LIVING LABS: A USER-ORIENTED APPROACH TO PUBLIC-PRIVATE INNOVATION NETWORKS.

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ABSTRACT
In recent years, 'Living labs' have played an increasingly prevalent role in design processes targeted at user-oriented innovation. This article presents the organisational set-up and discusses the development of two new living lab concepts from the HandiVision project, hosted by two public institutions that both work with people with physical or cognitive impairments. Based on Verna Allee's theory on "Value Network Analysis", we argue that the notions of 'roles', 'deliverables', and 'value conversion' is useful in order to understand the inter-organisational behaviour and the innovation potentials in living labs as a platform and a milieu for developing new assistive technologies between institutions, companies and intermediate organisations.

Introduction
The aim of this article is to present the organisational set-up and discuss the development of two new living lab concepts hosted by two Danish public institutions. They both work with people with physical or cognitive impairments but host different groups of peoples with handicaps and also have different competencies, values and interests to put into play with companies in the development of new assistive technologies.

The two living labs have been used for experiments with user-oriented innovation methods and have been further developed and branded as innovation platforms in the project *HandiVision - a demonstration project for the development of better assistive technologies* ending January 2011. The purpose of this three-year project was to develop methods for user-oriented innovation within the assistive technology field. The project has involved a total of eight companies, nine organisations and four knowledge institutions. The common goal of the project partners was to develop more efficient assistive technology by engaging users in all phases of the innovation process – both when it comes to developing new products and services, but also when it comes to testing and improving existing products. All project partners had their time spent in the project fully financed by the Danish state and regional authorities.

The article describes how the two living labs have been developed and analyses specific experimental activities that have taken place among the institutions and companies involved. The article also presents the results generated by the project in relation to third parties. In both living labs a third party has been involved in the development processes to undertake the role as an intermediate organiser and facilitator with

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competencies in user involvement methods, design processes and in building public-private partnerships.

Living lab as a platform for user-oriented innovation

The notion *living lab* was coined by professor William Michell from Massachusetts Institute of Technology in Boston who invited people from the world outside into living laboratories where etnographers and other researchers observed how the people use newly invented information technology. Later on, the concept has moved out of the laboratories and into the real world.

There have been numerous attempts to define what a living lab is. The literature suggests no firm agreement to just one definition (Følstad 2008). Some see living labs as innovation platforms where the partners involved develop and exchange ideas in a community. Others consider living labs as *testbeds*, special physical environments where companies and R&D partners are invited to test prototypes with users in a close-to-real-world setting.

Both views are present in this article where two living labs are described and analysed as two functioning public-private open innovation platforms in the field of assistive technology. Open innovation focuses on how to combine different competencies, or technological capabilities that reside in specialised organisations and companies.

The institutions made their physical facilities, staff (e.g., teachers, pedagogues psychiatrist, therapist, and relatives) as well as the primary users (students and residents with disabilities) available for the project. It is a defining characteristic of the living labs that the *relations* among all these roles are preserved and made available for innovation processes with companies.

The living lab concept can be thought of as a special organisation of the milieu of everyday life of the institutions and an approach to open innovation.

Open innovation and absorptive capacity

To understand how a living lab concept can function as part of daily life of the institutions, it is essential to understand the dynamics of *open innovation* and *absorptive capacity* of the institutions.

Open innovation
The two living labs both offer platforms for public-private innovation, which, at first sight, may be seen as a bilateral value exchange between only two parties, namely the public institution and one private company that wants to do open innovation by means of inflows of knowledge from the institution to accelerate the internal innovation of the company (Chesbrough 2003). However, the value exchange in the living lab settings have been more complex, and should be described and analysed as a network between at least three or more parties, who all have specific organisational roles and interests in the value exchange and creation process.

Absorptive capacity
Absorptive capacity is the ability of innovative firms and organisations to assimilate and replicate new knowledge gained from external sources (Vanhaverbeke 2007). Absorptive capacity is crucial in explaining why some organisations are much better than others at creating and capturing value from in-sourcing externally developed technology and technological collaboration with partners. Absorptive capacity and the

outside-in dimension of open innovation are linked to each other because enriching the knowledge base of an organisation through the integration of suppliers, customers and external knowledge sourcing can increase the innovativeness of an organisation.

