pilot's execution worry-free. Food & Beverage shop owner Cross for instance stated:

> "Someone needs to organize it. Someone who executes everything; who talks to the entrepreneurs to find out all the needs and wishes" (interview Cross, 1-11-2011).

This would ensure that the pilot would not cost the entrepreneurs too much time and indeed, make the implementation of technologies worry-free. This was very important to some of the entrepreneurs. As service provider Strong stated:

> "I joined, but they had to figure out what to do. They instructed me, although I had forgotten the instructions the next day. It should not cost me much time" (interview service provider Strong, 18-10-2011).

Saving money by saving energy was also one of the "smart" elements of the pilot. As restaurateur Ava effectively explained: "You were just crazy if you didn't join in. Saving energy is making money" (interview Ava, 18-10-2011).

According to Food & Beverage shop owner Cross, the chairman of the entrepreneurial association, that was the best way to reach the entrepreneurs: "You get them to join if there is a win-win situation. Saving costs" (interview Cross, 1-11-2011). But saving money sometimes first required the entrepreneurs to invest. For although energy scans and most of the ICTs were installed free of cost, LED-lighting needed to be bought. This investment proved too much for some. One entrepreneur explained that although she recognised the saving potential of LED, her business "could not invest those amounts of money" (interview retailer Mead, 25-10-2011).

To get the entrepreneurs enthusiastically involved, the project can be said to seek to accommodate the entrepreneurs' wishes to save time and money. Interestingly, only two of the eight entrepreneurs explicitly accommodated the goal of saving the environment by becoming part of the pilot (Food & Beverage shop owner Lyndon and restaurateur Ava). Ava explained:

> "I started this business on the premise that I would do everything in a sustainable way. And I don't think you can seriously join a project like this if that is not the case (…). When it is possible, I switch to something more sustainable. (…) I throw away as little as possible and (…) I make a game out of it" (interview Ava, 18-10-2011).

Food & Beverage shop owner Lyndon noted how his business revolves around reducing his carbon footprint, while:

> "many entrepreneurs needed to have explained that they could save. (…) In my case that was different, because I started this business with the idea that everything needed

> to be efficient and environmentally friendly" (interview Lyndon, 12-10-2011).

According to these two entrepreneurs being sustainable was something that they would have invested in, whether or not the pilot had existed. This is why they both readily accommodated this goal. Joining it just provided an opportunity to be "an ambassador" for the environment, and to have access to more technologies and advice (Ava). Food & Beverage shop owner Lyndon however, did not find the ICTs on offer very sustainable and thus – although supporting the idea – did not join the initiative to test an energy display or install a smart meter. He felt that he was knowledgeable enough to make his own choices. For him, the second goal proved more important to join: enhancing the image of the street (interview Lyndon, 12-10-2011).

Enhancing the street image

Some entrepreneurs saw the pilot as a marketing tool; to display their environmental involvement to their clientele. As retailer Ravel and restaurateur Ava note:

> "I always had the brochure [about the pilot] on my counter. When I told customers about it, they were always enthusiastic" (interview Ravel, 28-10-2011)

> "I think that the Climate street was a very nice way to report positively about the Utrechtsestraat" (interview Ava, 19-10-2011).

The involvement of many large companies added to the image that the pilot would bring positive reports about the street;

> "During the first large meeting all kinds of companies came to pitch their ideas. And a few other big companies were mentioned as possible parties. That gave us the feeling that we were going to do something special. (…) That you have the feeling that many companies are interested" (interview service provider Strong, 18-10-2011).

The whole project was perceived as "new" and "special"; joining the pilot would give the street a more innovative and sustainable image. However, using the Climate street as a marketing tool to generate a more collective, sustainable identity was problematic according to some entrepreneurs, because in practice it turned out that working together was a challenge.

Chairman Cross expressed that the entrepreneurs should have "[taken] meaningful action together", but that this required a great deal of time and energy. In the end "everyone was really working for their own shop" (interview shopping street manager, 17-10-2011) and some entrepreneurs experienced a difference in "power" in the street. Service provider Strong, retailer Ravel and retailer Winter expressed the expectation that joining the pilot would allow them "more say" in the street;

> "I wanted to be part of all the meetings (…) because I am retail. A lot of food and catering people joined. (…) And they hadn't even thought about some of the things I said" (interview Winter, 21-10-2011).

So although creating a positive street image was deemed important, taking collective action was perceived to be hampered by the "individual nature" of the entrepreneurs coupled with the heterogeneity of the group.

In other words, while Amsterdam Smart City had the goals of setting up a sustainable platform in the city and stimulating sustainable entrepreneurship among SMEs, these were shaped by the entrepreneurs into the idea that the pilot should generate positive publicity for their shops and street. Realizing the pilot should, in addition to this, also work to redistribute certain perceived divisions of "power" within the street, and help build a more unified identity for the street. Whereas the goal of using the pilot as a marketing tool is in line with and accommodates Amsterdam Smart City's goals, the entrepreneurs' ideas about power and a shared positive identity were brought in by the entrepreneurs themselves. This goal reflects the entrepreneurs' situated expertise; it was the result of how the entrepreneurs felt that the pilot could meet a social need and provide social innovation to improve their daily life realities, such as the perceived division of "power" in the street.

The entrepreneurs attributed a variety of goals and expectations to the pilot (and to their testing experience during the pilot). By appealing to these goals, Amsterdam Smart City succeeded in making the concept of the Climate street attractive to the entrepreneurs. This ensured that the entrepreneurs became participating testers. However, as they attributed their own goals to the pilot, they also diverged from certain goals and created their own expectations of both the pilot and ICTs that were to be implemented. How did they in practice work to reach their goals by testing the ICTs that were part of the pilot?

5.4.2 Users mangling goals and use of sustainable ICTs in testing practices

Smart plugs, an energy display, and smart meters were implemented in the workspace of six of the entrepreneurs who were interviewed. Coupled, these technologies provided overviews of energy usage. The plugs could also be used separately to read electricity use of individual appliances. The energy displays showed real time energy use and provided a translation into energy costs in euros. Below, a picture of the display in use is shown (image 2).

Image 2: The energy display allows entrepreneurs to interact with the thermostat, view the weather, current energy use, saving goals, graphs showing use and notifications. The photograph was taken during the open house event on the 24th of September 2011.

This display worked as a thermostat and as a central "energy management system" operable by interacting with the display or remotely via a mobile phone or computer interface. Via the screen or these other interfaces, the user could set saving goals, see how much energy was spent at any given time and plan patterns of use (e.g. switch machines on an off). The smart meter provided readings of both gas and electricity consumption respectively (Ondernemersvereniging Utrechtsestraat et al., 2011).

Seven entrepreneurs had an "energy scan" prior to the placement of the ICTs. This meant that a company measured the energy used by devices that cool, heat and light each workspace, after which the entrepreneur received advice about how to best reduce energy use. Three entrepreneurs installed LED-lighting via the pilot (two had installed LED-lighting via another route) and all entrepreneurs joined the electrical waste collection initiative.

When asked about the use that they made of each of the respective ICTs installed in their workspaces and how the ICTs gained meaning in their daily life routines, the entrepreneurs painted a complex picture. I analyse the uses made of the technologies by looking at how the entrepreneurs resisted or accommodated the ICTs in their daily life practices in terms of how these ICTs seem to resist or accommodate the goals of the entrepreneurs. In other words, I analyse how the entrepreneurs were enabled to realize their goals using the ICTs by looking at the dance of agency.

"Saving" by using ICTs

The entrepreneurs reported that the moment of implementation was important to subsequent ICT usage, as this was the moment instructions were provided about the technologies. Restaurateur Ava expressed how due to this explanation "[the smart plugs] were easy to use"

and gave direct insight into energy use; "[they showed] me that one of the machines that cost me the most was the cooling counter and made me aware that I could turn off the light in the refrigerator to save more" (interview Ava, 18-10-2011). On implementation, a shift in awareness seemed to occur. Retailer Ravel explained how the energy scan for instance showed how much energy was "leaking away through the big display window" (interview Ravel, 28-10-2011). This prompted her to adapt her already existing plans to renovate her store. The smart plugs and scan provided quick insights; they made energy use more visible and gave the entrepreneurs insight in how they could act to reduce energy consumption. In this way, the entrepreneurs were given the agency to take action to save energy.

The information communicated via the energy management system made invisible energy use visible which prompted a change in energy use habits for some. One entrepreneur reported that while he kept his baking oven on all day prior to the pilot, he changed this once the display showed him how much energy he was wasting. Instead, he started to switch it on only when he really needed it. Retailer Ravel adapted her behaviour by switching off the radio during the day and using the smart plugs as a light timer. The most striking example of changing behaviour was restaurateur Ava, who "became quite obsessed" with checking everything; whether or not personnel was pressing the dishwasher's "eco-button", switching off the refrigerator-light and the cooling unit in the display window at night and seeing a change in her habits as "a constant game to be as efficient as possible" (interview Ava, 18-10-2011). Due to the fact that for Ava being as sustainable as possible was already part of her way of doing business she regarded the ICTs not so much as instigators of more sustainable entrepreneurship, but rather as a means to complement her already existing efforts. In other words, these ICTs accommodated her way of doing business because they helped her attain her goal to be as sustainable as possible. "Dancing" with the agency of the ICTs became a game for her; more insight in energy use accommodated her goal to save energy, while she adapted her behaviour of energy use to accommodate the agency of the energy management system.

However, the ICTs seemed to resist the entrepreneurs' goal of saving time and a "worry free" transition to sustainable ICTs. Learning how to use the ICTs, for instance, cost more time than had been anticipated by some. Restaurateur Ava stressed that while she was very enthusiastic about the technologies, there simply was not enough time to learn everything: "As an entrepreneur, you are not going to say: 'Well, tonight I will spend an evening looking at those plugs'" (interview Ava, 18-10-2011). For others, explanations about the ICTs were not sufficient. Although six entrepreneurs had an energy display, they did not readily know how to operate it. Service provider Strong remarked that "learning something like that takes me years" especially when the display did not seem relevant: "When you are already at the bottom of energy use, a display makes no sense" (interview Strong, 18-10-2011). For Strong, the goal of saving time by allowing companies to take care of making the shop more sustainable was thus resisted by the energy management system. She had expected the ICTs to be more relevant for her line of business. Another entrepreneur turned off the display after it produced error messages (retailer Mead) or used it so little that they had to ask the developer to explain its instructions again (service provider Strong, retailer Ravel and restaurateur Ava), which made one entrepreneur "feel really dumb when it turned out I simply had to push a button"

(interview Strong, 18-10-2011). In these cases the ICTs resisted the goal of saving time, which led to non-use.

Even when time *was* invested to learn about how to use the ICTs, there were still reasons why they were not used. These were the times when running a business took priority over the pilot:

> "I took out the plugs because they worked against me. When we changed to daylight savings time, my machines got an error. And then you notice: No, my daily business has priority. Take out the plugs. And you know, once you tested it, there comes a moment that you cannot use them anymore. You can use smart plugs to see something, and then you get your result. But that is it. Then you know and save. (…) But how many "aha" moments can you have?" (interview Ava, 18-10-2011).

Daily life realities, coupled with the feeling that the smart plugs offered too little for continuous use, made this entrepreneur eventually discontinue use. For retailer Winter, these realities were infrastructural – the store could not be outfitted with a smart meter and display – which almost caused her to leave the frontrunner group. Another did receive the ICTs, but could not change anything in the energy use of the shop because all the "electricity switches are connected" (interview retailer Mead, 25-10-2011). Turning off the lights in the kitchen for example, automatically switched off all the lights in the store. Apart from infrastructural obstacles, there were also financial issues. Installing LED lighting required the entrepreneurs to buy the actual lamps which was "quite an investment" (service provider Strong) and did not always seem "a good investment [because] the lights on offer are not attractive for my store" (retailer Ravel). The LED lighting did thus not always fit into the infrastructural and financial realities or aesthetic demands of the entrepreneurs. Daily life realities in this way resisted implementation and use.

When ICTs offered direct insight in energy use which could be translated into easily realizable changes in routines, the entrepreneurs accommodated these. However, when the ICTs were deemed too difficult to use, not relevant enough or too expensive, the entrepreneurs chose to resist the ICTs by no longer using them in their daily life practices. The statement by Ava also illustrates how some technologies lost their relevance after initial use; the plugs and display were initially accommodated and worked to raise awareness and change habits of energy use, after which they were resisted and switched off.

Interestingly, some entrepreneurs felt their goals about "saving" via the pilot were not realized, because they did not feel taken serious as testers. This was both on the business level and on the individual shop level. Service provider Strong, for example, felt her shop was "left out" as she perceived that the ICTs only catered to food and beverage shops; she could not save energy on cooling machines or an oven for instance, because she is a service provider who does not use many machines. Restaurateur Ava perceived herself as an environmentally engaged entrepreneur, and felt insulted when she received "only one page" of very standard tips after the energy scan. Her annoyance was exacerbated by the fact that she had to "prove" that she had saved 20% on her energy bill "otherwise I would not even have been in the [pilot's]

brochure" (interview Ava, 18-10-2011). On the level of the pilot, these entrepreneurs did not feel like their feedback, as testers, was taken into account; it was as if they were resisted by the Living Lab to share their feedback and successes – something that made them, in turn, further resist the ICTs that were part of the pilot. Relating this back to the ideas of Pinch about how testing actually involves testing users instead of technologies, these entrepreneurs were tested as users of the technologies without granting them the agency to actually provide feedback.

Enhanced street image via ICTs

Despite the fact that not all ICTs were readily used by the entrepreneurs on a daily basis, all the entrepreneurs wanted the pilot to enhance the street's image and hoped that by implementing the technologies in their stores, they showed their support. For retailer Mead and service provider Strong, joining the pilot was even more important than adopting the technologies. When questioned about the use made of the display for example, entrepreneurs saw it as their way to show the community and their clientele that they were involved in the pilot and energy aware. Displaying the display to customers offered them a means to do so; they attributed the display an extra, symbolic meaning. The display therefore became a symbol - to become recognised by customers as a sign of sustainable entrepreneurship.

As I stated before, the goal of enhancing the street image was also related to perceived inequalities in "power" in the street. Some entrepreneurs joined the pilot to have "a say" in the street. And while the entrepreneurs who expressed this particular goal felt that they were happy that they joined the pilot, they also expressed that the ICTs did not truly help them realize this goal. For example, due to the fact that the energy displays in the individual stores and shops could not exchange their information, the entrepreneurs could not share insights via the display. The display resisted data sharing on the street level, which hampered a sense of a joint street efforts and identity for these entrepreneurs.

However, in terms of resistance the reverse also occurred: the energy management system, including the display, was actively resisted by an entrepreneur because he did not want to become part of what he perceived was the non-sustainable and unaware community in the street. Food & Beverage shop owner Lyndon felt that accepting these ICTs would effectively make him part of this "unaware community":

> "And such an energy display... I didn't take it. Because I am only going to see things on it that I already know, or I won't see them because they are not applicable for me. (…) It is also the idea that I have to implement such a thing that made me refuse it. I do think that some of the entrepreneurs can use the display, but only the ones who are not really energy aware. I know 10 entrepreneurs who apparently don't know that if you leave on all your lights, it will cost a great deal of energy. I don't think you are very energy aware if you're like that. So I think that those [ICTs] will help them, but it's just not for me" (interview Lyndon, 12-10-2011).

For Food & Beverage entrepreneur Lyndon, the display seemed irrelevant and invited unsolicited advice. Yet, resisting the ICTs was not only a question of the perceived usefulness

of the ICTs, but was also related to the rather negative image he perceived the other entrepreneurs to communicate. In his case, his perception of daily life "unsustainable" realities in the street made him resist the ICTs. To realize the goal of becoming a more sustainable street, he instead saw himself in the role of sustainability ambassador for the pilot. He felt more could be realized in the other areas that the pilot focused on: "Those technologies did a little, but where we could really make a difference is in distribution and logistics" (interview Lyndon, 12-1-2011).

Apart from the entrepreneurs' perception that ICTs resisted the goal of enhancing the image of the street and an entrepreneur resisting the ICTs precisely because of the lack of a sustainable image, some entrepreneurs actively sought alternative ways to use the ICTs to generate a positive image of the street. Retailer Ravel suggested – during a brainstorm session about new applications for the energy display – developing a collective security application for the display. This application would alert entrepreneurs to "unsafe" situations. This kind of monitoring could increase the street's quality mark for "safe entrepreneurship" and so make the area more popular among shoppers. Service provider Strong had a very similar idea and translated this into use. On finding that she did not use the display to monitor energy use – deeming it not relevant enough and too complicated – she commenced using it as a security display. The display, mounted to the wall close to her display window, made her think of "modern" security displays. By switching it on at night, she used it:

> "so criminals would think: 'I better not break in here'. (…) But that is also how I have set up my store. Look, that mirror over there. It makes criminals and other people think that there is an extra room there and that I am in the next room, keeping an eye on the store. So actually everything is set up to scare away criminals" (interview Strong, 18-10-2011).

Although the ICTs seemed to resist realizing the goal of enhancing the image of the street, Strong "mangled" the ICT and this goal in practice. Strong improvised with the display and moved beyond its foreseen use by attributing an alternative meaning and use to the display. Her use of the display did not go unnoticed; "some small newspaper wrote about me that I used it as a security display, but nothing further was done with it" (interview Strong, 18-10-2011).

What becomes clear when reviewing how the entrepreneurs resisted and accommodated the ICTs in practice is that the daily life realities of the entrepreneurs in the setting played a key role. Furthermore, as entrepreneurial goals are resisted by the ICTs the entrepreneurs start to improvise new meanings and uses for the technologies; they use their situated expertise to make the ICTs more meaningful and useful to suit their purposes. To understand how these ICT uses were or were not recognised as innovative, I turn to juxtapose the "dance" of the entrepreneurs and the ICTs with how Amsterdam Smart City configured the entrepreneurs as testers.

5.4.3 Tensions in the mangle: ambiguities between user configurations and user practices

The previous sections show how the goals the entrepreneurs attributed to the pilot and ICTs were not always readily accommodated by the pilot and the ICTs. These discrepancies draw attention to a number of tensions. These tensions directly relate to how the pilot configured the entrepreneurs as testers, or "tested the user" in practice as these tensions show how in this particular dance of agency the entrepreneurs were or were not enabled to improvise and act in "unforeseen" manners with the ICTs in their workspaces. Drawing out these tensions helps answer the question of what testing practices imply about user innovativeness in Living Lab-pilots such as this. It furthermore gives insight into the complexity of smart city projects like this which seek to test and implement new technologies in daily life settings.

The expert versus the lay user: situated expertise in daily life practices

The entrepreneurs displayed a double agency in practice: that of the expert sustainable entrepreneur and that of the novice energy "unaware" entrepreneur. For instance, Food & Beverage entrepreneur Lyndon saw himself as a very energy aware entrepreneur and as an ambassador for the pilot. He applauded the efforts made by the pilot organizers to engage "the unaware community", but at the same time did not feel like he was part of this community. In line with restaurateur Ava, who found the energy advice provided in the pilot too limited, he wanted the pilot to take entrepreneurs like himself more serious. In other words, in order to truly become part of the pilot, he felt like he should be treated as a partner, as an equal.

While the entrepreneurs were on paper referred to as pioneers with whom partner organizations should work on equal grounds, the experiences of the entrepreneurs painted a different picture. The entrepreneurs perceived themselves being treated as lay users; seemingly unaware of their energy consumption, they needed instruction and new technologies to enhance awareness and change behaviour. In some examples, this image seems fitting; as restaurateur Ava relates, the smart plugs led to an "aha-moment" about appliances' energy use or made it clear to retailer Ravel that energy was leaking out of her display window. "Unawareness" does not however imply that the entrepreneurs did not have innovative ideas. And clearly, in the set-up of the pilot, the idea was to give the entrepreneurs a platform to ventilate their ideas. Brainstorm sessions about new applications for the energy display were organized. Where a problem surfaced was in the implementation of the ideas of the entrepreneurs; retailer Ravel proposed the idea of a security application, which was not developed. Service provider Strong even attributed an alternative (security) meaning and use to the display. This use was not recognised as a "new" use for the ICT. The organization did not create an atmosphere that was favourable to "tapping" into the situated expertise and the innovative ideas of entrepreneurs. Rather, the frontrunner group was constructed as a lay community which needed to be educated. The latter configuration of the community was accommodated in the pilot while the more innovative configuration was resisted. This also resisted the agency of the entrepreneurs in terms of being enabled to voice unforeseen ideas or share insights that were the result of actual use of the ICTs. Entrepreneurs such as service provider Strong may have improvised a new use, but this use was not translated into new ICT

applications. In other words, the entrepreneurs were not treated as experts of their daily life setting; their ideas and practices - ground in their daily life setting - were not recognised as situated expertise. Instead, they were configured as a lay user community.

ICT owner versus ICT borrower

What enhances the image of a lay community is the fact that some entrepreneurs were not sure whether or not the ICTs that were implemented were to be returned to the companies that supplied and implemented them. Retailer Ravel thought they were on loan and retailer Mead expressed the thought that they were probably too expensive to buy then. Restaurateur Ava had already packed up her smart plugs at the time of the interview:

> "I am curious when they will come and pick up the plugs. That is also something I wonder about: they will come and pick it up again, right?" (interview restaurateur Ava, 18-10-2011).

The expectation that the ICTs (apart from the LED lights, which were bought) had to be returned, made the entrepreneurs feel like they were testers, not (co-)owners of the pilot.

This image stands in contrast to the statement made during the official close of the pilot, when the chairman of the entrepreneurial association talked about how the entrepreneurs in the Utrechtsestraat would now have to "take back the ownership" of the Climate street. At the very beginning of the pilot, the entrepreneurs had worked together with Van Gansewinkel and started to test with an electric waste removal vehicle. They had thus been "(co-)owners" of the pilot then. But during the pilot, expectations about their role shifted; the entrepreneurs expected the involved companies to take care of the implementation of new sustainable ICTs for them – thereby making their own role more passive perhaps. Moving the responsibility of implementing new technologies and of reducing the collective energy use of the street back to the entrepreneurs, led to tensions; both the more active as well as the more passive entrepreneurs felt let down. In other words, the ambiguity about their agency made the entrepreneurs unsure how to engage with the pilot and the provided ICTs.

Project dynamics versus daily life dynamics

When expectations about the ICTs were not met in daily practice, technologies were cast aside. In addition to this, at least one entrepreneur stated that each entrepreneur in the street "is an island" (restaurateur Ava). Working together to reduce energy use was not part of the routines of the entrepreneur. Furthermore, the ICTs that were implemented did not accommodate collective reflection or action either; the meters showed individual shop measurements. As a result of the heterogeneous assemblage of the group – coupled with tensions between entrepreneurs in the street – and the individually oriented ICTs, the group became an "uneasy" test community that only came together during brainstorm sessions to share ideas.

Another issue that caused tension was a disturbance of the daily life routines of the entrepreneurs caused by municipal activities. During the pilot, the municipality began to

restructure the public space in the Utrechtsestraat. And although this did not cause delays in the implementation of ICTs in the entrepreneurial space, it did influence the entrepreneurs' ideas about to what extent the pilot was generating a more positive image of the street; road works delayed the implementation of new technologies in the public space – making the pilot "less visible" to the shopping public. The implementation of the pilot in this area was even delayed to such an extent that at the time of the closing party, changes were still underway. Keeping the entrepreneurs motivated to continue with the pilot cost a great deal of work according to the shopping street manager and often culminated in non-use of technologies in the entrepreneurial space as well (shopping street manager, Food & Beverage entrepreneur Cross).

In reflecting about this, the project manager observed that: "like in any practical situation, you notice that there are a great deal of obstacles once you try to execute something, obstacles that you did not think about beforehand" (interview project manager, 28-11-2011). These obstacles were not embraced as a means to gain new and perhaps unforeseen insights, but perceived only in terms of resisting the project. In addition to this, the project manager pointed to an inherent problem of executing Living Lab-projects: "you are engaging in a participatory model, while there is a need to act fast [to implement a project] in the first place" (interview project manager, 28-11-2011). The constraints of the project itself (such as time limits) and daily life realities made it difficult to implement user feedback. This led to tensions, as restaurateur Ava summarises: "If you want us to believe in the pilot, then you need to make sure that we are heard. (…) Really listen to the entrepreneur" (interview Ava, 18-10-2011). Instead of seeing daily life realities as an opportunity to work with the situated expertise of the entrepreneurs, the project constraints seemed to dictate that less agency be granted to the entrepreneurs' ideas that resulted from ICT use.

5.5 Conclusion: resisted improvisations and situated expertise limit user innovativeness

The objective of this chapter was to investigate how users become involved as testers in a Living Lab-project and how in performing this role, testers are perceived as innovative by the overarching Living Lab. This case study illustrates the complexity of involving users as testers in a specific Living Lab smart city project. The entrepreneurs needed to be both actively and passively involved in the pilot: partaking in the process and utilizing new ICTs, while at the same time "only" acting as testers while companies implemented new technologies. This double image also became apparent when I looked at how the entrepreneurs were configured by Amsterdam Smart City on paper; they were configured as both tester and as pioneer. In practice, tensions appeared that made their configurations more complex; they were also expert/lay ICT users and owners/borrowers of the new technologies. The fact that one of the lessons of the pilot was that more attention should be given to "collective action" brings out another point. On paper, the entrepreneurs were part of a "frontrunner group" and even referred to as collaborators in the realization of 20 sustainable solutions (see Image 1). In practice, this group may have been physically located in one street, but was not necessarily a united community.

The analysis of the practices of the entrepreneurs shows how the entrepreneurs attributed their own goals to the Climate street pilot and to the ICTs in practice. As not all the goals of the entrepreneurs were part of the pilot's overarching agenda, these goals were resisted at the level of the Living Lab. This became even more clear when I looked at how the entrepreneurs acted with the sustainable technologies. While some technologies were readily accommodated by the entrepreneurs, others were resisted (and not used). However, when entrepreneurs improvised and found a way to fit the technologies into their daily life practices and goals by granting that technology a new use, this use was not recognised as innovative by the Living Lab-consortium. For example, service provider Strong's use of the energy display as a security display did not contribute to new developments for the display, presumably because this new use was not part of the overarching agenda of the project.

The practices of the entrepreneurs with the ICTs did not inform changes to the ICTs. This suggests that the entrepreneurs were not configured as "innovators" in practice. They were limited in their agency and also rather limited in their "innovativeness". This is further underlined by the tensions and ambiguities that I discern; the configuration of the more "passive tester" was accommodated during the project, while the more assertive tester was "mangled out". The same holds for daily life realities; these were labelled as "obstacles" to the realization of the project and "mangled out" as much as possible. In practice, testing meant that these users were resisted in their agency to contribute their situated expertise. Instead, the unaware lay user configuration was accommodated.

The asserted ambiguities furthermore suggest that there is an inherent tension in Living Lab-practices. Situating experimentation efforts, such as Living Lab-projects, in a daily life setting makes certain uncontrollable dynamics part of these efforts. At the same time, these "living" dynamics" need to be controlled to a certain extent in order to be able to draw conclusions about for example technology use in this setting. Configuring users in a specific ("controlled") way from a top down perspective may play out differently in ("uncontrollable") daily life practices. Opening up project practices to embrace these uncontrollable dynamics may be a challenge. However this would allow for more user agency and, as is suggested, stimulate the more readily recognition of user innovativeness.

On the whole, this case study provides a number of highly relevant insights in the kind of innovation practices shaped in Living Labs and allows me to further specify certain research challenges related to user involvement in the field of smart cities and Living Labs. First of all, this study shows that involving users and stimulating user innovation is very complex and that Living Labs should not only seek a connection to (communities of) users, but that investments should also be made in reflections about how to stimulate this kind of innovation from a "top down" (project) perspective – i.e. through public-private partnerships. Secondly, it illustrates how users - in this case entrepreneurs - are configured in such a way that their innovative ideas and innovation practices are precluded. Related to this is the idea that in order to stimulate user innovation, Living Labs should allow daily life dynamics a role in their projects as these are part of the sociomaterial setting. Unforeseen, improvised "bottom up" ideas may form in daily life settings, but require recognition by the "top down" structure of Living Labs if they are to be realized. Granting more agency to the users' ideas and

articulated problems may stimulate further engagement of involved communities. In order to become "smarter", cities are said to need to focus more of the innovative, creative potential of its citizens. But what is left of this idea or goal when the implementation of a project, connecting all the actors in a pilot for instance, requires so much energy that taking the next step (of collecting and implementing user ideas) becomes too much of a challenge, as was asserted at the beginning of this chapter? This Living Lab-project sought insights by testing ICTs in a shopping street, thereby testing assumptions and projections about technology use in a daily life setting while at the same time testing these entrepreneurs as users of new technologies. However, the project did not open up testing practices to "unforeseen" insights. Only when daily life practices of users with technologies and the situated expertise of users are recognised and granted agency, can these truly inform further ICT developments.

Chapter 6. Get Smart: citizens co-creating the community game "Swarm"

"Play is, by definition, a safety space. If a designer or artist can make safe spaces that allow the negotiation of real-world concepts, issues, and ideas, then a game can be successful in facilitating the exploration of innovative solutions for apparently intractable problems." (Flanagan, 2009: 261)

6.1 Introduction

In his book on the *Homo Ludens*, historian and cultural theorist Huizinga (1938) regarded the concept of play in culture and society. Playing is described as "free" and not part of ordinary life in neither time nor space; it has its own rules and order and creates tensions and chance while not leading to material gains. Especially the description of play in terms of having its own rules that are somehow not part of daily life is interesting, given the turn to the development of "serious games" in recent years. Serious games, originally used for military training or educational purposes are becoming more used to address social concerns, raise awareness and foster critical thinking (Flanagan, 2009: 243-244). The challenge of designing serious games is to find a balance between creating a game that is enjoyable to play while at the same time communicating a critical message, one that triggers discussions.[1] Juxtaposed with the characteristics of playing that Huizinga identifies, serious play seeks to combine activities that have their own rules and space but somehow reflect on actual situations in daily life. These games are therefore not set "apart from" daily life, but seek to inform changes in this daily life by changing perceptions, responses or interactions. Games can in this way empower players, according to Flanagan, but only if this empowerment is part of the game mechanic itself; merely playing a game in a specific space, does not in itself cause a reengagement with this space in terms of empowerment.[2]

This chapter delves deeper into the dynamics involved when a serious game is created together with the foreseen future players of the game; where citizens are positioned as co-creators of a - to be devised - community game. I turn my attention to the European project SMARTiP (Smart Metropolitan Areas Realized Through Innovation & People) which is one of 7 "smart city" projects the European Commission invested in between 2010 and 2013 under the auspices of the Competitiveness and Innovation Programme (CIP) "Open innovation for future Internet-enabled services in 'smart' cities".[3] In each of these projects, user-driven and

1 Flanagan notes how serious games can become dull and didactic or entertaining and hollow; the challenge is to find the right balance (Flanagan, 2009: 249).

2 "When taken to the streets, this empowerment can be transformed into a reengagement with the city and thus reclamation of that space. But if this is a goal, it must be integrated into the mechanic and the setting of the game system developed. Taking play onto the pavement, in this light, cannot be seen as a de facto act of empowerment in and of itself" (Flanagan, 2009: 206).

3 These are EPIC (www.epic-cities.eu), Life 2.0 (www.life2project.eu), Open Cities (www.opencities.

open innovation methodologies involve citizens as co-producers of new ICTs.[4] The SMARTiP project has a budget of 4,41 million euros, of which 2,21 million is granted by the European Commission.[5] It covers 5 cities, Manchester, Bologna, Ghent, Oulu and Cologne and involves 13 partners.[6] The overarching goal of SMARTiP is the empowerment of citizens to become smart citizens who help build smart cities that are "inclusive, innovative and sustainable" (SMARTiP Annex I – "Description of Work", 2010: 7). The promise is that when citizens and public services work together with technology developers, internet-enabled services are realized that are based on the widest possible digital inclusion.

