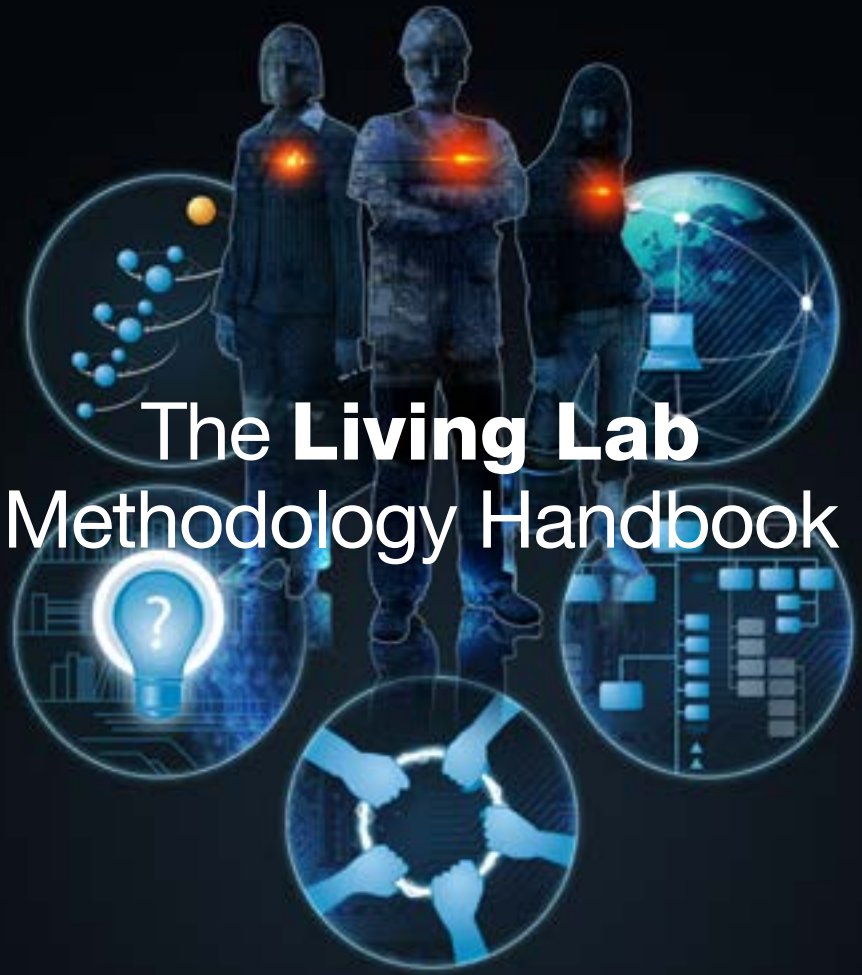


The **Living Lab** Methodology Handbook

This book is based on results from the collaboration within the project SmartIES and the process of using and evaluating the FormIT methodology in a Nordic cross-border pilot.

The goal has been to make the Living Lab Key Principles and the application of them more visible and easy to use.

SmartIES
Smart Individual Energy Savers

A Transnational Nordic Smart City Living Lab Pilot – SmartIES

BOTNIA LIVING LAB

Botnia Living Lab is an environment for end-user involvement in RDI projects focused on design and usage of IT (currently and in the future). In the SmartIES project Botnia Living Lab led the work-package focusing on the embodiment of the Key Principles and further development of FormIT. FormIT has been developed at Botnia Living Lab during the last ten years and is described in scientific journals, books and at international conferences (See bibliography for references).

Botnia Living Lab is hosted and managed by CDT at LTU. Our 6000 end-users are found across Sweden and they are engaged in various ways in the total process from need-finding and idea-generation, through concept-development and prototype/usability testing to service piloting. Since the start of our user panel in 2002 this has been one of our most important boosters in the creation of novel and valuable IT-services and products in several different domains: Energy and Environment, Smart Cities, Security, Mobile services etc.

Botnia Living Lab and the FormIT methodology have proved to be a powerful instrument to:

- speed up the innovation process from idea to market launch
- to co-create and improve innovative ideas
- to investigate and create new business opportunities

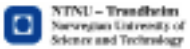
Authors: © Anna Ståhlbröst and Marita Holst, Social Informatics at Luleå University of Technology and CDT – Centre for Distance-spanning Technology, Sweden.
Phone: +46 920 49 10 00
Web: www.ltu.se/cdt

Thanks to the SMEs who worked with us in the cross-border pilots and told their stories:
Lars Kulseng (Wireless Trondheim LtD, Norway)
Finnur Friðrik Einarsson (ICEconsult ltd, Iceland)

Additional thanks to: Luleå Energi and Norrskenets Friskola i Luleå.

Financed by: Danish Agency for Science Technology and Innovation, Lietuvos Mokslo Taryba, The Research Council of Norway, Norden NordForsk, Rannís and Vinnova.

Contributions come from project partners:
John Krogstie (NTNU, Norway)
Thomas Jelle (Wireless Trondheim LtD, Norway)
Annie J. Olesen (A9 Consulting, Denmark)
Laurynas Braškus (Sunrise Valley Science and Technology Park, Lithuania)
Ásta Guðmundsdóttir (Innovation Centre Iceland, Iceland)
Hannes Ottósson (Innovation Centre Iceland, Iceland)



Production: Plan Sju kommunikation AB · **Illustration/Key Principles:** Lindgren+Flodin · **Printing:** LuleGrafiska 2012

CONTENT

THE HUGE SHIFT

There has been a huge shift from a product based economy to a service economy, especially with digital services. Innovative services can take many different forms: it can be to wrap a service around a product or reimagine a product as a service, such a software-as-a-service firms have done; it can also be to rescope the business area from products to services to feed future growth.

Creating innovative services that have market impact is not a straightforward process and for SMEs, the innovation process can be even harder to accomplish. Some SMEs might not have the resources, or all the needed competencies, to carry out the innovation activities. Living Labs strive to support the innovation process for all involved stakeholders, from manufacturers to end-users, with special attention to SMEs and a focus on potential users.

Living Lab research is emerging as a potentially important stream in innovation research. Until now, it has mainly been concerned with issues such as defining Living Labs, explaining how Living Lab supports the innovation process, presenting the outcome of Living Lab projects and suggesting how to effectively involve users in the Living Lab context.

For innovation professionals, Living Lab research can contribute to their innovation practices, since it offers an avenue to promote open service innovation. This book strives to raise awareness of the potential of Living Lab research and to increase its legitimacy in the innovation research area, by presenting the Living Lab methodology.

What is an innovation?

Most innovations come from gaps between an existing product and customers' expectations. The technological factor is only one element of the innovation. Other elements can be better working conditions or methods of service delivery that may, or may not, have a technological component.

To innovate means to create something new and different, and to be creative. One of the aims, when dealing with innovations, is to learn from mistakes so that these can be avoided in future innovation processes. In addition, when dealing with innovations, to learn means to seek, use and share information about what went wrong. Besides, innovation involves encouraging idea generation and to put promising concepts into the test.

An innovation can be an "outside-in" innovation that happens when customers' unmet needs are analysed in a new manner, or the innovation can be a "customer-pulled" innovation that might crop up when customers are gathered in a focus-group, in which the aim is to determine unmet needs.

Working with innovation is expensive, risky and time consuming. Additionally, the work with innovation is unpredictable. Hence, it is important to decrease these factors and to create opportunities for success for the innovations. One way to accomplish this is to have good market contact, meaning to know what the user actually wants and needs.

What is a Service?

Services cannot be seen, tasted, touched, or smelled, before they are purchased. A service can be an activity, a performance, or an object. A product may include a service, and a service is produced and consumed at the same time.

The difference between products and services is recognizable, but can be difficult to grasp. If we think of a service as a servant, the difference becomes more obvious. A service is always available; it is on-line, intelligent and cooperative. When a service is used, it is interactive and offers possibilities to correct and influence the performance of it. In addition, a good service is mobile, always in the background and ready to be activated when it is needed.

LIVING LABS

Living Lab is a concept to support the processes of user-driven ICT systems. One precondition in Living Lab activities is that they are situated in real-world contexts, not constructed laboratory settings.

Living Lab is an answer to many contemporary trends such as, for instance:
- users changed roles from passive consumers to active prosumers of content,
- shortened time to market for innovators,
- a globalized market through internet and IT's entrance into peoples everyday activities.

A network was established in 2006, European Network of Living Labs (ENoLL). At this moment (2012), 320 Living Labs are members of ENoLL and the network is continuously growing. The members are operating all around the world, but their main residence is in Europe.

A Living Lab has the endeavour to support the innovation process for all involved stakeholders, from manufacturers to end-users with special attention to SMEs, with the potential users in the centre in their real world context.