External knowledge can only be recognised, accessed and assimilated when organisations develop new routines and change their organisational structure and culture to facilitate open innovation processes. Hence, it is necessary to explore how open innovation forces the institutions and companies to develop new organisational routines to tap into external knowledge. In other words, developing and improving the absorptive capacity of the partners in the living lab value exchange is at the heart of open innovation.

We understand living labs as a way to offer a firm an external R&D "department" with a large number of users of assistive technologies and competencies in physical or cognitive impairments. In order to leverage this R&D potential, the firm has to look at the end users and the institutions as *users* as *knowledge partners*. Not *customers*.
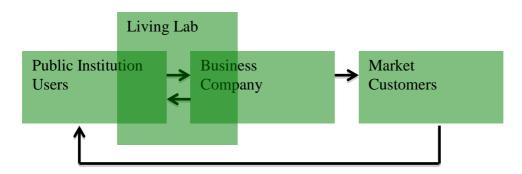

Figure 1. The living lab in the value chain.

Egmont folk high school for disabled young people
The first living lab is a traditional Danish folk high school, called Egmont Hoejskolen. It is a boarding school where young students typically stay for 4-10 months studying subjects like politics, culture, language, sports, sailing, outdoor living, arts, music, media etc. Approximately 1/4-1/3 of the students are people with disabilities.

The folk high school focuses on encouraging its students to become independent and active citizens. This gives the school an "innovative edge" as needs and ideas are outspoken.

A folk high school is a boarding school that provides living accommodation for its students. At Egmont Hoejskolen they say that the school is your home while you are staying there. The atmosphere is very informal, which comes as a surprise to many foreigners. Every year students, teachers and some researchers are welcomed from mostly Europe, Japan and the developing countries. There is very little hierarchy and the tone between teachers and students is very straightforward.

A lot of the Danish students consider their stay at Egmont Hoejskolen a break from the formal educational system. A place where they can take their time to figure out what they want to do with their lives – with the help from their teachers. The school believe that a large part of the students' education also lies in the process of being together, in discussing and sometimes in having conflicts.

The National Association of the Disabled in Denmark originally founded the school in 1956 as a place only for students with mobility impairments. In 1970 the formal purpose of the organisation was changed to secure real integration of people with disabilities. Today Egmont Hoejskolen is a school for all people but with a special obligation towards people with disabilities. Characteristic of the school today is total accessibility as this has been a main priority over the years. The school has a number of double and single rooms, especially designed to suit the needs of people with disabilities, modern well-equipped class rooms, excellent catering facilities, home helpers service, a lecture hall, a gym, and a swimming leisure center in under way.

Now 160 pupils attend the school which has about 80 teachers and a large building complex. Many activities and events are taking place as a result of the school's size and its focus on active citizenship. The school has an annual musical festival and often the students go on trips around Denmark or abroad.

As the pupils are young, many of them are very keen on using and experimenting with communication technology as any other youngsters or digital natives. Many use mobile phones and different cutting-edge technologies related to their handicaps. This gives the school another "innovative edge" as the innovative potential of technology is valued and explored by the students in their every day lives.

In the HandiVision project the school established a course called "The innovative user" as a platform for learning and innovation through dialogues with companies. An important step in this process was to develop the necessary competencies and methods suitable for engaging in participatory design processes in order to develop new assistive technologies and services together with companies. This living lab was founded on the strong positive values and enthusiastic energy of the students and presented to the companies as an innovation partnership.

Figure 2. Students from Egmont folk high school on a study trip to the exhibition "Health & Rehab 2010" in Copenhagen, acting as "accessibility police" and testing the new assistive technologies exhibited.

The village of Soelund
The other living lab, Soelund living lab, is based on Denmark's largest village for mentally disabled and physically challenged adult people (330 residents and 800 staff).