In practice, this entails involving citizens as "co-creators and co-producers" (SMARTiP Annex I – "Description of Work", 2010: 54) of public services. This is realized by means of "bottom up approaches based on user-generated content, social media and Web 2.0 applications" (Ibid, p. 7). These approaches should create "smart" and empowered citizens and additionally validate what in Living Laboratory literature has been referred to as the "quad helix" (Carayannis & Campbell, 2012): Public Private People Partnerships where "people" are added to the consortium of private companies, public organizations and research institutes. Internet-enabled services are expected to stimulate co-creation, which in turn should foster opportunities for citizens' engagement in developing "smart services". Inclusion – within SMARTiP - allegedly allows citizens to contribute wisdom and experience and is based on four principles: recognizing people as assets, valuing work differently, promoting reciprocity and building social networks (Ibid, p. 4).

The project is divided into three themes: smart engagement, environment and mobility. In this chapter I focus on the execution of the smart engagement theme in the city of Ghent. Within SMARTiP, smart engagement seeks to stimulate citizen engagement with data aggregated via Open Data commitments and by citizens themselves.[7] In Ghent this takes the shape of a pilot that develops – together with citizens - a smart sensor and RFID-enabled community game. The project foresees diminishing the digital divide by including citizens in the development process and by allowing citizens in two neighbourhoods to play the resultant community game. Relating this idea back to Flanagan's ideas about serious play, SMARTiP in Ghent seems to make playing itself the object of design in order to engage and ultimately

net), PEOPLE (www.people-project.eu) PERIPHERIA (http://peripheria.eu/), SMARTiP (www.smart-ip.eu) and SMART-ISLANDS (http://www.smart-islands.eu/) (accessed on 9-6-2012).

4 http://www.openlivinglabs.eu/news/eu-supported-smart-city-project-portfolio-future-internet-week-ghent (accessed on 9-6-2012).

5 http://ec.europa.eu/information_society/apps/projects/factsheet/index.cfm?project_ref=270971 (accessed on 9-6-2012).

6 Manchester City Council (UK), City of Cologne (DE), City of Bologna (IT), Regione Emilia Romagna (IT), Engineering (IT), iMinds (BE), City of Ghent (BE), Digipolis (BE), Alcatel-Lucent (BE), University of Oulu (FI), Peoples Voice Media (UK), University of Manchester (UK), European Network of Living Labs.

7 Smart environments targeted the inclusion of citizens in the co-production of environmental services and monitoring. Smart mobility supported "smarter" mobility of citizens through cities, based on collected data which would allow people to monitor and plan their travel routes.

produce smarter citizens. This stipulates that here, citizens become part of the mechanism that is set to empower them in the first place. They are envisioned to co-shape their engagement in terms of the ICTs they play with, as well as the actual gameplay itself.

SMARTiP's project description frames users as co-creators or co-producers of a new ICT and as included *throughout* ICT development processes. Being involved throughout design implies a different agency for these users compared to the other cases; users are not designers who physically develop a technological artefact, nor do they provide insights in technologies' usage by testing new ICTs. Rather, they are aligned as actors who co-create technological artefacts. The fact that users are involved in their daily life environment suggests that the development process depends to large extent on how users and producers negotiate meaning in and about this daily life environment. In other words, the negotiated meaning attributed to daily life environments becomes part of the dynamics involved while creating a new technological artefact.

In this chapter, I analyse how practices of user innovativeness are shaped by and in the Living Lab-project SMARTiP. For in order to meet the Living Lab-goals the developed technological artefact should not only be the result of a co-creative process, but also be "innovative" – produce innovative cities with smart citizens. This implies that the involved users contribute to the "innovativeness" of this process. The two central research questions of this chapter are: *how are user involvement and user innovativeness shaped and facilitated in the sociomaterial setting of SMARTiP and what kinds of innovation practices are constituted in SMARTiP?* To answer these questions, the analysis is guided by the following sub-questions:

1. How are citizens configured as co-creators in the project description?
2. How do citizens perform as co-creators in practice?
3. How can these co-creative practices be understood in terms of improvisation?
4. Are citizen improvisations recognised as situated expertise and as such facilitated in SMARTiP?
5. Are practices of user innovativeness perceived as innovative within SMARTiP?

The first two sub-questions focus on the involvement of citizens, while the third, fourth and fifth questions aim to understand citizen involvement in terms of innovativeness. I focus on these questions to analyse how in practices, agencies of various involved actors are performed in interaction; how the co-creator performance in practice consists of interactions between users, technologies, daily life settings – within the Living Lab-context.

The chapter is divided into 5 sections. I present the theoretical frame and methodology in section 6.2. Section 6.3 consists of a description of the sociomaterial configuration of SMARTiP with a specific focus on how citizens are configured as co-creators and part of the Living Lab-consortium on paper. In section 6.4, I investigate how this co-creation unfolds in practice and how user involvement is translated into ICT innovations. The dynamic observed between configurations, described and reflected upon in the conclusion (section 6.5), grants insight into what user innovativeness means in this Living Lab-case and what kind of innovation practices can be observed in SMARTiP.

6.2 Theoretical frame and research methodology

This chapter focuses on the co-creator performance of users in SMARTiP's Ghent pilot and relates this performance to practices of user innovativeness. To trace how the co-creator performance takes shape, I analyse how sociomaterial relations are enacted in practice; how the involved (human and non-human) actors interact and produce a new technological artefact, namely an ICT that seeks to produce and empower smart citizens. This means that the analysis gives insight into how citizens become co-creators as part of the enactment of sociomaterial relations during the process of ICT development.

I consider citizens' co-creator performance in terms of sociomaterial practices to underline the emergent character of these performances. I furthermore use Pickering's notion of the "mangle" to problematize how human and non-human actors engage in a dance of agency; his idea of the mangle regards agency in terms of resistances and accommodations of agency in practice. As noted in Chapter 2, I connect the concept of improvisation to this dance to emphasise how dancing agencies generate "unforeseen" and improvised ideas, practices and technological artefacts.

Improvisation works as a concept to both highlight and understand sociomaterial practices as they emerge throughout the SMARTiP project between the involved actors. This means that I do not merely focus on how citizens co-create a new technological artefact, but that I moreover view how their performances are the result of the interplay between Living Lab-actors – how sociomaterial relations shape this performance. So while the focus lies on how citizens co-create, I also look at how the organizing actors and material actors mutually shape their performance and the design process of the technological artefact.

This case study is not a reconstruction, but rather a "real-time" study; actors were in constant negotiation and the technological artefacts were developed as I followed the actors. While this posed some challenges e.g. how to combine different forms of analysis – document analysis, observations and transcriptions made during team meetings and focus group sessions, as well as interviews with testers of the newly developed game platform – this combining of methods also enabled me to follow debates and discussions and so recount the dynamics that shape how citizens become co-creators in SMARTiP.

To answer the research questions and reflect on the innovativeness of users in this case, I use a multi-method qualitative methodology. I first of all analyse how users are included in the project by analysing how the project configures "the citizen" in documentation (the project description and related publications) and subsequently focus the analysis on how users are included during the development stages of the community game via a crowdsourcing initiative, co-design sessions and internal testing. I analyse the data collected by the SMARTiP team via the crowdsourcing initiative (March-April 2011) focusing on the method of idea collection as well as on the actual crowdsourced ideas of Ghent's citizens to deduce citizens' views on the function of ICTs to increase social cohesion. Following this, I attended and transcribed one co-design session (with students) and two focus group sessions (with citizens) that were organized between March 2012 and September 2012. I also analysed three written reports documented after three earlier organized co-design sessions with students. During the internal testing phase of the ICT prototype, I analysed the questions and answers provided

by twelve testers to an online questionnaire. To gather more in-depth knowledge about the testers and their experiences with the prototype, I was also enabled to conduct two interviews with testers (which were supplemented by summaries of three other interviews undertaken by a Living Lab team member).

Secondly, I focus on how the project team reflects on citizen input and ideas and translates these into new ICTs. Between January 2012 and September 2012 I observed and transcribed 5 project meetings where research, public and industrial partners met to discuss the project. The analyses of these meetings focus on user configurations as well; how is citizen inclusion discussed, what obstacles are recognised to involvement and how do the actors reflect on the input or feedback received?

Thirdly, I turn my attention to how technology is included. I look at the choices that are made about and the meanings that are attributed to the to be developed technological artefacts by users and by the project team. I combine insights in these areas to reflect on the co-creative practices in the Living Lab; how the meanings attributed to both users and technology stand in relation to each other. This reflection furthermore allows me to draw out what kind of knowledge users/citizens contribute to the development of the technologies, and see how user improvisations are translated into technological developments. What, in other words, kind of meaning is attributed to user involvement and improvisations in the Living Lab-project.

The combined analyses, presented in a "chronological order" to follow how users and producers "interacted" in practice, paint a complex picture of what it means for citizens to be co-creators in this particular Living Lab-project. Analysing project documents, project meetings and actual involvement of users during development stages provides insight into how users are configured and act as co-creators. Juxtaposing the different analyses in the last section, enables me to reflect on how "user innovativeness" is shaped and facilitated in this Living Lab-project.

6.3 Sociomaterial configuration of SMARTiP: smart citizens co-creating smart ICTs

SMARTiP positions citizens as co-creators of smart ICTs. In this section I concentrate on how – on paper – the sociomaterial configuration of SMARTiP configures citizens as co-shapers of new technological artefacts. I do so by regarding how citizens are included as actors in the proposed ICT development process; how they are set to become accommodated or resisted in their agency within this project, and how their inclusion shapes the resulting technological artefacts.

Section 6.3.1 and 6.3.2 zoom in on this configuration by looking at how the project views "the citizen as co-creator" and what this implies in terms of the agency these descriptions suggest for the citizen. The insights in these configurations are offset in section 6.4 with an analysis of how citizens are in practice involved throughout the project. This analysis is guided

by and reflects on SMARTiP's method of user inclusion: the funnel approach.[8] This means that I analyse each step in this process and reflect on both the ways in which citizens are involved, as well as the ideas that the citizens have.

I work towards an understanding of citizen inclusion in theory and practice by focusing on how citizen inclusion is discussed by the project team. This gives insight in how citizens are indirectly involved in the project – how "the citizen" is referred to in team meetings and how the team positions the citizen in their discussions about the technology that should be developed. In the conclusion the analyses are juxtaposed in terms of resistances and accommodations of agencies and improvisation practices.

6.3.1 SMARTiP's Ghent pilot

SMARTiP's theme of smart engagement focuses on leading and facilitating activities that support user driven innovation. In the city of Ghent this is translated into the aim of realizing open platforms to develop innovative ecosystems (for and by active user involvement) (Smart mobility vision report, 2011: 38). Apart from the citizens of Ghent, the involved actors of the Ghent pilot actors are public, private and research organizations such as the City of Ghent (public), iMinds (research), the University of Ghent (research), Alcatel-Lucent (private) and Digipolis (public).

What binds these actors in the SMARTiP consortium is their experience and shared interest in ICT and "inclusion". The City of Ghent for example launched a strategic programme Digitaal.Talent@Gent in 2007 – to run to 2020 - to combat the digital divide and ensure digital participation of citizens in governance.[9] Apart from this program, Ghent's overarching "2020 mission" aims to make Ghent a creative city that plays a leading role in the development of a sustainable, solidary and open community. It stipulates that by 2020, Ghent is "internationally recognised as a centre for innovative experiments and a pioneer in the evolution towards a learning and creative society" (Stad Gent, 2007: 24). Meanwhile, research partner iMinds has a longstanding reputation in Living Lab-research.[10] It initiated one of the first Living Lab-

8 This funnel approach is treated as an artefact that is the result of performed sociomaterial enactments. This is in line with for example Suchman's argument that plans should not be treated as a specification for a course of action as this shuts off the space to investigate "the relations between an ordering device and the contingent labors through which it is produced" (Suchman, 2007: 187).

9 The objective of the digital communication agenda is that: "In 2020 the digital services and information in Ghent have increased. Through the active use of their information and through interactive ICT solutions, the social cohesion has increased". The same goes for digital participation: "In 2020 a representative portion of the population takes part in the policy making" (SMARTiP Annex I - "Description of Work", 2010: 54). For SMARTiP, the department of Strategy, Communications and International Relations is involved. This department is actively involved in the European Eurocities network and is specialised in management. It works closely with Digipolis. Digipolis is an intermunicipal services organization of the City and social welfare administrations of Ghent and Antwerp. As a telematics partner in the project, it develops and maintains ICT applications for the City of Ghent and manages the ICT infrastructure for SMARTiP. Apart from that, Digipolis will buy and roll out the needed ICT equipment for the project in Ghent (Ibid, p. 108).

10 iMinds has extensive experience with "ad hoc Living Labs (e.g. Living Lab related projects like Mo-

projects in Europe in 2004 and was part of the first wave of the European Network of Living Labs (2006).[11] Research group MICT (connected to the University of Ghent's Communication Sciences faculty) performs research in the area of new media and ICT with an emphasis on the role of end users as well as the role of other actors.[12] Alcatel-Lucent, SMARTiP's private partner, allows "service providers, enterprises and governments worldwide to deliver voice, data and video communication services to end users" (SMARTiP Annex I – "Description of Work", 2010: 97). In the project context, Alcatel-Lucent offers expertise and an architecture (platform) "that enables non-expert users to visualise and manipulate sensor data and to create web mash-ups using one or more sensors or data sources, potentially also enabling reuse of abstracted collective data patterns". In addition, it provides "technical input and feedback during the smart engagement application idea generation and evaluation" (Ibid, p. 99).

Together, these actors work to complete the SMARTiP project – which is divided in a number of set deliverables - in Ghent. The consortium of partners in Ghent are in the lead for 2 of the 8 work packages defined in the project description; the development and implementation of smart engagement prototypes and preparing these prototypes so that these may be reused in the other cities that are part of the project. It is within the frame of the work packages that the actors work together to reach the goals of the project. To complete the public-private-people partnership, the citizens of Ghent are also included. The project description defines certain promises and challenges to realize this inclusion and proposes a "Living Lab-approach" to overcome these.

Project promises: engaging and producing "smart citizens"

The SMARTiP project has three overarching user-focused promises. First of all, the project seeks to overcome the digital divide in urban contexts. Due to persistent spatial inequality, groups of citizens "with the highest need and of reliance on public services are the least likely to be able to use electronic channels" (Viitanen & Kingston, 2009 in SMARTiP Annex I - "Description of Work", 2010: 12). This hampers them in efforts to "[sustainably] reduce poverty, increase skills, employment and quality of life" (Ibid). By developing and offering Internet-enabled services (or ICTs) that facilitate the possibility for citizens to shape the public agenda, the project wants to turn citizens into active agents of change instead of passive recipients of institutional initiatives and practices. The project thus aims to connect to digitally excluded citizens.

Secondly, the project foresees the creation of smarter technologies by engaging citizens in a "virtuous circle" in the development of new ICTs. Taking the idea of co-production as its

bile television, eInk technology, Interactive Tv, mobile and contextbased services,...) as well as in the permanent Living lab at the VUB campus" (SMARTiP Annex I – "Description of Work", 2010: 89). As well as being part of the SMARTiP consortium, iMinds is coordinator of the EU-CIP APOLLON (Advanced Pilots of Living Labs Operating in a Network) project and involved in the EU Fireball project. These projects focus on cross-country collaboration and research on future internet research respectively.

11 http://www.openlivinglabs.eu/livinglab/iMinds-ilabo (accessed on 6-12-2012).

12 http://www.mict.be/main/onderzoek (accessed on 22-8-2012).

starting point, this circle work as follows:

"Internet-based technologies and services provide new opportunities for stimulating co-production while, at the same time, co-production provides new opportunities for securing citizens' engagement and active involvement in the process of developing 'smart services' which, in turn, can help to accelerate the uptake of these technologies and services. This 'virtuous circle' is then capable of enhancing cities' ability to grow and sustain 'innovation ecosystems' and, through this, to develop more inclusive, higher quality and efficient services which are then capable of being replicable and scalable for wider cross-border deployment on a much larger scale" (Carter, 2011: 4).

The newly developed technologies are to function as catalysts which both engage citizens in co-production practices as well as accelerate the adoption of these services. By becoming actively involved in this virtuous circle, a process is created that is not only "good" ("virtuous") for citizens but also serves a "greater good" of creating a smart ecosystem.

The third user promise is that the project will create "smart cities", populated by "smart citizens":

> *"Smart Cities will have smart citizens at their heart, enabling them to have the capacity and confidence to use state-of-the-art future internet technologies to transform the way they live and work and their quality of life. Future internet-enabled smart citizens will collaborate in new and dynamic ways, co-owning new ways of planning and delivering services and coproducing services both for themselves and for those that they live with, care for and work with. (…) Smart cities will enable smart citizens to make their environments greener, cleaner and healthier as well as more open and inclusive. Smart citizens in smart cities will ensure that smart cities are more democratic, resilient and attractive, using future internet-enabled services to generate and celebrate creativity, innovation and diversity"* (Ibid, p. 11).

By delivering connected, co-producing, smart citizens the project thus aims to enhance society as a whole. Smart citizens are confident users of ICTs, capable of transforming their lives and living environments and part of European efforts to innovate both socially and economically.[13]

What unites these three promises is the extent to which each promise insists that citizens need to change in order to become "smart". Certain citizens are positioned as lost behind the digital divide and in need of becoming smarter. They need to learn, become involved and co-produce new technologies. This is connected to an overarching societal promise that making citizens smarter by involving them in a virtuous circle enhances society as a whole. Technologies aid this transformation; by acting with and by creating technologies,

13 Important to note is that the SMARTiP vision document on Smart Engagement regards smart cities keeping in mind the contested status of the concept (Smart Engagement Vision Report, 2011: 5).

citizens live up to and fulfil each promise. They overcome the digital divide by learning how to use ICTs and become smarter by creating new technologies that transform their living environments. The resulting smart city enhances experiences of democratic societies. The overarching promise seems to be that by increasing citizen agency or power to create and act with technologies both citizens and societies will become smarter.

6.3.2 Citizen configurations

The passive citizen versus the active citizen: from consumer to prosumer

Within the project description, citizens are described as located at two ends of a spectrum, the passive and the active. On the passive side, citizens are disempowered and excluded.[14] They lack skills to collaborate, are not digitally involved and require incentives and "continuous efforts by policymakers and other stakeholders involved" (SMARTiP Annex I – "Description of Work", 2010: 57). At best, they are configured as passive recipients and primarily seen as customers of public services. Especially the image of the citizen customer is criticized; viewing citizens as customers contributes to "a 'top down' service model (...) which in turn has hampered more creative developments in government-citizen relationships" (Ibid, p. 12). Citizens should instead be stimulated to become part of the active side of the spectrum as co-creators (Ibid, p. 9), co-producers (Ibid, p. 7) and "smart citizens" (Ibid, p. 3). This is realized by offering the incentive of gaining access to "new skills, employment possibilities and quality of life" (Ibid, p. 9). Currently, citizens are passive because they are not supported nor given access to means of becoming more involved in government services (Ibid, p. 3).

The above descriptions reflect on and reinforce the "passive" image of citizens. They have needs, but require stimulation and incentives to become engaged. At the same time, citizens want to become actively involved in policies of their neighbourhoods (SMARTiP Annex I – "Description of Work", 2010: 49). The project seeks to facilitate this involvement so that citizens can change from consumers to producers or "prosumers" (Ibid, p. 3). Ideally, this prosumer works as a "catalyst not only for technological innovation but also for social innovation" (Ibid, p. 109). A prosumer is a co-producer of data and apps, an active co-creator in analysing the needs of local communities and involved in a collaborative approach to realize social capital (Ibid, p. 9).

The connection that is made between passivity/consumers and activity/prosumers is interesting; in the project description, the notion of citizens as consumers is criticised and used to characterise the perceived limitations of citizen involvement in current policy efforts. Activating citizens therefore requires a change in perceptions about citizens and involvement of citizens at the policy level. The call to overcome thinking about citizens along the lines of "passive consumption" implies that citizens can, if properly facilitated and governed, become collaborators of public policy. In the project description, key to realize this transformation is

14 These citizens have "unmet needs [that], in spite of increased funding (…) the intended policy outcomes of reduced poverty, increased skills and employment and an improved quality of life are not being met or sustained and inequalities persist" (SMARTiP Annex I – "Description of Work", 2010: 3).

the use that is made of technologies. Technologies will facilitate a change in active citizenship. This ties in to the second manner in which citizens are framed: citizens as "smart" versus "dumb".

The "smart" versus the "dumb" citizen

Citizens become "smart citizens" through ICTs and their involvement in ICT-development. Their enrolment in a virtuous circle allows citizens to "develop the social capital and capacity to be fully involved in the co-production of services, (…) resulting in improved citizen involvement as active producers/"prosumers" of public services" (SMARTiP Annex I – "Description of Work", 2010: 3). Drawing out the contrasts between passive and active, consumer and producer/prosumer, this implies that currently, unconnected or unreached citizens are in some way the exact opposite of smart: "dumb".

The fact that the project aims to facilitate the process of transformation of citizens actually further underlines this "dumb" image; citizens currently lack or are not given access to knowledge and skills to be active collaborators. The project offers citizens the chance to acquire skills and knowledge by gaining access to new Internet-enabled technologies and services. This is presented as an added value and incentive for citizens to join the project, as this allows citizens to generate new knowledge and Internet-enabled services (as co-producer) themselves.

Technological artefacts facilitating the change into smart citizens

The channels that facilitate citizens to become "smart" are envisioned as open platforms and tools that support collaboration.[15] These platforms should be "open" in more than one way. Firstly, they should be "as accessible as possible for citizens, making innovative use of user generated content, social media applications and Web 2.0 approaches more generally" (SMARTiP Annex I – "Description of Work", 2010: 4). Secondly, the technologies should "[open] up possibilities for a new interpretation and understanding of spatial inequalities (...) seen through the experiences of citizens themselves, leading to new forms of empowerment for those citizens" (Ibid, p. 7). New ICTs that will be developed within the context of the project should empower through access and grant citizens a voice to share their views.

Despite this pre-defined openness, clear technical parameters are defined. These suggest that prior to development, certain uses (and users) are foreseen. The technologies "will combine existing prototypes, using available Internet-based technologies, e.g. mobile and location based services, next generation access (NGA) service networks and applications based on the emerging "Internet of Things", including RFID, sensors and networks" (Ibid, p.

15 The core of the platform should be open to partners to build and realize "new urban smart engagement applications, to gather feedback from a range of potential stakeholders (users as well as suppliers), to let citizens use a selected and developed amount of urban smart engagement applications, iterative testing in ecosystem and investigation of drivers and barriers, [and] to let specific groups of users (government professionals,..) co-create urban smart engagement applications" (SMARTiP Annex I – "Description of Work", 2010: 59).

10). These technologies focus on data sharing and on ubiquitous applications, which suggests that "smartness" is not only reserved for people; it may be closely related to the sharing of information, but this can also take place between people and "things" (and "things" amongst themselves).

Users are expected to (learn to) be able to use (online) data and newly developed applications on the platform. The latter will offer means to integrate datasets[16] and "[enable] non-expert users to visualise and manipulate sensor data and calibration through a web browser, and to create web mash-ups using one or more sensors or data sources" (Ibid, p. 60). This description paints quite a tech savvy and active image of the foreseen users. Users can access information and communicate via the application, and provide "feedback, tips, remarks, signal concerning formal as well as informal aspects related to environments or objects" (Ibid, p. 70). The open platform should offer the possibility to access and build applications, while also stimulating the use of applications and sensors, the co-creation of datasets and generation of data visualisations.

This active and knowledgeable image of the user is offset against the image of the user as a "non-expert" who, before they can undertake these activities on the platform, requires an "abstraction phase" (Smart Engagement Vision Report, 2011: 26). Because non-expert "prosumers are typically not software experts" (SMARTiP Annex I – "Description of Work", 2010: 27), the platform should allow end users to find and use information without having to understand all the technical details. The platform will be therefore be presented as "a gameified community barometer" (Ibid, p. 62) and be "attractive and exciting" to "stimulate citizens to engage themselves in their communities/neighbourhoods and to be more involved" (Ibid). In order to facilitate the change to smart citizen, the platform should be open, appeal to active users while at the same time be engaging enough.

This engagement is translated into certain pre-defined non-technical user requirements. These stipulate that the technologies should respond to a "need", be fun and interesting, create momentum (to ensure continued use), and be sustainable and "good" for the user. These latter two requirements are presented as paramount as these ensure that "users (…) feel taken seriously and that the practical outcome of the planned activities will provide a real material change to the way the service is delivered and to the outcomes" (Smart Engagement Vision Report , 2011: 37).

Overall, the user is configured as one who needs to become smarter and empowered both through using and by developing new technologies. This suggests a double role: they are partners in the public-private-people partnership while they at the same time require empowerment to become "smart". Practically too, this suggests a double role. On the one hand, users should work with technologies and aggregated data to become more informed

16 Geo-datasets related to young people (children- and youth organizations, youth houses), playgrounds and organized playground activities, libraries, public parks and other green environments, schools (both primary and secondary), playstreets, swimming pools and public sports accommodation, cinema, public transport and the bicycle network (SMARTiP Annex I – "Description of Work", 2010: 62).

and smarter. On the other hand, they are referred to as co-producers and prosumers of new services and generate data themselves. Making engagement with the platform "playful" is expected to stimulate the process of making citizens "smart".

The question that presents itself when reviewing the pre-defined technological and non-technological requirements is what kind of agency citizens have in the development process of this technology or the (game) applications. User inclusion is not unambiguous. Is the citizen a "co-producer" in the sense of populating the application and platform with data? Is he or she "a sensor" (SMARTiP Annex I – "Description of Work", 2010: 4), or a creator of the newly developed technology? These are pertinent questions, especially as the stakes are high: the project promises a transformation of passive/consuming citizens into active/prosumer smart citizens.

The importance of citizen inclusion: challenge and method

Citizen inclusion is framed as an opportunity to meet recognised challenges to successful ICT development. These are described as a lack of accurate insight in end users' expectations and requirements and a lack of adequate user-centricity from the early development stages on (SMARTiP Annex I – "Description of Work", 2010). Coupled with the challenge of ever shortening product cycles, the project description suggests that this often leads to a rather fragmented inclusion of end users during ICT development processes. This leads to situations where "innovations increasingly fail to reach a critical mass of users" (Ibid).

To meet these challenges in the SMARTiP project, a Living Lab-methodology is used to gain insight in end user expectations and requirements. The project description defines this method as follows:

"*A Living Lab is a usercentered open innovation ecosystem, often operating in a territorial context (city, region, etc.), integrating research and innovation processes with an interactive Public-Private-People Partnership (PPP) involvement. It is based on a systematic user and stakeholder co-creation approach integrating research and innovation processes through the continual exploration, experimentation and evaluation of innovative ideas, scenarios, concepts and related technological artefacts in real life use cases involving user communities not only as observed subjects but also as a source of creation. The active involvement of users as partner in the innovation development process corresponds with another trend, i.e. active user involvement/ smart engagement*" (Ibid).

The user, as citizen and/or as consumer is to be continuously involved as a stakeholder, as partner, and as part of the user community that is a source of creation instead of only an observed subject. In this way the project aims to counter fragmented inclusion while also "[bringing] together both the e-government and e-inclusion agendas" (Smart Citizens Vision and Strategy, 2011: 5). The Living Lab-approach is furthermore used for "its ability

to merge research and innovation processes with the daily, local, real-life context"[17] (Ibid, p. 20-21), which is especially relevant as local people need to take ownership over these kinds of processes (Ibid, p. 9).

The proposed manner through which continuous involvement is to be realized is a "funnel approach"; combining "in-depth iterative user research" with user monitoring, starting in a broad way, but "resulting in specific input for certain groups of applications or services" (Ibid, p. 57). This approach consists of different stages; opportunity identification, exploration of wild ideas, use cases, prototyping and implementation in a Living Lab evaluation. Mixed methods "reveal a long list of 'possible opportunities' (…) from a diversity of perspectives (user, business, policy)" (Ibid). The first stage consists of collecting "wild"[18] ideas from a diversity of perspectives.[19] These "wild" ideas will subsequently be evaluated in focus groups by experts and thematically clustered, reviewed and translated into prototypes that are implemented in a Living Lab environment. In short, while citizens will be included, they will primarily be monitored and will offer "wild" ideas that will reviewed by experts. What does this mean for their role as partners in the project? Throughout the development process, the project envisages that both the value of the developed technologies in creating smart environments and the role of user engagement should be validated.[20] Citizen inclusion in the development process therefore serves several purposes: to mine ideas, to make citizens "smarter" and to validate the Living Lab-approach.

While citizen involvement is emphasised, it is not perceived as "a given". For instance, the number of test users depends on how the funnel approach works out in practice, and the applications that are developed (Ibid, p. 59). The involvement of experts, meanwhile, is also stressed. Citizens may provide "wild" ideas for instance, but these require evaluation by experts in order to "keep a broad focus and not to be limited by the limited imaginative capacity of citizens" (Ibid, p. 58). In other words, it is expected that the ideas supplied during the ideation stage of the pilot will require "broadening" by experts. For a project that prescribes the involvement of citizens in a public-private-people partnership, the expectation that citizens have limited imaginative qualities suggests that there is a tension in the perceived roles of citizens and reinforces the image that currently citizens are not expected to come up

17 They also reflect on the challenges of the approach. It is important to ensure that "its main strength in terms of local embeddedness does not turn into a significant weakness in terms of the general applicability, validity and robustness of Living Lab test results" (SMARTiP Annex I – "Description of Work", 2010: 21).

18 The use of the term "wild" could signify "wild" in the sense of originating from "the wild" (i.e. real life) or "outrageous" from the perspective of the supplier of the idea. The fact that "wild" is used in the context of referring to opportunities that may be "very incremental as well as "wild" ideas" (Smart Engagement Vision Report, 2011: 38) suggests the latter interpretation.

19 The "demand side (user research) as well as from the supply side (technology developers, content providers, city representatives)" (Ibid, p. 58).

20 "Given the objective of intensive user involvement (smart engagement), the possibilities for and willingness of non-expert users to engage (e.g. data sharing, predicting behavior based on data, visualizing and reporting of data, etc.) in these applications (including the potential of self-development of applications) will be validated" (Smart Engagement Vision Report, 2011: 42).

with "smart" ideas.

To return to the first sub-question of this chapter, the citizen is configured as a co-creator in a rather ambiguous manner. Citizens are to become empowered and smart through inclusion in the project, while they are also recognised as passive and in need of incentives and learning to become smarter. The proposed technologies also waver between the image of citizens as "tech savvy" and prosumers, and that of a passive, excluded person who needs a game to become engaged. The iterative processes prescribed by the funnel approach underlines the ambiguous image; citizens are non-experts, yet prosumers, who may own and validate technologies and development processes, but who also have limited imaginative capacities. The tension between "smart" and "dumb" makes for quite a fuzzy or ambiguous image of "the citizen". This makes it even more interesting to see what active engagement of citizens mean in this project; how are citizens enabled to contribute their ideas and how do these contradictions play out in practice?

6.4 User innovativeness: co-creation in practice

In this section I analyse how citizens are included in the funnel approach in practice, which offers insights into how citizen agency is performed and user innovativeness is perceived within SMARTiP in practice. Citizens are included in different manners: through a crowdsourcing initiative and in two focus group sessions. In addition to this, the SMARTiP team includes groups of people (students and employees of research organization SMIT) during development phases to test methods of inclusion and the game platform respectively. In this section, I analyse these steps in the funnel approach and reflect on how the inclusion of (the ideas of) citizens, students and SMIT employees shapes SMARTiP's co-creative practices. At the same time, I look at how each step in the funnel approach is reflected upon by the SMARTiP team in Ghent. This way, I look at both the ideas of "users" and "producers" to trace how ideas are translated in innovative technological artefacts.