To date there exists no agreed upon definition of the concept. It has been defined as a methodology, an organization, a system, an arena, an environment, and/or a systemic innovation approach. Based on our interpretation of the concept as well as our experiences of Living Lab practices, we define Living Labs as both an environment (milieu, arena) and an approach (methodology, innovation approach).

Living Lab as an Environment

Many different types of Living Lab environments exists such as:

1. **Research Living Labs** focusing on performing research on different aspects of the innovation process.
2. **Corporate Living Labs** that focus on having a physical place where they invite stakeholders (e.g. citizens) to co-create innovations.
3. **Organizational Living Lab** where the members of an organization co-creatively develop innovations.
4. **Intermediary Living Labs** in which different partners are invited to collaboratively innovate in a neutral arena.
5. **A time limited Living Lab** as a support for the innovation process in a project. The Living Lab closes when the project ends.

Due to the constant development of the concept other types of Living Labs certainly exists.

In a Living Lab, the aim is to accomplish quattro helix by harmonizing the innovation process among four main stakeholders: companies, users, public organisations and researchers. These stakeholders can benefit from the Living Lab approach in many different ways, for instance companies can get new and innovative ideas, users can get the innovation they want, researchers can get study cases and public organisations can get increased return on investment on innovation research.

The components of a Living Lab are ICT and Infrastructure, Management, Partners and Users, Research and Approach. At the centre you always find innovation.

- **ICT & Infrastructure** outlines the role that ICT technology can play to facilitate new ways of cooperating and co-creating new innovations among stakeholders.
- **Management** represent the ownership, organization, and policy aspects, a Living Lab can be managed by e.g. consultants, companies or researchers.
- **Partners & Users** bring their own specific wealth of knowledge and expertise to the collective, helping to achieve boundary spanning knowledge transfer.
- **Research** symbolizes the collective learning and reflection that take place in the Living Lab. Technological research partners can also provide direct access to research that can benefit the outcome of a technological innovation.
- **Approach.** Represents the methods and techniques for Living Lab practices which are nesessary for professional and successful Living Lab operations.

Hence, a Living Lab environment should have a good relation with, and access to, users willing to be involved in innovation processes. Any Living Lab should also have access to multi-contextual environments, as well as high-end technology and infrastructure that can support both the processes of user involvement and technology development and tests. Each Living Lab environment also needs organisation and methodologies suitable for its specific circumstances. Finally, a Living Lab needs access to a diversity of expertise in terms of different partners that can contribute to the current activities. Equally important are the Key Principles of the approaches applied in Living Lab activities.


Value
Openness
Realism
Sustainability
Influence

Living Lab Key Principles

In Living Lab activities there are five Key Principles that should permeate all operations:

VALUE
INFLUENCE
SUSTAINABILITY
OPENNESS
REALISM

These Key Principles are valuable since they provide the foundation for design of Living Lab operations. They also define what counts as a Living Lab and how the value of Living Lab operations can be assessed.

Why is value important and what does it stand for?
Providing a superior value for customers and users is a key aspect for business success. To be able to create value for customers and users, it is important to understand their needs and motivations as well as how these needs can be met by an innovation. This focus gives organisations an opportunity to increase the level of innovation and to decrease the risk of developing something that customers do not want.

Consumer value can be defined in terms of the monetary sacrifice people are willing to make for a product. Money is seen as one index of value. The assumption is that at the moment of purchase, the consumer makes a calculation and evaluation of what is given (value) in respect to what is taken in terms of money.

What is the value of value in Living Lab?
Living Lab processes support value creation in at least two different ways: for their partners (e.g. SMEs) in terms of business value and for the presumptive customer or user of the developed innovation in terms of user value. Business value includes aspects such as employee value, customer value, supplier value, managerial value and societal value. One way to mitigate competition and open up entirely new markets is by focusing on creating advances in customer value.

How can it be implemented in Living Labs?
Living Lab processes support the process of understanding if the customer or user has a need for a service and how intense their attraction or repulsion for that service is in the real-world context. Living Labs can support processes by allowing users to elaborate with the service in their context to determine if it provides a value for them. In addition, a Living Lab can also provide insights about how users perceive value. These insights can guide the innovation process to deliver innovations that are perceived as valuable from a business and a customer perspective.

Why is influence important and what does it stand for?
One key aspect of the influence principle is to view users as active, competent partners and domain experts. Their involvement and influence in innovation and development processes shaping society is essential. Equally important is to base these innovations on the needs and desires of potential users and to realise that these users often represent a heterogeneous group. This means utilising the creative power of Living Lab partners while facilitating their right to influence these innovations. By stressing the decision making power this principle differs from related concepts such as participation, involvement, and engagement.

What is the value of influence in Living Lab?
Some of the most lucrative and novel innovations have been developed by users aiming to adapt existing product to fit their needs more appropriately. Involving more stakeholders in the innovation process can improve the quality of the service being developed. Hence, many commercially attractive

products that is at the forefront come from user innovations. In addition, the amount of ideas that users render as well as the heights of the innovative ideas are greater than those rendered by developers.

Users can also be involved and have influence on innovation processes for democracy reasons, learning reasons or economical reasons. Adding to that is the emerging trend of customers and users who want the opportunity to influence products and services. For instance, Nike involves customers in developing and designing shoes. The trend of letting customers and users influence companies' services can be expected to grow.

Based on the reason for participation, the value to be achieved from participation is obviously varying. It is prudent to define and explain the concept as clearly as possible when applying a Living Lab approach.

How can it be implemented in Living Labs?
To take the step from participation or involvement to influence, domain experts' and users' needs and ideas should be clearly traceable in concepts, prototypes, and the finished product.

One important issue that Living Labs need to manage is how to assure that participation, influence, and responsibility among different partners are balanced and harmonised with each other and with the ideology of the user influence of the project.

Why is sustainability important and what does it stand for?
Creating a sustainable environment includes economical, ecological and social aspects, which makes it a complex and multifaceted task.

Sustainability can be defined as development that meets the need of the present without compromising the ability for future generations to meet their needs. Many organisations have potential to contribute to sustainable growth while improving productivity, lowering costs and strengthening revenue. The environmental activities taken today in many organisations are not adequate and can lead to different types of waste such as unused resources, inefficient energy use, and emissions which decrease energy efficiency.

What is the value of sustainability in Living Lab?
An important aspect of a Living Lab is the partnership and its related networks since good cross-border collaboration builds on trust, and this takes time to build up. In order to succeed with new innovations, it is important to

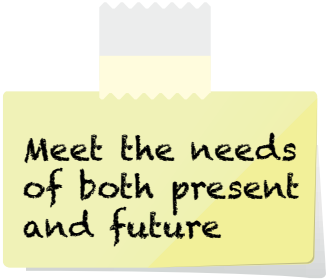
inspire usage, meet personal desires, and fit and contribute to societal and social needs. However, in line with the general sustainability and environmental trends in society it is of equal importance that Living Labs also take responsibility of its environmental, social, and economic effects.

There is a need to develop methods that help labs to take care of the learning generated and to transform this learning into scientifically sound models and methods. Different Living Labs have different constellations, often with a weight on either public or private organizations. It is important to learn more about how this affects the development and viability of a Living Lab.

How can it be implemented in Living Labs?

Focusing on the sustainability of the Living Lab highlights aspects such as continuous learning and development over time. Here, the research component of each Lab plays a vital role in transforming the generated knowledge from Living Lab operations into models, methods and theories.

It is important that Living Labs take responsibility for their ecological, social, and economic effects. The innovation processes supported by a Living Lab must address sustainability issues, for instance, by choosing the right materials, implementing environmentally-friendly processes, and considering the social and economical impact that the innovation might have once implemented.



Why is openness important and what does it stand for?
The current innovation landscape has changed. Many companies have thus identified a need to open up their innovation processes since innovation stakeholders have become more mobile, venture capital more abundant, and knowledge more widely dispersed across different types of organisations.

In Living Labs, several stakeholders are invited to participate in the innovation process. Digital innovations are created and validated in collaborative multi-contextual empirical real-world environments. Openness is essential to gather a variety of perspectives that might lead to faster and more successful development, new ideas and unexpected business openings in markets.

What is the value of openness in Living Lab?
To stimulate creativity and create new ideas, Eriksson et al. (2005) suggest open collaboration between people of different backgrounds, with different perspectives that have different knowledge and experiences.

Living Labs and similar innovation environments can strengthen innovation capacity due to cross-fertilization and open collaboration between different actors. The Living Lab may also provide an arena where different stakeholders can meet to support the innovation process.