The majority of the residents have severe physical and mental challenges. The residents can thus not verbally express their opinions on matters including general or imaginative thinking and reasoning. Many residents do not have the cognitive ability to keep attention focused on a given subject matter for a longer period of time. The personal relations between staff and residents constitutes the basis for the activities in the village. Building up trust can take months or even years. This depends on personal chemistry and on understanding the communicative signs in a given situation.

The residents of Soelund will never be able to live an independent life under normal conditions outside the safe and supportive environment of the village. Therefore, the village staff focuses on helping the residents to explore their full life potential on their own terms rather than to practice the routines of a 'normal' life. The village can be seen as a small community of its own that resembles the real society outside. On numerous occasions, the leader of the village has expressed a wish for a subversive integration process. Not that the village residents should be integrated into the surrounding society, but the other way around: The "normal" society could be invited to and partly integrated into the village on the terms of the residents.

The 'Village of Soelund' is an institution organised as a real village where the residents live in their own apartments grouped in houses. Each house has a pedagogical leader and staff and the residents are more or less put together on the basis of temper, age or abilities, or friendship.

The village has different workshops where the residents work or spend their leisure time, a cafe, a swimming pool and an additional range of activities. One of the most popular activities is horse riding, which is an effective therapy for people bound to a wheelchair – Horse riding is an amusing 'bodily' experience for the residents. It strengthens their back and stimulates their balance and, just as importantly, being close to a horse has a psychological therapeutic effect. The 'horse therapy project' is characteristic for the innovation culture at Soelund. New projects are frequently formed around particular interests and run by enthusiastic employees from all over the village. Some of the successful projects later become a permanent activity in the village as is the case for horse riding.

There are two main theories/practices that govern the daily life and work in the village: Gentle teaching and snoezelen.

Gentle Teaching is, in short, a practice striving to encourage the residents to develop their own individual life potentials. Using any kind of force in relationship with the residents is out of the question. If a resident refuses to eat at a particular time, it is regarded as a positive sign of self-control and empowerment. According to the staff, the resident often have no clear idea of a *self* separated from others as they have been institutionalised all their life.

Snoezelen is a therapeutic practice using multi-sensory environments to create experiences for the residents. Snoezelen is derived from the Dutch words "snuffeln" (to sniff, to snuffle) and "doezelen" (to doze, to snooze). It was developed in the

Netherlands in the seventies by institutions caring for severely disabled people. Often the residents have a chaotic inner life, and they suffer from perceptual disturbances. These stress factors cause fear and anxiety and make them redraw from any kind of extrovert life. The snoezelen environment induces wellbeing in a calm atmosphere without fear and encourages active sensing. Snoezelen is a therapy used for all stages of cognitive development.

These two main theories/practices can be described in a way accessible for outsiders but the application of these practices is bound to personal relationships and the highly individual approaches and contexts. This knowledge within the organisation is the key to developing assistive technology and can be operationalised through a participatory innovation process. This is the idea of this living lab.

Figure 3. A picture from the central hallway in the snoezelen house built at Soelund.

A value network approach to living labs as virtual organisations
In an open innovation context, organisations *jointly* create value through a number of transactions in so-called value networks. This is also what is going on in the two living lab contexts introduced here. Value exchange is the central aspect of living labs as open innovation networks where actors exchange different forms of value. Values include both tangible and intangible assets because knowledge is such an important intangible asset.

In this paper we use Verna Allee's theory on "Value Network Analysis" (Allee 2008) in an exploratory approach to the formation of the two living labs in the project. Especially her notions of tangibles and intangibles and her approach to how to convert intangible assets such as human knowledge, internal structures, ways of working and business relationships into negotiable forms of value.

Because network is the primary economic mechanism for value conversion, network analysis can be used to describe and understand the value creation dynamics in an innovation process facilitated by a living lab. It can be used to understand the specific outcomes that generate economic growth for the companies involved and the social goods for the institutions involved as well.