6.4.1 Crowdsourcing initiative with citizens

The kick-off of the Ghent pilot consists of an online crowdsourcing initiative to harvest the ideas of the citizens of Ghent. On the website http://www.mijndigitaalideevoorgent ("my digital idea for Ghent") initiators iMinds, Digipolis and the City of Ghent ask citizens to submit their ideas about "how ICT can make it even more pleasant to live in Ghent?" The website, set up as a forum, invites citizens to upload ideas about smart engagement, mobility and environment (Smart Engagement Vision Report, 2011: 31), to comment on the submitted ideas of others and to vote on what they deem to be the best idea. People are informed about the website through e-mail, social and print media and have the opportunity to exchange ideas and vote for a period of 8 weeks. After this time period, one submitter is drawn from a raffle and wins an iPad 2.

The platform is a "crowdsourcing enabler" (Schenk & Guittard, 2009 in Mechant, De

Marez, Claeys, Criel, & Verdegem, 2011: 4) and based on uservoice.com software.[21] It offers feedback collection, voting, prioritization of ideas and an email service notifying members of a platform about new postings. The crowdsourcing initiative involves three "stakeholders": "the individuals forming 'the crowd', the companies (in this case the city) looking to benefit from the crowd input, and an intermediation platform building a link between the crowd and the company" (Smart Engagement Vision Report, 2011: 31). The goal of the initiative is open innovation with customers.

The use of an online tool to collect ideas of citizens is quite interesting in the context of the larger promises and goals of the SMARTiP project. For while using an online platform does facilitate discussions between different groups of people (from "the crowd" as well as "professionals" or members of public organizations for example), and while using this type of Web 2.0 technology does appeal to the idea of allowing citizens to "speak up", this type of medium also excludes certain citizens from joining in on these discussions. These are precisely those citizens whose opinions and experiences are sought: the people without access to online services, caught behind the digital divide. The people, in other words, who need to become "smart".

The method used to collect ideas thus seems to *rule* out precisely the group of people who are not yet users of digital services. Instead, using this online tool suggests that only "smart" people are sought; that only "smart" people have "smart" ideas. As a kind of mise en abyme, the crowdsourcing enabler is used as an online tool to come up with ideas for other online (or ICT) tools. The "crowd" uploading, commenting and voting on ideas needs to have access to internet and have to know, or be open to learn, how to use the tool. This implies that this crowd is to some extent "tech savvy". This stands in contrast to the user that the project aims to reach: the passive user who is lost behind the digital divide.

The fact that an iPad 2 is offered as an incentive to join in on activities on the platform also suggests a number of things about how the initiators perceive citizens. First of all, the inclusion of an incentive implies that citizens need to be "activated" to become engaged. This is in line with the configuration of citizens as "passive consumers". Secondly, the nature of the incentive underlines the idea that primarily "tech savvy" citizens are appealed to. To become enthusiastic about an iPad 2, one obviously needs to know what kind of technology it is.

What is so interesting about this choice in methodology and incentive is that while these suggest a "tech savvy" citizen, these choices do not entirely counter the citizen-image projected in the project description. As stated before, the ambiguous image of the citizen also refers to citizens who are or can become part of the virtuous circle, and who can function as catalysts to transform cities into smart cities. This ambiguous image allows the project team to appeal to citizens who they think will respond to their call. In this case, the choices made suggest that the tech savvy citizen is sought. Put differently, at this stage in the funnel approach, the citizen who is accommodated in agency is the "tech savvy" one; these citizens are asked to share ideas, as collaborators, on a virtual platform. Meanwhile, the citizen who is

21 Uservoice's plan "for Civic Engagement makes it simple to reach out to those who can't attend town hall meetings" http://www.uservoice.com/for/civic_engagement/ (accessed on 6-12-2012).

not connected is resisted.

In addition to a user image derived from the method that is chosen to harvest ideas, the suggested ideas and the comments made about these ideas also create certain images of citizens and future users. A total of 128 ideas were uploaded onto the website, 5451 unique visitors visited the platform and 1400 people registered their e-mail on the website and cast their votes (each visitor was limited to give up to 20 points in total). A total of 4800 votes were cast, mainly in the first week after launch (Mechant et al., 2011: 2).[22]

The idea of a "multifunctional application or website" received 812 votes, followed by 662 votes for "digital information kiosks placed in the city" and 397 votes for "ASUM: Automatic System for Unified Mobility".[23] Ideas that did not make it to the top three but were included in a top 10 included a "digital opinion/feedback platform for urban projects", "a mobile [phone] app[lication] for the Ghent street festival", "Wi-Fi coverage all over the city", "QR codes in public buildings"[24], "a system that enables voting from the comfort of your own home", "an interactive street map/route planner (with indication of shops, people)" and "API's on government data that are open for public development and DIY [do it yourself]"[25] (Mechant et al., 2011). These ideas broadly deal with the accessibility of data (information in the shape of kiosks, apps, QR codes or planners) and with the ease of sharing of data (voting from home, sharing opinions on a platform and Wi-Fi coverage across the city). Making Ghent more pleasant to live in is translated by these citizens into easy access and sharing of information. What these ideas furthermore suggest is that the citizens submitting these ideas are quite knowledgeable about technological possibilities and technological jargon ("ASUM", "API's" and "QR codes").

The winning idea, to create a broad application, platform or overarching website with municipal information, suggests that the involved citizens expect the developed technology to offer information *about* the city, provided *by* the city – not so much a platform made by and provided with content by citizens. Referring back to the configurations of citizens in section 6.3.2, this idea reinforces the image of the citizen as a consumer. Comparing this winning idea to some of the other ideas, it also becomes clear that most ideas (such as a

22 After submitting an idea, it could be labelled by the uploader to fit into a "theme": e-government, mobility, leisure, culture, health, environment, tourism, education, sport, security, houses and "other". The submitter could also choose not label the idea and leave the ideas "uncategorised". The most voted for ideas fell into the "uncategorised" and "mobility" categories; apparently users did not always feel a need to label their idea and when they did, mobility was a popular theme.

23 This idea is to create a "multi-platform" application that will calculate a real-time most efficient route to take (Source: "Crowdsourced ideas", 2011)

24 A QR or quick response code is a two-dimensional barcode that allows the rapid scanning of great volumes of information. QR codes can be scanned using mobile phone cameras. After photographing a QR code, the mobile phone decodes and responds to the code by for example dialling a phone number, sending a text message or visiting the website that corresponds to the decoded URL (Uniform Resource Locator) (Rouillard, 2008: 51).

25 API stands for Application Programming Interface. The Software Engineering Institute defines an API as "technology that facilitates exchanging messages or data between two or more different software applications" (in Daughtry, Farooq, Myers, & Stylos, 2009: 27).

mobile application for the Ghent street festival) can be made part of this larger idea for a platform; the winning idea can provide the technical solution to combine all the "smaller" ideas for new online services. The winning idea seems quite generic and open. This is much in line with the technology that is sketched in the project description: an open platform on which a number of services can run.

The comments that are made about this winning idea clearly show how meaning is attributed to the idea of a broad application. The submitter describes the idea as "an online application, through kiosks or smartphones that enables you to consult in real time the bus schedules, the upcoming events in the city and all the relevant facts associated with these points of interest. In this app you can also find culture, leisure, tourist spots, sports accommodation etc." (Crowdsourced ideas, 2011). This idea triggered 54 comments. Most commenters lauded the idea. A few comments are made about how not one, but maybe more applications are needed (for different audiences, such as citizens interested in culture and sports and tourists visiting the city) and how the connecting website should target these different audiences. Others find that the idea only targets the younger generation, who "own a smartphone" or propose that the information be made freely accessible on smartphones by making use of online hotspots in the city. Another issue brought up in the discussion on the platform is how to integrate the information about events in the city and bus schedules for instance, as the latter information is not "owned" by the city, but rather by the bus companies. Commenters are concerned about how the tool and website should approach "target users" or audiences (probably the younger generation, tourists and citizens with an interest in culture and sports, who own a smartphone). Content-wise, the application should provide integrated information, available for each "target audience".[26]

The commenters therefore move beyond the technical solution and instead discuss the future perceived user of the application and how the application should be embedded in daily life contexts (e.g. free hotspots in the city). The fact that they discuss perceived users, obstacles to use and solutions to these obstacles again suggests that the involved citizens are quite "tech savvy". This is underlined by their reference to other online examples of "good" tools or websites when discussing other ideas (they were aware of other ideas "out there" online). Also, their remarks about possible obstacles and solutions suggest that these citizens are thinking in terms of local context; what should be kept in mind while creating something that will make Ghent a more pleasant city to live? At the same time, discussion about who should be included during the development of this application is not started. Perhaps the question formulated on the website does not suggest that development should be taken into account.

The initiative sets out to realize a cooperative relation between the city and its citizens. The fact that many people register, upload and vote for ideas, shows that there certainly is a

26 The category in which the most ideas were submitted, was the e-government section, suggesting – as Mechant and colleagues (2011) argue – that citizens "increasingly expect local governments to embrace new and mobile technologies as service outlets".

group of people willing to engage with an online call by the municipality. Still, the most voted for ideas call for the development of new services by the municipality instead of referring to this as a co-production effort between the city and citizens. In a paper about the initiative, the organizing actors involved in the Ghent pilot stress that a crowdsourcing initiative like this underlines the importance of local people taking ownership over implementation and the owning of an issue (Mechant et al. 2011). In terms of people connecting to the online call, engagement can surely be noted (exemplified by the amount of registrations). Yet, in terms of subsequent creation of the application, citizen ownership is not immediately suggested – as this does not seem to be the central issue of the crowdsourcing initiative. Co-creation here means contributing and commenting on ideas.

Conclusion: the crowdsourcing citizen as ideator

To conclude, some very interesting user images can be gleaned from this kick-off stage of the Ghent pilot. First of all, the methodology (and medium) used suggests that a specific type of user is stimulated to become involved in the crowdsourcing initiative namely tech savvy internet users, who to some extent want to win an iPad 2. Noting the amount of ideas and comments uploaded on the website, these users are quite active. The winning idea suggests that the involved citizens translate the question of how to make Ghent a nicer place to live into a question of information/data accessibility: making data more readily accessible and easier to share. It should furthermore take the shape of a platform, targeted as specific user groups. The foreseen end users, according to the citizens, fall into categories based on interests (sports, culture, tourism), age (youngsters) and access to technologies (mainly smartphone users).

The contributing citizens readily accommodate the role that the initiative attributes to them. They provide ideas and critical commentaries on the ideas of others. Their performance can be characterised by this contribution to ideation. They furthermore accommodate the "active" image of the citizen by coming up with ideas, by reflecting on feasibility of ideas in the local context and by critically questioning who the user of the foreseen platform will be. At the same time, they do not readily recognise a role for themselves in the realization of this platform.[27]

When I compare these practices to the citizen images and foreseen technology to be developed that is presented in the SMARTiP project description, it seems that the initiative primarily accommodates citizens who are already "smart" (connected, knowledgeable) and active. Meanwhile, the "passive" citizen who is currently "unconnected" is not appealed to using this method; these citizens are "resisted" in their agency as they do not have access to the initiative. As a result, the project appeals to one "kind" of citizen in this initiative.

That is not to say that the accommodated citizens see themselves as actively contributing and owning the to be developed technologies. These citizens see "the city" as a primary owner and do not necessarily see themselves as "stakeholders". This may be because of the implied municipal "ownership" of the tool by asking the question on a municipally-initiated website.

27 Nor do they at all times feel a need to "label" and categorise their ideas.

The citizens who are accommodated to contribute here, contribute by providing –asked for- ideas and their local and contextual insights in the areas of foreseen use, users and perceived possible obstacles. They can be characterised as critical ideators.

6.4.2 In the mangle: resisting and accommodating crowdsourced ideas by the team

Ideation by means of the crowdsourcing initiative gives citizens a way of performing their agency. How is this agency "mangled" when confronted with the agencies of the other project members? To take the next step in the development of the ICT "the technical boundaries for developing the application and the available datasets and logistical issues" (Mechant, De Marez, Claeys, Criel, & Verdegem, 2011: 8) have to be taken into account. The crowdsourced ideas are juxtaposed with the "boundaries" of the project in terms of the project's process (how much time and funds are available), content ("does it fit the agenda?"[28]) and technological (what is possible to build and what is required to be included by the project) deliverables.

The crowdsourced ideas are reviewed by means of a number of focus groups with municipal representatives, academics and technical experts. In line with the proposed funnel approach, the ideas are translated into 10 broad application categories: alert services, augmented reality applications, e-gov applications, interactive maps and points of interest, a complaint and alert platform, real-time information outlets, social tools that connect people and enable networking between citizens, tourism applications, supply and demand applications (i.e. showing where to get free stuff) and other initiatives (e.g. offer a discount on smartphones) (Mechant et al, 2011). These ideas are furthermore applied to the idea of the gameified community barometer that was presented in the project description. This leads to the idea of developing a Smart Communities Game framework (SCOGA). This name changes during the development process; from "KLIEK" (referring to the Flemish translation of a "clique" of people) to "Zwerm" ("Swarm"- people as a swarm of birds). The game is set out to activate the citizens in different neighbourhoods to carry out assignments that are beneficial to the community. By carrying out assignments, people score points for their neighbourhood.

The ideas are translated and framed within the larger SMARTiP project context; i.e. into software ideas. Based on the 10 categories of ICT applications, a number of software applications are devised that could become included in the Swarm game: Mapr, Collectr, Captr and Pollr. Mapr is an application that allows people to add points of interest in an area on a map. Collectr allows people to post calls to join in on collecting activities (such as batteries, empty bottles, clothing). The idea of Captr is to organize a "capture the flag" initiative whereby the citizens of one neighbourhood need to capture something in another neighbourhood and Pollr is an online polling tool. The game should become playable online, on smartphones and by making use of a distributed RFID-card. The team will place a "totem pole", equipped with an RFID-reader, on one location in the neighbourhood. There, citizens can swipe their RFID cards to "check in" alone or in a group and so gain more points in the game.

28 Quotation taken from SMARTiP team member C during focus group session on 27-3- 2012.

When I compare the crowdsourced ideas with the idea for a game and the four applications, some of the ideas of citizens are resisted while others are accommodated. Ideas are accommodated in the sense that the envisioned "users" in the crowdsourcing initiative, namely "smartphone owners" are catered to; the game is envisioned to be played in part on smartphones. At the same time, the critical question posed by citizens about this focus on smartphone users is also accommodated as the game should be playable on different platforms and in this way not only focus on these users. Also, combining the data that is collected and uploaded via these media on a game platform adheres to the "winning" crowdsourced idea of creating a platform with information, events and facts about the city (or neighbourhood). On a more general level, the Swarm game entails the sharing and playing with data – which is in line with the crowdsourced idea that the platform should make it possible to access and share information. The idea of using a "totem pole" in the game can even be loosely related to the second popular idea of creating information kiosks in the city. These ideas are therefore accommodated.

Specific ideas are however resisted, such as QR codes for all public buildings as well as the concerns that some technologies – such as smartphones- may only cater to a younger audience. This is responded to by ensuring that people can play via internet, other mobile phones and by using RFID-cards, so that more and different audiences can join in. Moreover, the idea that information should be provided by the municipality is also resisted; the data used in the game should only partially be provided by the municipality – citizens are also expected to actively share data. Keeping in mind the pre-defined idea of the "gameified community barometer", the crowdsourced ideas are translated into ideas for four applications. This suggests that easy access and sharing of information needs to take the shape of applications and that to make Ghent a nicer place to live, a fun game is required.

This game idea is the result of a mangling of the ideas of citizens by the experts attending the focus groups. Ultimately the experts make decisions on how to proceed; ideas are resisted and discarded, while other are partially accommodated, adapted and re-shaped. Apart from adapting the "winning" idea of the crowdsourcing initiative, this mangling of ideas also influences the performance of the citizen co-shaping new technological artefacts; in the game scenario, the citizen becomes a "possible player" who is willing to map, collect, capture and poll. One, who in addition to this, is able to use at least one of the technologies needed to play this game: internet, smartphone or RFID-card. This citizen therefore either already has the skills or is willing to learn how to engage with these technologies. Looking back at the overarching SMARTiP promises, this idea leans heavily on the conviction that passive consuming citizens can be triggered to connect and become part of the virtuous circle by co-shaping and playing an exciting and fun game. Playing effectively makes the transition to becoming a "smart citizen" possible.

6.4.3 Co-design sessions with students

After the crowdsourcing initiative, a second way in which prospective users are involved in the development of the technological artefacts is via co-design sessions. Between December 2011 and March 2012, four sessions are organized to gain insight in the ideas of possible

(future) users of the Swarm game. During these sessions, organized at the University of Ghent, students of the Communication Studies Bachelor use a number of methods to facilitate 12 female and 13 male students (of an average age of 20 years old) – as representatives of citizens - to share their opinions and ideas.

Students as a sounding board

At the start of each of the four co-design sessions with students, the organizers explain the Swarm-concept as a "city game" between two neighbourhoods that aims to stimulate engagement and social cohesion. The game is playable using an RFID-card to "check in" on a "totem pole" (with an RFID-reader and interactive screen), online, via SMS text messages, and using smartphones. At the start of the game, each neighbourhood receives a "totem pole". This pole visualises information about game scores. To collect points, people can "swipe" their RFID-card across an RFID-reader on the pole to "check in" and so collect points for their neighbourhood. Each game also comprises "campaigns"; weekly activities where citizens can join in and collect points. These activities can make use of each of the Mapr, Pollr, Collectr and Captr applications. At the end of each campaign, one neighbourhood wins.

Following the explanation of the game, a short introduction of the co-design method that is used during the sessions is given: physically building a totem pole model with Lego or using Post-it notes to share ideas about the four applications. During the last session, students are asked to come up with activities that either involve the four applications or the idea of a community game to stimulate social cohesion. After discussing in duos, the students write down their ideas on Post-it notes and attach these onto a board, in the appropriate section (corresponding to that specific ICT application, or in the "free space"). When all applications are discussed, the teams are asked to divide their ideas into "tame" or doable ideas and "wild" or not so easily achieved ideas and vote for their favourite ones. To give the students a clearer image of citizens in the neighbourhood, the neighbourhoods' demographics are projected on a screen. In addition to this, places in the neighbourhood, such as pictures of cafes and squares are depicted.

Both methods facilitate a kind of group brainstorm; these allow the students to collectively discuss the game using materials such as Lego and Post-it notes. The students are stimulated to think through making (Lego) and think by reflecting (coming up with ideas and labelling these) and in doing so, translate the concept of the game into possible concrete shapes (totem poles built in Lego) and application-related activities. In addition to this, especially the method where ideas are divided according to perceived "wildness" asks students to reflect on how "realizable" they feel their ideas are, based on their knowledge and ideas about the neighbourhoods, their ideas about community games and their perception of what citizens will or will not do (what is "too wild").

Image 1: sharing ideas using Post-it notes (session 14-3-2012)

Images and meaning attributed to the totem pole

The two groups that use Lego both visualise the totem pole as a "house" with a roof (against the rain). The first group includes a Lego-broom (to symbolise the idea that it needs to be kept clean); while the second builds in a public restroom next to the totem (available for women as they perceive a lack of public restrooms in the city). An RFID-reader is placed in the centre of the "house". The second group suggests the totem be powered using solar panels and that the player receives feedback about his or her score through LED-lights on the totem (lighting up to show higher scores). This score is also published on a larger scoreboard outside the "house". The first group expresses how "people from the neighbourhood" should manage and explain the pole's usage to other citizens. The pole should furthermore be built together with the citizens and placed in the centre of a square or park in the neighbourhood, so that people can easily meet.

In these sessions, the totem pole is presented as a meeting spot in the neighbourhood, complemented with some public services. Citizens are involved in the creation and management of the pole and scoreboards should make clear that it is part of a game. The constructed totem pole creates an image of the citizen who is "involved" in the neighbourhood and in the game. This presumes an active and engaged citizen, which seems to be "a given" for the students. They do not question whether or not citizens can and will be engaged by the totem pole.

Images and meanings attributed to the ICT applications

The students readily relate ideas to the functionality of each of the four applications. For

Mapr, ideas involve mapping the neighbourhood: transportation routes (bike), footpaths, problems with the sewers, the location of nice clothing shops, cheap supermarkets, sandwich shops, banks, parking places, bus stops, park benches, picnic areas and an overview of how safe a certain area is. Explicitly referring to people in the neighbourhood, one group suggests locating people who speak different languages (and map nationalities). Pollr is perceived as a questionnaire tool to ask after the safety in areas, the events and amenities in the neighbourhood, or about the citizens themselves ("who has lived here for more than 20 years?" and "I want to organize a chess game, who wants to join?"). One group comes up with the idea to use Pollr to predict the results of sports' events using the application. Collectr is seen in terms of collecting matters: clothing, bikes, empty cans, recipes, old cell phones, magazines, names of cafes, lamps, and bread to feed ducks. The idea of capturing the flag using Captr is perceived to only work if additional obstacles to this capturing are created such as capturing the flag of the other team in a busy spot in town, in a cafe or painting the other team's totem a different colour.

While the students easily come up with ideas, they question the role of the applications in the overall game. The students see Mapr and Pollr for example as more "profitable" for the city of Ghent than for the citizens themselves. They suggest that the information provided by the applications should be separated from the gaming element, as they expect that not many people will be motivated to check in at the totem pole to access the applications, especially not together with other citizens. This is also why they suggest including incentives for citizens to stimulate the use of Pollr.

The dividing line between ideas that the students feel are "too wild" or "tame" is formed by their ideas about the required collective and daring efforts of citizens. For example, organizing flash mobs, street races (checking in at as many points as fast as possible – which was the most popular idea), covering a square in the neighbourhood with as many people as possible, organizing a camping event on a square, building a high tower in the neighbourhood or collecting poisonous snakes are labelled by the students as "wild". All these ideas need collective activity (effort and organizing skills) and, in the case of the last two ideas, no small amount of "daring". Alternatively, "tame" ideas are ideas that should be organized *for* the citizens such as a geocaching game[29] (the most popular "tame" idea), an "orientation walk" to explain the game through the neighbourhood, an on- and offline tag game, an SMS text message quiz about the neighbourhood, eating contests and the selection of a neighbourhood hero.

The students perceive "the citizen" as not easily engaged in collective action. The students correlate more difficult to achieve ideas and the activity level of citizens. This seems perhaps logical, as more difficult activities require more effort. However, what is striking is that the students attribute "tame" ideas to activities that are organized *for* citizens; these seemingly require less effort (at least not from the citizens) as these should be offered – more

29 Geocaching is "a free real-world outdoor treasure hunt. Players try to locate hidden containers, called geocaches, using a smartphone or GPS and can then share their experiences online". http://www.geocaching.com/ (accessed on 23-5-2013).

as services. What the labelling also suggests is that wild ideas require more effort to realize because citizens are not so easily activated.

Ideas that do not specifically refer to the four applications are added in a "free space" on the board. Incidentally, these ideas are also the most voted for. These ideas mostly involve or allude to the *physical space* of the neighbourhood, such as wearing a certain colour on the street, organizing a flash mob or band performance, talent show, or benefit for homeless people on the street and hiding objects in the neighbourhood for others to find. Other ideas are associated with creating or reinforcing a *neighbourhood identity*, such as thinking of a new name for the neighbourhood, creating a logo for or short film clip about the neighbourhood, writing a newspaper with all the neighbourhood news, building a communal artwork or organizing an event where citizens tell amusing or touching anecdotes about the neighbourhood. This identity is also suggested to be taken online, in a "neighbourhood Facebook".

Conclusion: students frame citizens as passive individuals

The students create a specific citizen image while they come up with ideas for the totem pole and ICT applications. Citizens should be responsible "owners" of the totem pole in the sense that they should keep it clean (symbol of the broom) and the totem pole should become a meeting point (in line with an interpretation of the "totem pole" as a symbol for a clan). For the applications, the students come up with ideas that mirror the functionality of each application.

Asking the students to label their ideas in terms of "wildness", works to make the students reflect on what they perceive is and is not attainable. This creates the image of a citizen who is less likely to engage in collective games. At the same time, asking the students to label their ideas in this manner causes the student to "censor" their ideas. The more daring and "difficult" ideas - incidentally also the most voted for ideas - that may be somewhat more *unforeseen* (such as a street race or the collecting of poisonous snakes) are enthusiastically received but ultimately resisted by the students themselves as these are perceived as being "too wild".

Presenting the project in terms of the game and applications and asking the students to reflect in this manner, reduces the possibility for these students to come up with other ideas about community engagement and social cohesion. The students are steered to "think for" other citizens. This makes students perform the role of a "sounding board"; reflecting on given ideas, responding to given concepts while they imagine what citizen will or will not do. This approach, while in line with the team's "funnel approach" as it builds on previously made decisions, resists alternative readings of these concepts by the students. This "top down" approach resists alternative ideas and anchors ideas to concepts of a game, a totem pole and applications.

Working with these resistances causes the students to improvise in the sense that they are required to relate their ideas strictly to what they deem possible in the context of two

neighbourhoods in Ghent.[30] Asking the students to label ideas - as "wild" or "tame" - further resists any unexpected ideas. The fact that most of the ideas about the applications mirror the foreseen uses of the applications (e.g. coming up with subjects that can be "mapped" for Mapr) further underlines this. It additionally suggests that the perceived meaning and use of each application is limited to one dominant reading or interpretation, and that the students feel that the citizens they imagine can only understand the applications in terms of this dominant meaning. Alternative readings and interpretations are put forward (and valued), but resisted via the students' dominant image of the citizen. The citizen image they create only accommodates dominant interpretations of the applications. Citizens are thus positioned not as active collaborators, but rather as passive individuals.

6.4.4 In the mangle: team decisions about citizens inclusion

How is the students' input valued by the team developing the game and applications? Are their ideas treated as a kind of local, situated expertise? During SMARTiP project meetings the project team, consisting of people from iMinds, UGent, the City of Ghent, Alcatel-Lucent and KULeuven[31], discuss the status of deliverables and the process of ICT development as well as the role of citizens throughout the development of these ICTs. Initially, the idea is to include citizens by means of the same kind of co-design sessions that are organized with students. These can take the shape of citizens building a totem pole in Lego as a model of the actual totem pole, creating collective scenario's using photographs or even drawings, or creating other mock up's of the pole. However, after the first sessions with the students, the idea of using Lego is abandoned because the team feels that the method is not fruitful. The students build "huge constructions" which are not "useful" for the further development of the totem pole:

> C: "How do you see that concretely with Lego? I think that first of all, we are wasting time by building with Lego. You let them build something for 30 minutes, something that you cannot really use." (…) "I don't see how we can let 5 people build something with Lego that will lead to relevant input for us."
>
> F: "How would you do it?"
>
> C: "I am not sure yet. I have done some suggestions, but that is more in terms of an evaluation. But I think that I will be better off with 35 interviews with citizens with questions like 'How would you fill in Pollr?' or 'How would you fill in Mapr?', 'What are the dos and don'ts of the totem on that location?'"

30 This seems to entail coming up with ideas to overcome certain obstacles in a makeshift fashion.

31 They are in charge of the planning, execution and the production of work package deliverables for the project and all bring specific expertise to this team. The team members of iMinds have extensive experience in Living Lab-projects and technological development, the UGent team member is a communication studies scholar, the representative from the city of Ghent has expertise in Ghent's administration and is also a member of the Ghent Living Lab, while the PhD student from KULeuven is specialised in the design of street furniture.

F: "Wouldn't you want to keep things a little bit more open?"

C: "Do you think we still have the room to do so?" (team meeting 29-2-2012)

In addition to not being perceived as fruitful, the team thus also feels that there simply isn't enough time and space to diverge from the totem idea that is already developed. The team members also specify that they do not know what this method will lead to as they note that they are not co-design specialists; instead, a known method such as interviews is seen as more relevant. The fact that the students tried the co-design methods suggests that the students' sounding board function is not only focused on "testing" the idea of a community game and applications, but that this testing is also extended to the methods of user inclusion. In the meetings, the team mainly reflects on the outcomes of testing these methods, instead of on the students' ideas about the game and applications. In other words, the ideas of the students about the possible uses of the applications are not directly recognised as situated expertise. As representatives for citizens, the students are configured as testers of the "citizen engagement approach" during these team discussions, without agency to alter the game and applications as such.

To make the co-design sessions more relevant, a team member suggests using a cultural probe; to place a customizable block of wood in the area and see what citizens do with it e.g. stick something on it, write on it, paint it, build on top of it. That way, the block can be used to "generate ideas" (team meeting 13-2-2012). Alternatively, the idea is put forward to place a blackboard somewhere so that citizens can write their ideas for the neighbourhood on it. There are, however, several perceived issues with these proposed ideas. On the one hand, placing a probe or blackboard in a neighbourhood might create public support for the project, but on the other hand costs a great deal of time and effort to realize (it requires a license from the city, and security precautions to ensure that the object is not stolen). Moreover, the uncertainty of results makes them drop the idea:

F: "What will we get out of this? It sounds great, but it takes time. Time that we could also invest in other things. And do we get something valuable out of it?"

E: "If we go for the totem pole concept, what should that totem look like? Are people interested in customizing it? Because we can offer that. We can place a blackboard alongside it [so people can add their wishes and ideas], rubber bands around it, or attach nails to it [for people to attach things] but will people continue to do these things, will they pick it up? Is this supported by the community?"

F: "And what if the answer is no?"

C: "Then we will have to create this base of support ourselves. By involving the neighbourhood" (team meeting 13-2-2012).

Involving the neighbourhood can take the form of allowing citizens to actually build a totem pole together – as a kind of kick-off event for the community game as such. In the end, this idea is refuted because first of all, there is the fear that not enough citizens will show up to build a totem pole. This seems to mirror the dominant citizen-image created by the students

in the co-design sessions; citizens are not so easily activated. Secondly, there are too many municipal rules and regulations for the totem pole to really be able to create something freely. In other words, this idea is perceived as resisted by daily life realities. Thirdly, there is the expectation that citizens will not be able to build something aesthetically pleasing. Allowing citizens to build something by themselves might lead to "ugly" designs; it may be better to develop something and ask citizens for feedback. In short, citizens are expected to lack an aesthetic awareness.

Ultimately, the decision is made to invite citizens to focus groups. These have a double function. They allow the team to gauge citizens' ideas about the game; presenting citizens with mock-ups of the game elements, with possible locations, activities and incentives can help the team complete the game. At the same time focus groups also offer a means to start involving citizens in the game itself, although the expectations of what can be learned from the focus groups are not yet specified;

> C: "I still have the feeling that I need more input about what I need to ask them. Can I confront them with Mapr and Collectr? People will say: 'Yes, that sounds good'. You always have one person who will say that it is all a waste of money. And there is always a creative one who has a few good ideas, but I don't know if that will help us." (…)
>
> F: "We cannot go into the neighbourhoods and place a totem pole and then say: 'Ok, play the game'. Just like that. That won't work."
>
> C: "You are right."
>
> F: "We have to get the neighbourhoods involved."
>
> C: "The focus group will create a certain awareness in neighbourhoods, but I think that we will also have to invest in publicity and marketing. (…) Creating support will not happen via a focus group."
>
> F: "No, of course, but that could be the beginning of creating support. If you connect a number of central people, then they can spread the word in the neighbourhood. And tell us about specific issues" (team meeting 13-2-2012).