One way to strengthen smaller enterprises' innovation capacity is by collaborating with other actors such as academia, the public sector and other enterprises. Living Lab and similar innovation milieus might thereby strengthen the innovation capacity and may also provide an arena where different stakeholders are needed to either support existing relations between business stakeholders or create a milieu where partners get the chance to meet and collaborate.

How can it be implemented in Living Labs?

The key principle openness emphasises creating an innovation process that is as open as possible with the stakeholders since multiple perspectives bring power to the development process. Openness is crucial for innovation processes in Living Labs to gather a multitude of perspectives in order to develop as attractive an innovation as possible. Opening up innovation processes also offers potential to decrease the time to market and to better utilise collective creativity. However, to be able to cooperate and share in a multi-stakeholder milieu, different levels of openness between stakeholders seems to be a requirement.

Why is realism important and what does it stand for?
One of the cornerstones of the Living Lab approach is that innovation activities should be carried out in a realistic, natural, real-life setting. This is important, since people cannot experience anything independent of the experience they get from being embodied in the world. To increase understanding of how a digital artefact influences and fits into the actors' activities and goals, it is important to study them in their context.

What is the value of realism in Living Lab?
Since all stakeholders have their individual local reality, everyone have a potential useful view of how the current situation can be improved. Including more people in the process will ideally increase the possibility of keeping up with the ever more rapidly changing environment of the organization. Orchestrating realistic use situation and understanding users' behaviour is one way to generate results that are valid for real markets.

This principle does not distinguish between physical and online contexts. Instead, it is argued that activities carried out in both contexts are real and realistic to actors. Inspired by online reality, we argue that IT based tools and methodologies can function as twin-world mediators that facilitate the interconnection between real-world devices and their virtual counterparts.

How can it be implemented in Living Labs?
When it comes to facilitating realistic use situations, two different approaches can be observed in relation to Living Labs. In the first approach, environments for testing and evaluating products or services are created in ways that are similar to the real world, while in the second approach, products and services are tested and evaluated in users' real-world environments. It is crucial to involve users as well as other stakeholders in the innovation process. The reality aspect is also considered by involving real users rather than relying on personas or other user representative theories.

Based on the description above, we argue that striving to create and facilitate realism is a task that needs to be grappled with on different levels and in correlation to different elements such as contexts, users, use-situations, technologies, and partners. All these elements necessitate different approaches to understand and mirror the users' diverse reality and realism.

FORMIT – THE LIVING LAB METHODOLOGY

THEORY AND GUIDELINES

FormIT is a methodology that is developed to suit and support Living Lab activities. Three theoretical streams inspire it: Soft Systems Thinking, Appreciative Inquiry, and NeedFinding.

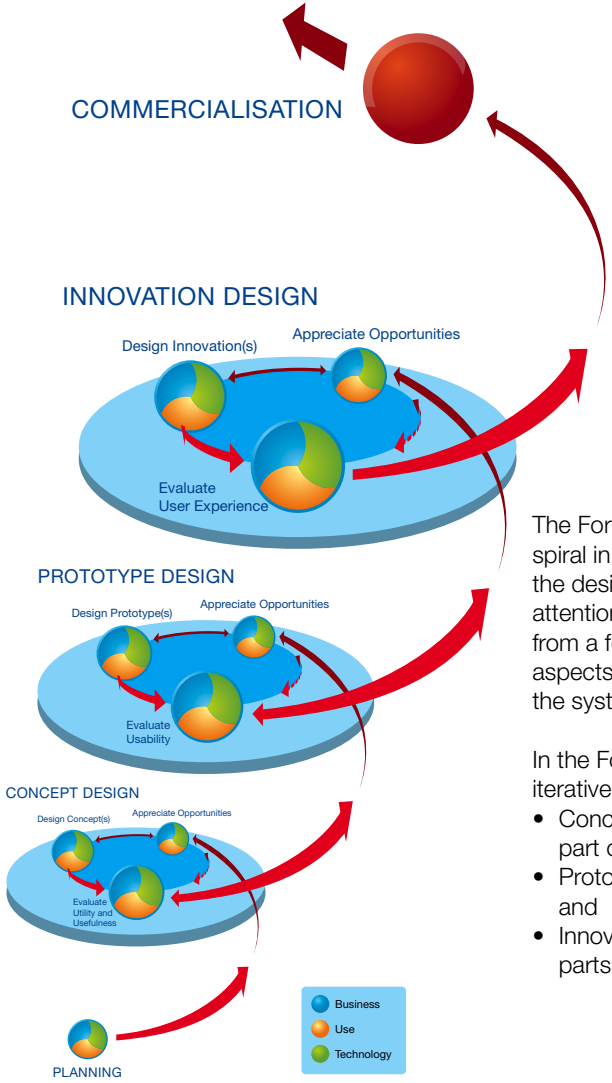
Grounded in these three theoretical streams, FormIT enables a focus on possibilities and strengths in the situation under study; which is fundamentally different from traditional problem-solving approaches.

FormIT strongly stresses the importance of the first phase in the concept design cycle, usually referred to as analyses or requirements engineering. Since this phase creates the foundation for the rest of the process, errors here becomes very hard and expensive to correct in later stages. This also is the phase in which users can make the strongest contributions by actually setting the direction for the design.

Since users' needs and requirements can change as users gain more knowledge and insights into possible solutions, it is important to re-examine their needs continually and make sure they correlate to given requirements.

In accordance, the FormIT method is iterative and interaction with users is an understood prerequisite. The idea is that knowledge increases through iterative interactions between phases and people with diverse competences and perspectives. Cross-functional interaction enables the processes of taking knowledge from one field to another to gain fresh insights, which then facilitates innovative ideas.

The FormIT Process



The FormIT process can be seen as a spiral in which the focus and shape of the design becomes clearer, while the attention of the evaluation broadens from a focus on concepts and usability aspects to a holistic view on the use of the system.

In the FormIT process there are three iterative cycles:

- Concept design cycle in the lower part of the figure
- Prototype design cycle in the middle and
- Innovation design cycle in the upper parts of the figure.

In each cycle there are three phases:

- Appreciate Opportunities
- Design
- Evaluate

Three aspects within each phase:

- Use
- Business
- Technology

Before and after these three cycles, two additional cycles are included in the process. The first is **planning**, seen in the lower part of the figure, and the second is **commercialisation**, which is visible in the upper part of the figure.

FormIT embodies the five Key Principles of Living Lab operations.

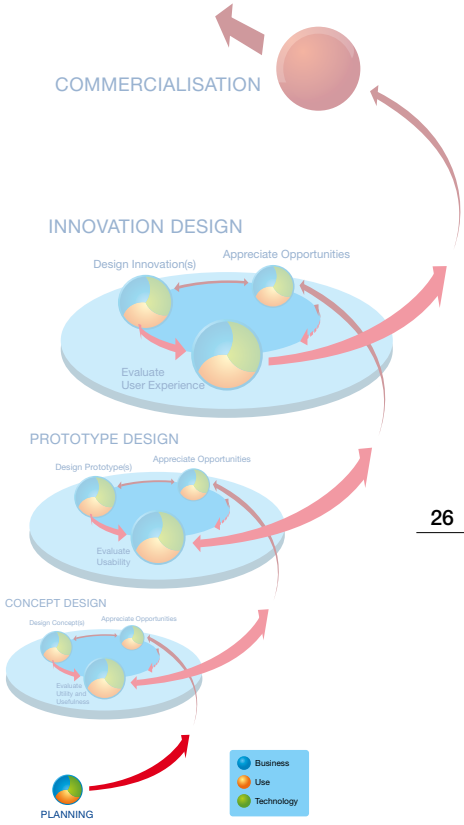
www.ltu.se/cdt
You will find our handbooks and more detailed guidelines for each phase on the right hand side of the webpage.

PLANNING

In this phase is it important to gain as much information as possible about the underlying circumstances for the project. It is important to mix different competencies to stimulate knowledge sharing and an increased understanding of the involved stakeholders' visions.

This process can be difficult to accomplish since project participants usually want to make contributions to many diverse areas, hence making it hard to decide what to include and what to exclude in the intervention. Thus, it is important to support a continuous and communicative approach to build trust and confidence between the stakeholders.

During this process it is important to keep the five Key Principles in mind and to consider how, for example, **value** can be created for the users, how the users can **influence** the process, how **sustainability** take form in this project, how **openness** should take form and how the process should be designed to capture as **realistic** situation as possible.



Examples of explicit questions that need to be discussed among project partners before the appreciating opportunities phase starts can be:

- ☐ What is the goal with the R&D project?
- ☐ Who are the target user-groups, customers, intended users, as well as non-users of the innovation that is developed in the R&D project as a whole? (e.g. energy consumers)
- ☐ How are Key Principles addressed in designing the process as a whole?

When these questions have been handled and discussed the detailed planning of the project can start.