According to Verna Alle understanding intangibles as assets is fairly new in the literature of "value exchange". To understand how intangible assets create value we may take a look upon her basic notions

Intangible assets include relationships, employee know-how and competency, the effectiveness of the organisation's work groups and structure, the efficiency of the organisation's production and service and the level of trust between people or

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organisations forming the relationships.

Tangible assets are, on the other hand, financial resources and other capital-based resources that are controlled by an organisation.

The definition of whether a deliverable is considered tangible or intangible is dependent on its contractual nature, not its physical nature, according to Allee. This is an important issue as the nature of living lab value exchanges in the HandiVision project mostly has been non-contractual.

Further notions:

1) *Roles* are played by real people or participants in the network who provide contributions and carry out functions. Participants have the power to initiate action, engage in interactions, add value, and make decisions. They can be individuals; small groups or teams; business units, whole organisations.

2) *Transactions*, A *transaction* occurs when a *deliverable* originated by one participant (role*)* is conveyed to and received by another (role). Two or more reciprocal transactions are an *exchange* of values.

3) *Deliverables* are the actual "things" that move from one role to another. A deliverable can be physical (e.g., a report or a prototype) or it can be non-physical (e.g., a message or an idea from a user that is only delivered verbally). It can also be a specific type of knowledge, expertise, advice, or information about something, or a favour or benefit.

4) *Value conversion* is the act of converting or transforming financial to non-financial value or transforming an intangible input or asset into a financial value or asset. Whenever one type of value has been created from another type of value, a value conversion has taken place. In that sense, business models in a living lab context are based on how the involved organisations can capture part of the value created in the living lab context through value conversion. This intraconvertability of value is a foundational dynamic of the knowledge economy, and in this case knowledge put into action and managed in an open innovation process. Knowledge is, as an intangible asset, one of the most interchangeable commodities, as Verna Allee puts it.

The map in Figure 4 depicts the overall structure of how we conceive both of the living labs. Notably we talk of the two living labs as anchored in the two institutions (to be presented) but the living lab activities is of course based on interactions among all partners in the project.
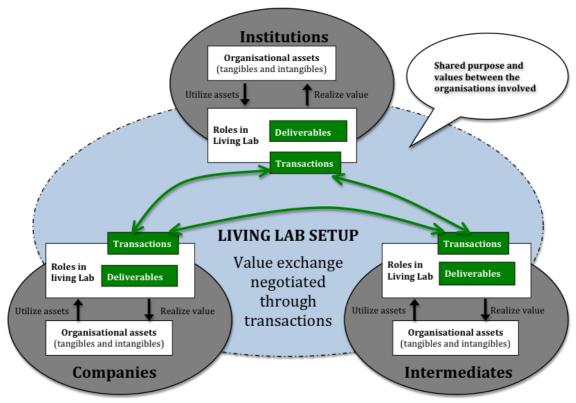
Figure 4. Based on Verna Allee's Value Network Strategy Model: A strategy model for the value exchange setup in a living lab frame.

Intermediary organisations
In both living labs a third party has been involved in the development processes to undertake the role as an intermediate organiser or facilitator with competencies in user involvement methods, design processes and facilitating public-private innovation partnerships. The two intermediates, VIA University College and the Alexandra Institute, will be described shortly.

VIA University College is one of the biggest Danish providers of bachelor programmes for students, with a number of faculties and campuses. VIA acted as the intermediate organiser to the Egmont living lab activities and as project leader for Egmont and the "case companies". VIA participated in the concrete casework with a consultant from their "Idea factory" who had the facilitating role in introducing user-involvement methods, in close cooperation with the teachers from Egmont. Selected students and teachers from VIA's programme of mechanical engineering also took part in some of the innovation processes of building prototypes but did not play a vital role in the depicted cases.

The Alexandra Institute is a bridge-builder between research, private corporations, public institutions and citizens and had a designing and facilitating role at Soelund. With research-based innovation, the Alexandra Institute create ICT-based products and services that generate social value and contribute to economic growth. The Insitute has done extensive work on research-based userdriven innovation, which is a special approach to application-oriented ICT research. The aim is to fuse commercial relevance, research and user involvement.