The reasoning behind the use of each method depends not only on what the team expects of each of these methods, but also on a number of specific matters that steer the decision-making process. These are uncertainties related to (1) (prior) knowledge about user research (2) expectations about the abilities and interests of citizens (3) time pressures, and (4) material and contextual (municipal) demands of the project in the setting. The project members, each with his own expertise – about technology, design, and municipal regulations – interact and seek a common ground. And while methods such as building with Lego or a cultural probe are deemed interesting, these methods are discarded because the team is not sure about the functionality of these methods, especially in the context of their expectations about citizen involvement, marked time pressures, material demands (sensors are required, as are RFID-cards and the technical platform) and administrative requirements. These matters resist and

accommodate decisions made about citizen involvement; as focus groups are expected to lead to more "effective" results, these are used to involve citizens – thereby resisting other methods. Due to time pressures, decisions need to be made about citizen inclusion. This is also reflected in discussions:

> F: "The question is if it is worth all the trouble. We need to be sure that something comes out of this. We need a proper research question. Perhaps we can compromise? The method doesn't need to be 100% structured. But we do need to be clear about what we want to learn from this. It needs to have an added value. In the sense that it will lead to concrete ideas for the design." (team meeting 29-2-2012)

Where does this leave the citizen? The chosen method of citizen-inclusion (focus groups) not only says something about the team's choices, but also about how the team views citizen inclusion as such. As the Lego method led to "huge constructions" when students tested the method, the expectation is that citizens will not come up with other ideas to use Lego either. Building a totem pole together with citizens is discarded as there is a fear that no citizens will show up and the cultural probe idea leads to questions within the team whether or not citizens have wishes for their neighbourhoods. The focus group method, on the contrary, provides a method where citizens can share ideas, provide feedback and add relevant local knowledge about their neighbourhoods in a clear manner. The method fits best noting the constraints of time and openness of the design.

Citizens are discussed in various ways – their role in the project, their ideas and possible influence on the final designed technological artefacts - which again creates an ambiguous citizen image. For example, citizens are described as users who "do not own a PC" but who at the same time "have Facebook"; as households, communities, tactical players of a game, anonymous, non-willing to speak to each other in public spaces, dividable into groups of hard-core technology enthusiasts and "soft users", but also as "possible thieves" of the totem pole. Possible users or players of the game can be "the elderly person" as a demographic group, but also entire families or people aged around 30 or 40 years old (referred to as "the usual suspects").

The SMARTiP project targets a specific kind of citizen: the more passive citizen who needs to change into a "smart citizen". It is possible to connect the before-mentioned ambiguous references to "citizens" in the project description to what I see as a tension between "smart" and "dumb" citizens that the team indirectly articulates in their discussions about the method of citizen inclusion. This tension is related to the project's double citizen-related goal, to transform citizens into smart citizens by (1) including citizens during ICT development and (2) including citizens in a community game. These are two entirely different matters, while on paper, the two are readily connected.

Citizens need to be included during development and need to play the game. This is perhaps also why the methods of inclusion are not only discussed in terms of leading to "good ideas" for the artefact, but also in terms of "building a base of support for the game". Citizens are, apart from ideators and sounding board, also the future users and players of the game.

These different roles are interchanged as the team discusses user inclusion.

In the end, the decision is made to ask citizens from the two to be involved neighbourhoods for feedback during the focus group sessions, while performing – in parallel with this – internal usability testing at the SMIT[32] department located at iMinds and at UGent. The team decides to test internally to see how people respond to the idea of checking in and posting wishes in a "real setting", and in addition to this ask the employees of SMIT what they think about the game by means of a survey and short interviews. During a team meeting, the goals of the survey and interviews are specified;

> B: "Of course, I think you will get some ideas. But what do they get out of it? You learn about that from the survey. It is interesting to ask them about their ideas and dreams. To go there. And not ask them 'how did you experience this?' Because then they will say: "Well the RFID didn't work". And we know that."
>
> F: "And that is a big problem." (…) "What do you want to get out of this user research?"
>
> C: "Input for you. And to get more ideas and input about how to launch the game."
>
> F: "And to relate it to a paper?"
>
> C: "Ideally, yes." (team meeting 8-6-2012)

Apart from testing the functionality of the game, the internal testing and following survey and interviews have multiple goals: to move beyond function and lead to new design ideas, inform the communication plan for the launch of the game in Ghent as well as collect data for academic publications about the project.

6.4.5 Focus group sessions with citizens

On the 27th of March 2012 and the 15th of October 2012, two focus group sessions are organized where members of the SMARTiP team and eight citizens of the two neighbourhoods, Papegaaiwijk and Ekkergem, discuss the Swarm game. The two neighbourhoods became involved in the game because they responded to an open call by the City of Ghent to join (Papegaaiwijk) and because of their "new media interests" (Ekkergem).[33] These involved citizens (2 men and 2 women per session) are middle-aged and actively involved in the community by blogging about their neighbourhood, attending community events or taking

32 "SMIT stands for Studies on Media, Information and Telecommunication. The research centre, founded in 1990 at the Vrije Universiteit Brussel, is part of iMinds (…). SMIT specialises in social scientific research on media and ICT, with an emphasis on innovation, policy and socio-economic questions. Currently, the research centre consists of over 60 researchers. SMIT research combines user, policy and business analysis with both quantitative and qualitative research methodologies. In order to develop new methodological tools, a continuing dialectic between theory and empirical research is one of the centre's high-level objectives. Three methodologies have become the core of SMIT's research agenda: user research, policy analysis [and] business modelling. Together with research centre MICT (UGent), SMIT forms (and leads) iMinds' research department Digital Society." http://smit.vub.ac.be/Smit (accessed 29-5-2013)

33 Ekkergem hosts a local television station and is active in creating and sharing media.

part in the local neighbourhood association.

Citizen framing by the team

Not only are these citizens different from the students who were previously asked for ideas in terms of their age; they are not asked to think about what "citizens would do" but are expected to be the *actual future players* of the game. Moreover, as they are actively involved in their respective neighbourhood boards, these citizens are also expected to be knowledgeable about other citizens in the neighbourhood and to actively ask other citizens in their neighbourhood to join in. They are expected to act as experts and brokers.

At the start of the sessions, one member of the project team explains the context of the community game and the goal of the sessions to the citizens; to discuss the idea of organizing a competition between neighbourhoods using virtual and physical elements in the street image. These elements consist of an online platform coupled with a physical totem pole (presented as a "hollow tree") that functions as both a "login spot" to play the game as well as function as a meeting point for citizens. The game is explained not only in terms of the two neighbourhoods competing with each other to win a prize, but also as a way to allow citizens to gather information about each neighbourhood for municipal and communal use. Apart from discussing the game concept in the context of reducing the digital divide, the citizens are also asked to give feedback about the designs of the totem pole, about the four game elements (Mapr, Captr, Pollr and Collectr) and a new idea of making people's online social network in the neighbourhood visible once they log on to the totem pole. In addition to the request for feedback about the designs for totem pole, a new "physical intervention" is also introduced by the team members, an electronic sparrow, which I will discuss at a later stage in this section.

Asking these citizens' opinions about the game and applications positions the citizens primarily as a sounding board for previously devised ideas. At the same time, new ideas, such as the possibility of viewing ones social network on the totem pole or hollow tree as well as the concept of an electronic sparrow suggests that these citizens are also testers for new ideas: how will actual citizens respond?

Citizens' accommodating and resisting the team's framing

Immediately following the explanation, the citizens ask questions. What is the function of the game, is it only to gather information from the people in the neighbourhoods? How does a competition make people more engaged? Will the game be played all over the city or only in their neighbourhoods? And how does the interface of the tree work? Is the tree concept already fixed? What happens if you didn't own a smartphone? And how is the gathered information used? Questions are asked about the concept, the technology and also about what is exactly expected of them that evening and while playing the game: are they asked for ideas that will be implemented? In other words, these citizens critically question what kind of influence their feedback will have and what kind of meaning they can ascribe to the technologies involved. The project team members answer these questions, clarifying and explaining the motives behind the concept and technology. They also stress that none of the concepts are fixed as such and that user-friendliness of the technologies will be assured; they

would like their feedback on the ideas.

I discern a mixed user image from this discussion. The project team members describe the user as a game contestant who is willing to execute neighbourhood assignments such as mapping points of interest on an online map, who is proud to be part of the neighbourhood, curious to ask neighbours questions about the neighbourhood and open to collecting or playing together. The citizens do not readily connect this image to themselves. On the contrary, they do not identify with the role of "player" or "contestant" and even immediately place this role outside their own "demographic group". The first comment made about "the user" illustrates this: "The population won't join in easily. I think that probably the youth or students will do things like this. I don't see myself joining in really" (Female1) only to add one minute later that "[she] is not thinking about the city's issues. If there is graffiti somewhere... maybe the elderly can get involved. People of my age won't know what to do" (Female1).

There is thus a mismatch between the user framing of the project team and the citizens. This mismatch is not only concept-related, but also related to the technology. Female1 refers not only to the issues in the neighbourhood, but also to current access and knowledge about the technologies that are involved, specifically smartphones;

> "You will have to know how to work with the technology. The audience you are directing your questions at won't know about these technologies. (...) Those are the students and youngsters. So my children are in the target audience. And I don't think that they will say: 'Come on, you can win something. I will join'." (Female 1).

These citizens state that they do not own smartphones, and that they feel that "it will be difficult to reach people via that medium" (Female1 and Male2). Instead of uniting and activating people, the citizens see these technologies - and especially the lack of knowledge about smartphones - as an obstacle to getting citizens involved. This affirms the image of the citizen who is currently not yet "knowledgeable" about (certain) ICTs and perhaps – from the project team's point of view - somewhat "lost" in the "digital divide".

The citizens primarily respond to the game as critics; they question the functionality and the role of citizens in playing the game and even wonder whether citizens will join in playing the game as they themselves do not readily identify with the role of "player". This is also reflected in their response to the concept of the hollow tree. How will checking in with an RFID-card work and how will it be possible to view your own personal social network? Why do they need to "check in" to join in on activities? Is "yet another" profile necessary (in addition to existing Facebook-accounts for example)? And how does one meet new people via the totem pole? One citizen sees the totem pole becoming more of a "complaints pole" where people complain about their neighbourhood. When the gaming element of the totem pole is stressed, it is agreed that to make people more engaged with the game via the totem pole, it should be possible to see your individual score, the neighbourhood score and to offset this against the other team's score.

Apart from critically relating to the functionality of the tree, the citizens also stress how keeping in mind local context is essential for the game to succeed. For example, they

argue that the location of the tree is of utmost importance. To make the tree recognizable as a meeting point it should be placed on a "natural" meeting point, on for example a square in front of a school, a playground, public park, a local bar or in front of a cloister in the centre of the Papegaaiwijk. The discussion about the location of the tree is also viewed in terms of the "competitive advantage"; if the tree in Papegaaiwijk is placed in front of a school, and the tree in Ekkergem close to a church, the former will surely have the advantage as more people pass by that tree every day? A warning is also given; one specific square is prone to acts of vandalism so the team might reconsider this location?

The citizens provide their situated expertise about their neighbourhoods by giving this feedback and relating each of the applications to their knowledge of the local context. For example, Mapr is seen as a tool to for example map locations where bicycles are stolen and Collectr as a means to organize environmental games (collecting litter or cell phones to recycle) in different streets. These two applications could benefit the neighbourhoods. Captr is recognised as more of a gaming application, although it is questioned how this could be made into a challenge.[34] Asking questions via Pollr is not readily seen as a useful idea, unless people can use it as a "search and find" application (to match people – when for example someone is looking for a babysitter). The municipality can be asked questions via "other channels via the internet" (Male2). Using the application to ask a neighbour something about the neighbourhood itself is not recognised as useful either: "Something about the neighbourhood? Is that something that people will respond to? Because if I am quite honest, I don't see myself doing that" (Female1). Other practical obstacles are noted. If they would post questions themselves on the hollow tree via their home computer, how will they be able to alert the community that there is a new question; "You need to advertise that in some way to make people respond. And you need to be aware of the context" (Male2). They also wonder about the response when people ask questions, but no answer is given. As one citizen notes: "If you ask people to do something, it needs to have added value for the neighbourhood. Something that lasts beyond the game. I think that that is much more important than a competition" (Male2).

Local usefulness is of paramount importance. Usefulness here means that the game should fit into planned or existing neighbourhood events and initiatives (such as school activities or pub games).[35] The citizens also feel usefulness is important because community volunteers have too much on their plate already. Integrating the game with existing and planned events can reduce the pressure on these volunteers to help out during the game's activities. Furthermore, this anchoring to existing events gives the game an added value and

34 Simply placing the hollow tree at a fixed point in the other neighbourhood was deemed too easy. Perhaps the hollow tree could instead be moved around the neighbourhood or people can be forced to complete assignments before they can "capture" the totem.

35 For example, two citizens are trying to set up a walking route would take hikers on a tour of all the cloisters in their neighbourhood. The game could fit into this concept by for example allowing people to map cloisters or getting them involved in a "treasure hunt" of knowledge about cloisters. Coupling the game to an idea or event like this would make it more likely that people join in on the game: "You should do this once or twice a year" and then "make sure that everyone in Papegaaiwijk joins in" (Male2).

makes it more likely that people will join in. As a standalone game, Swarm is expected to require too much "pushing" (Male1). Stating that the game should be "fun" is not enough:

G: "(…) It should be fun and significant."

Female3: "Social contact is not easy and simple is it?"

G: "Exactly." (focus group 15-10-2012)

When the idea of an incentive to join – such as a neighbourhood barbecue - is mentioned by the SMARTiP team, the citizens think that this could work, but perhaps more in the shape of a community event instead of a prize. Male2 feels that the idea of an incentive is perhaps not really necessary: "Only if you really choose to make [the game] very competitive. But I think that if you need a reward to get people to join something, an individual won't join anyway". The overarching notion of creating a competitive game to stimulate social cohesion is resisted by the citizens, because it seems to underline the "passive" characterization of citizens instead of creating an atmosphere of "working together" to win.

The game is perceived as having potential added value for existing events, but not as an "activator" for families or households. As an individual game, the citizens do not expect it to reach many people. The perceived lack of internet access for many families is seen as one of the reasons why this would not be successful. In other words, the game – designed to overcome the digital divide and enhance engagement – will be hampered by exactly that which it seeks to overcome: the digital divide. The citizens talk about this in terms of building "social fabric", and suggest that it is important to "engage existing groups that are already connected, because creating "fabric" around the game, seems very difficult"; the game is not expected to trigger a sudden activation of the entire population (Male2). To enhance the social fabric, local businesses such as bakeries and bars should become involved. That way, the game gains local relevance and may appeal to larger groups.

Interestingly, whereas the hollow tree concept and the applications are met with reluctance, the citizens are very positive about the second physical intervention that the project team members present during the session: the sparrow. The sparrow is a small bird, equipped with LED-lights and a sound-measuring sensor. By whistling to the sparrow, its eyes light up. The team members suggest placing four sparrows in each neighbourhood. The citizens come up with different shapes this concept can take: parrots – mirroring the literal meaning of "papegaai" in Papegaaiwijk- cats, windmills and policemen (the windmills are connected to the heritage of Ekkergem and the policemen to the popular television show "Flikken Ekkergem") and like the idea of people whistling in the street. The sparrow is attractive to the citizens because it does not require "technological knowledge" (an earlier voiced obstacle) and can be "played" individually (not requiring collective communal activation).

Conclusion: citizens as critics, experts or brokers?

Throughout the focus group sessions, a negotiation process takes place. The project team treats the citizens as future players, as a sounding board, as experts and as brokers (as they are asked how the team can ensure that citizens will play the game), while the citizens – who are quite sceptical about the competitive game and about community activation – resist their

positioning as future players and brokers. Instead, they ask critical questions and provide situated expertise about their neighbourhoods. Unless a direct contextual relation to other initiatives and groups is sought, they do not see the game succeeding – apart from the sparrows which are perceived to require less effort. They mainly question the concepts and think in terms of possible perceived audiences, such as students, schools and bars and do not readily identify themselves as the future players of the game.

These citizens can be said to resist their configurations (Neven, 2011) as players and brokers and instead – based on their situated expertise - question the game and the technologies as experts. The technologies that should be used such as the internet and smartphones are seen as obstacles to engage people than as media that will engage individuals or groups within each neighbourhood. Furthermore, the game's physical intervention, the hollow tree, should be placed at a natural meeting point in the neighbourhood to make the connection to "the community" more explicit. The overarching notion of a competition is questioned because it is understood as a kind of paradox; is it possible and appropriate to create more social cohesion by means of a competition?

In terms of the mangle, the framing of the citizen as a competitive, active player is resisted by the citizens, as are the technologies. Due to the fact that these citizens primarily respond in a critical fashion, noting obstacles and their knowledge about their neighbourhoods, they behave as critical experts – thereby accommodating this image. They stress how if more alignment with existing initiatives is sought, neighbourhood "accommodation" could take place; the game can then become part of each neighbourhood's activities. The concept of the sparrow, which requires less technological "know how", is received more positively by the citizens. Ideas for other shapes of the bird are readily thought of and due to the perceived easy use of the sparrow, the citizens see this concept as a more "easily fitting" their neighbourhoods.

6.4.6 Internal testing of the game mechanics at SMIT

In parallel with the focus group sessions, internal testing of the game platform and RFID-card mechanics is undertaken in May 2012. At the time of testing, the physical design of the hollow tree and sparrows is still underway. Around 60 employees of SMIT receive a letter explaining the game (referring to the game's website for more information) and an RFID-card to play the game. The goal of testing is to gather feedback on game mechanics as well as to test the included software. On the game's website it is explained that testing the game in a "real life setting" is expected to both find bugs in the game (and gameplay) as well as find new exploits of the game.[36] In other words, both the functionality as well as the usability of the game is tested.

SMIT employees as testers

Employees are divided into two teams, a red and blue team. Individual players register their card online to be able to join the game and start collecting points by "swiping" their RFID-

36 http://www.scoga.eu/content/about (accessed on 21-5-2013).

cards to "check in" at the RFID-reader on their floor. Each "check in" earns that player - and their team - points. Checking in at the reader with more people (a "combo check in"), allots more points. It is only possible to check in with a colleague once; after that, new "combinations" have to be made to earn points. In addition to this, players receive credits at the start of the game that can be used to upload "wishes" – for example requesting information or favours, such as a cup of coffee, from a colleague - on the online platform. Wishes can only be fulfilled by a member of the other team, after which the wish-requester gives points to the wish-granter. The game's website provides a user guide, an overview of individual and team scores and a space to share wishes and comments. The game consists of weekly "campaigns". During the game campaigns, it becomes clear that no wishes are actively uploaded by the players and that while most players start enthusiastically, eventually less people continue playing. To trigger more gameplay, an incentive (a gift card) is added to the game.

After a number of campaigns, the team posts a survey online to gain feedback about user experiences. A total of 12 people (6 male and 6 female) respond to the questionnaire. In addition to this, 5 short interviews with players are conducted.[37] The survey consists of 22 statements or questions that a respondent can respond to along a 5 point scale. The statements focus on the player's experience while playing the game (e.g. "everything worked properly", "it was easy to work with the RFID reader" and "the game was fun"), what the game offers ("more knowledge sharing" or "a better work atmosphere" and "with how many people did you have more contact because of the game"), opinions about the game (e.g. "I think the SCOGA trial should be played permanently") and the player's previous experiences with similar games ("I have experience with geo-based games").

The average age of the respondents is 30 (the average year of birth is 1982) and only 4 (3 male and 1 female) of the 12 respondents previously played a geo-based game. The survey results show a number of high and low scoring elements of the game and the trial. The highest scoring game-related questions are about the ease of playing (4,25 score average), the ease of working with the RFID-reader (3,9 average) and the fact that the game is perceived as "fun" (3,75 average). In addition to this, most players feel that the game improves a team spirit (3,4 average). Lowest scoring elements are the functionality of uploading and granting wishes (1,6 and 1,8 averages respectively) and the question whether or not the game improves work efficiency (1,7 average score). Respondents have no decisive opinion about whether or not incentives are necessary to play to game (3 points average) and whether or not a permanent implementation of the game is desirable on the work floor (3 points average). On average, the respondents report that they have more contact with 2,5 more people because of the game, but that the game does not strongly promote the sharing of knowledge (2 points average).

When these results are reviewed, it is important to take into account the kind of users that are asked to test the game. SMIT is a research organization that focuses on media, information and telecommunication. One of its key research areas is user research. This implies that the people who take part in this trial or internal test are quite digitally literate

37 Two of these interviews were conducted by me on 29-06-2012 and 3-07-2012.

and professionally focused on "users". This suggests that in terms of the ease of playing, these users may respond differently from not so digitally literate players. Keeping this in mind, the fact that these "tech savvy" users find uploading wishes troublesome suggests that less "tech savvy" players may have even more issues with this functionality.

To gain more in depth information about the user experience and to gauge ideas of the players about the foreseen playing of the game in a neighbourhood setting, interviews are set up with 5 respondents of the survey. These are 3 women (born in 1981, 1985 and 1988) and 2 men (one born in 1980, the other not disclosed). Four of the interviewed users explain that they feel that they received too little information about the game when they received their RFID cards to be able to gauge the goals of the game. One respondent was nevertheless triggered to join in because she had seen the RFID-reader in the hallway and was curious what this object might do.[38] When asked why they did not upload wishes on the online platform or why they did not grant wishes, three respondents clarify that they did not feel that they could come up with an "interesting" or "inspired" question in the work context and that they felt frustrated because they could only grant wishes made by the opposing team. Another reason for not posting wishes was the "unclear" communication about the wishing module and the responses of other players to it. When one respondent's wish was not granted, he lost interest.

One respondent thinks that coming up with wishes will be easier in a neighbourhood context although she does wonder how and if the game would "work" there. She expects that a certain amount of social cohesion needs to exist to make people play the game. In other words, she does not expect the game to create new social fabric or social capital. This feeling is shared by two of the other respondents. When asked whether or not they would play this in their neighbourhoods, they concede, but add that they would probably only play with people they already know. One person furthermore expects the game to work better in neighbourhoods with younger families; the elderly (such as her parents) will not join, even if incentives are provided. The reason for this is not "technological", but due to a lack in curiosity about games. Another respondent shares this expectation of a lack of engagement among the elderly, as they "won't get it".

The idea of a competition with RFID-cards interests the respondents. For one respondent the game element triggered her to join in ("as [she] is always interested when new technologies such as RFID are used"), but also caused her to drop out; once an incentive (a gift card) was introduced, she ceased to play as she expected other players ("die-hards") to win. The incentive also caused some minor controversy, as some players asked others to "check in" using their cards on days that they were not present to up the score for their team. Cheating was possible, which both stimulated more playing, while also causing some to drop out of the game entirely. The ways in which employees, as testers, played the game suggests that these tech savvy players did not readily accept the "wishing" module of the game, and instead sought to – at times – look for the boundaries of the game by cheating.

38 The RFID-reader seemed to work as an evocative object (Turkle, 1984) for this person.

Conclusion: employees as cheaters?

While internal testing gives insight into the reception of the game mechanics of using an RFID-card and reader- within a work space setting, the game does not include the 4 applications that were discussed in the co-design/focus groups with students and citizens. Nor does the test work with the actual foreseen future players of the game. At this stage in development, the team wants specific feedback by "tech savvy" users (who perhaps require less explanation) about gameplay and "bugs" in the system. The employees, acting as testers, provide feedback on the game design. What this internal test clarifies is that players need more explanations about the game, that swiping an RFID-card is "fun" and "easy", but that thinking up and uploading and granting wishes is not easily realized. The game also encourages some small way of cheating, by allowing employees to check in with each other's cards.

The internal functionality and usability testing offers employees the opportunity to play with the boundaries of the game. One respondent even notes how cheating with the cards enhanced interactions on the work floor. As they discuss who would check in for the other, people interact more. In this way these testers therefore improvise with the rules of the game, creating their own version of it.

The testers, who were overall quite young, have their reservations about how the Swarm game will be played in actual neighbourhoods. They expect that only "digitally literate" people, who are not "old", will be interested enough to play the game. The testers emphasise the diversity of citizens and suggest possible mismatches between the game and specific demographic groups. This makes them question the success of the game. The game will only succeed if there is enough social fabric. They do not expect the game to activate passive citizens. They, in other words, resist the notion of an active citizen and expect citizens – somewhat like themselves – to lack incentive and inspiration to join. The question is how the results of the internal tests and the feedback gathered during the focus group sessions influence the final designs of the Swarm game. How does the team reflect on the feedback of the testers and citizens?

Images 2 and 3: the first concept of the totem pole (image taken 27-1-2012) and the final hollow tree[39]

6.4.7 Material outcomes of the mangle: translating insights into technological artefacts

Swarm is to be played using an RFID-card to "check in" at an RFID-reader that is built into a totem pole that took on the shape of a "hollow tree" (image 3). This tree also has an interactive screen that displays a person's score and social network (with whom that particular person has "checked in"). "Checking in" generates points and the more points collected, the higher the score. Players can also collect points by joining in activities that are programmed on the game platform by the development team or by players themselves. Every week a new activity or "campaign" is launched. Points can also be scored by playing the game using a mobile phone, visiting the game website and whistling to a "sparrow" (Image 4). After the total runtime of the game, one of the neighbourhoods will have collected the most points and win the game.

In this section I consider how the technological artefacts that are part of Swarm are shaped by analysing how the ideas of users are part of discussions during team meetings and subsequently accommodated or resisted during technology development. How are the ideas and feedback collected via the co-design sessions, focus group sessions and internal testing translated into these technological artefacts? Or, put differently, how do users/citizens co-create these ICTs?

39 Image taken from the game's public Facebook-page: https://www.facebook.com/zwermgent (accessed on 15-3-2013).

In terms of resistances and accommodations of the agency of citizens (and the students and employees of SMIT), some user ideas are accommodated; such as the idea of the tree as meeting point (students), the reduction of the centrality of the tree in the game (citizens), the change of the polling application into a "search and find" application (citizens) and the importance of the sparrows (citizens). At the same time, certain ideas are also resisted. Most of the students' "wild" and "tame" ideas are resisted. Also, the citizens' and testers' questions about using the technological artefacts to create a competition are resisted in the overall design of the game. The same happens to the more negative feedback of the employees about creating wishes; the wishing module is kept – albeit in a different form.

To understand these accommodations and resistances, these should be regarded in the context of the overarching Swarm project. Decisions about the technological artefacts are made during team meetings. Tracing how the ideas about the technological artefacts form during these meetings gives insight in the dynamics of the mangle; what informs certain resistances and accommodations.

During team meetings, the hollow trees that are first conceived of as totem poles are discussed – as stipulated in the project description – in terms of activating social capital in a ludic manner; i.e. to incite action and invite people to play the community game. In the first few team meetings, the "look" of the totem pole is discussed, as are the sociotechnical requirements stipulated by the project and the city of Ghent. In other words, discussions focus on the totem's design, technical and contextual requirements. The totem has to function on a low power supply such as a car battery to make it easier to place the totem in the neighbourhood without needing power supply cables. It needs to make use of a tablet as a touchscreen so that no extra buttons need to be incorporated on the totem pole itself as this makes the totem more complex and may also invoke vandalism. Also, an RFID-reader and sensors should be incorporated, the pole should be weather-proof and properly anchored to the ground. In order to meet Ghent's regulations, it should switch off after 10 o'clock in the evening, neither be placed in the middle of the sidewalk nor on a pole – in order to be friendly to the blind - and should not look "too finished" as it is meant as a temporary artefact; it is suggested to use wood as a casing, to make it look less finished – to escape the prescribed municipal RAL-colours. In order to ensure a proper anchorage, the team discusses either using concrete or a water tank.

The actual shape of the totem pole is a topic of team discussions. Mirroring the ideas of the students who built the Lego totem pole during the first co-design sessions, the totem pole is foreseen to become a place where people meet and play the Swarm game. It should symbolise the community although whether or not people will perceive it as such, is questioned;

> E: "The concept of the totem pole, is that effective? Will people think: 'Yes, this is us? This is what we will go for! I see myself in this'." (team meeting 13-2-2012)

The totem pole alludes to a Flemish cultural symbol, the "spijkerboom" ("nail tree") where people could come to make a wish and attach something symbolic to the tree. The notion of using the tree to "wish" something is also translated into the concept of the totem pole in the shape of a wishing well: people thinking about the future of their neighbourhood and sharing

wishes. The totem pole can then take the shape of a table with a digital touchscreen where people place their RFID cards on the table to connect to each other and share their wishes (team meeting 13-2-2012). However, this idea is dismissed due to two reasons. First of all, the concept of the wishing well is expected to raise the expectation of people: they probably want their wishes to come true, which is not something the municipality will be able to guarantee. Secondly, the team wonders whether or not citizens have many wishes and wants to research this idea more.

The idea of sharing wishes is adapted in the final design of Swarm game in response to the feedback of citizens during focus groups and after the response of the internal testers. Feedback from the testers is brought in during a team meeting (on 8-6-2012) to argue that the Swarm wishing-module does not work appropriately and needs changing especially because the people who trialled the game are already "people from the sector who you want to talk to" (team meeting 8-6-2012), thereby stressing that if these experts do not use the module, how will ordinary citizens be able to use it? The input from the internal testers is recognised as situated expertise. The feedback from the citizens is treated in the same way; they expect the Pollr (wishing) application to be more useful if this is reshaped into a "Search and Find" application for the neighbourhood, which is what the eventual application becomes.

In response to user ideas and feedback, the function of the totem pole in the Swarm game also shifts. As a symbol of "the living being of the neighbourhood" (team meeting 13-2-2012), the totem is reshaped into a tree that allows people to symbolically and physically interact with the tree and with each other through customisation activities. Initially, the team foresees that by making interactions with the tree fun, citizens will engage more readily with the tree. These engagements can take the shape of painting the totem with blackboard-paint so people can write on it with chalk, allowing people to power the totem's screen by connecting a bicycle and dynamo or a pump handle to turn to the totem, changing the look of the totem by adding their own text on a digital display (which would then be displayed on a LED screen on top of the totem), or by adjusting the height and colour of the totem by adjusting painted car tires. Participating and actively becoming involved is translated by the team into physically altering the totem. Yet, when the citizens respond quite critically to the idea of the hollow tree during focus group sessions, the focus on customization of the tree within the game begins to shift; the tree becomes "fixed" in shape.

In the end, it is agreed that people should be able to view their own scores and their team score on the tree and be presented with a visualization of their social network – based on their "check ins". That way, "social cohesion" becomes visible. The other applications should be playable via smartphones, PC's and a tablet that will be made available for community-use. This tablet can be used to set up activities in the neighbourhood – so that people always have access to creating their own events during the game.

As a result of the positive response of citizens in the focus group sessions to the "sparrow" idea, these artefacts become more important in the overall design of the Swarm game. This technological artefact requires no direct knowledge of ICTs and is added by the team member from KULeuven – also in the context of his PhD research. When the team members from Alcatel-Lucent question to what extent this part of the project is to be

customizable or participatory, it is agreed that citizens should be enabled to customise "their neighbourhood bird" in terms of colours of the lights. This is deemed "participative" enough.

Although the competitive element of the game is questioned by the citizens during the focus group sessions, it remains the overarching unifying concept of the Swarm game. Critical feedback is resisted in view of the larger goals of SMARTiP to realize social cohesion by means of a game. In addition to this, the improvisations of the testers while playing the game (using the RFID cards to cheat for example) are not recognised as decisive feedback about gameplay. Instead, the feedback of the testers is used to test the functionality of the RFID-cards and RFID-reader that were part of the game.

The concept of a neighbourhood competition is further reinforced by adding a group prize such as a neighbourhood barbeque, free ice-cream or hotdog stand, a free bar or another fun event. This notion of an incentive or prize was discussed during the focus group sessions and actually introduced during the internal testing and continued to be part of the game's set-up. This suggests that while citizens are perceived as willing to actively engage in the game by simplifying the gaming element itself, the team still feels that in order to ensure players are drawn in, the "fun" element needs to be complemented with an incentive to participate in the game. Playfulness is therefore not expected to motivate citizens enough. To counter this uncertainty, a prize is connected to the game.