Cycle 1.
CONCEPT DESIGN

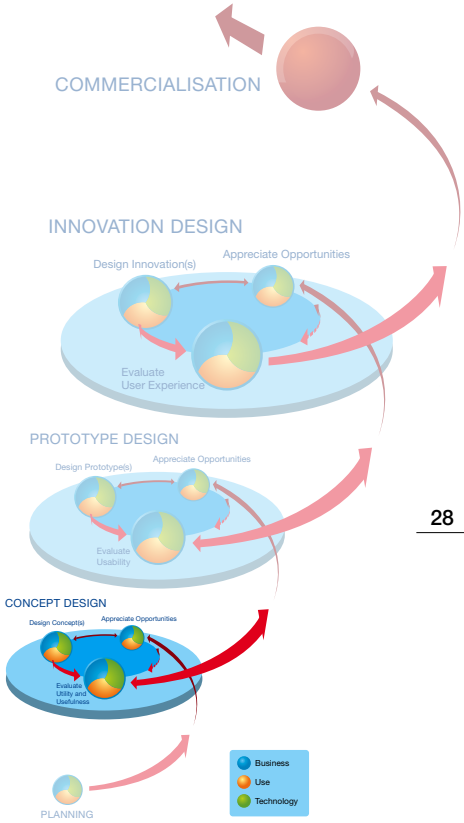
The first cycle of FormIT, **concept design,** focus on the appreciation of opportunities and on generating the basic needs that different stakeholders have of the product or service.

This cycle should end up in a concept, which represents the generated needs from the first step in the cycle.

The process of the concept design phase starts by appreciating opportunities which included:

- define the scope for the process
- the target-user group and their important characteristics
- where these users can be found and their role in the user involvement process.

The needs in focus here are the needs that motivate the users to buy and use a particular innovation, i.e., what triggers their motivation.



This process is supported by obtaining a rich picture of different stakeholders and user groups, their behaviour, attitudes and values by letting the users tell

stories about their lives. In these stories, the users should be encouraged to tell stories about their history, their everyday practice and their dreams of the future to facilitate an opportunity to find users' needs.

During this process it is important to keep the five Key Principles in mind and to consider how, for example, **value** can be created for the users, how the users can **influence** the process and the innovation, how **sustainability** take form in this cycle, how **openness** should take form and how the process should be designed to capture as **realistic** situation as possible.

When the data collection process is finalised, the users' expressions should be analysed and needs should be generated and translated into concepts, and by that, the focus for the work shifts from generating needs to designing concepts.

The design of the concepts needs to be detailed enough for the users to understand the basic objective of the innovation, without having a design of the innovation to keep more doors open and to avoid premature solutions.
After the design is finalised, the focus shifts again, but this time from the design phase to the evaluation phase. The aim of the evaluation of the first cycle is to:

make sure that the involved stakeholders such as users agree with the basic objectives of the developed concept.

This means that the basic objectives and functions of the innovation should be related to the generated needs of the innovation to make sure that these are consistent. If not, this cycle needs to be reiterated until such coherence is achieved. The aim of this evaluation is also to give users the opportunity to co-create the concept according to their needs.

Cycle 1, phase 1
APPRECIATING OPPORTUNITIES

The aim is to gain insights into what needs users might have of the innovation. This process can be combined with the evaluation phase in later stages in the innovation process, but at the start of the project it is crucial that this process is a separate process to ensure that user needs is the driving force of the development of the design throughout the whole innovation process. We suggest using focus-group interviews as method for data-collection since they are easy and effective. In these groups, the process benefit from a mixture of roles; users, developers, business people and so forth.

In this phase the following issues and questions needs to be managed and decided to start with before designing the process as a whole.

- ☐ What is the purpose of the appreciating opportunities phase in the project? What do you want to achieve?
- ☐ Who are the target user-groups that need to be involved in this process? How should they be involved? What are the users expected to contribute with?
- ☐ Which needs, requirements and wants does the users have or express in the study?
- ☐ How are the Key Principles adressed in this phase?

Cycle 1, phase 2
DESIGNING CONCEPT

The aim is to develop concepts or rough prototypes based on the constructed needs from the former phase. The concepts need to be detailed enough for the user to understand the basic objective with the functions.

Questions that need to be discussed in the concept design phase are for example:

- ☐ Which user expressions are most relevant?

  Use methods and tools to support the creative process of creating new concept ideas. These methods can be for example: Future Workshops, Brainstorming, Method 365, Experience Prototyping, Innovation by Boundary Shifting, or other informal techniques to remove fixations. The main objective is to look beyond the immediate vision that comes to mind and to do that with the users' expressions in focus. Aim to develop different concept ideas.

- ☐ On what level should the concept be described to illustrate and transfer users needs?

  Use methods such as Scenarios, Mock-Ups, Storyboards, Films, Visual Narratives.

- ☐ How are the Key Principles adressed in this phase?

Iterate in the process to make the concepts more detailed.

This concept is one of the concepts developed in the SmartIES project first cycle. It was used in user workshops during second cycle, first phase as stimuli for the discussion.

Example of concept

Cycle 1, phase 3

EVALUATE UTILITY AND USEFULNESS

The focus is to encourage users to express their thoughts and attitudes towards the concepts being developed from the basis of their needs. This is combined with the aim to identify any unexplored needs or needs that are modified in some way.

Concept evaluations should be iterated until the concepts answer to relevant user needs in satisfying manners and no new insights about user needs can be identified. The aim is to identify how the concepts should be related and refined to answer to the needs that have been identified in previous inquiries.

Issues that need to be discussed in this phase are for example:

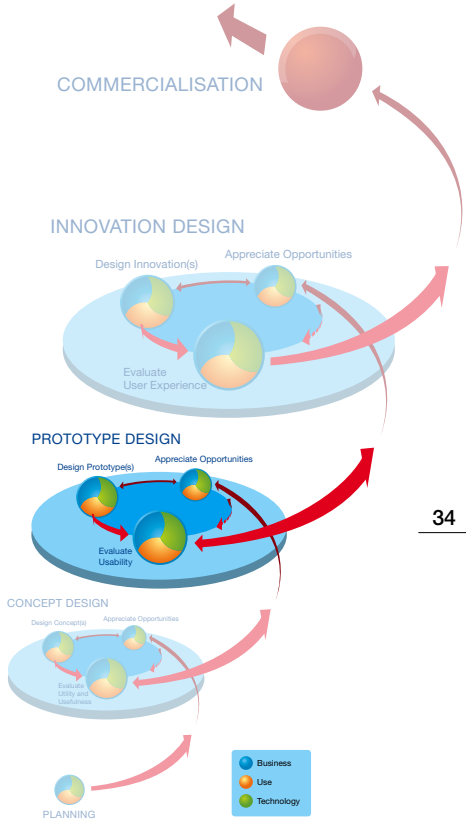
- ☐ What is the approach and purpose for the evaluation? What results can be expected?
- ☐ What is the main question that needs to be answered?
- ☐ How are the identified needs and/or requirements reflected in the concept?
- ☐ How are the Key Principles adressed in this phase?

Cycle 2.
PROTOTYPE DESIGN

The second cycle starts with the process of identifying stakeholders' needs in the innovation. That is, when using a innovation, what needs are then important for the users?

As in the first iteration, this is done through a variety of data gathering methods, such as interviews and observations.

One way of doing this is to keep the concept design, with key needs related to it, visible for the users during the data collection activities, so it is possible to relate to these during the discussions. When the data collection no longer generates new insights and findings, the focus again shifts to the design phase. However, in the second cycle the design of the innovation broadens to include basic functions, workflows, and interfaces.



During this process it is important to keep the five Key Principles in mind and to consider how, for example, **value** can be created for the users, how the users can **influence** the process and the innovation, how **sustainability** take form in this cycle, how **openness** should take form and how the process should be designed to capture as **realistic** situation as possible.

The prototype needs to be detailed enough for the users to understand and be able to experience how the final service will look and feel. This leads to the evaluation that is centred on usability aspects.

- how easy it is to learn
- how effective and enjoyable it is to use

Hence, the evaluation is focused on **INTERACTION** between the user and the service. It is not limited to the user interface, even though this plays an important role in how the user experiences the interaction.

"The challenge is to identify needs that users consider relevant, and the different expressions they may take.

Cycle 2, phase 1

APPRECIATING OPPORTUNITIES

The focus here is to find what needs users have. We want to find the basis for the design of the systems interface, and its functionality. The overall purpose is to collect sufficient, relevant, and proper data so that stable requirements can be produced. You already have a picture of the requirements, but they need to be expanded, clarified and confirmed.