Case study: Egmont living lab

A number of companies were recruited as cases for a shorter or longer period in the project during the three-year period. The course "The innovative user" became involved at different stages of the innovation process ranging from explorative co-creation workshops (identifying user needs and challenges and idea generation) to testing prototypes in school settings.

In the following, we will focus on two different cases and analyse how the notion of living labs can be unfolded and how the exchange of value took place and was facilitated.

Case: Aabentoft

Aabentoft was one of the "case companies". Aabentoft is supplier to a number of wheelchair companies, covering the majority of the Danish market. Aabentoft is a rather small company specialised in complete solutions for electric wheelchairs, including service, and other rehab equipment for handicapped people. They have their own R&D department and production of electrical and mechanical components. A large part of their work and product portfolio has to do with communication equipment and aids for controlling the environment.

In the case of Aabentoft, the students visited the company headquarters in one of their sessions of "The innovative user". The purpose of the visit was to give the students more detailed knowledge on the companies' product portfolio and on the innovative potentials of technology. On the other hand, the people from the company would get a clearer picture of the needs and desires of the students in their everyday life. The workshop was a first exchange of knowledge and idea generation.

During the visit, one of the boys from Egmont, who uses a wheelchair, expressed the need for a solution that would enable him to play "Sony Playstation 3" from his wheelchair. Many young guys with a handicap play computer games and have special needs and knowledge as to the design of the joystick. When it comes to designs and workarounds, some of them can actually be considered as *near lead users* in reference to von Hippels famous notion *lead users* as the boys are close to create their own custom solution, but in this case with the help from a company. During the workshop, the student coined the idea of using the joystick of the wheelchair as a controller for the game console. This was not possible at that time.

The joysticks of the wheelchairs are often custom-made for the user or at least the user is familiar with it. Using the joystick of the wheelchair as a control for gaming could thus be a great advantage compared to designing a separate joystick. This idea was in complete alignment with Aabentoft's other products and a natural extension of what they had been doing for years.

Using the terms of Verna Allee, the workshop may be considered a place where intangible knowledge and values are expressed and negotiated. The lead user gamer had not only an explicit knowledge on special user interfaces, he also proposed a simple solution on how to improve gaming. This is value conversion in the sense that the idea of a lead user was expressed at a workshop and thus distributed among R&Ds of a relevant company that was present.

After the visit, the company analysed the boys' idea and made their own value conversion as they considered it a clear business opportunity. They developed a control

device to enable communication between the joystick of the wheelchair and the Sony game console. Aabentoft attended different trade shows with this prototype to get initial response from the market. It was met with enthusiasm.

Importantly, Aabentoft later tested the prototype in the shared accomodation of three former students from Egmont, who had attended the course "The innovative user" but no longer attended the school. In that sense, the *Egmont living lab* was extended with a *private lab* recruiting former students. The prototype delivery was installed in their home in order to let the three boys play from their wheelchairs over a period of two weeks. An etnographer instructed the boys to make *video dairies* based on their gaming experiences during the period and she facilitated a *focus group interview*. The purpose of using these two methods was to convert intangible knowledge to "packaged" tangible knowledge. The result was a report and a number of videos as a tangible deliverable to the company who afterwards took the prototypes closer to a market introduction.

But the company was also partly present in the boy's home during the testing period. However, the company's presence tended to generate less direct and useful evaluation comments from the boys as they felt that their criticism would be taken as impoliteness.

Figure 5. Boys testing a new prototype, making it possible to play "Playstation 3" games with the joystick on the wheelchair.

Case: Cura Innovation
Cura Innovation was another "case company" at Egmont involved in living lab activities. Cura is a small start-up company in the business of developing "intelligent bathroom solutions". The company wanted to test the prototypes of a toilet and a wash basin at Egmont with the intention of improving the solutions by involving the users. This process had a tangible deliverable that initiated the process.