This unifying concept of the game is a topic of heated discussion. These are however not primarily focused on the notion of a competition, but instead centre on how the different elements of the game can be "unified". Discussions focus on the different elements that constitute the game and move between topics of the totem's symbolism, the narrative story of the game concept, technical requirements and possibilities that the back-end system of Alcatel-Lucent as well as the sensors that have to be re-used (supplied by Manchester) offer. These subjects are regarded in the context of expected timelines for development, ordering of parts and relevant municipal permits and decision-making processes. At one point, a team member summarises that they will need a hollow tree, gaming applications, communication to servers, sparrows and sensors, and concludes:

A: "We need a story."

B: "We don't have a narrative."

C: "These are details."

B: "No, because technically these things are a lot of work."

C: "If we decide now that we will or will not use actuators, then that is settled."

A: "And if we say 'yes', then we need to drop other things."

D: "We need to decide what the minimum us. Because we need to sort it out."

A: "Nothing works, we need to focus on 2 things that will work."

C: "That is your decision."

B: "That is not true. [E] has a vision about social cohesion, that is not solely a technical decision."

C: "I think it is a technical decision. We have been having the discussion of what is or is not possible for 4 or 5 months now."

A: "I see it differently. We work with ideas that emerged from bottom up, not purely from technology. What timelines are involved in realizing this. These are the things we need to realize within a certain timeframe, but the group as such needs to decide what needs to happen. So what are the things that are needed, because only after being clear about that can we make an assessment of everything. Not about the architecture, but about features. On a more fine-grained level that applications." (team meeting 8-6-2012)

This short excerpt shows how team members move between topics of (conceptual) narrative, technical functionalities, choices that need to be made and timing issues. Team member A calls for a simplification of the plans for technological developments, in order to meet both the demands of the project and keep the technological artefacts "simple" in view of time pressures. He also underlines the fact that this project should unite the bottom up ideas of the community and the technical possibilities that they have at their disposal – to find an optimal mix.

This discussion is informed by aesthetic, technical and time constraints, or resistances that causes the team to "drop" certain applications from the game. The applications (Mapr, Pollr, Collectr and Captr) that arguably underline an "active" image of citizens are partially removed from the eventual design. Whereas citizens are first seen as willing to map, ask and answer questions, help collect and capture the totem of the other neighbourhood, the newly to be developed applications for the game change this image. Initially these applications were to be accessible via the online platform (via PC and smartphone) and via the hollow tree. Even so, as technological developments got underway, there proved to be too many difficulties to realize this. The team fear that by adding too many applications on the totem pole, they will be left with a "dirty interface" (team meeting 8-6-2012) and that the totem pole will start to resemble a digital kiosk (Ibid).[40] There is quite some discussion about what the function of the totem pole becomes when it will no longer be possible to access these applications:

E: "To play a quiz or poll together for example. This is about bringing people together".

D: "But that is just not possible. You won't be able to do things together".

E: "But that is important. You have to make it a fun activity".

D: "The most fun will be: I swipe and you swipe".

40 Previously, the city of Ghent introduced digital kiosks in the city where people could access municipal information. The totem should not resemble these kiosks as these "failed" to engage the community.

E: "That is too individually oriented. That is not organic".

D: "We have to be pragmatic". (team meeting 8-6-2012)

The changes to the development of the tree and gaming activities show a great divergence from the initial idea of making the hollow tree central to the entire game. Due to aesthetic and technical difficulties – the issue of ensuring 3G internet coverage and expected delays in communication to the servers – the features on the totem pole have to be simplified. Making the totem pole customizable is also dropped in favour of a more "finished" totem pole in the shape of a tree. Here, the materiality of the technological artefact is used to resist the development of certain features.

Looking back at the project's goals of creating active, smart and prosuming citizens who are to become smart through involvement in the creating and playing of a community game the final concept of the Swarm game suggests that although citizens may learn something by playing the game, this learning is not so much ICT-oriented. The design and functionalities of the tree and birds can be used to respectively swipe an RFID-card to connect to others and gain points, and invite citizens to whistle and so collect points. These functions of the tree do not stress the idea of making people "smarter about" ICTs, but rather enhance their virtual connectedness through a game. Citizens can engage with each other by creating, as it were, a virtual hub where they can tell each other about e.g. their favourite places, or organize battery-collection events. The developed artefacts suggest that in the Ghent pilot "smart" citizens are connected citizens, and that connecting takes the shape of swiping, whistling and competing together against another neighbourhood.

The project's boundaries can be said to resist realizing certain ideas in the technological artefacts that become part of the Swarm game. Prior to the focus group sessions and internal testing, the team extensively discussed the development of the technologies, primarily along two lines: technical specifications and conceptual unity and how well these fit the goals and boundaries of the project. At the same time these boundaries also shaped to what extent the ideas of the team members themselves could be realized, such as creating a totem pole that could be customised by users. The team discussions show how in this dance of agency, the overarching frame of the project actively resisted and accommodated certain ideas, including the ideas of users that were recognised as situated expertise, as well as the team members' own ideas.

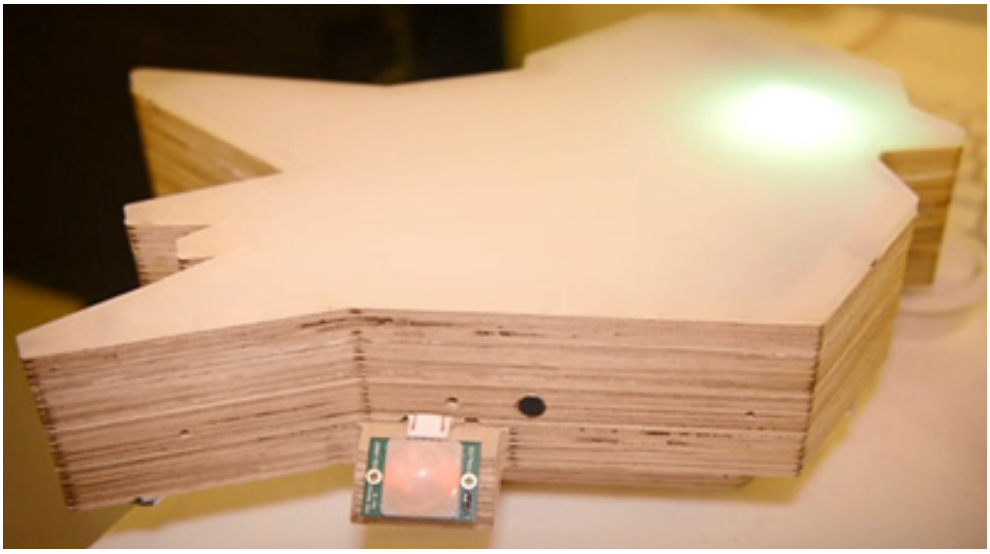


Image 4: "Sparrow" (still from promotional video for the Create Media Days 2012, by REC)

6.5 Conclusion: user innovativeness – improvisations accommodated and resisted by ambiguities

To return to the main research questions of this chapter, user involvement and innovativeness is shaped both by how "the citizen" is configured as co-creator on paper and in practice through the team's use of the "funnel approach". During the different stages of development, different users are enrolled in every time changing roles: as critical ideators during the crowdsourcing initiative, as prospective players, sounding board, experts, critics and brokers during the focus group sessions, but also in the guise of testers in the co-design sessions and internal testing where students and employees are involved to test methods of inclusion, and to provide feedback on ideas and use of the game's elements.

At different stages in development, different "users" are "injected" in the development cycle. Each of these "instances" of involvement provides ideas and feedback for the team. The challenge for the team lies in navigating between this feedback and the sociotechnical boundaries of the project: the work packages, timelines, deliverables, but also matters such as technical specifics demanded by the project and the context of local administration (licensing, timelines) as well as the expertise of the team itself.

What complicates and at the same time allows for flexibility in this navigating process is the ambiguous configuration of the citizen as a co-creator. The project description calls for a transformation of citizens from a passive consumer, who may be lost behind the digital divide, into an active, empowered, prosuming smart citizen. Becoming smart entails joining the "virtuous circle of development" and becoming connected in ICT development, playing a community game to enhance social cohesion and – ultimately - become more active in local governance to make themselves and their city "smarter".

These configurations of citizens can be juxtaposed with the ways in which citizens are

subsequently enrolled in the project's execution. The crowdsourcing initiative actively rules out the inclusion of "unconnected" and "digitally illiterate" citizens, because it makes use of an online tool to collect and discuss bottom up ideas. While this would seem to counter the goals of the project (e.g. to overcome the digital divide), this method does target those citizens who –most immediately – can become part of the virtuous circle; the more "tech savvy" citizen who is equipped to enter in dialogue with the city administration and the development team via an online tool. This initiative illustrates how the project accommodates certain citizens, while resisting others.

Using students as a sounding board and as testers for methodologies to be employed when sessions with "actual" citizens are to be organized, leads to insights in methods of inclusion (e.g. the Lego-method is discarded) but also reinforces the idea of "the citizen" as passive and less likely to engage in collective activities as these were labelled as "wild" and difficult to achieve by the students. While reflecting on the proposed technological artefacts, the students provide ideas (such as the idea of a totem pole situated in a natural meeting point on a square) that are readily taken up by the team.

The focus groups with citizens from the two neighbourhoods that are to play the game provide a more "critically aware" citizen image; these citizens explicitly wonder about their agency in developing the technologies, stress the importance of contextual factors and are not overly enthusiastic about introducing a competitive game in their neighbourhoods. Although the concerns of citizens are noted during the team meetings, these do not radically change the design of the technological artefacts apart from reducing the central role of the hollow tree in favour of developing the sparrows. In other words, the "sounding board" function of these citizens is accommodated, but their more critical questions are resisted. Meanwhile, the internal testing also uses "internal testers", employees to test the functionality of the game. The choice to test internally is made to make testing more "functional" at that particular stage in development.

Within the sociomaterial context of the project, it is the team that does the decision-making; the team decides when and how to include citizens and how to deal with the feedback and ideas of prospective users. This is also what characterises the innovation practices in this case. The ambiguous configuration of the co-creating citizen as both shaper and user of the new technological artefacts facilitates or allows the team to improvise; to locally give meaning to the funnel approach and include (representatives of) citizens as they see fit. The ambiguous role of citizens is enacted in practice by the team's accommodations to and resistances of citizen agency in the development of ICTs. This creates a "mangled" practice of the co-creatorly performance of citizens.

The ambiguity creates an "openness", or freedom for the team. At the same time, the project and contextual resistances of the setting limit the possibilities for citizen inclusion; everything needs to build up to realize the project deliverables. This suggests less openness and space to allow for uncertainty. Therefore, the mangling of agency that characterises improvisation practices here rests with the project team; citizens, in their various guises, are injected but never become actually part of "the team" as such. They co-shape "directly" by providing ideas and feedback and "indirectly" via the team's perceptions of citizens in relation

to gaming and social cohesion caught in the materiality of the developed technological artefacts.

The mangled performance of the role of co-creator implies that improvisations are primarily recognised on the project team level.[41] In effect, the team interactions themselves become acts of co-creation, where the agency of citizens is mangled. The developed technological artefacts are the product of collaboration between all the actors that are involved, but citizens are "resisted" during improvisation as the project's deliverables and deadlines press on the team.[42] In other words, the project's pressures work to push all ambiguities from the user role - thereby reducing the agency of citizens and their local knowledge about their neighbourhoods. The dominant citizen/user that is accommodated is the "tech savvy" and engaged citizen instead of the more "passive and dumb" citizen.

Interestingly, while the agency of citizens in the actual development of ICTs is therefore limited, the team does stress the situated expertise of the citizens who are included. During the crowdsourcing initiative and focus group sessions, the citizens are treated as actors who are very knowledgeable and valuable to the development and implementation of the game. Their local knowledge is valued. Despite this, their situated expertise only gains limited agency to alter the technological artefacts. This begs the questions of what will happen when the game is actually introduced in the neighbourhoods: will these artefacts be resisted or accommodated by citizens?[43]

At the beginning of this chapter, I made a reference to "serious games" as Mary Flanagan defines these. She defines play as a kind of safety space. In this case, I would argue that it is not primarily the safety space of the Swarm game that facilitates an exploration of innovative solutions to issues such as "a lack of social cohesion", but rather the process leading up to the development of the game itself that allowed for this exploration. Working with the project's set rules while trying to take into account local issues and technical parameters, creates tensions. The team explores the limitations of the space provided and boundaries set by the Living Lab-project.

Whether or not the performance of citizens as co-creators is innovative is perhaps less relevant than the fact that in the improvisation practices of the project team, the role of citizens is resisted to such an extent that any "innovativeness" is only noted by looking at the activities of the team. As they navigate between project deliverables, promises, local concerns and technical execution, their "dance" perhaps does not target the transformation of citizens into smart citizens, but rather the transformation of a set of boundaries and uncertainties into technological artefacts.

41 A level that is also "local" from the point of view of the overarching SMARTiP project.

42 Some roles are more readily resisted than other (e.g. the active citizen is sought via the crowdsourcing initiative, while the passive citizen is seen as more easily approached via a "fun" game that includes incentives), leading to a "mangled" performance of the co-shaping role.

43 Due to the implementation of the game in the neighbourhoods in the beginning of 2013, I was not able to include insights into citizen responses and use of the technological artefacts at the time of writing.

In terms of the dance of agency, this chapter shows how - due to certain ambiguities and diversity in user configurations - the Living Lab actors improvise with user configurations; i.e. they adapt the role of the user to their project-determined goals. By analysing and describing the project's dynamics by focusing on the performance of the role of the citizens as co-creator, I showed how the diverse and multiple user/citizen configurations are in practice reduced or "simplified" due to the pressures of "the mangle". While citizens may provide ideas and feedback (local knowledge), their situated expertise is not enrolled in terms of "innovativeness". Instead, it is the team that choreographs this particular dance of agency.

Image 5: Promotional poster for the Swarm game[44]

44 Image taken from the game's public Facebook-page: https://www.facebook.com/zwermgent (accessed on 15-3-2013).

Chapter 7. Conclusions

7.1 Introduction

In this dissertation, I untangled the concept of user innovativeness in Living Lab-practices by analysing how "the living" was exactly involved in "the lab" in three case studies, taking different manners of user inclusion as my point of departure. In this concluding chapter, I summarise my main research findings. After giving a brief overview of my initial research questions and theoretical concepts in the introduction, section 7.2 consists of a summary of the three case studies. Section 7.3 turns to a comparison of the cases, guided by the research sub-questions. Following this, in section 7.4 I expand upon three overarching themes that strongly come to the fore in all three case studies and answer the two main research questions of this thesis. In the final section, I present a number of suggestions for Living Lab-practitioners that are based on both practical and theoretical insights.

The main research questions of this thesis were *how are processes of user innovativeness shaped by and facilitated in Living Lab-practices and what kinds of innovation practices are constituted in Living Labs?* These questions were divided into four sub-questions:

1. How is user agency configured in Living Lab-practices?
2. How do users improvise (with) new technological artefacts in Living Lab-practices?
3. Are user improvisations recognised as situated expertise and as such facilitated in Living Lab-settings?
4. Are practices of user innovativeness perceived as innovative by Living Lab-initiators?

The main research questions focus on the role of "the user" and the innovativeness of Living Lab-practices. These questions were triggered by the promises on Living Labs, presented in chapter 1. In chapter 2, I formulated the above four sub-questions, based on how I conceptually connect the concepts of improvisation, user agency and innovativeness. Following this, the exploratory analysis of the Living Labs that are united in the European Network of Living Labs showed, in chapter 3, that while user involvement across Living Laboratories is defined along some common characteristics, there are large discrepancies as well. The analysis showed how the category of "the user" is not unambiguous in Living Laboratory-literature and practices. Users include organizations, cities and demographic groups "of interest". These users are referred to in various ways: as developers, (co-)designers, co-creators, (co-) innovators, testers, to name but a few. Sometimes users are not even specifically defined at all by the Living Labs that are part of the network. Overall, I concluded that within the European Network of Living Labs, users, methods of user inclusion and user representations can be characterised by their multiplicity.

Due to this multiplicity as well as the fact that the Living Lab-concept as such is a moving target, it was my goal to articulate what practices of *user innovativeness* occur in Living Lab-projects. To do this, I made the decision to focus on three different Living Lab-projects that sought to include people in different user guises: as designers, as testers and

as co-creators. This decision was made to delineate and investigate what different kinds of *innovative practices* are performed by users in Living Labs. What designing, testing and co-creating entails is especially interesting keeping in mind that Living Labs aim to situate development practices in a "real" daily life setting, preferably the daily life setting of the to be involved users. In other words, investigating user practices in Living Labs involved analysing what actually happens when people, as users, become part of ICT development processes in (their) daily life settings. My analyses therefore focused on practices of user involvement and user innovativeness, bearing in mind relations that are enacted with both material (technological) artefacts and social context (daily life settings); how users become part of and shape the sociomaterial configuration that constitutes the Living Lab as such in each respective project.

I used several theoretical concepts to frame the Living Lab-practices in my empirical chapters (chapters 4, 5 and 6). I started from the premise that to understand user innovativeness in Living Lab-practices first a conceptualization of the interrelation between users, technological artefacts and daily life settings in the context of Living Lab-project practices is required. I characterised this interrelation using Pickering's notion of the "dance of agency" (Pickering, 1995); where the dynamic between actors is viewed in terms of situated sociomaterial performances and practices. As an extension of how Pickering looks at this dynamic in terms of resistances and accommodations of agency, I chose to focus on how this dance of agency led to improvisations; how the entanglement of agency led to unforeseen practices and performances and how furthermore, these improvisations were perceived as innovative by the involved actors.

I connected innovativeness and improvisation to study Living Lab-theory in practice. Living Lab-literature suggests that users have ideas that are unforeseen and somehow based on a kind of knowledge that I dubbed situated (location or context-based) expertise; knowledge somehow unique to their daily life setting that, being the object of scrutiny in Living Lab-projects, is treated as a kind of expertise. Improvisation takes the shape of a play with structures (goals, materials) in response to challenges and opportunities in a situation or context. How users use their knowledge to act upon these challenges and opportunities therefore shows how in improvising, they display their situated expertise; as they engage with technological artefacts and as they become involved in different stages of ICT design. Improvisation draws specific attention to situatedness and the emergence of sociomaterial practices over time. I connected these improvisations to the notion of user innovativeness by analysing how the former were translated and perceived as innovative (i.e. new) by the other Living Lab-actors. Juxtaposing promises and the practical performance of user involvement in Living Lab-practices ultimately shows how processes of user innovativeness are shaped by and facilitated in Living Lab-practices and what kind of innovation practices are constituted in Living Labs.

7.2 Case study summary

In chapter 4, I showed how students became designers for a day; how they engaged with available elements in the sociomaterial setting of the SensorLab to build smart sensor

prototypes. Constantly repositioning themselves with respect to the available materials, the knowledge provided by sensor and design experts and the assignment, the students engaged in collective improvisation (Sawyer, 2004) to design, build and test their prototypes. Mapping the elements in the setting and showing how these work to accommodate and resist each other in a dance of agency, led to the recognition that practices through which the students became designers can be characterised as improvisational. As they engaged in design practices they "made do" and "let go"; as they acted, they changed the pre-set structure of the assignment, they adapted goals when confronted by (material) challenges and were overall accommodated in exercising their situated expertise. For although these students were "lay designers", they were treated as experts during the SensorLab workshop: they were supported in their ideas and activities to create their own smart sensor prototypes.[1]

In terms of user innovativeness, this case illustrated the complexity of what may be perceived as innovative. What characterised the students' designer performance is the way in which they used their situated expertise to engage with the ingredients that the SensorLab offered them and how they used their built prototypes to explore the environment (the park and the festival grounds). All the actors in the SensorLab setting were required to collaborate; this configuration allowed the students to improvise together with the other actors. Their collective improvisation shaped their mangled form of user innovativeness.

The chapter furthermore made clear that the students were treated not only as designers, but also as learners and testers. They were students about to learn about sensor technology and design practices and in addition to this, they tested a new workshop format. The latter made the SensorLab into a "learning experience" not only for the students, but also for the other actors. As the lab spokesperson noted at the beginning of the workshop, the students were both designers and guinea pigs. This is important in relation to what may be deemed innovative. The students were facilitated to design "new" and "unforeseen" smart sensor prototypes, but in the end the technological artefacts may have been of less importance than the actual testing of the workshop format as such, which facilitated and realized a process in which different actors interacted that usually do not interact. The reduced importance of the technological artefacts is also reflected in how the sensor technology was positioned in the workshop; the students could not tinker with the sensors themselves. This black boxed this particular sensor technology for the students, something they themselves felt was a shame. The sensor technology itself was therefore excluded from prospective innovative practices. It is the workshop and the kind of interactions that the format invited that were noted as innovative; the workshop became the innovative sociomaterial artefact.

1 By characterizing the interactions in the lab as improvisational, both the creative agency of the users (in the shape of articulating the use they made of their "background" or implicit knowledge) and the decisive role of the "daily life setting" could be brought to the foreground. In this way, on a more general level, the chapter gave a first indication that not only can interactions be viewed from the theoretical perspective of "improvisation", but that in this case, the Living Lab-practice itself can also the referred to as improvisational.

In chapter 5, I investigated how entrepreneurs with businesses in a shopping street in Amsterdam became part of an effort to make their street more sustainable by testing a number of smart ICTs. This case study, which was a reconstruction of Amsterdam Smart City's Climate street project, firstly focused on the enrolment of the entrepreneurs in the sociomaterial configuration of the project. I subsequently viewed how the entrepreneurs attributed different meanings to and uses for the technological artefacts that were part of the project, as well as the project as such. Finally, I discussed how and to what extent the entrepreneurs were considered as "innovative".

In terms of the enrolment process, I compared and contrasted the goals and expectations of the different involved actors. This led to the conclusion that on paper, the entrepreneurs were configured as both pioneers (becoming part of the implementation of a sustainable street) and as testers (of the new technological artefacts). The entrepreneurs, in turn, attributed different goals to the pilot and to the technologies – which was reflected in their opinions about and the uses that were made and meanings that were attributed to the technologies that were part of the Climate street. Some were very enthusiastic about the concept of the sustainable street and did not think the project went far enough, while others took a more passive stance and expressed the hope that the involvement of large and knowledgeable parties would make their street and stores more sustainable without them having to take too much action themselves.

The diversity of these configurations and expectations created an ambiguous user image. In practice, this ambiguity was reflected in the expressed difficulty experienced when trying to unite the group of entrepreneurs. Although it was the entrepreneurial association of the street that instigated the project, the entrepreneurs had their own businesses to run. The statement made at the close of the project that they would now need to "take back ownership" of the project therefore led to some confusion: who was in the lead? This question was also reflected in the perception of the use of the implemented technologies: were these on loan or could these be kept?

The entrepreneurs attributed various goals and expectations to the technological artefacts: saving time, energy and money and the expectation was voiced that the street as such would receive positive PR in the press following the project. While some of these expectations were met, the entrepreneurs expressed double feelings about the technologies and the sustainable street concept as the project unfolded in practice. Following delays in the physical alterations to make the street more sustainable, unclear communication about the technologies, the fact that despite best intentions the entrepreneurs could not focus solely on the project, coupled with the feeling that they were not being listened to when voicing concerns or ideas, the entrepreneurs became disgruntled.

The case study showed the complexity that is involved when trying to stimulate bottom up innovation from a top down perspective. Realizing a test bed in a real life setting involved overcoming what were referred to as "local obstacles" to implement and actually "launch" the sustainable street. During this process, bottom up practicalities and daily life realities of the entrepreneurs were "mangled out" of the project; the daily life situatedness of the project – one of the key characteristics of the Living Lab-approach – was seen as an obstacle rather than

as enriching the project.

In this context, the unforeseen (non)uses of the technological artefacts being tested were not recognised as "innovative"; these did not inform changes to the technologies or to the concept of the sustainable street as such. The entrepreneurs were, in other words, not granted the agency to contribute their situated expertise and change or adapt any of the technologies or the concept of the Climate street. This left them feeling not taken serious. The project resisted the more "assertive tester" configuration and instead accommodated the more "passive tester" configuration. In addition to this, the project resisted the daily life reality of the entrepreneurs in the street – thereby skirting the opportunities of opening up testing to these same daily life realities. Instead, realising the project was discussed in terms of implementation challenges; the challenge of realizing the changes to the street and shops, the challenge of keeping the entrepreneurs motivated and the challenge of reducing energy consumption in the street.

The project *itself* was noted as being innovative. The entrepreneurs were however configured in such a way that in practice, their innovative ideas were precluded. The suggestion made at the end of the chapter is that Living Labs should, instead of noting "daily life" as an obstacle, open up their practices to allow these challenges to change into opportunities; reflect on the processes involved in including entrepreneurs as pioneering testers and accommodate instead of resist alternative ideas and uses of technological artefact. Improvisations with these artefacts can grant new insights.

In chapter 6 I focused on how citizens became involved as co-creators in the SMARTiP project where a community game, set in two neighbourhoods in the city of Ghent, was being developed. After analysing the different ways in which citizens were configured as in need of becoming "smart" through ICTs, I traced the iterative process of user involvement while different technological artefacts were developed. The artefacts were a game platform, a "hollow tree" where citizens could "check in" with RFID-cards to collect points to win the game and a "sparrow" – a constructed bird equipped with sensors and lights that responded to whistling sounds of people by lighting up.

To include citizens from the onset, the project commenced with a crowdsourcing initiative, asking citizens how ICTs could make Ghent a nicer place to live. Citizens could comment on and vote for each other's ideas. After the ideas of citizens were collected, these were evaluated and categorised by a team of experts. Taking the most voted for ideas as a starting point, the SMARTiP-team began to develop a community game.

Following a number of co-design and focus group sessions that were organized with students and citizens respectively, the ideas for the technological artefacts changed; some applications that were to be part of the game were dropped, while team interactions also led to alternative ideas. The concept of the hollow tree began with the idea for a community totem pole. This idea gradually changed into the shape of a hollow tree, complemented with the sparrow. As the project unfolded, certain technical specifics changed as well; the interactive interface of the hollow tree was "cleaned up" by reducing the number of available applications on the screen – certain design decisions were not only made based on functionality, but also based on the team's perceptions of interface aesthetics and usability.

The design of the gameplay was tested internally, using employees of one of the involved organisations, SMIT, as testers.[2] The team experimented by asking these testers to perform single and group check in's with RFID-cards at a centrally positioned RFID-reader on the work floor, noting whether or not testers would post and respond to wishes of others on the online platform and checking whether or not introducing an incentive or prize for the player with the highest score would further stimulate gameplay. Test results were incorporated in the further design of the gameplay. Following a final focus group session with citizens, the game was further developed.[3]

Citizen inclusion took the shape of the proposed "funnel approach" where users were included in different stages of development. Citizens gave direct input via the crowdsourcing initiative and focus groups and were also indirectly included – in the perceptions of "citizens" of the team, students (during co-design sessions) and employees (during internal testing). Together, direct and indirect inclusion was caught in the materiality of the developed technological artefacts.

The ambiguous configuration of citizens – as in need of transforming from passive consumer to active, empowered and presuming smart citizen (as articulated in documentation) and as critical ideators, prospective players, sounding board, experts, critics, brokers and testers (as articulated in practice) – enabled the inclusion of citizens as the team saw fit within the boundaries of the overarching SMARTiP project. Project boundaries and pressures (time, deliverables) eventually pushed all ambiguity from the user/citizen role, to primarily include the more "tech savvy" and locally engaged citizens in the project; the more passive and "not yet smart" citizen was thus not included during design (although this citizen was ultimately also targeted by the game, and by the larger SMARTiP project). Interestingly, the local, situated expertise of citizens was however stressed throughout the project process – suggesting that citizens were essential to the development process, only not always reached or engaged enough to become included.

In terms of user innovativeness, I concluded that the process dynamics suggest that it was primarily the team who improvised: who transformed a set of goals, deliverables and boundaries into working technological artefacts in the face of local uncertainties (e.g. will citizens play the game?). Citizens may or may not have had innovative ideas, but as citizens never became fully fledged team members, they never became part of the public-private-civic

2 "SMIT stands for Studies on Media, Information and Telecommunication. The research centre, founded in 1990 at the Vrije Universiteit Brussel, is part of iMinds (…). SMIT specialises in social scientific research on media and ICT, with an emphasis on innovation, policy and socio-economic questions. Currently, the research centre consists of over 60 researchers. SMIT research combines user, policy and business analysis with both quantitative and qualitative research methodologies. In order to develop new methodological tools, a continuing dialectic between theory and empirical research is one of the centre's high-level objectives. Three methodologies have become the core of SMIT's research agenda: user research, policy analysis [and] business modelling. Together with research centre MICT (UGent), SMIT forms (and leads) iMinds' research department Digital Society." http://smit.vub.ac.be/Smit (accessed 29-5-2013)

3 The community game was launched in February 2013.

partnership as such. Instead, the team improvised with the multiple configurations of "the citizen" and ultimately reduced the role of "the citizen" due to the pressures of the mangle.

7.3 Comparing cases

The above three case study summaries show a wide range of practices of user inclusion and user innovativeness in Living Labs. This diversity suggests a richness in Living Lab-practices, but also illustrates one of the expressed challenges of Living Labs; as there is no one quintessential Living Lab-approach, it is difficult to pin down. The concept and its related methodologies are in flux as local applications and realizations are very much context-dependent. Investigating user inclusion and user innovativeness in Living Labs therefore leaves me as a researcher also facing a challenge; how to draw decisive conclusions about user innovativeness in practices that are not (yet) generally accepted methods of ICT product innovation practices?

It is safe to say that my analyses provide a "snapshot" of Living Labs and that my conclusions draw attention to certain overarching characteristics of the kinds of user inclusion and user innovativeness that is sought and facilitated in Living Labs: about how public-private-civic partnerships work to stimulate, guide, embrace and learn something about the innovativeness of users and more especially about user innovativeness in a daily life setting.

The three cases show different forms of user inclusion, but how do these forms of inclusion translate into user innovativeness; what does user innovativeness signify in these Living Labs? When comparing the three case studies, I focus on three topics that help answer each of the defined research sub-questions and the main research questions: the role of users, the role of improvisations in daily life settings and the methods of user inclusion that are used in the Living Lab-projects scrutinised in this thesis.

7.3.1 The Living as part of the Lab: agency of end users

In chapter 2, I questioned the role of end users in Living Labs by inverting the concept of the "laboratorization of the world" (Callon et al., 2001); Living Labs can be argued to "worldize the laboratory", thereby opening up the laboratory to daily life practices, sites and situations. In this scenario, the users of technologies that inhabit this daily life become part of this "displaced" laboratory. But I wondered whether these users are included as a strategy to prevent or reduce mismatches between technologies and users (to more readily appropriate ICTs to the daily needs of users) or if they are included to draw out new ideas for ICT products and services? I translated these concerns into my first sub-question, *how is user agency configured in Living Lab-practices*?

It becomes clear when comparing the three cases that the involved "end users" are configured in a multitude of manners. While on paper they are positioned as designers, testers and co-creators, the analyses show a broad range of configurations; as designers, testers and learners (SensorLab), testers and pioneers, collaborators, part of a user community, but also as "islands in the street" (Climate street) and as co-creators, co-producers, dumb and smart citizens, soundboards, critics and brokers (SMARTiP). This multitude created an ambiguous and complex picture in terms of user involvement in all three cases.

What binds these different user configurations is the idea that these users should be

transformed through their experiences of inclusion; they should become "smarter". This means in this context: more knowledgeable, consumers of less energy, and more connected to the community. "Smart" here functions as an ideograph. As Neven summarises: "Ideographs (Van Lente, 1993; McGee, 1980; De Wilde, 2000) are terms which we quickly recognise as good and which we feel we should strive for, though they are often poorly defined and multi interpretable (De Wilde, 2000)" (Neven, 2011: 71). "Smart technologies" fit this description; no one will protest against the idea of making technologies and people smarter.