- ☐ What is the purpose of the prototype? What situation does it aim to contribute to?
- ☐ In which **physical, social, technical and organisational** context is it going to be implemented?
- ☐ Decide which data-collection methods to use
- ☐ Which needs does the users have IN the system?
- ☐ How are the Key Principles adressed in this phase?

Cycle 2, phase 2
PROTOTYPE DESIGN

The aim is to move from concepts (or low-fidelity prototypes) to high-fidelity prototypes with a focus on users identified needs throughout the whole process. The main objective is to **look beyond** the immediate vision that comes to mind and to do that with the **users expressions** in focus. Aim to come up with different design solutions.

- ☐ What is the overall purpose of the innovation to be designed?

  Discuss the user requirements that have been identified and presented in the former process. Clearly express the underlying values important to consider in the design.
- ☐ Which hardware should the innovation be designed for? (e.g. mobile phone, PC, surf pads, or other gadgets)

Document and design the prototypes:

- ☐ Decide on what level the prototypes must be described to express the feeling you want to mediate.
- ☐ How are the Key Principles adressed in this phase?

Constantly go through the design to make sure that the user needs, values and requirements have been considered. Iterate in the process to make the design more and more focused and detailed.

Cycle 2, phase 3
USABILITY EVALUATION

The focus is to encourage users to express their thoughts and attitudes towards the innovation being developed.

- ☐ What is the purpose of the evaluation? (e.g. Navigation issues, user satisfaction, graphical design, efficiency, utility, learnability?)
- ☐ Which evaluation method should be used? (e.g. think aloud, usability evaluation, field study, logging, cognitive walkthrough, focus-groups)
- ☐ Who is the typical user?

The analysis of the data from the evaluation should emphasis what went wrong as well as what needs to be changed and modified in the next iteration.

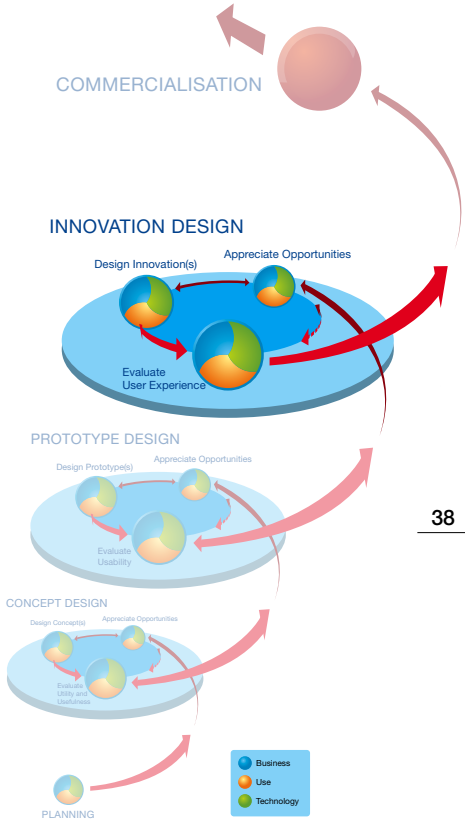
- ☐ Does the design answer to user needs, values and requirements which the prototype has been designed for? How can it be redesigned to better fulfil the needs?
- ☐ How are the Key Principles adressed in this phase?

Present the findings from the evaluation in an evaluation report including users' comments and design suggestions.

Cycle 3.
INNOVATION DESIGN

The third cycle starts by analysing the results from the usability evaluation in order to generate changes in the needs of and in the innovation.

Small changes and adjustments in the needs are quite common, especially in relation to the needs in the innovation, as it develops and users' understanding of structure, content, workflow, and interface deepens. Based on these changes, changes in the design of the innovation also take place, as well as general development work to finalise the innovation as a whole. User experienced goals can be positive and negative, for example both enjoyable and frustrating. They are primarily subjective qualities and concern how the innovation feels to a user and differ from more objective usability goals in that they are concerned with how users experience an innovation from their perspective, rather than assessing how useful or productive the innovation is from its own perspective.



During this process it is important to keep the five Key Principles in mind and to consider how, for example, **value** can be created for the users, how the users can **influence** the process and the innovation, how **sustainability** take form in this cycle, how **openness** should take form and how the process should be designed to capture as **realistic** situation as possible.

Cycle 3, phase 1

APPRECIATING OPPORTUNITIES

The aim is to gain insights into what needs users might have both of and in the innovation. As in earlier phases, the questions that need to be answered are focused on identifying who the users are etc. This process can be combined with the evaluation phase in previous cycles in the process, for guidance see cycle one and two. Questions regarding both utility and usability issues needs to be formulated and asked to the users.

☐ How are the Key Principles adressed in this phase?

Cycle 3, phase 2
INNOVATION DESIGN

The aim of this design phase is to move from a high-fidelity prototype with a focus on users identified needs to a innovation. This means to include both business model aspects as well as designing a fully functioning innovation. The main objective is to re-design the innovation according to feedback gained in earlier phases.

☐ How are the Key Principles adressed in this phase?

Cycle 3, phase 3
USER EXPERIENCE EVALUATION

The focus is to encourage users to express their thoughts and attitudes towards the design. User experiences goals can be both positive and negative, for example both enjoyable or frustrating. They are primarily subjective qualities. User experience goals differ from the more objective usability goals in that they are concerned with how users experience an innovation from their perspective.

Issues that need to be clarified before a user experience evaluation starts:

☐ What is the purpose of the evaluation? What to you want to achieve?

☐ How can we encourage and stimulate users to use the innovation during the test period?

☐ Develop a “test-storyline” to support the users in their test showing what is expected from them:

- Activities they must do, for example, number of surveys, typical tasks, use of certain functionality, etc.
- Activities they can expect from us
- Frequency of use
- Test-period, for how long will the test pro-long
- Time required from them

☐ Are there any ethical considerations that need to be handled?

Create questions or other material for the evaluation focusing on what should be. Develop questions on the basis of the users identified user needs, values and requirements in the system and relate them to experiences.

☐ How are the Key Principles adressed in this phase?

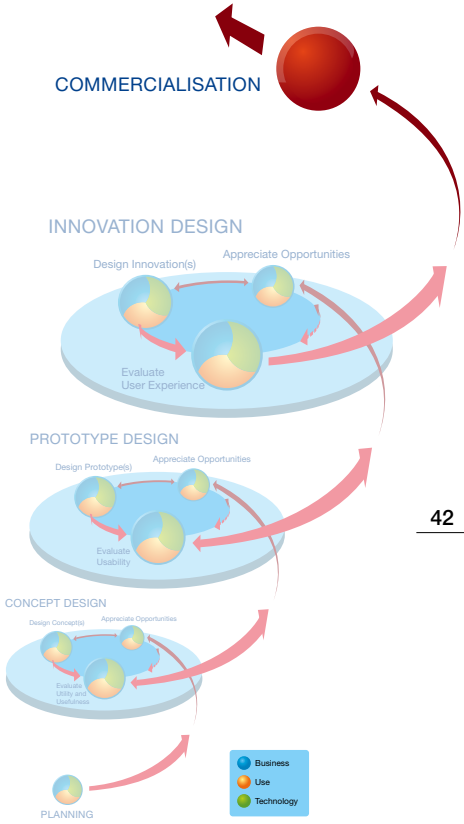
Carry out the evaluation:

☐ How does the innovation answer to user needs, values and requirements which the innovation has been designed for? Which improvements are needed to better fulfil the needs?

The challenge is to evaluate users' actual experience of the final version of the innovation.

The analysis of the data from the evaluation should emphasis **what went wrong** as well as **what needs to (or must) be changed and modified** in the next iteration. Present the findings in an evaluation report including users' comments and design suggestions.

COMMERCIALISATION



The **commercialisation cycle** can be viewed as a separate project in which the aim is to introduce the innovation to a potential buyer and assess its potential on the market.

Adoption of innovation is in many cases only referring to the process of buying an innovation, but adoption also includes using the innovation. In general, innovation adoption is a multidimensional process where individual's behaviour is influenced by a variety of conditions.

These conditions can be learning, social and technological conditions. **Firstly**, learning conditions are individual characteristics of a single user. These conditions can be expected to have influence on the attainment of new competencies needed to use the new innovation. **Secondly**, social conditions explain the cultural and relational specifies shared within the communities to which the user belong. **Thirdly**, technological conditions facilitate the explanation of technical features of the innovation.

Naturally, the importance of each of these conditions differs depending on the context in which the innovation is intended to be used.

Studying changes in behaviour when a new innovation is implemented into a specific context is a complex task. It is difficult to determine what has caused the change as well as understanding all the different factors that might influence the behaviour change.

In this process, the focus is to understand that the innovation being implemented actually has been adopted and used by the users.