To get testing and evaluation results from bathroom visits can be a fairly delicate matter methodically, because direct observation is a no go. The facilitator from VIA decided to introduce a user involvement method called "mobile probe" that seemed ideally suited

for the challenges. A mobile probe is a newly developed digital and mobile phone based user involvement platform based on the principles of the anthropological method *cultural probes.* The idea is that you deliver a message to a number of end users with questions and tasks including tools that can generate and collect answers and input from the users (in the case of the cultural probe a package with video camera or a post cards that have to be returned to sender – in the case of the mobile probe a system that collects and sorts text messages sent in by the user). Before the test, the prototypes were installed in a bathroom used by the students at Egmont. A number of yellow arrows with different questions were put on the walls of the bathroom, e.g. "If you wanted to change something with this wash basin, what should it be?" The yellow arrows also had keywords and a mobile number to let the users send in experiences, ideas and frustrations via their mobile phones. This method was a tangible delivery to the project with the purpose of explicating tacit knowledge of bathroom use.

The probe was a sort of urban probe, a publicly accessible probe for all the users of the bathroom. It was available for input from the users for a period of three weeks' time. A small happening for the students was held during the period to give attention to the feedback possibilities.

Approximately 10 different students participated by using the mobile probe feedback possibility during that period by sending texts or MMS picture. All this digital feedback information was automatically collected in the mobile probes software system. The package of input resulted in a number of pictures with attached descriptions of experienced functional challenges but also positive comments, such as the ability of the sink to carry the weight of the handicapped student's helper. The answers from the students were, in fact, a value conversion, where their personal (intangible) knowledge on bathroom use in general was converted to tangible feedback based on their experience of those specific prototypes in that specific bathroom setting.

Finally, Cura Innovation looked at the mobile probes deliverables from the students and made a value conversion as to which comments and ideas could be used to alter or further develop their two prototypes before market introduction.

Figure 6. Yellow arrows depicting questions to answer to the "mobile probes system". Managing director of Cura Innovation in the Egmont bathroom with his two prototypes.

Case study: The Village of Soelund living lab
In the Handivision project the Alexandra Institute brought their experience of user involvement and participatory design into the project as well as the experience of developing and deploying new technology. The goal was to develop special methods for engaging the user-residents in a participatory design process and implement these as a resource in the village living lab.

Two Danish companies were engaged as well. One, Personics, is a manufacturer of a training game for people with disabilities, e.g. people with cerebral palsy. The product works by tracking the movements of a finger or an arm and then transferring them to a computer game. Personics entered the project with the clear goal of improving or redesigning their product and extend its use to people with physical and cognitive deficits. The other company, Amfitech, had a role as merely engineering consultants with experience of sensor and tracking technology. The motivation and interest of the village was to enhance the quality of life of the residents. This could be put in a slightly different way: The pedagogical staff was eager to expand their pedagogical toolbox by exploring some of the possibilities of new technology. As *reflective practitioners* the pedagogues were looking for new ways of working with the residents, and thus turn some of the established routines into something fun. The ultimate goal was of course to enhance the quality of life of the residents.

Giving the high degree of resident reliance on the staff and their highly individual preferences and abilities, it was clear that the focus of attention should be on the meaningful relationship and interplay between the residents and staff members. An approach that turned the scope of innovation away from an individual user perspective (roughly speaking) to the question of how to enhance or innovate *a relationship between resident-user and staff-user*. Therapist and pedagogues were interested in inventing new tools for developing their professional practice. In this respect they also became users, with professional and personal needs and requirements relating to their work practice. This became the defining characteristic or even the core idea of the living lab.

Understanding the innovation culture of Soelund became an important base for the project. The idea of creating 'bubbles' soon became a base for the project activities. Participants among the staff were easy to identify as those who where the most active and productive at the preliminary workshops. As such they where not appointed but more likely accepted by the leadership of the village to take part in the innovation process.

At that time the village had plans to build a new house (850 m2) especially made for Snozelen practice. A house inspired by the rich narratives of fairytales and filled with all kinds of pedagogical tools and technology. All designed to give the residents perceptual experiences and stories. Of course this was a gift for the project. Entering and integrating with already ongoing activities in the village became a main driver and enrichment for the project. The project thus became a semi open part of the ongoing activities of the village.