User agency became apparent as I studied the performances of users as they interacted with the other actors – including the technological artefacts. I used Pickering's metaphors of the dance of agency and the mangle of practice to catch how their agency unfolded in practice. The concept of improvisation worked to, in addition to this, articulate how in the sociomaterial setting of each Living Lab users contributed to the development of technological artefacts, and whether their (unforeseen) performances led to innovative insights.

In practice, users improvised with technological artefacts - they attributed meanings to these through exploration (SensorLab), use (Climate street), and through the generating of ideas for (functional aspects of) future ICTs (SMARTiP). These improvisations were however not always recognised by the other Living Lab-actors as innovative. Instead, the "innovativeness" of Living Lab-practices was more related to the ideas of making users "smarter" and of innovating the *ICT design process* itself.

On paper, Living Labs are proponents of a democratic ideal of user inclusion while at the same time striving for market successes. In a sense, including users in development processes should work to overcome tensions between functional design and meaning attributed to technological artefacts in use. Objects, materials and ideas about future use are to be developed, used and articulated by including (future) end users. End users are explicitly included to discover unexpected uses of technology and to validate new products (Følstad, 2008). They seem to be made part of this practice precisely because Living Lab organizations realize that user adaptation of technologies is of great importance for the future success of technologies. This would be, I argue, due to the fact that users use their situated expertise to influence design processes in Living Labs.

However, what is left of this democratization ideal when the situated expertise of end users is not included in the development of new ICTs? When users *do* become part of development processes, but actual insights are not always readily adopted. There is, in short, a gap between activities in the Living Lab, and the translation of practices into concrete insights that contribute to the development of innovative ICTs. Referring back to Pickering's dance of agency, it seems that in practice Living Labs accommodate users primarily as *users*; instead of becoming part of the public-private-civic partnership as actively contributing actors (i.e. with the agency to fundamentally inform changes to technologies), they never actually transcend the more passively configured role of "the user" (who needs to become "smarter"). They somehow remain at a distance, while the overarching goal of each Living Lab-project seems more focused on realizing the Living Lab-project as such instead of granting agency to the involved users.

7.3.2 The Lab as part of the Living: the daily life setting

The second sub-question was *how do users improvise (with) new technological artefacts in Living Lab-practices?* To answer this question, it is not only important to focus on user improvisations (as I described in the previous section), but also on the role of daily life environments in the Living Lab-practices I investigated. In a sense, this means analysing what comprises the "labbiness" of Living Labs – how "the laboratory" operates in a daily life environment. Is daily life, the setting of the lab, structured by means of the ordering device that is the Living Lab or do Living Labs specifically invite "the unexpected" to surface as end users become enrolled in ICT development processes?

The three cases involve very different physical settings and situations. In the SensorLab case, the workshop took place in a large tent in a public park. For the Climate street a popular shopping street in the centre of Amsterdam figured as the setting of the Living Lab. During SMARTiP, the stage was formed by two neighbourhoods in Ghent while in practice users were included via a number of different settings; citizens were asked to share ideas in an online environment and asked to attend focus groups prior to testing the game in both the work space of SMIT employees as well as in the actual neighbourhoods.

These daily life settings had different "functions" in the respective Living Lab-projects. The tent formed the actual site of the workshop (replete with materials and access to experts) while the park was to inspire the students and offered a site for exploration and measurement taking. In other words, the park was part of "the laboratory" and what the students perceived this setting to offer in terms of pollutants influenced their design plans and practices. In the Climate street, the street was the laboratory where over a period of two years tests were undertaken. Testing the Climate street concept as such bound the project to this street. The SMARTiP project aimed to anchor the developed technological artefacts in local concerns and ideas of citizens to ensure local engagement with these artefacts (and with each other). The two neighbourhoods are the setting for the tested community game, which mirrors the Climate street's use of "the setting" as a test bed environment. In addition to this, on a more general level, the entire city of Ghent formed "the setting" of the Living Lab, as citizens are initially approached with the question of how ICTs can enhance the quality of life in the city.

While the settings differ, there are parallels between the cases in terms of how the settings play a role. In all cases the aim is to use ICTs and user inclusion during the development of ICTs to somehow change (1) the perceptions of people about these settings, (2) people's behaviour in these settings and (3) the setting itself. In the SensorLab, the developed prototypes should measure a pollutant in the setting in order to trigger people passing by to ask about their designs and so learn something about pollution in the park. Underlying this assignment is the conviction that by making the implicit explicit and measurable, a change in people's behaviour can be realized. In effect, the public park becomes a site to measure pollution, thereby gaining a new meaning. The Climate street not only aimed to change the perception of entrepreneurs in the street with respect to energy consumption, but also the perceptions of the shopping public passing through the street; the project was to generate positive publicity. Secondly, enhancing the awareness of primarily the entrepreneurs in the street about energy consumption would lead to a reduction of their actual energy

consumption. Thirdly, the Climate street would physically alter the street to such an extent that the street would gain a new, more sustainable, identity. Through SMARTiP, the people living in the two neighbourhoods in Ghent would experience more social cohesion by playing the game; while changing public space into a gameified space would at the same time facilitate a change in citizens – turning these into "smarter" citizens. The Swarm game set out to alter people's behaviour in the neighbourhoods, specifically around the introduced technological artefacts. Their involvement in the development process of the game functioned not only as a means to generate and reflect upon ideas for smart ICTs, but also – to some extent – facilitate a dialogue between members of the community, the municipality, research organizations and commercial parties. The inclusion of citizens throughout development would, in effect, make these citizens more aware of social cohesion and the uses of ICTs to enhance living experiences in Ghent.

Apart from its function as a setting, daily life plays an important role in Living Labs, because of the Living Lab-idea that in order to create more successful ICTs, more use should be made of the daily life experiences and insights of users. The often mentioned "uncontrollable dynamics" of daily life (Boronowsky et al., 2006) are positioned as an opportunity to realize a certain innovative potential of end users. These cases illustrate how Living Labs deal with these dynamics in practice; in order to realize "the Living Lab", in practice Living Lab-actors can be seen to actually configure the daily life setting so that "uncontrollability" and unforeseen ideas and uses of technological artefacts(-in-the-making) are precluded or not recognised in practice. Instead realizing "the lab" in "the living environment" somehow forces the organizing actors to mangle out the unforeseen.

In this respect, the cases show different dynamics. Whereas all cases illustrate a rich variety in user improvisations, there are major differences in the ways in which these were recognised or subsequently incorporated in ICT development processes. In the SensorLab, the students shaped their own semi-structured activity as they made use of the "ingredients" of the SensorLab (the assignment, the knowledge offered by the experts and the materials) to create their smart sensor prototypes. Their creative activities are facilitated by the sociomaterial setting; they are configured as "experts" in this setting, and granted the agency to exercise their situated expertise. They grappled with "the unforeseen" to collectively create their prototypes. However, while their improvisations - part of the sociomaterial setting of the workshop – are accommodated and part of the "learning experience", it is ultimately the workshop as such that is the innovative outcome. Facilitated improvisations in the daily life setting become the innovative product. In the Climate street, the entrepreneurs improvised as they accommodated and resisted the pilot project itself and the related ICTs. The entrepreneurs improvised with the technologies by attributing new meanings and uses to technologies; using the energy display in the shop as a security device to scare away potential criminals for example. However, realizing the project in an uncontrollable setting seemed to require closing off the project to user improvisations. Unforeseen feedback and ideas that were the result of testing in a daily life setting were not recognised and incorporated in the technological artefacts that were part of the pilot. In the SMARTiP project, different users were included in the different stages of ICT development. The crowdsourced ideas, uploaded

and commented on by citizens were the starting point for the development of the community game. During development, specifically the ideas and feedback of citizens about for instance the best place in the neighbourhood to place the hollow tree or about the incorporation of certain game applications were recognised and made part of the development of the game. Yet, actual improvisation was only observable at "the level" of the project team that worked to integrate user ideas and feedback into the final ICT designs; they "made do" and "let go" of user ideas and feedback as the game was developed.

A key concept to describe how daily life settings are approached in these cases is that of *transformation*. Living Labs not only aim to transform existing daily life settings into laboratories and to transform the people in these settings, but also transform something that seems uncontrollable into a setting where experimentation can lead to insights. To gain insights, the uncontrollable thus needs to be shaped into something that can be overseen and that can be to some extent, controllable. This move to control may however frustrate the recognition of innovative practices taking place.

This need for controllability mirrors traditional scientific experimentations and technological test practices. In order for outcomes to become persuasive, experiments and tests need to - in the words of Downer (2007) - be reproducible, controllable and comparable, but at the same time also authentic and representative of reality. As MacKenzie (1989) and Pinch (1993) have also argued, this makes tests projections that are ambiguous; a test needs to be like the real world, but at the same time sufficiently like other tests to be valid. This has led to questions of relevance and correspondence: how do tests and test outcomes stand in relation to "real life"? In Living Labs, this inherent tension seems to collapse as the laboratory becomes the daily life setting. Test outcomes would then always be authentic due to the fact that there is no longer a boundary between the artificial and the real. The representation is the real.

However, as Downer argues, "there is a degree to which experiments are useful because they are *not* like the real world: specific changes are made so that their circumstances are more controlled and outcomes are more legible" (Downer, 2007: 9). Experimentation balances between control and authenticity (Henke, 2000, in Downer, 2007: 9). This is also observable in the Living Lab-cases. Whereas the projects seek to take into account "authentic" "uncontrollable dynamics" of local context and local "users", the Living Lab-projects can at the same time be seen to control the setting and practices that shape and constitute this setting in order to gain insights. Practices in the daily life setting are made comprehensible by understanding these in terms of the goals Living Lab set for their projects. In these cases, this means that the goal of transforming daily life becomes a priority and unforeseen ideas and practices of users are not always recognised. These may be authentic, but not controllable.

7.3.3 Methods of Living Labs: resisting and accommodating user innovativeness

Closely related to the roles played by end users and the daily life setting in each of the three cases, is the method of user involvement used in each Living Lab-project. These were a workshop format, a test bed and a multi-method funnel approach. Through the enrolment and practices of users the Living Lab-projects aimed to both gain innovative insights and at

the same time somehow change the users: to teach them something about technologies and about their own daily life practices. The developed technologies foresaw something similar; these were envisioned to be "dually effective" (Ganzevles, 2007) sustainable technologies that require the users to adopt not only a technology, but change their behaviour as well.

Although "real life" played a large role, the actual methods used in this setting were quite strictly configured and specific in their approach with respect to what users could contribute. In the SensorLab an *educational format* – to allow students to learn about sensor technology, design processes and citizen science - was presented and tested, where students could contribute by taking part in the workshop without changing the format as such. In the Climate street entrepreneurs contributed to testing to what extent sustainable technologies and a sustainable concept reduced energy use by entrepreneurs. In SMARTiP the concept of "users" was rather broad (citizens, students, employees) during the development stages and users were injected in the development process at particular moments. Inclusion thus revolved around the ICTs that were developed or tested. There were clear-cut goals and while means of including users were at times relatively open (for example in the SMARTiP case, where the actual methods of citizen inclusion is repeatedly discussed), each project had set goals in terms of the technologies that were to be designed, tested and co-created.

The performances of users that were afforded by the methods used created, different user-technology dynamics in each case. Asking students to design and test prototypes for example invites specific sociomaterial performances: to alter materials, to build an artefact and to use existing knowledge and elements in the setting to collectively improvise a smart sensor prototype. Configuring entrepreneurs as testers and testing a smart meter and display in turn invited other kinds of performances; using technologies and reflecting on this use. Using a multitude of methods to collect ideas (such as crowdsourcing ideas online, reflecting on ideas via focus group sessions) asked citizens to think about ICTs in a certain way – how ICTs could overcome certain neighbourhood issues for example. Relating these user-technology dynamics to my third and fourth sub-questions, the questions thus become *how these methods facilitated improvisations that were recognised as situated expertise?* And *whether and how practices of user innovativeness were perceived as innovation by the Living Laboratories?*

In chapter 2, I related "innovation" to perceived product or process newness. I subsequently connected innovativeness to insights that could be gleaned from new processes such as a new combining of knowledge (knowledge of public-private-civic partners) and the new way of situating development processes in daily life environments. I furthermore argued that to trace user innovativeness, I needed to focus on emerging agencies and improvisation practices; the route to innovation and how users – in acting with technologies in perhaps unforeseen ways, in a play with existing structures - can be said to engage in situated innovation as they improvise in the daily life setting. Viewing whether and how these practices were treated as a kind of situated expertise by the other actors part of the Living Lab-consortium would offer me a means to make the innovative character of user practices discernible.[4]

4 In other words, I connect expertise and innovativeness here; users, acting in their daily life setting with (new) technological artefacts are treated as experts (of and in this daily life setting). By highlighting

Due to the differences in methods used in each case, the situated expertise of the included users that is appealed to is different. Where the students can be said to be both treated and acted as experts due to their configuration as designer and due to the space granted to their interactions, ideas and uses of the available elements that constituted and shaped the sociomaterial setting, this was completely different in the other two cases. For although the entrepreneurs were referred to as pioneers, in practice their expertise did not change the development of the included ICTs or the concept of the Climate street as such. While they improvised in unforeseen ways with the ICTs and within the Climate street, they were not granted the agency to actually change the Climate street. In the case of SMARTiP, the citizens were treated as experts of their neighbourhoods, but not directly referred to as having "new ideas" when it came to ICTs. Citizen input and feedback was sought, but in the end it was the project team that steered the process.

The latter point is of great importance to understand user innovativeness in Living Labs. As I discussed in chapter 1, the concept of the Living Lab is still in flux. Practitioners are reflecting on the current diversity of methods of user inclusion and what "the Living Lab" has brought in terms of innovative ICT products and services. The added value of user inclusion is even questioned, while practitioners increasingly articulate the difficulties involved in using the daily life setting as a site for experimentation. This means that as a concept, the Living Lab is currently perceived as relatively innovative, although it may be difficult to realize in practice.

This is also reflected in the case studies presented in this thesis. Setting up a public-private-civic partnership and a test bed in an existing daily life environment are recognised as challenges. Overcoming certain obstacles in order to realize "the Living Lab" is still a topic of discussion. It could be that realizing "the Living Lab" is in itself so innovative, that connecting to daily life realities is sometimes a bridge too far. Or, put differently, while improvisations of users in the sociomaterial setting of the Living Lab are realized, these are not always recognised due to constraints (in terms of resources such as limited time and money) and the challenge of giving agency to the situated expertise of users. These constraints and challenges make it more difficult for Living Labs to take the innovativeness of users into account. I return to this idea in section 7.4.3.

7.4 Governing user innovativeness: themes across Living Labs

Realizing a laboratory in a daily life setting is not straightforward. Nor is user involvement in design practices a given. The popularity of initiatives such as Living Labs, crowdsourcing efforts, DIY hackerspaces and FabLabs however shows that there is a strong belief in the wisdom of the crowds and the creative potential of bottom up community practices. Still, facilitating user engagement and user innovativeness requires, as Verhaegh (2010) previously

how their expertise is translated by the Living Lab in new products or processes, I am enabled to show how user agency is constructed in Living Labs. In addition to this, it allows me to make their innovativeness explicit.

concluded, different kinds of "work".[5] In this thesis, I did not view these types of work, but rather attempted to catch the creative unfolding of user-technology practices in Living Labs. I placed the emphasis on the situatedness of innovation (starting from Orlikowski's conceptualization of situated innovation) and dubbed the recognition of users' daily life knowledge situated expertise. I highlighted user practices and at the same time closely scrutinised Living Lab-practices – to see how the lab and the living produced innovative (smart) ICT's, people and methods of user-centered design.

The previous sections focused on a comparison of the three case studies to see how and to what extent users, in different roles, could be seen to act in innovative manners in the context of each Living Lab-project. The role of the user, improvisations in the daily life setting and the different methods employed to facilitate user innovativeness and processes of ICT development were juxtaposed, with often overlapping themes.

In this last section, I discuss three themes that form motifs across these case studies – themes that are discernible in all three cases, albeit in different forms. These themes help make explicit how exactly processes of user innovativeness are shaped by and facilitated in Living Lab-practices and what kinds of innovation practices are constituted in Living Labs. Moreover, these themes form the backbone of what I refer to as suggestions for Living Lab-practitioners that I formulate, admittedly based on my limited experience in the Living Lab-field. In this way, my experiences and analyses garner practical insights.

7.4.1 Theme: multi-interpretability of daily life as a site of discovery and transformation versus a *given* stage

Living Labs connect certain promises and expectations to situating "laboratories" in the living, daily life setting. These promises create a double image of "daily life" as a lab-site. First of all, daily life is included to lead to unexpected insights that will transform both the ICT product and the site itself. This means that daily life is treated as a site for discovery; what will people do with technologies in "real life"? Technologies are, as it were, injected in a setting that, though "natural" is treated as a constructed laboratory setting. Observing what happens during and after this injection leads to insights in (1) product use and (2) local applicability and appropriation of the technology. The focus thus lies on the technological artefacts. In the three cases, "daily life" fulfils this kind of role. In the SensorLab, there is even a kind of double effect of this use of the daily life setting. The SensorLab itself tests what happens when a lab is moved into a public park, while the students who enrol as designers within this lab explore the public park and festival setting as a site for discovery as well. The technological artefacts become the means to explore this setting. The workshop is a lab, as well as the context in which the lab is situated. The Climate street also treats the daily life work setting of the entrepreneurs in the shopping street as a site for discovery: will the technologies "work" in this setting? However, here user appropriation seems of lesser importance to the project as such. If the users "listen" to the ICTs, they will act in more sustainable manners. The discoveries are thus also related to

5 In the shape of alignment, domestication, care and coordination work (Verhaegh, 2010).

transforming the setting and how people relate to this setting. The discoveries are in practice more concept-related than use related; the diverging uses or non-use of technologies are –at times- recognised and flagged as a "issue of non-commitment of the community" and even discussed in terms of "challenges" related to testing in daily life, but not directly connected to the technologies tested. Instead, there is a perceived problem in keeping entrepreneurs engaged in the project. In SMARTiP, the local context forms a site for inspiration while the citizens provide ideas and feedback. As the project unfolds, the daily life setting is however reduced to the second meaning attributed to daily life, namely that of daily life as a "test stage".

The second image of daily life is that of the somehow "objective" laboratory, where daily life becomes a kind of neutral test stage. This neutral stage is a *given*; the laboratory can be inserted in the location. But by situating a Living Lab in a daily life setting, this setting takes on a new meaning; situating a lab in a daily life setting alters the experience of people who join in on the activities that take place in this daily life setting. As they engage with technologies in this setting, people are transformed into users. Instead, the location is presented as a given setting that is - while fitting to develop or test a specific technological artefact - also quite "universal" and objective in character. It offers certain characteristics (pollutants, energy consumption, social interactions) that are quite easily related or recognizable in other settings. The daily life setting becomes partially experienced as an objectified test site.

By objectifying the complexity of daily life interactions, experiences and settings, Living Labs seemingly contradict their own adage of opening up the laboratory to the uncontrollability of daily life. While Living Labs stress the importance of locality and context-dependent insights, they seem to strive to find insights that are more generally applicable; the SensorLab workshop is to be offered to other schools in other settings, the Climate street concept should become exportable to other cities and the technologies that are developed in the context of SMARTiP should be shared across European cities. This is interesting because while the Living Lab-movement may be more globally-oriented, it also underlines the importance of investigating local contexts (local users, contextual use). The Living Lab is thus positioned as something that is neutral or context-independent, while in literature it is exactly the richness of the daily life setting (ideas, uses, routines, values) that is heralded as making the Living Lab-concept something new and innovative. The living is reduced to "the site", not as a rich ingredient of the lab that brings all kinds of insights to the foreground. Moreover, while insights into the social aspect of each project are anchored in local contexts, technical insights are attributed a more universal character.

To understand how user innovativeness is shaped and facilitated and what kinds of innovation practices are constituted in Living Lab-practices, it is important to further regard this "universal character" of the technological artefacts that are developed or tested in local contexts in the three Living Lab-project studied in this thesis. As stated in chapter 2, the technological artefacts that are part of the Living Lab-projects I focused on in the empirical chapters of this dissertation share certain characteristics. They are all labelled as "smart technologies" and are developed to make certain matters which were hitherto "invisible", visible. The students in the SensorLab measure pollution levels with their prototypes, the smart technologies in the Climate street show the entrepreneurs how much energy they are

using in their workspace and the developed Swarm game allows citizens in Ghent to become more aware of social cohesion and social interaction in their neighbourhoods. In other words, the technological artefacts not only collect data, but also seek to grow user awareness.

In these cases, user involvement is thus not only connected to transforming ICT products and settings, but also to transforming users. I have referred to dually effective technologies before, where technologies should serve both the consumer and the environment. As Ganzevles argues, the effectiveness of sustainable technologies depends strongly on user behaviour. Technologies may also "backfire" when a user starts to use a more efficient technology more often, thereby crossing out the reduction in energy consumption (Ganzevles, 2007). Jelsma, alternatively, argues that instead of making people behave more environmentally friendly, one can also work to "remoralise" technologies or spaces (Jelsma, 2006). Instead of changing behaviour, the sociotechnical landscape should be changed. Reviewing the Climate street goals leads me to conclude that it aims for both the "dually effective" technology as well as a "remoralisation" of the sociotechnical landscape via technologies. The same argument can be made of the SMARTiP project and SensorLab. By inserting the hollow tree, the sparrows and the community game in two neighbourhoods SMARTiP seeks to stimulate social cohesion – leading to a situation where social interactions are "remoralised". Likewise, albeit to a lesser extent, the students in the SensorLab receive the assignment of building prototypes that draw the attention of the people in the park in order to talk to them about pollution.

The technological artefacts should thus "do good".[6] This is also in line with the social innovation agenda of Living Laboratories. Broadly defined social innovation "refers to the process of collective idea generation, selection and implementations by people who participate collaboratively to meet social challenges" (Dawson & Daniel, 2010: 16). Social innovation has strong emancipatory objectives (Holmlid, 2009) and is more than product or process innovation; it seeks to resolve social challenges and enhance social well-being (Dawson & Daniel, 2010). In the field of Living Labs, social innovation is used to characterise how Living Labs focus on the development of specific services for people (Pallot et al., 2010). However, at the same time, the technological artefacts should be "successful" as well. They are part of projects that seek to engage further (commercial or social) interests. The fact that this second objective also plays an important role in Living Labs does not mean that the goal of producing "good technologies" should be interpreted as a kind of "social façade"; that underneath the ideal of developing socially significant sustainable technologies, lies a commercial objective of developing "killer apps" or "killer sustainability concepts". The two matters seem to be united in the projects: developing successful sustainable ICTs requires these ICTs to somehow "do good".

Interestingly, these technologies, developed or tested in the local contexts are however not only to be applied in the contexts in which they were developed or tested. These are pervasive and ubiquitous technologies and developed to be shared across other contexts. The local Living Lab therefore poses as a universal site of application and implementation.

6 Technologies that "do good" are also discussed as "moral artefacts" by for example Achterhuis (1995).

The technologies are specifically developed to transcend local boundaries. This presupposes that what may be experienced or deemed as a "good" technological social innovation in one setting can be translated into "good use" in another. But why would one develop and test these ICTs specifically in a Living Lab, or a living environment? Does the Living Lab then not become an exercise to prove the universality of ICTs, user testing and even of the daily life setting as such? Does the Living Lab then not reduce all complexity and unforeseenness or uncontrollability to a rather flat world? In opening up the lab to the living in this way, all diversities of "the living" seem to become removed from it.

In this context, user innovativeness is facilitated to lead to (locally-oriented) social and (more universally-oriented) technological discoveries that can be translated into innovative products. It takes the shape of practices that require transformations: of daily life settings into laboratories and of "people" into "users". By treating daily life as a "given stage", the innovation practices in the Living Lab-projects not only seek insights in local applicability of technologies, but also garner more "universal" insights. Referring back to the parallels I drew between Living Lab experimentation and more "traditional" laboratory experimentation in section 7.3.2, the given stage of the Living Lab becomes an experimentation site that would collapse the boundaries between representation (the setting framed as any daily life setting) and the real (where uncontrollable dynamics are at play). By "worldizing the lab", innovation practices in Living Laboratories transform daily life settings into controlled settings. These labs focus on specific activities within this setting, while excluding others from innovation practices.

On the whole, the goal to realize innovation translates into innovation practices that are characterised by a wish to include end users in technological development process and realize more participation in ICT development processes across society while at the same time creating more awareness in the end users about technologies and (their) daily life environments. Through inclusion and awareness, users should become "smarter". User innovativeness should be perceived in this light; people transform into "users" whose innovativeness depends on how they are facilitated to become "smarter" through inclusion during technology development and through using smart technologies. Innovation practices, in turn, strive to "do good" and create "good technologies". Furthermore, innovation practices are both locally and more "universally" oriented and work to integrate social and technological innovation. Yet, in striving to realize sociotechnical innovation practices, it seems that the "socio" part of innovation is to be controlled to gain insights in the "technical".

7.4.2 Theme: user inclusion in Living Lab-methods, not in public-private-civic partnerships

How processes of user innovativeness are shaped and facilitated in Living Lab-practices also depends on how users are included as actors in Living Lab-practices. I argued in section 7.3.1 that while in theory the role and agency of users in Living Labs is considerable, in practice this agency was to some extent marginalised. One of the reasons I identified was that Living Lab-actors needed to put considerable efforts in realizing (user inclusion in) each project in the first place, and that due to this, the results of user involvement and user innovativeness

became less accentuated. Here, I want to nuance that view, by suggesting that what I have seen occurring in the case studies has less to do with issues of user inclusion, but more with what is *perceived* as user inclusion and user innovativeness.

In all three cases, users performed agencies that were related to their configuration as designers, testers and co-creators of technological artefacts. I focused on how they were configured on paper and in practice within the sociomaterial configuration of each specific Living Lab and how their performances could be connected to user innovativeness. The main focus was on preconceived and actual performances of agency in order to trace unforeseen actions and how the other Living Lab-actors translated these practices into innovative ICT products and services.

What became clear was that while the users were in each case enrolled within the user-centered methodologies employed within each respective project, they were never enrolled actors in the public-private-civic partnerships. And with this I mean that the users were never part of the project team of each of the Living Lab-projects. They were part of the actor network, and enrolled in practice, but always at a distance; there was a gap between being enrolled as a user and being enrolled as a partner. This has implications for what the shaping and facilitation of user innovativeness meant in these cases. It entailed the selective inclusion of users in a co-creative methodology, as opposed to inclusion in co-creative partnerships.

This is also what characterises the innovation practices in these cases. Users were part of the daily life setting as "experimentation" and development practices took place in their (at least in the Climate street and in the SMARTiP project) daily life environments. Technological artefacts were "injected" in these environments, after which ideas about and practices of users with these technological artefacts in their environments were observed. Blatantly put, in this scenario, the user was thus more of a guinea pig than an equal partner in the Living Lab-consortium. As part of the method of user inclusion, the user was accommodated; ideas and practices were observed, taken into account when deemed appropriate and acted upon. This translated into for example allowing a re-phasing of the workshop phases in the SensorLab by the students, the acceptance of entrepreneurial non-use of the ICTs in the Climate street and changing certain functional aspects of the Swarm game in the case of SMARTiP. In the second and third case the attempt was made to enrol the testers and co-creators as partners prior and after the implementation of the Living Lab; the entrepreneurial association that initiated the first tests in the shopping street was referred to as the owner of the project, and the citizens of Ghent were the ideators of the Swarm game by providing the initial ideas for functional aspects of the game. However, and this is the general point to be made, while they were framed as partners in each of the projects, they became primarily enrolled as designers, testers and co-creators due to a strong focus on methodological (development-oriented) user inclusion.

In other words, the larger Living Lab-promise of the democratization of the design process and of making people smarter through technological artefacts and through user inclusion in design processes, was realized in each innovation practice by keeping a firm focus on methods of user inclusion in these design processes. Yet users were resisted – to use Pickering's metaphor of the dance of agency once again – at the level of the actors governing

the Living Lab-project. Although these Living Lab-projects were clearly focused on employing user-centered methodologies to create innovative ICTs, there were strong overtones of also enrolling users in public-private-civic partnerships. However, to realize a public-private-civic partnership user inclusion at the level of the composition of the project team should be considered essential as well.

Efforts were made in the SMARTiP case to include representatives of citizen communities (such as neighbourhood "directors") during focus groups. The same occurred in the Climate street, where the project management organization kept in contact with the shopping street manager and with the chair of the entrepreneurial association. While these contacts were established, somehow the inclusion of citizens and entrepreneurs in the public-private-civic partnership (as part of the team) was not realized. They were kept at some distance while technologies were developed or implemented. It seems that the configuration of users in certain roles (as tester-entrepreneur and as co-creator-citizen) actually resisted further inclusion.

In the case of the SensorLab, this was a little different, as the lab was configured to such an extent that the role of the user-daily life setting was framed more in terms of exploration than in terms of "implementation" and in that user inclusion never moved beyond the workshop format (nor was this, it should be stressed, the intention). The other two cases did however intend to include users. These projects emphasised - in line with their social innovation agenda - that without collaboration with users, the projects would not be successful. Collaboration, co-creation and partnership seem rather slippery terms in these cases.

Sub-theme: users are in need of motivation

The innovation practices in these Living Lab-projects can be reflected on in terms of a dance of agency. Users can be observed to perform a dance with technological artefacts, while a dance with any of the other partners is resisted. Here, I focus more on this idea, because it is of central concern to understand what user innovativeness means in practice in Living Labs.

Each of the analysed cases showed how users were enrolled in each Living Lab-project. In the SensorLab, the students were given the chance to design, to explore new technologies, machines and environments and to collaborate creatively in their sociomaterial improvisations. They were provided with a "fun" exploratory educational assignment. The designs should be outrageous and what's more, the students were (for once?) in charge. They could - to some extent - direct their teachers to help build their visions of a sustainable sensor prototype. The entrepreneurs in the Climate street were "seduced" by promises of saving time, money and the environment and the hope that the project would generate positive PR for their shops and shopping street. Lastly, within SMARTiP the idea was that in order for the citizens to play the game, it should be "fun" to join in. In addition to this, citizens were encouraged to join in by means of a more generic motivator, namely an actual prize for the winning player/team.

Of course, to join in on any practice requires a certain motivator or motivation. Nevertheless, it is interesting that in these cases the "fun factor" as well as the "incentive element" were quite central to practices of user inclusion. The users seemed not so much

inherently motivated to become enrolled in these practices. This brings up the question to what extent these Living Lab-practices can actually be framed as facilitating user innovativeness in "bottom up innovation practices". Perhaps the notion of "user inclusion" itself already carries overtones of the need to facilitate users in becoming included in the first place (who, after all is doing the "including"?). At the same time, there are promises of co-creation through bottom up innovation in Living Lab-literature (Almirall, Lee, Wareham, & Schrage, 2012; Mulder, 2012; Van der Walt, Buitendag, Zaaiman, & Jansen van Vuuren, 2009); that users have innovative ideas and that facilitating bottom up innovation will lead to innovative products and services. One needs to channel these ideas, through Living Labs, to tap these ideas and translate these into commercial successes.

Innovation practices here require the top down facilitating and shaping of bottom up innovation, which thus takes the shape of first of all motivating users to become involved. This may be hampered by the fact that users are perhaps not easily accessible (in the case of SMARTiP explicitly connected to the fact that citizens may be lost behind a digital divide for example) or even not immediately interested in becoming involved (as, in the case of the Climate street, the entrepreneurs had their businesses to run). The Living Lab-projects therefore need to accommodate these users in order to be able to include them, especially in view of the promises that are connected to the technological artefacts: these smart technologies seek to make users "smarter". This objective may at first alienate a prospective user as it suggests that he or she is currently not smart. Simply proposing that "it" will be "good" for the user may not be enough, hence the perceived need to motivate users in alternative manners.