CASE STUDY – THE FORMIT PROCESS IN SMARTIES

The SmartIES project was carried out in collaboration between Iceland, Sweden, Norway, Denmark and Lithuania. The project started in 2010 and ended in December 2012. The overall objective of the project was to exchange, analyse and disseminate Smart City Living Lab pilot initiatives in the area of Energy saving towards successful implementation of a Nordic transnational best-practice Smart City Living Lab pilot. The project focused on energy saving solutions for individual households, in private houses and in transportation.

The process of the SmartIES project was set up in three iterative cycles following the FormIT Living Lab methodology with a strong focus on the five Key Principles. As a result the FormIT methodology has been used and evaluated and thereby also strengthened to better embody the five Key Principles.

In the first cycle and first phase needfinding was conducted through user-pool brainstorming sessions where the users told their stories and needs. We also discussed ideas, and suggestions on energy saving solutions were given. This phase also included public authorities, developers and providers of energy saving solutions. The sessions were conducted in all participating countries, and with the best practice Living Lab methods. The user-pool suggestions (and solutions) were documented in each country and then compared and packaged into one report where future scenarios and concepts were described.

In the next phase these scenarios were elaborated further and two concepts (Smart People and Smart Kids) were chosen among users as the most-wanted pan-national pilot set-up.

In the third iteration a pan-national beta-trial were conducted. The private businesses involved are experts in energy saving solutions and ICT and they decided on which concepts they could integrate into their own current energy saving service offers and also develop further. The experts then proposed on how to work on development of the concept, time and funding wise. The project partners choose two proposals for funding and tried to initiate co-operation between companies, and preferably in different countries, to reflect a true Nordic cooperation and added innovation value.

The co-partners then did innovation development. During the development stage a small pre-pilot was conducted in each partner country, to give valuable feedback on the prototypes and make sure that possible nuances are solved before the trans-national pilots was conducted across partner countries. In the trans-national pilot the different innovations that the co-partners have developed were tested in real life situations with user-groups in different partner countries. In the following we will outline the experiences and lessons learned from the two chosen pilots.

Lars and Finnur will tell the stories of their pilots.

Key Principles in Living Labs operations

In this project the partners involved had an assignment to use and give feedback on the Living Lab methodology FormIT. In this process, the partners got a handbook describing the process and steps to be taken.

LARS KULSENG
Operations Manager at Wireless
Trondheim, Norway

AMS WiFi – Smart People

We wanted to develop a service where users can visualise their own power consumption especially on a minute consumption. Our application has both visualisation and control that turns on and off automatically. The idea is that you can make it automatically based on the energy price

AMS WiFi – Smart People

FINNUR FRIÐRIK EINARSSON
Director of MainManager in Iceland
at ICEconsult

ENEGA Project – Smart Kids

Enega was about changing our energy behavior through education, games and competition for children, a way to educate people who are still learning the way of life. The focus was set on 11 to 13 years old children.

ENEGA Project – Smart Kids

so that some appliances are not turned on during the more expensive hours. The main goal was to visualise the consumption and the cost as well as what consumes energy.

The proposed solution was a demonstration concept with three goals:

- to show how easy it is to save energy using new technology.
- test a new technology for AMS potentially reducing the cost of AMS with 30-50 % utilizing existing infrastructure.
- show how the end user and the society can benefit from the massive rollout of AMS planned throughout Europe by 2020.

You can have a look at the prototype in use both in lab-environment as well as in a household on Youtube. Please follow the links below.

LAB DEMO SMART HOUSE CONTROL:
http://www.youtube.com/watch?v=DM18Rlm_aWo

DEMO SMART HOUSE CONTROL AT END USER:
http://youtu.be/Tc472pxjpUE

The main objective of the innovation was to make advanced energy monitoring and managing tools accessible to a new audience. By enabling school children simple access to those tools we reach both schools and homes in a new way.

The concept was put in words and presented as following:

"The design suits each individual at all ages starting from preschool to adult age by providing the appropriate visual interface for each age group. The simplest being a simple entering of schoolroom energy consumption resulting in the appropriate level of happiness for the environment.

The goal was to increase environmental awareness through monitoring of energy usage and cost. This results in cost savings for the school and the homes of the participants.

Normally, in an AMS-rollout, an electrician would have to install a new meter. To install this solution, little if any additional work has to be done by the electrician. The idea is that a package that enables the end user to monitor and control his usage can be almost fully, and easily, installed by the end user her-/himself. In this way, the end user can get an affordable solution to control his smart home and save power and money.

The concept consists of three main "modules":

- Using existing Wi-Fi as transport for AMS meter readings
  This makes using Wi-Fi as the AMS-traffic carrier attractive, from both a deployment/installation point of view, and an economical point of view.
- Smart house technology enabling the user to control (turn on/off) power devices through an app
- An app showing real-time energy consumption and other power statistics.

AMS WiFi – Smart People

With the revolution of the smart grid and increased smart metering at the utility level, access to low cost metering data is becoming a reality for homes. The solution is designed to support automatic import of such data and already support some systems.

The innovation is a web based educational system with the purpose to decrease energy use. It is focused both on the teachers and the children who have had educational material to their support.

By enabling the students to monitor their home usage their families can participate actively in energy/carbon emission monitoring and conservation.

ENEGA Project – Smart Kids

METHODS AND PLANNING

Planning of testing was done with "FormIT" used as a basis for iterations of user trials and feedback loops, including surveys for both pre-pilot and cross border pilot. In the planning phase the FormIT handbook was very valuable.

We wanted to do measurement of attitudes among the users. We performed start interviews and then during the pilots we had questionnaires and at the end we planned to do interviews. The handbook definitely gave some ideas on how to design the feedback loop.

The recruitment of test users was defined in our plan, we wanted to have a group of houses that were similar in size, type and also families living in them. On both sites the energy companies have helped us with the recruitment of test users.

The FormIT methodology was used in the beginning of the pilot to plan the process. It was different than we thought and from the beginning we focused on the cycles in the process. Thereafter we could focus more on methods for user involvement and evaluation. For example it made us understand that we needed to develop support material for the teachers.

It was also a new experience to work in this iterative way and to start all over again and again instead of just continue working. But, in the end it really improved our solution.

CROSS-BORDER COLLABORATION AND TESTING

The project consortium had six companies from four countries and end users from two countries.

For the testing we set up collaboration with Luleå Energy, which is the Swedish partner for our cross border pilot. They agreed to have equipment installed in private households. Now we have two households who have equipment installed in Sweden. In Norway Trønder Energi is the partner and here installations have been made in four households.

Working across border does of course offer some challenges. It is a challenge to not be able to meet and discuss with the people testing. To really see the environment first hand affects the process. We have on the other hand had a very good collaboration with Luleå Energy and a lot of communication to support the installations in the houses in Luleå. One other challenge was that we were many partners involved from many countries. Hence, coordination and communication became very important to manage.

AMS WiFi – Smart People

The purpose of the pilot was to try it out and see how it works, if it is usable for the pupils and the teachers and to see if we could adjust it to another country.

In Sweden we found a partner in KYAB who helped us with adjusting the material to the Swedish market. Three schools are participating, two in Reykjavik, Iceland, and one in Luleå, Sweden, (Norrskenets friskola).

It was difficult to work in cross border collaborations due to language barriers and different environments in Sweden and Iceland.

"Collaborating with a Living Lab was a new experience. We are not used to get assistance from another organisation in that way. Working with several partners was a totally new experience. If I could do it again I would have more regular meetings to get feedback and new perspectives. The largest benefit from working across border is the learning and that we now believe that it is possible to use the system outside Iceland."

ENEGA Project – Smart Kids

We tried to design this project in a way which gave all partners something to gain, knowing that it is more likely to succeed if we create value. We found it beneficial and important to consider the whole value chain already from start.

The innovation would offer added value to the whole value chain of this product/service. For example, energy companies are probably interested to sell extra services. The power company could reach significantly reduced costs for installing and running AMS, The meter company could beat competitors by offering a more cost efficient solution, and the ICT company could deliver a solution for using WiFi to the power companies as well as offering an interface for providing the AMS data to the end user. Conside-

An added value was the knowledge and environmental awareness. It also was a value to change the behaviour among the users. Showing children how they can save energy will be valuable for them the rest of their lives.

The identified value for the users and society:

- Less energy usage = lower carbon emission
- Energy cost savings
- Increased environmental awareness
- Benchmarking related to similar users (schools and homes)

ring the end users we found several benefits for them. So all in all the link of companies and the dependencies between them were analyzed and found to give all stakeholders added value.

Societal benefits would be that people have the possibility to save energy using their smart homes. The aim is that the concept will be attractive to order because the end user sees the benefits.

The aim of the project was to make a proof-of-concept and to get feedback from the end-users to be able to determine whether they find the concept valuable or not, as well as how they use the concept, what they want more of etc. To be able to do this we needed a qualitative study of selected households.