The two companies and the people from the Alexandra Institute soon became known as 'the technology people' in the village and understood as representatives of all the possibilities connected to the imaginative sphere of 'technological wonders'. This 'technology' speculation expressed during various workshops became an excellent way to 'indirectly' map out user needs and form design principles. Ask people to imagine

the future and you will have a good idea of their everyday troubles and speculations and needs. We formed three bubbles concerned with different aspects of technology put into use in the village. All groups came up with good and useful ideas and points of references for the actual prototype development. The designer from the Alexandra Institute took the role of prioritising and realising the most important ideas in a prototype based on the Personics game.

As to the development of new methodology and resident involvement (Kramp 2010), we set up a range of low-tech prototype testings: A test period with the Personics product, and a testing of a handful of available commercial products. In this way the residents could be engaged directly in the process by being confronted with concrete things and situations. The residents would respond by showing real interest or joy during the sessions, or they would simply leave because of boredom or unease with the situation. These sessions were videotaped and later interpreted and thoroughly discussed with the professional staff.

The professional staffs' knowledge was of course of paramount importance to the project. But instead of being merely representatives of the residents giving general introductions to their fields of work, we tried to anchor their beliefs in concrete situations as well. In a video prototyping workshop we asked some of the staff to act as residents. The output became very different from the usual roundtable discussion because it explicated fundamental tacit and bodily knowledge, which is often overlooked in general discussions.

To a large extent the methodology-development part of the project was about explicating tacit knowledge into – with the words of Verna Allee – intangible negotiable values. Intangible because of its status as knowledge and negotiable because the knowledge explicated could be shared, transferred and discussed. Clearly the prototype sessions became vehicles in the process of explication unknown potentials.

The prototype was developed through an iterative process between the designer and technical people on the one hand and the village on the other hand. The old Personics game was given a new interface and a new game underpinning the communication between the staff and residents was developed.

Figure 7. An illustraion on how the prototype will be tested in the snoezelen house at Soelund by the residents and pedagogues.

Forming and facilitating living labs – lessons learned
The Handivision project finished in January 2011 and the living labs are now without the supportive funding. Both institutions are engaged in new living lab activities with companies.

Living lab business planning
During the last phase of the project we asked the project leaders of each of the two institutions to develop a business plan for their living lab together with their colleagues. The standard business plan asks the tough questions of value propositions. What can a living lab offer to companies developing assistive and communication technology? How can the developed methodology for user-oriented innovation be put into action and improve value conversion? How can all the other experiences from the project be put into action in a future living lab setup?

New project activities
The business plan raises important issues such as strategy, marketing plan and a description of internal "living lab roles" at the institutions. Products and services as well as a careful planning of the overall organisation of the living lab should also be considered. Both labs succeeded in doing this and are now promoting themselves as living labs though some changes has been made in the setup. The Egmont Hoejskole no longer bases their living lab on a single course and the students attending this. Instead, the school as such acts as a living lab. Currently they are engaged in an EC-project about accessibility and the use of sensors in the urban environment. The Soelund living lab has a firm base in the Snozelen House. A special experimental room is provided for companies to use and both the professional staff and residents are ready to join new innovation processes. They are now used to deal with outsiders such as 'technology people' as a result of the HandiVision project. In general, the potentials of the living lab are closely conneced to snoezelen as a therapeutic practice and organisational asset present in many corners of the village.

Next practice
Both institutions have expressed a wish for going even further. Instead of waiting for the companies to buy into their living lab they are seriously considering the possibility of reversing the process: The living labs could put their own ideas into action by inviting relevant companies to be part of a joint enterprise. The case story from Soelund shows that this is partly what already happened there because the institution entered HandiVision with an outspoken vision, namely to take snoezelen practice and interactive communication technology to the next level. This vision was partly converted to a *shared value and purpose* between Soelund, Alexandra and the two companies involved.