After motivating users to become involved, they need to actually become part of the ICT development process. The Living Lab-partners seek to find the optimal means of including users, which can take different shapes as the cases show. The configuring of users in certain roles and certain performances is part of the construction and realization of each Living Lab-project; the users are part of the daily life setting and part of the laboratory. Strictly speaking, bottom up innovation in the Living Lab consists of channelling the possibly unforeseen and innovative ideas and practices that are the result of user-technology improvisations in the daily life setting into innovative ICT products. But at the same time, bottom up innovation depends on how Living Labs frame the users and how they define what innovativeness means in each specific project and practice. This leads me to the third theme: the tension between top down and bottom up innovation.

7.4.3 Theme: tension between top down and bottom up innovation

Innovation practices are not easily dividable in clear-cut categories of top down or bottom-up innovation. For example, Daft (1978) observes both processes of top down and bottom-up innovation in organizational innovation.[7] In the same vein, Enkel and colleagues (Enkel, Gassmann, & Chesbrough, 2009) articulate the importance of different flows of knowledge

7 He therefore proposes a "dual core method" consisting of for example technological and administrative "cores".

to help establish (open) innovation: outside-in processes, inside-out processes and coupled processes, the latter of which is specifically connected to practices of co-creation.

Innovation practices thus depend on different process "flows". Living Labs are no exception. The three case studies in this dissertation illustrate how certain Living Lab-projects and practices created a hybrid form of top down/bottom up innovation. These Living Labs aimed to facilitate the development of innovative ICTs through the inclusion of users of technologies and by situating experimentation in a daily life setting. In other words, practices of user innovativeness were shaped as these projects tried to innovate by facilitating bottom up user innovation within the context of ("top down") project boundaries and partners.

This "combining" of top down and bottom up innovation also takes place at the level of the larger Living Lab research landscape. In chapter 1, I referred to Pallot and colleagues' illustration of the research landscape of Living Labs, here depicted once more in figure 1. Individual users, as well as groups of users are said to collaborate in various ways.

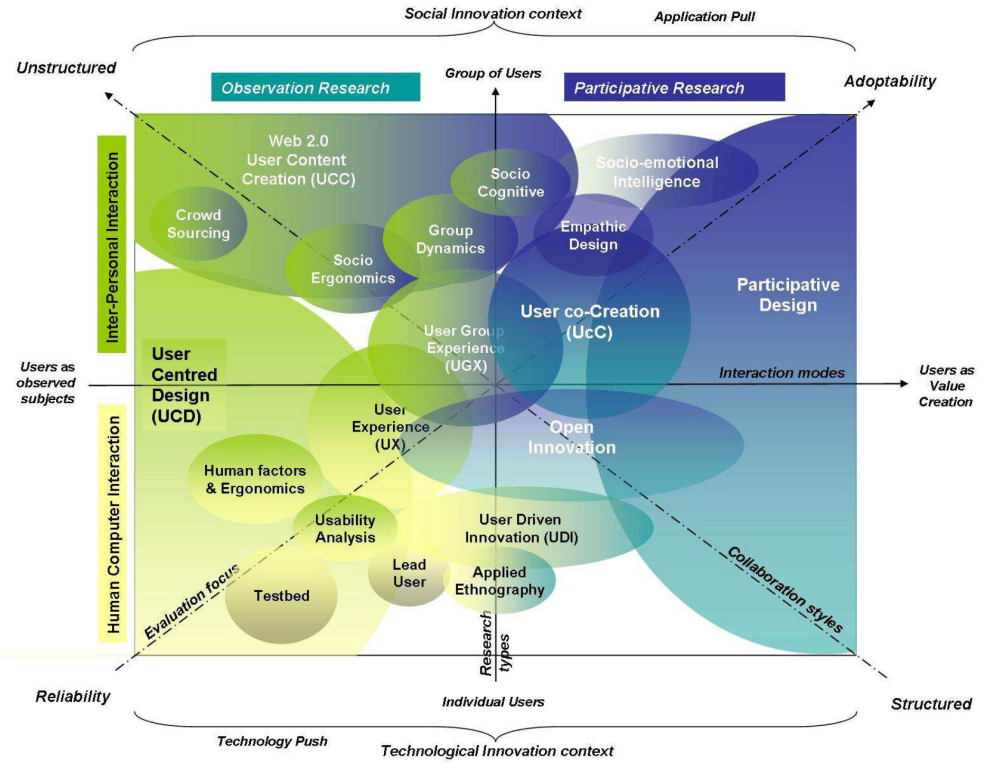


Figure 1: Living Lab methods of user involvement (Pallot et al., 2010: 7)

The authors stress the importance of a research domain overview to help researchers - that are part of the movement to realize co-creation with users - gain a broader understanding of the

Living Lab-concept (Pallot et al., 2010: 8). While I agree that the diversity makes it difficult to "pin down" *a* Living Lab-methodology, I argue that this landscape overview appeals to the idea of viewing innovation processes in Living Labs as hybrid. Moreover, as I will argue below, this diversity appeals to the open innovation principle of uncertainty.

Chesbrough argues that in order to cope with the uncertain success of innovations, companies should open up their innovation processes. Likening the hitherto "traditional" innovation processes of firms to a game of chess, he proposes that in practicing open innovation, companies should instead focus on developing a process for playing poker. This means accepting that successful innovation is very much uncertain and dependent on uncontrollable contextual (in this case market) conditions (Chesbrough, 2004: 25). Situating open innovation experimentation in a daily life setting would lead to what Hartley, in the area of innovation management in public services, refers to as the recognition that:

> "[…] context has an impact, both directly on innovation determinants, processes and outcomes and indirectly through organizational features such as the amount of organizational resources and organizational strategy. Tidd (2001) argues that the complexity of the innovation and uncertainty of the environment substantially shape innovation. These are key dimensions for public service organizations. We also need to understand much more about the organizational processes of innovation development through 'top-down' policy development, through 'bottom-up' innovation emerging from the activities of managers and staff in organizations, and through 'lateral' innovation from good practice adoption and adaption" (Hartley, 2005: 33).

The open innovation "process for playing poker" operates on the organizational and the experimental or locally situated level in Living Labs and involves combining top down, bottom up and "lateral" innovation. The Living Lab research landscape, in my view, illustrates this. The Living Lab-approach employs methods that are perceived to be applicable and relevant depending on different contexts. Schaffers refers to this as the Living Lab innovation ecosystem, consisting of different layers:

> "The Living Labs concept represents a powerful view of how user-driven open innovation ecosystems could be organized. As a concept applied to smart cities it embodies open business models of collaboration between citizens, enterprises and local governments, and the willingness of all parties -including citizens and SMEs- to engage actively in innovation. The Living Lab concept should be considered also as a methodology, a model for organising specific innovation programmes and innovation projects and conducting innovation experiments. Whereas the last aspect has gained most attention, both levels and their interaction are important: *shaping* and *operating* the innovation ecosystem" (Schaffers, Komninos, Pallot, & Trousse, 2011: 444).

As an innovation ecosystem Living Labs are themselves innovative, because they seek to embrace "poker-style" uncertainty. Looking at the myriad of methodologies presented in figure 1, it seems that the methods used to operate and shape the ecosystem are "alive" as well;

methods are not fixed and depend on manners of interactions between actors, goals and on local suitability. In terms of opening up "innovation" to bottom-up processes and practices (and "lateral" innovation), Living Labs experiment in daily life, in the habitus of people.

This serves several purposes. In his research about how pervasive mobile media configure spaces, Richard Coyne characterises "the everyday" in terms of repetitions; "the medium of repetition is the message of the everyday" (Coyne, 2010: 82). He describes how designers "sometimes deliberately present everyday phenomena as if strange" because "innovation often is born of looking at things in afresh and unusual way" (Ibid, p. 89). The inclusion of users in their daily life context seems to invert this idea – inserting new technologies in a known setting in order to trace new ideas. Or, by inserting ordinary people in design processes that are unknown to them, new and unforeseen conclusions are reached. Living Labs thus seek to force a meeting between people in their habitus and new technologies or processes of ICT development to gain insight in innovative ideas, uses and to – at the same time – transform people. In the three case studies, this transformation was set to make them "smarter".[8]

Whereas the Living Lab ecosystem can be said to seek to combine different flows of innovation, the cases showed that top down facilitation and shaping dominated the Living Lab-projects. Also, the cases conveyed that due to a tight – though often ambiguous – configuration of "the user" in each case, there was less room and recognition for users to contribute innovative ideas and uses of ICTs to the innovation process. Users could be observed to improvise, but these improvisations were not the central concern in the projects. User innovativeness was thus resisted on the project level. The central point of interest (in especially the second and third case study) seemed to be the realization of "the lab" in "the living setting" in order to intervene and alter the (experiences in and perceptions about the) habitus of users. To return to the idea of open innovation as poker, the importance of user inclusion was underlined, but the "uncertain" innovativeness of users in the Living Lab-setting was granted less agency; user innovativeness was not recognised in practice.

In chapter 2, I connected user innovativeness to improvisation and argued that improvisation should not only be perceived in terms of a "makeshift" solution to a sudden obstacle. Improvisation should also be seen in the light of a "virtuose" play with structures, and a play with repetitions; of creatively using existing patterns (of use, practice) and adapting these to situations. The improvisation practices in the cases highlighted how these practices consist of different dimensions. These included collective creative practices (SensorLab), the attribution of alternative uses and meanings, the creation of new "user logic" to engage with technological artefacts (Climate street) and of navigating within certain set boundaries (the SMARTiP team). In terms of the shaping and facilitation of user innovativeness, it is especially this latter dimension of improvisation that seemed to shape perceptions of what it meant to

8 Coyne discusses pervasive technologies, which are also the subject of the three case studies. There are certain repetitions in daily life performances – and in a way, it would seem that pervasive technologies can be inconspicuously integrated into the fabric of daily life. However, the technologies developed in the three cases seek to, while making use of pervasive ubiquitous media, create an awareness in users.

"be innovative": to respond adequately to perceived challenges, to align all actors and to reach the project goals of the Living Lab-project.

While the other dimensions of improvisation were also observed, these were not the main focus in these Living Lab-projects. In short, in line with Pallot and colleagues' call to present *a* Living Lab-landscape, current projects are still defining what the Living Lab-concept or ecosystem consists of exactly. This takes the shape of an improvisation process at the level of the consortium of partners. Channelling the improvisation practices of users - who are currently primarily enrolled in methodologies and not as part of the consortium of partners – into ICT products and services requires opening up innovation processes to uncertainty.

This calls for hybrid top down/bottom-up innovation practices where improvisation becomes the subject of study; where sociomaterial interactions and practices take centre stage. However, as long as discussions centre on dichotomies of top down versus bottom up and of control of experimentation versus the uncontrollability of daily life, it seems that processes of innovation and innovativeness are kept separately as well: user innovativeness is not translated into new ICTs. User ideas and practices may be positioned as a kind of situated expertise, but the insights gleaned from this expertise are not always perceived to be translatable into "concrete" new products and services. Combining top down project structures and structuration with daily life practices seems to lead to insights that only fit the project structures and mangle out unforeseen ideas and practices.

7.5 Six suggestions

Be it chess or poker, games start with people who are willing to play. In Living Laboratories, prospective technology users are invited to join the game of open innovation. At the same time, these users are part of the gameplay itself; their inclusion is part of the rulebook. Their actions, ideas and contributions may well be, coupled with the fact that Living Lab-practices are set in a daily life setting, "the uncertain" elements that characterise open innovation in Living Labs. Still, their inclusion is regarded with some ambivalence exactly because of the uncertain outcomes. It is not clear in advance what their contributions will bring to the innovation process.

This final section consists of six suggestions for Living Lab-practitioners who want to embrace this uncertainty. In this dissertation, I articulated how in three Living Lab-practices user innovativeness was constructed. In other words, I viewed how users were configured as users who become part of innovation practices, be it as designers, testers or co-creators and what kind of user practices were facilitated and recognised as "innovative". Based on the conclusions that were drawn from the case studies, I present my suggestions in this final section. Broadly outlined, these suggestions call for reflection about and the emancipation of end users through an involvement strategy that embraces collective improvisation as an opportunity to innovate.

7.5.1 Reflect on what the inclusion of the daily life setting and practices offer the innovation process

Living Labs aim to embrace the uncontrollable dynamics in daily life settings. First and

foremost, this requires a reflection about what these dynamics in the daily life setting offer the innovation process. In the three case studies, these settings worked as sites for inspiration, exploration and as a testing ground. Yet while these settings functioned as "locations" for Living Lab-practices, the settings were to – at the same time - become "transformed" through the Living Lab-projects. Daily life settings and the dynamics that are part of and shape these settings are thus not only the site for the Living Lab, but also part of the "object" that needs to be transformed.

What makes the situating of the lab in the living environment unique is the fact that this environment is populated by "ordinary people". What the case studies - as well as the challenges explicated in Living Lab-literature – suggest, is however that the inclusion of these ordinary people is more often than not referred to as a challenge. "Ordinary people" are – as I stated at the beginning of section 7.5 - invited to play the game of open innovation and at the same time part of the gameplay. Similar to how daily life settings are positioned, the people who populate daily life settings that are framed as the Living Lab are to *contribute* to innovation practices while they also need to *transform* in roles ranging from "users", "designers" to "smart citizens".

By reflecting on the configuration of the daily life setting as a "laboratory setting" it becomes clear what this environment is to offer also in terms of how this configuration frames "the user" in this setting. From the point of view of Living Lab-practitioners this may seem an obvious suggestion, as specific settings are chosen precisely because of what these would offer in terms of insights (e.g. pollutants in a park, information about energy consumption in work spaces or insight in social cohesion in neighbourhoods). However, reflecting on the configuration of the daily life setting also allows reflecting on what is expected of the people in this setting. Making the pre-conceived role of "users" in this setting more explicit in turn allows a review of the goals of user involvement. Are users in this daily life setting positioned as innovators, is there space for uncertainty, or are users "locked in" another role?

7.5.2 Reflect on the role of ordinary people as "ICT users"

The diversity or multiplicity of Living Lab-goals, practices and user configurations within and across Living Lab-practices is not somewhat unfortunate, as some argue[9], but instead calls for more reflection about the role of ordinary people in Living Labs. I suggest that in practice, more attention should first of all be paid to how practitioners position the people who are to be included in ICT development practices as *users* of technologies – let alone designers, testers or co-creators - in project proposals, in discussions and in practices of user inclusion. Configuring people as "users" creates certain representations: people become framed in terms of their technology use. This leads to certain expectations about what their inclusion in Living Lab-practices will grant insights in. Are people included because they are (prospective) users of a technological artefact, or because they might have insightful ideas about their

9 In chapter 3, I referred to an evaluative report of the European Commission (2009b) about the European Network of Living Labs. In this report, the large variety of Living Lab-goals, practices and definitions is noted as in need of harmonisation.

daily life surroundings? Second of all, by reflecting on how in practice users are furthermore configured in certain roles (designers, testers, co-creators) and what this configuration means in terms of expectations (what are they expected to contribute) and in practices (methods of user inclusion) will help elicit how expectations and methods meet in practice and what this means for the innovation process.

7.5.3 Enrol users as partners in the public-private-civic partnership

The innovation practices that characterise Living Labs seek discoveries that are local and universal, social and technological. These innovation practices require transformations of firstly daily life into a laboratory that is somewhat controlled in order to be able to generate insights and secondly of people into "users". Especially the latter transformation should not only benefit the innovation practice in Living Labs, but also benefit the users in question. Overall, the innovation practices in these cases primarily involved users in their methods instead of as "equal partners" in public-private-civic or public-private-people partnerships. When users were treated as partners in practice (e.g. when they were treated as "experts" of their neighbourhoods in the focus group sessions in the SMARTiP project), they were granted more agency and could more readily contribute their specific knowledge to the innovation process. Positioning users as partners grants more agency to user innovativeness in Living Lab-practices

Without "users" there is no Living Lab-consortium. Naturally, the same holds true for a conception of "the living lab" in a daily life setting; without framing a certain setting as "a lab", there is no laboratory. Currently user inclusion is noted as a challenge. One of the reasons for this is that while users are expected to act as innovators or to be innovative (on paper) they are often configured – in practice – as passive users. Although they are to become enrolled in projects as partners, they are thus often strictly entrenched in their primary role as "users".

The issue of motivating people to become part of Living Lab-projects was a topic in two of the three case studies. I argue that partially due to the fact that people are configured as users instead of as partners in these Living Lab-practices, it becomes more difficult to enrol people. For example, as one of the entrepreneurs in the second case study (chapter 5) complained, she did not feel taken serious in the entire process – while she did feel that she "invested" in the project. The configuration of the entrepreneur as "passive tester" hampered her involvement. Drawing in users by positioning them as partners – and ensuring that they are included as partners who can influence design decisions throughout the Living Lab-project – is an important step in this process.

7.5.4 Open up innovation practices to improvisation

Apart from a careful reflection about the configuration of "the user" in Living Lab-practices and the realization that these users should be involved as partners, I suggest to further embrace user practices in daily life dynamics by opening up innovation practices to improvisation. In my analyses I drew attention to improvisations in Living Lab-practices to focus on unexpected or unforeseen interactions in these practices. I have argued that improvisation offers a conceptual tool to analyse the connection between creativity and innovation.

These improvisations took the shape of user attributions of meanings and uses to Living Lab-projects as such and to the involved technological artefacts, that were based on users' situated knowledge. These improvisations were both makeshift and virtuose. This means that improvisations were based on users' limited knowledge of the technological artefacts coupled with an intimate knowledge of the daily life setting that formed the context of the Living Lab (e.g. the Climate street and SMARTiP). Or alternatively, that knowledge about for instance materials was applied in a setting that was less known (e.g. the SensorLab).

Improvising implies doing something unforeseen, something that is uncertain. Becoming sensitive to user improvisations is, as I have argued, essential to start to recognise user innovativeness. Stimulating user inclusion by enrolling users as partners in Living Labs is therefore a first step. Subsequently allowing agency for improvisation practices of users in the Living Lab is a second step.

In this thesis I have argued that in order to "catch" innovative ideas and practices it is important to not only concentrate on (pre-established) deliverables, but also focus on "unexpected" and "unforeseen" ideas and practices. The challenge then becomes integrating pre-set goals with improvised ideas and practices in innovative products and services. I argue that by reflecting on user-technology practices in the Living Lab-setting in terms of improvisation (and a dance of agency) it becomes possible to articulate where accommodations and resistances occur. These may then inform adaptations of ideas, processes and products.

7.5.5 Recognise improvisations in the daily life context as situated expertise

Furthermore, by framing improvisations as situated expertise these improvisations are granted agency to influence innovation practices. Enrolling users as partners in the Living Lab-consortium in practice allows users the agency to contribute their ideas, insights and practices. Partially bound to the daily life setting that facilitates and informs their experiences and actions, these users can contribute their situated knowledge about e.g. technology use in a certain setting. However, without treating this knowledge as a kind of expertise, the sharing of this knowledge becomes more of a promissory practice rather than one that can inform actual new insights. By treating the shared knowledge as a kind of expertise, the Living Lab-consortium can benefit from these insights and translate these into new practices or new ICTs. A good example of this was the selective inclusion of citizens during focus group sessions in SMARTiP; citizens were perhaps only included when this was deemed "useful", the input from the citizens was treated as expert knowledge. Their feedback had immediate effect on the designed technological artefacts.

Recognising the situated expertise of users allows embracing the richness of daily life dynamics, which is one of the promises of Living Labs. In practice, however, it is clear that only by limiting the influence of these daily life dynamics, "a" Living Lab can be realized. Living Labs have clear (project) goals, be these to educate and "smarten up" people or to develop new technological artefact. To achieve these goals, measures are taken to "mangle out" the unforeseen. And whereas goals may themselves change as daily life dynamics and user involvement unfold, these still steer innovation practices. By granting agency to the unforeseen in the shape of situated expertise of users, innovation practices are kept open to

improvisation, and open to daily life dynamics.

7.5.6 Perceive Living Lab-practices as practices that facilitate and govern open innovation through collective improvisation

Finally I suggest that opening up innovation processes to daily life dynamics and the innovativeness of users in this innovation space requires rethinking "openness"; to perceive openness not as a challenge, but as an opportunity. I fully realize that Living Lab-literature already argues for this openness and that this suggestion may therefore seem redundant. However, there is a difference between proposing practices of open innovation, and actual open innovation in practice (as the literature readily suggests as well). In this dissertation, I have argued that the concept of improvisation helps to catch and articulate the "generative dance of agency" that I have observed in the three cases. By embracing "the unforeseen" and continuously working to recognise how users, technological artefacts and daily life settings interact by drawing attention to how these engage in a dance of agency, Living Lab-practitioners and projects can more fully benefit from opening up innovation practices. When, instead, improvisations are only characterised as *obstacles* to innovation, Living Lab-practitioners and practices counter their own adage. Recognizing the opportunities of improvisation requires all Living Lab-partners to collaborate in governing open innovation through collective improvisation. This can be realized by explicitly drawing out how people "make do" and "let go" and perceiving the observation and analysis of these dynamics as one of the innovative products of the Living Lab-endeavour as well, instead of focusing "only" on developing new ICT products and services.

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Co-design session SMARTiP (students), Ghent: 14-03-2012
Focus group session SMARTiP (citizens), Ghent: 27-03-2012
Focus group session SMARTiP (citizens), Ghent: 15-10-2012
Group discussions of the 5 student groups during the SensorLab workshop: 22-9-2010.
Team meeting SMARTiP, Brussels: 27-01-2012
Team meeting SMARTiP, Brussels: 29-02-2012
Team meeting SMARTiP, Brussels: 13-03-2012
Team meeting SMARTiP, Ghent: 8-06-2012
Team meeting SMARTiP, Ghent: 19-09-2012
The Climate street "open day", Utrechtsestraat, Amsterdam: 24-9-2011

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Samenvatting in het Nederlands

Gebruikersinnovativiteit in Living Laboratories – Alledaagse gebruikersimprovisaties met ICTs als een bron van innovatie.

Succesvol innoveren in de Informatie en Communicatie Technologie (ICT) sector is niet alleen afhankelijk van het produceren van steeds meer technologisch innovatieve producten en diensten. Innovatie valt of staat met het bereiken van een markt, een publiek en een eindgebruiker. Teneinde deze gebruiker beter te bereiken, wordt deze gebruiker soms ook betrokken bij technologie ontwikkelingsprocessen. In zogenaamde "Living Labs", wordt getracht samen met de eindgebruiker tot nieuwe innovatieve inzichten te komen, om zo sneller en directer in te kunnen spelen op wat "er leeft" in de markt.

Onder de noemer van sociale innovatie faciliteren Living Labs kennisdeling via publiek-privaat-civiele samenwerkingen. Daarnaast wordt het Living Lab ook beschouwd als een technologische ontwikkelingsmethodiek. Deze wordt gekenmerkt door (1) het centraal stellen van de eindgebruiker en (2) het situeren van technologische ontwikkelprocessen in de dagelijkse "werkelijkheid" of leefomgeving van deze gebruiker. Het Living Lab is derhalve een organisatie die samenwerking faciliteert, een methodiek en een daadwerkelijk laboratorium – gesitueerd in de dagelijkse context.

De beloftes van Living Labs zijn enerzijds economisch, anderzijds sociaal. Door partijen samen te laten werken (in processen die worden beschreven als "open innovatie") en door het centraal stellen van de eindgebruiker wordt gezocht naar het optimaliseren van technologische ontwikkelprocessen. Immers, door aansluiting te vinden bij gebruikers alvorens "de markt" te betreden met een product kan een nieuwe ontwikkeling "in de realiteit" van het Living Lab worden getest. Daarnaast suggereert het betrekken van de eindgebruiker dat deze meer invloed kan uitoefenen op technologische ontwikkelprocessen; door de eindgebruiker plaats te laten nemen aan de ontwikkelaarstafel kunnen ontwikkelprocessen worden gedemocratiseerd. Dit is belangrijk omdat eindgebruikers innovatieve ideeën hebben; er bestaat iets als de "wijsheid van de massa" (wisdom of the crowds) waar ontwikkelaars graag van leren.

In dit proefschrift wordt onderzocht op wat voor manieren vorm wordt gegeven aan de innovativiteit van eindgebruikers in verschillende Living Lab-projecten. In hoofdstuk 1 wordt het fenomeen "Living Lab" geïntroduceerd, waarna de volgende twee onderzoeksvragen worden geformuleerd: *Hoe worden processen van gebruikersinnovativeit gefaciliteerd en gevormd in Living Lab-praktijken en wat voor innovatiepraktijken vinden plaats in Living Labs?*

Het beantwoorden van deze vragen vergt allereerst een theoretische positionering. Wat wordt bijvoorbeeld in dit proefschrift beschouwd als "innovatief"? In hoofdstuk 2 wordt het theoretisch raamwerk van het proefschrift uiteengezet. Na een korte bespiegeling over de contradicties welke besloten lijken te liggen in de term "Living Lab" – in het klassieke, traditionele laboratorium wordt juist de werkelijkheid "buitengesloten" om tot universele inzichten te kunnen komen – wordt ingegaan op de sociale constructie van feiten; uiteindelijk wordt na menselijke deliberatie en overeenstemming besloten iets tot een feit te benoemen.

De vraag wordt gesteld hoe in een Living Lab wordt omgegaan met deze deliberatie. Hoe beïnvloedt de dagelijkse context de uitkomsten van het lab; hoe wordt betekenis gegevens aan dat wat er gebeurt?

Om innovativiteit te positioneren in inzichten uit relevante vakgebieden, gaat dit hoofdstuk verder in op hoe in Science and Technology Studies (STS), Innovatiewetenschappen (IS) en Management Studies innovativeit wordt beschouwd. Iets is innovatief als het vanuit een bepaald perspectief nieuw is. Een technologie hoeft bijvoorbeeld niet nieuw te zijn, maar wordt als innovatief beschouwd als deze voor het eerst wordt geïmplementeerd in bijvoorbeeld een bedrijf. Toch wordt de term "innovatief" vaak verbonden met "een nieuwe uitvinding"; innoveren betekent vaak iets nieuws creëren. In de context van Living Labs wordt de innovativiteit van eindgebruikers in verband gebracht met het opdoen van nieuwe, vooral onverwachte ideeën (vanuit een andere bron, namelijk de eindgebruiker, in de dagelijkse context). Het uitgangspunt binnen Living Labs is dat de dagelijkse werkelijkheid niet te controleren valt en dat de handelingen van eindgebruikers in de realiteit tot onverwachte ideeën zullen leiden. Met andere woorden, innovativiteit wordt in verband gebracht met het onverwachte.

In het laboratorium van het Living Lab staat de dynamiek tussen gebruikers en technologieën centraal. En dan vooral de onverwachte dynamiek, aangezien deze tot innovatieve inzichten zal leiden. Om de dynamiek van gebruikersinnovativeit te vangen, worden verschillende methodes gehanteerd. In dit proefschrift worden deze methodes benaderd vanuit een conceptualisering van de dynamische interactie tussen eindgebruiker en technologie in de dagelijkse setting als improvisatie. Improvisatie wordt vaak in verband gebracht met creatie, en wordt hier neergezet als het proces waaruit innovatie voortkomt.

Improviseren en improvisatie worden onder andere bestudeerd in Management Studies en Muziekwetenschappen; hoe door confrontatie met de werkelijkheid of met elkaar tot iets nieuws wordt gekomen (een nieuwe routine in een bedrijf, of samenspel tijdens een jazz jam sessie). Binnen STS en IS is het concept minder gangbaar. In het conceptuele raamwerk wordt improvisatie gepositioneerd als een verrijking van een aantal specifieke STS-theorieën en opvattingen. Improvisatie wordt ingezet om te articuleren hoe in Living Labs technologieën-in-ontwikkeling vorm krijgen in de praktijk. Eindgebruikers krijgen immers een bepaalde vorm van agency (= macht/ruimte tot handelen) toebedeeld in Living Labs. STS heeft eerder laten zien dat technologische artefacten ook agency hebben. Deze komt tot uiting in het handelen met een technologie. Tegelijkertijd "configureert" of vormt deze agency ook het handelen met een technologie.

Vanuit een performatief perspectief beschouwt de theoreticus Andrew Pickering deze interactie als een "dans van agency" waarbinnen agencies elkaar weren en accommoderen (of wegdrukken en toelaten). Gedurende deze dans, worden agencies "gemangeld"; door wederzijdse druk (van mens en materiaal/technologie) worden deze "door de mangel gehaald" en vormt zich een nieuw artefact. In deze dissertatie worden Living Lab-praktijken beschouwd vanuit het perspectief van de "dans van agency", waarbij door het gebruik van het concept "improvisatie" de nadruk komt te liggen op "het onvoorziene" in de dynamiek van deze dans; hoe de centraal staande eindgebruiker de ruimte krijgt te improviseren met

technologieën en zo bijdraagt aan het innovatieproces. Natuurlijk is het uiteindelijk het Living Lab dat bepaalt wanneer de bijdrage van de improviserende eindgebruiker als innovatief kan worden bestempeld. Op dat moment wordt de bijdrage van de eindgebruiker (h)erkend als een vorm van expertise, die ik "gesitueerde expertise" heb genoemd; kennis die voortkomt en/of tot uiting komt in de dagelijkse context.

Na het uiteenzetten van het theoretische raamwerk, besluit hoofdstuk 2 met de presentatie van een viertal deelvragen en een beschouwing van de gehanteerde onderzoeksmethodologie. De deelvragen behelzen de volgende vragen: 1) hoe wordt de ruimte tot handelen van eindgebruikers gevormd in Living Lab-praktijken; 2) hoe improviseren eindgebruikers met technologische artefacten in Living Lab-praktijken; 3) worden deze improvisaties (h)erkend en gefaciliteerd als situeerde expertise en 4) worden de innovatiepraktijken van gebruikers (h)erkend als innovatief door Living Lab-initiatiefnemers?

De eerste deelvraag richt zich op de ruimte welke wordt gegeven aan de eindgebruiker in de dagelijkse context in Living Lab-praktijken. Deze vraag gaat derhalve in op de twee centrale beloftes van Living Labs: dat zij de eindgebruiker en het dagelijks leven centraal stellen. Vervolgens bevraagt deelvraag 2 hoe eindgebruikers improviseren in de dagelijkse setting in Living Lab-praktijken. Dit geeft een beeld van hoe Living Labs improvisaties en innovativiteit faciliteren. De laatste twee deelvragen leggen vervolgens een verband tussen de acties en improvisaties van eindgebruikers en hoe de overige partners in het Living Lab deze beschouwen en vertalen in "innovatieve" producten. Uiteindelijk geeft dit inzicht in hoe innovativiteit wordt geconstrueerd in Living Lab-praktijken.

Bovenstaande vragen worden beantwoord aan de hand van drie verschillende casussen om interacties tussen eindgebruikers en technologische artefacten binnen Living Lab-praktijken te bestuderen. Er werd gekozen voor een kwalitatieve onderzoeksmethodiek. Deze bestond uit het verrichten van tekstanalyses (documentatie, primair en secundair brononderzoek) en het (waar mogelijk) doen van observaties, het interviewen van betrokkenen en het analyseren van gesprekken, handelingen en projectbijeenkomsten.

Deze casussen werden geselecteerd uitgaande van een eerste, exploratieve, analyse van 129 Living Labs verbonden aan het Europese Netwerk van Living Labs (ENoLL). In hoofdstuk 3 wordt deze analyse gepresenteerd. Door in kaart te brengen hoe Living Labs hun gebruikers, doelen, thema's en methodes definiëren, wordt het mogelijk een scherper beeld van het heterogene Living Lab-landschap te krijgen. Wat deze analyse illustreert, is dat er veel verschillende manieren zijn waarop eindgebruikers worden betrokken in de praktijk en dat eindgebruikers verschillende rollen worden toebedeeld in het technologisch ontwikkelproces. Om in deze rijkheid onderzoek te doen naar gebruikersinnovativiteit, besluit hoofdstuk 3 om de selectie van de casussen te baseren op drie verschillende manieren waarop de eindgebruiker bij Living Labs kunnen worden betrokken. Dit zijn de rollen van gebruikers als ontwerpers, als testers en als co-creators.