We wanted to more or less have the user involvement in an organic way, meaning that the users would use the application because it was useful. Still we have also tried to do some tasks to them both in the questionnaire and in other ways as a way to really evaluate all functions in the system.

In questionnaires we have for example asked about how the application altered usage and use, but we also asked for feedback on functions.

AMS WiFi – Smart People

The users have been involved in everything from the planning of the first pre-pilot. Meetings with the teachers and with the children have been held. Interaction with the kids and teachers has led to learning and feedback continuously. The teachers interacted with the parents and informed them about the project. Before each iteration we prepared questions to the students as well as to the teachers about their usage and the functionality of the system.

If we would not had involved users so early in the process we would have had a totally different solution. One large challenge was to meet users regularly and to get the feedback and to talk about the feedback you get in a way which enables you to prepare and understand their totally different view. Actually, it is

ENEGA Project – Smart Kids

During the project we have done a lot of changes based on the users input (unless it was totally contradicting to our thoughts with the application).

In total 15 different changes was made as a direct response to the feedback. Two examples of changes were:

- The graphs displayed the data in a way that made it hard to know what date had what data, some dates were given multiple times in a single graph. This was corrected to give a more structured presentation where lines were used to divide dates, and have the dates show up only once per graph.
- Some users tried to use older browsers (Internet Explorer 8) to view the application. This caused the application to display errors, or in some cases displayed nothing. Steps were taken to avoid code that caused these problems, but since our focus was on modern technologies, we did not make sure to cover all browsers and operating systems.

easy to misunderstand what they are actually saying. Hence, enough time for analysis is essential.

From each cycle, the concept evolved. In the design of the final solution we focused very much on making it easy for both teacher to register the class and for the kids to register both their meters and then the readings of the meters.

For example we learned and made changes such as:

- Teacher's overview was missing. The teacher could not see how the students were performing unless login in to each kids account.
- Graphs and graphic were not good enough.
- Possible to insert many readings for each day.
- Possible to insert readings for future date.
- There is no data-quality check on inputs, for example: Is today's input higher than yesterday's input?

Both the potential savings using Wi-Fi for AMS and the reduced power consumption will benefit society and the environment.

This solution will contribute to increase the effect of AMS and thereby reducing the peaks and leveling the power consumption.

This product in every home would create awareness about how much they are spending and give people a chance to control their energy consumtion more closely, not only by using the application but also by having an opportunity to change the routine about power usage to less expensive hours.

AMS WiFi – Smart People

Energy efficient homes contribute to taking better care of our environment. Energy savings and less carbon dioxide emission are of great benefit for the society. The project will provide the tools for schools and homes to systematically reduce energy usage.

To increase awareness among children is a sustainable way to create knowledge and changed behavior in the long run. We also focused on these key points as to what the kids should get out of ENEGA:

- What can I do to reduce pollution?
- Learn about the connection between energy and nature
- Take a look on their own surroundings
- Let them find out how changed energy behavior makes a difference

ENEGA Project – Smart Kids

Having so many partners and users made it extra important to be open and to have continuous communication. Information and knowledge has been shared willingly among stakeholders. The end-users themselves are also interested in this technology since they are involved in it every day.

We have had a feedback loop with the users in which we continuously have communicated about the solution and its functions. Also communication with stakeholders has been continuous.

However, one drawback was that we wanted to have an open standard for communication and after a long time we acknowledged that this could not be done and we redesigned our solution a bit.

AMS WiFi – Smart People

Having an open process has been important, since this is the way to really develop the solution in the best way. Therefore, we have sent out information on the concept and about all steps of the work openly to stakeholders. This has of course been an important way to get feedback.

We have written regular reports and given presentations about the project and the concept in different settings. In all these cases we have received very positive and valuable feedback.

ENEGA Project – Smart Kids

We have a lab for experimenting and developing something with very little changes. We usually start of in the lab and at least make sure that we can deploy it as much as possible and iterate it. In the lab we do prototyping and testing of new features, but from previous projects we know that putting the innovation into real world environments needs to be carried out as soon possible.

There are as many scenarios as there are households. You also get a first hand view of how it is to install this kind of technology and specific changes that are needed to fit into the intended context. Experience of seeing the innovation in a real home in early phases has been extremely important during this project.

It was important to get to see how the students are participating and to see if they understood the concept and learned anything about energy saving and its impact on environment.

To motivate the users to find a reason to take part in the project we designed a scoring system for the webpage in terms of stars they earn when they used the system in different ways and entered data. To have this competition in the system, we also designed to have energy rating of the household according to how much they are saving.

The feedback from the users influenced the system. And thanks to the testing in a real environment improvements were possible to make early in the process.

The main expectation with this project was that our solution would go to market direct after closing the project. We also expected to learn something from working with partners from different countries and getting to know other markets. Furthermore, we also expected to learn more about AMS.

"Expectations were at least partially fulfilled and we have learned more about what questions to ask and what to expect from different parties and what they can deliver or not. How to manage such a complex process is valuable learning for us. Whether we have a product or not that goes to market we need to test the product more. We will include and extend the project to be able to test power control with users."

During the project there was problems with technical parts such as the power meters and that they do not work as expected from the vendor. The power meter did not always

"There are few things that were new to us in the ENEGA project. ENEGA is for example the first side-product that we produce from MainManager, which has no direct value for our current customers. It is also designed for kids and as an educational solution, which is also a new experience for us. It did take some effort to think outside of our standard MainManager webpage layout and the pilots and feedback from users was essential in doing so to simplify the ENEGA web-page."

We have found that it is important that the local Living Lab and the local project are working in close collaboration.

store the data and then we needed to go to the test people's house and ask them questions according to the pilots.

It is always a challenge in testing prototypes in real world settings. And the earlier in the process the more opportunities for technological problems there are.

However, testing in real environment with real users was important and now we know a lot more than we could have learned from just testing in a lab. For example, the solution did not behave in real life as it did in the lab.

LESSONS LEARNED

One lesson learned is that we should have made some delimitation and tested one innovation at the time. It was too many innovations tested for the first time outside of lab.

Furthermore, the complex set up with six companies from four countries (Sweden, Denmark, Germany and Norway) with over 20 employees involved led to a time consuming process of coordination and communication. In the end the product will include all these stakeholders input and it was good to have them onboard. But, we were a bit naive on the complexity. Next time we will be better prepared to manage such a complex setup.

The idea has evolved and matured during the project and each pilot has given new information that had led to change of direction for the ENEGA web. It has been an invaluable experience to go through this process and work under the guidelines of the FormIT Methodology.

FUTURE PLANS

All parts of the solution are working, even if there are several issues that need to be handled before it is commercialized. Furthermore, end user feedback has been essential for all parts of the solution. The project was extended for one month to be able to do final tests. ABB wants to include the application in their portfolio of products.

In conclusion Wireless Trondheims expectations were met even though we had hoped for a shorter patch to commercialization. Product packaging of smart house solutions must be done to make it easy for households to see the benefits and to choose and handle the system.

The final product out of the Smart-IES project is a beta version of ENEGA. But now the big question is how to proceed? ENEGA is the second side product made by ICEconsult that is “Powered by MainManager”. It is different from the other in the sense that ENEGA is not something the current customers are interested in buying and it calls for entering new markets which is not an easy task for a small business like ICEconsult.

LIST OF REFERENCES

1. Ståhlbröst, A. and Bergvall-Kåreborn, B., Exploring Users Motivation in Innovation Communities. International Journal of Entrepreneurship and Innovation Management, 2011. 14(4): p. 298-314.
2. Følstad, A., Living Labs for Innovation and Development of Information and Communication Technology: A Literature Review. The Electronic Journal for Virtual Organisations and Networks, 2008. 10 (Special Issue on Living Labs,): p. 100-131.
3. Feurstein, K., et al., Living Labs: A New Development Strategy, in European Living Labs - A New Approach for Human Centric Regional Innovation, Schumacher, J. and Niitamo, V.P., Editors. 2008, Wissenschaftlicher: Berlin. p. 1-14.
4. Schuurman, D., Evens, T., and Marez, L.D., A Living Lab research approach for mobile TV, in Proceedings of the seventh european conference on European interactive television conference. 2009, ACM: Leuven, Belgium.
5. Mulder, I., et al., Real-World Innovation in Rural South Africa. The Electronic Journal for Virtual Organisations and Networks, 2008. 10(Special Issue on Living Labs): p. 7-20.
6. Schaffers, H. and Kulkki, S., Living Labs: A Strategy for Open Innovation Fostering Rural Development. Asia-Pacific Tech Monitor, Special Issue on Open Innovation: A New Paradigm in Innovation Management, 2007(September-October 2007).
7. Bergvall-Kåreborn, B. and Ståhlbröst, A., Living Lab - an Open and Citizen-Centric Approach for Innovation. International Journal of Innovation and Regional Development, 2009. 1(4): p. 356-370.
8. Ballon, P., Pierson, J., and Delaere, S. Open Innovation Platforms for Broadband Services: Benchmarking European Practices. in 16th European Regional Conference. 2005. Porto, Portugal.
9. Eriksson, M., Niitamo, V.P., and Kulkki, S., State-of-the-Art in Utilizing Living Labs Approach to User-centric ICT innovation - a European approach. 2005, Centre of Distance Spanning Technology at Luleå University of Technology, Sweden, Nokia Oy, Centre for Knowledge and Innovation Research at Helsinki School of Economics, Finland.
10. Dutilleul, B., Birrer, F.A.J., and Mensink, W.H., Unpacking European Living Labs: Analyzing Innovation's Social Dimensions. Central European Journal of Public Policy, 2010. 4(1): p. 60-85.