Lessons on open innovation and absorptive capacity
Open innovation and absorptive capacity are closely related, as discussed earlier. For companies to engage in open innovation processes under the living lab umbrella, the basic impediment has to be overcome. In this paper we have mainly presented company cases where they actually benefitted from the engagement with users. Some of the other partners in the project felt reluctant as to the degree of involvement in the project. For instance the questions of IPR came up on a regular basis for some of the partners, a hindrance for their full engagement. Other companies felt a bit overwhelmed by meeting the users and all their requirements and ideas. They did not have the adequate absorptive capacity or business interest to capture that potential value from the end

users. They sometimes felt that the users lacked a basic understanding of the capabilities of their companies. And sometimes they were right. The right matching of expectations sometimes lacked when values were to be exchanged. This was an important lesson learned and has to be carefully integrated into the future work of the living labs. Companies' successful use of and participation in a living lab is closely related to the acceptance of open innovation processes but also a deliberation on the absorptive capacity as to how the company can benefit from engaging with a living lab.

The flux and instability of living labs
The living lab as a network for exchanging and negotiating values will always fluctuate over time due to changing organisational assets and new persons with changing roles in both institutions, companies, and intermediary organisations. This poses a major challenge to the stability of the living lab strategy and branding as to what kind of deliverables and value creation the partners interested in cooperation can expect to receive.

Trust, curiosity and sustainability
On the other hand, trust between partners in an open innovation processes is a shortcut to more efficient value exchange. Trust comes out of a will to deeply understand the purpose of the other partners involved and to be curious. This paves the way for a better shared understanding of risks and possibilites ahead. Curiosity did not kill the cat! Sustainability of the living lab is dependent upon there being a high level of both transactional and network perceived value. This is what constitutes the shared purpose. Otherwise, all three types of partners will not find it attractive as a platform for creating innovative products or services.

Taking living labs to another level
Living labs that are set up for the purpose of radical innovation, as in the HandiVision project, are not successful only because they are organised in a way that combines strategic resources of different partners, but also because the partners over time have to develop their organisational mechanisms to realise benefits from these different strategic resources. As we have seen it in the HandiVision project so far, the two living labs still have a way to go in order to realise the full innovation potential. Strategic management decisions as a next step can strengthen the ability of the institutions to benefit from external knowledge from companies, research institutions, and intermediary organisations. Such decisions can make the living labs even more interesting for companies within the assistive technology field and for intermediate organisations that are in the business of creating public-private projects.

WEB SITES
Egmont folk high school**:** http://www.egmont-hs.dk
Egmont living lab: http://diblab.wordpress.com/
The Village of Soelund: http://www.solund.dk
Soelund living lab: http://www.solund.dk/Guldhornet/Living_Lab_-_Udvikling.aspx
HandiVision project homepage: http://www.handivision.dk

REFERENCES

Allee, Verna (2008). "Value Network Analysis and value conversion of tangible and intangible assets", *Journal of Intellectual Capital*, Volume 9, No. 1, 2008, pp. 5-24. Available at:
http://www.openvaluenetworks.com/Articles/Value_Conversion_JIC_online_version.pdf

Chesbrough, Henri (2003). "Open Innovation. The new imperative for creating and profiting from technology", *Harward Business School Press*, Harvard, Boston.

Følstad, Asbjørn (2008). "Living labs for innovation and development of information and communication technology: A litterature review", *The Electronic Journal for Virtual Organisations and Networks*, volume 10, "Special issue on Living Labs", August 2008. Available at:
http://iceconference.org/projects/264/Issues/eJOV%20Special%20Issue%20on%20Living%20Labs%202008/eJOV10_SPILL7_Folstad_Living%20Labs%20for%20Innovation%20and%20Development.pdf

Kramp, Gunnar, Peter Nielsen, Anne Steen Møller (2010). "Participatory interaction in therapeutical settings". Working paper. NordiCHI Conference 2010.

Vanhaverbeke, Wim, Myriam Cloodt, Vareska Van de Vrande (2007). "Connecting absorptive capacity and open innovation", 28th October 2007. Available at:
http://www.cas.uio.no/research/0708innovation/CASworkshop_VanhaverbekeEtAl.pdf