Deze rollen suggereren verschillende vormen van betrokkenheid van eindgebruikers in technologische ontwikkelprocessen. Immers, iets ontwerpen behelst andere activiteiten dan iets testen. De geselecteerde casussen richten zich op hoe in de praktijk deze rollen vorm krijgen. Een verbindende factor tussen de casussen is één overkoepelend thema: "slimme"

technologie. Deze technologieën kunnen worden ingebed in bestaande infrastructuren en maken het mogelijk om door middel van actuatoren en sensoren direct inzicht te krijgen in bijvoorbeeld energieverbruik (via slimme meters). Een van de beloftes van slimme technologieën is dat via het verzamelen en communiceren van data de levensstandaard kan worden verbeterd; door inzicht in bijvoorbeeld energieverbruik leert men beter om te gaan met energie. In de eerste casus worden slimme sensoren gebruikt door middelbare school scholieren om meetobjecten te bouwen die aangeven hoe vervuild een stadspark in Amsterdam is. In de tweede casus testen ondernemers duurzame technologieën, zoals een slimme meter, slimme stekkers en een energiedisplay om zo inzicht te krijgen in energieverbruik en gedrag aan te passen om minder energie te verbruiken. In de laatste casus worden burgers betrokken bij de ontwikkeling van een buurtspel. Tijdens dit buurtspel maken burgers gebruik van onder andere RFID-kaarten, smartphones, en een online platform om tegen elkaar te strijden. Uiteindelijk is het de bedoeling dat door het inzetten van "slimme" technologieën, burgers betrokken raken bij de digitale beeldvorming over en betrokkenheid met de buurt; zij zullen hierdoor "slimmer" worden. De "slimme belofte" heeft derhalve niet alleen betrekking op de te ontwikkelen technologische artefacten. Door het betrekken van scholieren, ondernemers en burgers wordt ook gepoogd de eindgebruiker en diens omgeving "slimmer" te maken. Hier wordt in het concluderend hoofdstuk op teruggekomen.

In hoofdstuk 4 wordt geanalyseerd hoe scholieren "ontwerpers voor een dag" worden tijdens een SensorLab workshop. Deze workshop, georganiseerd in het kader van het sensorwijsheid programma van Waag Society (instituut voor kunst, wetenschap en technologie), vond plaats tijdens het multimediale festival PICNIC in september 2010. Het doel van de workshop was scholieren slimme, opvallende prototypes te laten bouwen waarmee zij (1) vervuiling konden meten op de locatie en (2) bezoekers van het park konden attenderen op deze vervuiling door aandacht te trekken met hun prototypes.

Na een beschouwing van de sociomateriële setting van het SensorLab, richt de analyse zich op hoe de scholieren vormgeven aan hun prototypes. Duidelijk wordt dat zij improviseren door gebruik te maken van hun eigen kennis, materialen en machines, de kennis die wordt aangereikt door de aanwezige sensor/ontwerp experts en door de opdracht zelf. De analyse van hun collectieve improvisatie laat zien hoe zij vorm gaven aan de "dans van agency" en hoe zij hun "gesitueerde expertise" inzetten tijdens het bouwen en testen van hun prototypes. Deze expertise wordt gevormd door de door de scholieren ten toon gespreide kennis en hoe de overige actoren deze kennis omarmen; "dagelijkse kennis" wordt beschouwd als expertise.

Met betrekking tot gebruikersinnovativiteit laat deze casus de complexiteit zien van wat als "innovatief" kan worden beschouwd. Hoe de scholieren handelen en hoe hun gesitueerde expertise de ruimte krijgt, karakteriseert hun uitvoering van de ontwerpersrol. De actoren in het SensorLab werkten samen – in de mangel van de samenwerking kwam de gebruikersinnovativiteit naar voren. Wat dit hoofdstuk verder duidelijk maakt, is dat de scholieren niet alleen werden behandeld als ontwerpers, maar ook als leerlingen en als testers. De scholieren kwamen naar de workshop om te leren over sensor technologie en ontwerppraktijken en testten samen een workshopformat; het SensorLab zelf. Dit maakte het SensorLab tot een dubbele leerervaring, niet alleen voor de scholieren maar ook voor

de overige actoren. Dit is belangrijk om in ogenschouw te nemen bij de analyse van "de innovativiteit" van de scholieren. Zij ontwierpen wellicht nieuwe en onvoorziene prototypes, maar uiteindelijk was het testen van het format belangrijker – om zo te testen hoe de verschillende partijen samen konden werken.

In hoofdstuk 5 wordt gekeken naar hoe ondernemers in een populaire winkelstraat in Amsterdam hun straat trachtten duurzamer te maken door mee te doen aan het Klimaatstraat project. Dit project, geïnitieerd door de ondernemers zelf, werd begeleid en gestuurd door Amsterdam Smart City (een organisatie die deel uitmaakt van Amsterdam Living Lab). Het project omvatte 2 jaar (2009-2011). De analyse reconstrueert het project door documentanalyse, observaties en interviews met 7 betrokken ondernemers en 2 project actoren.

Eerst wordt geanalyseerd hoe de ondernemers betrokken raakten bij het project, waarna dieper wordt ingegaan op de betekenissen welke aan het project en de verschillende duurzame technologieën werden toebedeeld door de ondernemers. Zo worden de doelen en verwachtingen in kaart gebracht. Hieruit kan worden geconcludeerd dat de ondernemers werden geconfigureerd als "pioniers" (door deel te nemen aan het project) en als testers (van nieuwe technologieën). De ondernemers zagen zichzelf anders; sommigen waren enthousiast over het concept van de duurzame straat en vonden dat het project lang niet ver genoeg ging, terwijl anderen zich minder enthousiast uitlieten over hun betrokkenheid. Deze laatste ondernemers hadden verwacht dat er meer voor hun ondernemingen gedaan zou worden. Zij vonden dat zij in hun dagelijkse werkzaamheden al druk genoeg waren en zaten niet te wachten op meer werk. Deze ambiguïteit in de houding van ondernemers maakte dat de projectleiders soms moeite hadden met het samenbrengen van de ondernemers. Ook was door onduidelijkheid over eigenaarschap van het project en de technologieën niet altijd duidelijk voor de ondernemers wat er precies van hen werd verwacht.

De technologische artefacten werden op verschillende manieren gebruikt door de ondernemers. Zij verwachtten dat deze hun tijd, energie en geld zouden schelen. Daarnaast sprak men de verwachting uit dat het project an sich positieve PR zou genereren voor de winkelstraat. Terwijl aan sommige van deze verwachtingen werd voldaan, hadden de ondernemers gemengde gevoelens over de technologieën en het project. De ontevredenheid van sommige ondernemers werd gevoed door vertragingen aan de herinrichting van de openbare ruimte, onduidelijke communicatie over de technologieën, het feit dat ondanks de beste intenties de ondernemers niet al hun aandacht aan het project konden geven en het gevoel dat hun ideeën en feedback niet altijd serieus werden genomen.

De casus toont de complexiteit van het trachten innovatie van onder-naar-boven ("bottom up") te stimuleren vanuit een van boven-naar-beneden aanpak ("top down"). Het realiseren van een test bed-omgeving vergde het overwinnen van "lokale obstakels". Gedurende de implementatie van het project werden de praktijken van de ondernemers "uit het project gemangeld"; de dagelijkse context werd uiteindelijk beschouwd als een belemmering voor het project. In deze context werd ook het onvoorziene gebruik van de technologieën niet (h)erkend als "innovatief". Het onvoorziene gebruik werd derhalve ook niet verwerkt in het veranderen van de technologieën of het aanpassen van het concept van de duurzame straat

tijdens het project.

De ondernemers kregen een beperkte rol als innovator. Hierdoor voelden zij zich niet serieus genomen. Uiteindelijk werden de ondernemers op een dergelijke manier geconfigureerd dat voorbij werd gegaan aan hun ideeën en input. Het project zelf werd door Amsterdam Smart City wel gezien als innovatief. In de conclusie van het hoofdstuk wordt de suggestie gedaan dat Living Labs het betrekken van de dagelijkse werkelijkheid niet als een obstakel of uitdaging zouden moeten zien, maar deze als een kans zou kunnen positioneren. Door de ondernemers meer ruimte te geven, en meer ruimte voor improvisatie te laten, kunnen onverwachte ideeën opborrelen. Deze kunnen dan tot nieuwe inzichten leiden.

In hoofdstuk 6 ligt de focus op hoe in een Europees Living Lab-project, SMARTiP (Smart Metropolitan Areas Realized Through Innovation & People), burgers in de stad Gent werden betrokken bij de ontwikkeling van een buurtspel waarbij ICTs worden gebruikt om sociale cohesie in twee buurten te versterken. Binnen dit project (2010-2013) werkten verschillende publiek-private partijen samen, zoals de stad Gent, Alcatel-Lucent en onderzoeksinstituten iMinds, SMIT (Studies on Media, Information and Telecommunication, dat deel uitmaakt van onderzoeksinstituut iMinds) en de Vrije Universiteit Brussel.

Eerst wordt geanalyseerd hoe "burgers" worden geconfigureerd als co-creators in de SMARTiP projectbeschrijving. Hieruit volgt het beeld van "de burger" als enerzijds "slim" en "productief", en anderzijds als "dom" (want niet verbonden via digitale media), tegengehouden door "de digitale kloof" en als "passieve consument". Door betrokkenheid in het project en het (leren) gebruiken van ICTs kunnen burgers "slimmer" worden, waardoor de stad zelf ook een "smart city" kan worden.

Terwijl in de voorgaande hoofdstukken werd gekeken naar de betrokkenheid van eindgebruikers als ontwerpers en als testers, wordt hier de burger als co-creator betrokken tijdens het ontwikkeltraject. In het hoofdstuk wordt geanalyseerd op wat voor manieren dit plaatsvond tijdens het project en hoe de inbreng van eindgebruikers werd vertaald in een aantal technologische artefacten. Deze artefacten waren een online gameplatform, een "holle boom" waar burgers konden inloggen met een RFID-kaart om zo punten voor hun buurt te verzamelen, en een "mus" – een vogel, uitgerust met sensoren en LED-lampen – waar mensen ook punten mee konden verzamelen door naar de vogel te fluiten.

Burgers werden op verschillende manieren betrokken. Het project ging van start door middel van een "crowdsourcing" initiatief (in 2011); een online platform waarop Gentenaren antwoord konden geven op de vraag hoe ICTs Gent tot een leukere stad om te wonen zouden kunnen maken. Burgers konden ideeën uploaden, commentaar geven op elkaars ideeën en stemmen op het beste idee. Uiteindelijk werden na het initiatief de ideeën gegroepeerd door een expertgroep (waar o.a. betrokkenen van de gemeente en het project deel van uitmaakten). Het meest populaire idee vormde het uitgangspunt voor de te ontwikkelen ICTs, namelijk het opzetten van een overkoepelend online (diensten)platform voor de stad. Het project team vertaalde dit naar het opzetten van een online gameplatform (genaamd "Zwerm") om sociale cohesie te bevorderen.

Na een aantal co-design en focusgroep sessies met studenten en burgers, werd het idee voor de technologische artefacten aangepast. Zo vielen sommige "features" van het te

ontwikkelen gameplatform af. Tegelijkertijd werden de artefacten ook uitvoerig besproken tijdens team bijeenkomsten; waar eerst werd uitgegaan van een soort totempaal waarop mensen het buurtspel zouden kunnen spelen, werd uiteindelijk bepaald dat dit een "holle boom" zou worden en dat de boom zou worden vergezeld van een aantal mussen waar burgers naar konden fluiten om punten te scoren voor hun wijk.

Het spel werd eerst intern getest. Werknemers van SMIT speelden in 2 teams tegen elkaar. Zij konden meedoen aan verschillende "campagnes", waarbij ze telkens alleen en samen hun RFID-kaart konden scannen om punten te verzamelen. Ook konden zij online wensen plaatsen. Als een collega hun wens vervulde kon deze punten krijgen. De testresultaten werden meegenomen in het verdere ontwerp van de game. Daarnaast werden een aantal deelnemers geïnterviewd.

Burgerbetrokkenheid kreeg de vorm van een "trechter aanpak", waarbinnen verschillende burgers op verschillende momenten tijdens het ICT ontwikkelproces werden betrokken om bijvoorbeeld ideeën te genereren en om feedback te leveren. De configuratie van burgers als "slim" en tegelijkertijd "dom" bood het SMARTiP team de mogelijkheid om op verschillende manieren om te gaan met burgerbetrokkenheid. Door druk vanuit het project (zoals bijvoorbeeld tijdsdruk voor het opleveren van EU project resultaten zoals rapporten en ontwikkelde technologieën) werd uiteindelijk alle ambiguïteit uit de betrokkenheid van de burger "gemangeld".

In de conclusie van hoofdstuk 6 wordt beschreven hoe tijdens het ontwikkeltraject voornamelijk het Gentse SMARTiP team was dat improviseerde. Zij transformeerden de doelen, het realiseren van de project resultaten en grenzen van het project en vertaalden deze naar een aantal technologische artefacten, rekening houdend met onzekerheden (zoals of burgers het spel zouden gaan spelen). Burgers hadden ook innovatieve ideeën, maar omdat zij niet werden betrokken als partners in het co-creatieve proces kregen zij niet de ruimte grote inspraak te hebben. Ondanks het feit dat de ideeën van burgers het uitgangspunt vormden voor het spel, werden deze ideeën eerst vertaald door een team van experts. Daarnaast is er de vraag of via een online crowdsourcing initiatief de burgers die niet bereikt konden worden door de digitale kloof wel een mogelijkheid werd geboden deel te nemen. Het team improviseerde met de verschillende configuraties van "de burger"; de meer betrokken - en deels technisch onderlegde - burger werd uiteindelijk gefaciliteerd tijdens het ontwikkeltraject als gevolg van de druk van "het project". De betrokken burgers werden behandeld als experts.

In het concluderend hoofdstuk, hoofdstuk 7, worden de casussen met elkaar vergeleken, waarna wordt ingegaan op de onderzoeksvragen. Om de casussen met elkaar te vergelijken worden drie onderwerpen besproken: wat het betekent om eindgebruikers deel uit te laten maken van ICT ontwikkelprocessen in het Living Lab, wat het situeren van "het lab" in een "levende" dagelijkse omgeving inhoudt en hoe verschillende methodes om eindgebruikerbetrokkenheid te faciliteren de ruimte bieden om gebruikers uiting te laten geven aan gebruikersinnovativiteit. Daarnaast komen een aantal overkoepelende thema's aan bod.

Om antwoord te geven op de hoofdvragen, wordt eerst ingegaan op de vier deelvragen; hoe eindgebruikers agency krijgen in deze praktijken (deelvraag 1). Daarna

wordt geanalyseerd hoe, in de dagelijkse omgeving, eindgebruikers improviseren met nieuwe technologieen (deelvraag 2). Ten derde wordt beschouwd of deze improvisaties worden (h) erkend en gefaciliteerd als gesitueerde expertise door de Living Lab-actoren (deelvraag 3) en of de innovatiepraktijken van gebruikers worden (h)erkend als innovatief door Living Lab-initiatiefnemers (deelvraag 4). Hierna worden op basis van de antwoorden op deze vragen, conclusies getrokken over hoe processen van gebruikersinnovativiteit worden gevormd en gefaciliteerd in Living Lab-praktijken en wat voor innovatiepraktijken plaatsvinden in Living Labs. Als afsluitende paragraaf, worden – gebaseerd op deze drie casussen – 6 suggesties gepresenteerd om Living Lab-professionals inzicht te geven in hoe Living Lab-praktijken kunnen worden geoptimaliseerd door beter gebruik te maken van de innovativiteit van eindgebruikers.

1. De agency van eindgebruikers in Living Lab-praktijken

In theorie zijn Living Labs voorstanders van het idee om ICT ontwikkelprocessen te democratiseren, terwijl tegelijkertijd wordt gezocht naar marktsucces. Eindgebruikers worden expliciet betrokken om nieuwe, onverwachte ideeën op te doen en om in dagelijks gebruik nieuwe ICTs te valideren. Door deze betrokkenheid kan de eindgebruiker worden ingezet als een soort "expert van alledag".

Wanneer de casussen worden vergeleken, wordt duidelijk dat de betrokken eindgebruikers op verschillende manier worden geconfigureerd. Gebruikers worden op papier betrokken als ontwerpers, testers en co-creators. In de praktijk worden ze betrokken als ontwerpers, testers en leerlingen (SensorLab), als testers en pioniers (Klimaatstraat) en als co-creators, co-producenten, "domme" en "slimme" burgers, klankbord, critici en "makelaars" (SMARTiP). Dit schept een ambigu beeld van de rol van eindgebruikers in de verschillende projecten.

Wat de gebruikers verbindt, is dat zij allen worden geacht te "transformeren" door middel van 1) hun betrokkenheid in het Living Lab-project en 2) het gebruik van de (nieuwe) technologieën. Zij dienen kennis te vergaren (SensorLab), minder energie te verbruiken (Klimaatstraat) en een sterkere verbinding te voelen met hun buurtbewonders (SMARTiP).

Tegelijkertijd werd duidelijk dat terwijl de gebruikers werden betrokken via gebruikersgerichte methodes, zij vooral werden betrokken als "technologiegebruikers" en niet als partners in publiek-privaat-civiele samenwerkingsverbanden. Er is een kloof tussen activiteiten in het Living Lab en de vertaling van gebruikerspraktijken in concrete inzichten die bijdragen aan (verdere) technologie ontwikkeling. Eindgebruikers blijven hierdoor "steken" in hun activiteiten als meer passieve gebruiker van technologische artefacten. Dit heeft implicaties voor hoe de gebruikersinnovativiteit wordt gevormd. Eindgebruikers worden op een zekere afstand gehouden, terwijl de overkoepelende doelen van elk afzonderlijk Living Lab-project veelal gericht blijken te zijn op het realiseren van het Living Lab-project an sich.

2. De improvisaties van eindgebruikers in de dagelijkse omgeving

Het situeren van het laboratorium in een "levende omgeving" is één van de centrale aspecten van het Living Lab-fenomeen. In literatuur komt naar voren dat deze levende omgeving, de dagelijkse leefomgeving van de eindgebruiker, wordt gezien als oncontroleerbaar. Door het betrekken van deze oncontroleerbaarheid wordt sneller duidelijk of een technologie "werkt" in deze setting. De casussen tonen hoe Living Labs deze dagelijkse setting in de praktijk configureren; dat wil zeggen, hoe de oncontroleerbaarheid van het dagelijks leven zoveel mogelijk wordt ingebonden, om zo tot inzichten te kunnen leiden.

Dit komt tot uiting in de wens het dagelijks leven te transformeren via het Living Lab-project en via de te ontwikkelen technologische artefacten; de wereld moet "slimmer" worden via de projecten. De dagelijkse setting wordt getransformeerd tot een laboratorium, waarin experimenten kunnen leiden tot inzichten. Het onverwachte en oncontroleerbare moet dus op de een of andere manier "hanteerbaar" worden; met betrekking tot hoe eindgebruikers "onverwacht" handelen, of improviseren, betekent dit dat improvisaties zouden moeten worden (h)erkend om zo invloed te kunnen hebben op het (verdere) ontwikkelproces van nieuwe technologieën.

In de casussen werd beschouwd hoe de eindgebruikers improviseerden. Tijdens het SensorLab maakten de studenten gebruiken van de door de workshop aangereikte "ingrediënten" (de ontwerp opdracht, de aanwezige experts, de materialen en de omgeving van het park) om vorm te geven aan hun prototypes. Hun collectieve improvisatie werd "geaccommodeerd" en maakte deel uit van hun leerproces. Tegelijkertijd werden niet hun improvisaties erkend als innovatief, maar werd de innovativiteit van de workshop zelf benadrukt; de workshop welke improvisaties faciliteerde werd het innovatieve product.

In de Klimaatstraat improviseerden de ondernemers terwijl zij het project en de technologieën weerden en accommodeerden; zij koppelden hun eigen doelen en verwachtingen aan het project en de technologieën. Dit leidde tot onvoorzien gebruik van bijvoorbeeld het energiedisplay (als beveiligings technologie). Uiteindelijk werd duidelijk dat deze improvisaties niet werden (h)erkend als innovatief en niet werden betrokken bij de (door)ontwikkelingen van het concept van de Klimaatstraat of de betrokken technologieën.

Gedurende het SMARTiP project werden verschillende gebruikers op verschillende momenten tijdens technologieontwikkeling betrokken. De ideeën die werden verzameld tijdens het crowdsourcing initiatief vormden het startpunt voor de te ontwikkelen technologie. Tijdens de ontwikkeling werden de ideeën van burgers verzameld over de technologieën en over hun leefomgeving. Deze ideeën werden (h)erkend en meegenomen. Toch was improvisatie alleen zichtbaar op het "niveau" van het project team; zij gaven betekenis aan de ideeën en feedback van gebruikers; zij gaven vorm aan de te ontwikkelen technologie en zorgden dat het uiteindelijk concept aansloot bij de doelen van het overkoepelende Europese SMARTiP project.

3. Het faciliteren van improvisaties van technologiegebruikers als gesitueerde expertise

De aangesproken expertise van de eindgebruiker in deze dagelijkse setting is afhankelijk van de gehanteerde methodiek in de verschillende casussen. Waar de scholieren in het SensorLab

werden gefaciliteerd om zich te gedragen als experts - door deze te configureren als ontwerpers en door ruimte te geven aan hun beslissingen, ideeën en hun gebruik van de materialen in de sociomateriële setting - was dit compleet anders in de overige twee casussen. Ook al werden de ondernemers "pioniers" genoemd, hun activiteiten en ideeën werden niet meegenomen in de doorontwikkeling van de ICTs. Terwijl zij wel improviseerden (en zo bijvoorbeeld met nieuwe ideeën voor het gebruik van technologieën kwamen), kregen zij niet de ruimte om iets te veranderen aan de technologieën of het concept van de Klimaatstraat. In het geval van SMARTiP werden burgers benaderd als experts, maar niet direct geconfigureerd als "ideators" met betrekking tot het ontwikkelen van ICTs. Betrokkenheid vormde dan wel de kern van het grotere SMARTiP project en burgers werden actief aangespoord mee te denken over het buurtspel, uiteindelijk besloot het project team wat ontwikkeld zou worden.

4. Gebruikerinnovativiteit (h)erkend als innovatief door Living Lab-initiatiefnemers

De improvisaties van de betrokken eindgebruikers werden niet altijd (h)erkend als expertise. In plaats daarvan werden Living Lab-praktijken veelal verbonden met het doel om gebruikers "slimmer" te maken en het doel het ICT ontwikkelproces zelf te innoveren. Dit laatste punt is van groot belang om gebruikersinnovativiteit in Living Lab-praktijken te begrijpen. In hoofdstuk 1 werd aangegeven dat het concept van een Living Lab nog in flux is. Daarnaast is nog niet geheel duidelijk wat het betrekken van eindgebruikers exact biedt als het gaat om het ontwikkelen van meer innovatieve ICT producten en diensten. Het betrekken van eindgebruikers wordt zelfs kritisch bevraagd, terwijl tegelijkertijd de moeilijkheid van gebruikersbetrokkenheid en het situeren van experimenten in de dagelijkse context wordt gearticuleerd. Als een methode en als concept is het Living Lab zelf nog relatief innovatief.

Dit komt ook naar voren in de drie casussen. Het realiseren van publiek-privaat-civiele samenwerkingsverbanden en het daadwerkelijk opzetten van bijvoorbeeld een test bed in een dagelijkse omgeving vormen een uitdaging. Het realiseren van een Living Lab-project wordt gezien als zo innovatief, dat het opzetten van een lab in de dagelijkse setting bijna een brug te ver lijkt. Vertaald in theoretische concepten lijkt het zo dat terwijl improvisaties in deze dagelijkse setting plaatsvinden, deze niet altijd worden (h)erkend vanwege een veelheid aan uitdagingen – die tot uiting komen op bijvoorbeeld "het niveau" van het consortium. Het realiseren van publiek-privaat-civiele samenwerkingsverbanden behoeft improvisaties op het consortium niveau, voordat improvisaties *in* het Living Lab kunnen worden herkend; daarna kunnen deze worden geïncorporeerd in verdere ICT ontwikkelingen.

Conclusie: gebruikersinnovativiteit en innovatiepraktijken in Living Labs

Met betrekking tot de vraag hoe processen van gebruikersinnovativiteit worden gevormd en gefaciliteerd in Living Labs zijn aan de hand van 3 thema's de volgende conclusies getrokken. Ten eerste wordt duidelijk dat "het dagelijks leven" wordt gepositioneerd als een plek waar ontdekkingen worden gedaan, waar transformaties gebeuren (van de omgeving en van het gedrag van eindgebruikers) maar ook als een meer "neutrale" setting waar inzichten in technologie ontwikkeling en gebruik kunnen worden opgedaan. Deze neutrale setting wordt verkregen door het reduceren van de rijkheid van deze setting; onverwachte en

oncontroleerbare zaken worden onderdrukt of niet erkend als mogelijk innovatief. Het sociale aspect en de innovatieve rol van de eindgebruiker in deze setting worden in de casussen wel benadrukt, maar uiteindelijk wordt vooral "het fenomeen" van het Living Lab en de meer algemene bruikbaarheid van ICT producten en diensten getest en ontwikkeld in de projecten.

Ten tweede maken de casussen duidelijk dat eindgebruikers vooral worden gezien als dat: gebruikers. Zij worden niet betrokken als partners in publiek-privaat-civiele samenwerkingsverbanden. Dit betekent dat de "civiele partner" vooral wordt betrokken in de methodiek van het Living Lab. Dit heeft tot gevolg dat de democratiserende belofte van Living Lab voornamelijk wordt vertaald in het centraal stellen van gebruikers in ontwikkelprocessen. Een belangrijk sub-thema hierbij is dat eindgebruikers niet worden gepositioneerd als partners, omdat wordt waargenomen dat het erg moeilijk is om eindgebruikers te motiveren om mee te werken aan Living Lab-projecten. Om mensen te motiveren om mee te doen, werden verschillende stimulerende factoren in de projecten geïntroduceerd zoals een spel element, het winnen van een prijs, of het kunnen besparen van geld.

In deze Living Lab-projecten komt ten derde naar voren dat gebruikersinnovativiteit gevormd wordt door innovatiepraktijken die vanuit een boven-naar-beneden ("top down") perspectief zochten naar het faciliteren van beneden-naar-boven ("bottom up") innovatie. Dit kreeg vorm door het allereerst motiveren van eindgebruikers om deel te nemen aan de projecten. De doelen van het "slimmer" maken van de eindgebruiker middels ICT producten en diensten en via het betrekken van de eindgebruiker in het Living Lab-project, zorgden daarnaast voor een "framing" van de eindgebruiker als "nog niet slim". Dit maakte het wellicht minder aantrekkelijk voor eindgebruikers om mee te werken aan dergelijke projecten.

Met betrekking tot de vraag wat voor innovatiepraktijken plaatsvinden in Living Labs worden de volgende 3 conclusies getrokken. Ten eerste maken de casussen duidelijk dat de innovatiepraktijken in Living Labs zich richten op het betrekken van eindgebruikers in technologieprocessen met als doel het creëren van zowel technologische als sociale inzichten; niet alleen bij de ontwikkelaars (wat de technologie in de dagelijkse context doet) maar vooral ook bij de eindgebruikers (het versterken van het bewustzijn van eindgebruikers over bijvoorbeeld vervuiling, energieverbruik of social cohesie). De innovatiepraktijken zijn dus sociaal (vooral lokaal) en technologisch (vooral universeel) georiënteerd.

Ten tweede wordt duidelijk dat innovatiepraktijken zich richten op het betrekken van eindgebruikers als technologiegebruikers in plaats van als partners in het Living Lab. Dit uit zich in praktijken die gebruikersinnovativiteit trachten te faciliteren en expertise van gebruikers wel erkennen, maar deze niet altijd betrekken in de (door)ontwikkeling van ICT producten en diensten. Gebruikers worden geconfigureerd in bepaalde rollen die niet direct als innovatief worden beschouwd, maar welke passen binnen de vooropgestelde doelen van de Living Labs.

Dit wordt verbonden met de derde conclusie die getrokken wordt over de innovatiepraktijken in Living Labs. Door het trachten de beneden-naar-boven innovatiepraktijken van eindgebruikers van boven-naar-beneden te sturen of te controleren ontstaat uiteindelijk minder ruimte voor het erkennen van het "onverwachte". De innovatiepraktijken die plaatsvinden in deze Living Lab-projecten worden gekenmerkt door

de geobserveerde spanning tussen boven-naar-beneden en beneden-naar-boven innovatie. De suggestie wordt geopperd dat deze spanning zich uit in het proberen te controleren van de dagelijkse context binnen het Living Lab, terwijl juist één van de doelstellingen van Living Labs het ontdekken van "het onverwachte" in de dagelijkse context is. Door het aanhouden van "top down" project structuren in de dagelijkse context wordt "het onvoorziene" uit het innovatieproces "gemangeld"; de gesitueerde expertise van eindgebruikers kan wel worden (h)erkend, maar door een "top down" druk niet worden geimplementeerd. Op deze manier worden improvisaties in de dagelijkse context niet vertaald in nieuwe ICTs.

Zes suggesties voor het omarmen van onzekerheid in Living Lab-praktijken

Het omarmen van onverwachte inzichten in technologiegebruik vergt een open perspectief; het openstellen van ontwikkeltrajecten voor het onverwachte. Open innovatie expert Chesbrough noemt dit het benaderen van innovatie als een spelletje poker. Het omarmen van de improvisaties van eindgebruikers in Living Labs vergt ook het realiseren van een hybride vorm van innovatie, waarin boven-naar-beneden innovatie en beneden-naar-boven innovatie worden gecombineerd. Nu blijkt het combineren van boven-naar-beneden innovatie en beneden-naar-boven innovatie te leiden tot het in zoverre proberen te structureren wat er in "de living" gebeurt, dat sneller voorbij wordt gegaan aan wat inzichten in de interacties van eindgebruikers en technologieën in deze dagelijkse setting te bieden hebben. Juist het onverwachte wordt door een boven-naar-beneden perspectief uit de Living Lab-praktijk "gemangeld".

Gebaseerd om de inzichten verkregen in dit proefschrift, wordt hoofdstuk 7 afgesloten met een zestal "suggesties". Deze worden samengevat als:

Suggestie 1:	Reflecteer op wat de dagelijkse context en praktijken het innovatieproces bieden.
Suggestie 2:	Reflecteer op de rol van "gewone mensen" als "ICT gebruikers".
Suggestie 3:	Betrek ICT gebruikers als partners in publiek-privaat-civiele partnerships.
Suggestie 4:	Open innovatie praktijken voor improvisatie.
Suggestie 5:	(H)erken improvisaties in de dagelijkse context als gesitueerde expertise.
Suggestie 6:	Beschouw Living Lab-praktijken als open innovatie-praktijken welke door collectieve improvisatie worden gefaciliteerd en bestuurd.

What happens when the ideas of ordinary people become the starting point for the design of new ICTs? This PhD thesis aims to answer this question by investigating Living Laboratory practices. The guiding principle of Living Laboratories is that user-centered design situated in a daily life context instigates unexpected new ideas and uses of technologies, culminating in the development of more successful ICTs. Working from a Science and Technology Studies-perspective, the author focuses on how the dynamic relationship between user, context and technology is translated into new ICTs in Living Laboratories. The concept of improvisation is used to guide the analysis of end user innovativeness.

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