11. Bergvall-Kåreborn, B., et al. A Milieu for Innovation - Defining Living Labs. in The 2nd ISPIM Innovation Symposium - Stimulating Recovery - The Role of Innovation Management. 2009. New York City, USA.
12. van de Vrande, V., et al., Open Innovation in SMEs: Trends, Motives and Management Challenges. Technovation, 2009. 29: p. 423-437.
13. Praest Knudsen, M. and Bøtker Mortensen, T., Some Immediate - But Negative - Effects of Openness on Prodeuct Development Performance. Technovation, 2011. 31: p. 54-64.
14. Chesbrough, H., The Era of Open Innovation. MIT Sloan Management Review, 2003. 44(3): p. 35-42.
15. Chesbrough, H., Open Innovation; A New Paradigm for Understanding Industrial Innovation, in Open Innovation: Researching a New Paradigm, Chesbrough, H., Vanhaverbeke, W., and West, J., Editors. 2006, Oxford University Press: Oxford.
16. Chesbrough, H., Open Service Innovation - Rethinking your business to grow and compete in a new era. 2011, San Fransisco: Jossey-Bass.
17. Huizingh, K.R.E., Open Innovation: State of the Art and Future Perspectives. Technovation, 2011. 21: p. 2-9.
18. Chesbrough, H. and Appleyard, M., Open Innovation and Strategy. California Management Review, 2007. 50(1): p. 57-76.
19. Bond E, U., et al., Reputational Effectiveness in Cross-Functional Working Relationships. Journal of Product Innovation Management, 2004. 21(1): p. 44-60.
20. Sleeswijk Visser, F., van der Lugt, R., and Stappers, P.J., Sharing User Experiences in the Product Innovation Process: Participatory Design Needs Participatory Communication. Creativity and Innovation Management, 2007. 16(1): p. 35-45.
21. Barki, H. and Hartwick, J., Rethinking the Concept of User Involvement. MIS Quarterly, 1989. March: p. 52-63.
22. Di Gangi, P.M. and Wasko, M., Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell IdeaStorm. Decision Support Systems, 2009. 48(1): p. 303-312.

23. von Hippel, E., Democratizing Innovation. 2005, Cambridge, Massachusetts: The MIT Press.
24. Magnusson, P., Customer-Oriented Product Development - Experiments involving users in service innovation, in Stockholm: Economic Research Institute. 2003, Stockholm: School of Economics: Stockholm.
25. Bergvall-Kåreborn, B. and Ståhlbröst, A. Participatory Design - One Step Back or Two Steps Forward. in PDC 2008 Experiences and Challenges. 2008. Bloomington, Indiana, USA.
26. Yoo, Y., Computing in Everyday life: A Call for Research on Experiental Computing. MIS Quarterly, 2010. 34(2): p. 213-231.
27. Ståhlbröst, A., et al. Striving for Realism in a User-involvement Process. in 2nd ISPIM Innovation Symposium - Stimulating Recovery - The Role of Innovation Management. 2009. New York City, USA.
28. Mingers, J. and Willcocks, L., Social Theory and Philosophy for Information Systems. 2004, Chichester: John wiley & Sons.
29. Markopoulos, P. and Rauterberg, G.W.M., LivingLab: A White Paper, 35, I.A.P.R., Editor. 2000. p. 53-65.
30. Ståhlbröst, A., Forming Future IT - The Living Lab Way of User Involvement, in Department of Business Administration and Social Sciences. 2008, Luleå University of Technology.
31. Boztepe, S., User Value: Competing Theories and Models. International Journal of Design, 2007. 1(2): p. 55-63.
32. Cagan, J. and Vogel, C.M., Creating breakthrough products: Innovation from product planning to program approval. 2002, Upper Saddle River, NJ: Prentice Hall.
33. Patnaik, D., System Logics: Organizing Your Offerings to Solve People´s Big Needs. Design Management Review, 2004. Summer 2004: p. 50-57.
34. Patnaik, D. and Becker, R., Needfinding: The Why and How of Uncovering People's Needs. Design Management Journal, 1999. 10(2): p. 35-43.
35. Helander, N. and Ulkuniemi, P., Customer Percieved Value in the Software Business. Journal of HIgh Technology Management Research, 2012. 23: p. 26-35.

36. Scholer, A.A. and Higgins, E.T., Exploring the complexities of value creation: The role of engagement strength. Journal of Consumer Psychology, 2009. 19(2): p. 137-143.
37. Vargo, S.L., Maglio, P.P., and Akaka, M.A., On value and value co-creation: A service systems and service logic perspective. European Management Journal, 2008. 26(3): p. 145-152.
38. Vargo, S.L. and Lusch, R., Service-Dominant Logic: What it is, What It Is Not, Wha tIt MIght Be, in The Service-Dominant Logic of Marketing: Dialog, Debate and Directions, Lusch, R. and Vargo, S.L., Editors. 2006, M.E. Sharpe Inc.: Armonk. p. 43-56.
39. Watson, R., Boudreau, M.-C., and Chen, A., Information Systems and Environmentally Sustainable Development: Energy Informatics and New Directions for the IS Community. MIS Quarterly, 2010. 34(1): p. 23-28.
40. Melville, N., Information Systems Innovation for Environmental Sustainability. MIS Quarterly, 2010. 34(1): p. 1-21.
41. Checkland, P.B., Systems Thinking, Systems Practice. 1981, Chichester: John Wiley & Sons.
42. Checkland, P. and Scholes, J., Soft Systems Methodology in Action. 1990, Chichester: John Wiley & Sons.
43. Cooperrider, D.L. and Whitney, D., Appreciative Inquiry - A Positive Revolution in Change. 2005, San Francisco: Berrett-Koehler Publishers.
44. Cooperrider, D.L., Whitney, D., and Stavros, J.M., Appreciative Inquiry Handbook. 2005, San Francisco: Berrett-Koehler Publishers.
45. Norum, K.E., Appreciative Design. Systems Research and Behavioral Science, 2001. 18: p. 323-333.
46. Holst, M. and Ståhlbröst, A., Enriching the Process of Appreciating Needs with Storytelling. International Journal of Technology, Knowledge and Society., 2006. Vol. 2(4): p. 61-68.
47. Ståhlbröst, A. and Holst, M., Appreciating Needs for Innovative IT Design. International Journal of Knowledge, Culture and Change Management, 2006. Vol. 6.
48. Patnaik, D. and Becker, R., Needfinding: The Why and How of Uncovering People's Needs. Design Management Journal, 1999. 10(2): p. 37-43.

49. Kankainen, A. and Oulasvirta, A. Design Ideas for Everyday Mobile and Ubiquitous Computing Based on Qualitative User Data. in User Interface for All, LNCS 2615. 2003. Berlin.
50. Mirijamdotter, A., Somerville, M.M., and Holst, M., An Interactive and Iterative Evaluation Approach for Creating Collaborative Learning Environments. The Electronic Journal of Information Systems Evaluation (EJISE), 2006. 9(2): p. 83-92.
51. Ståhlbröst, A. and Bergvall-Kåreborn, B., FormIT – An Approach to User Involvement, in European Living Labs - A new approach for human centric regional innovation, Schumacher, J. and Niitamo, V.-P., Editors. 2008, Wissenschaftlicher Verlag Berlin. p. 63-76.
52. Sharp, H., Rogers, Y., and Preece, J., Interaction Design: beyond human-computer interaction. 2nd ed. 2007, Chichester: John Wiley & Sons Ltd.

VINNOVA

rannís

norden
NordForsk

Danish Agency for Science
Technology and Innovation
Ministry of Science
Technology and Innovation

Lietuvos
mokslo
taryba

Forskningsrådet