THE SENSORY DELIVERY ROOMS OF THE FUTURE: TRANSLATING KNOWLEGE ACROSS BOUNDARIES IN A PUBLIC-PRIVATE INNOVATION PARTNERSHIP

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Abstract

One of the biggest challenges when co-designing new and innovative products, services or systems is to handle the different knowledge perspectives of the involved project partners. In design and innovation processes the ability to translate knowledge across knowledge boundaries by enrolling actors and building up stable networks is crucial for success. Transferring knowledge across functions within the same company, has proved to be a problem, however, this might be an even bigger issue when it comes to Public Private Innovation Partnerships (PPIs), where the project participants (both the selected representatives and their organisations) might have very different backgrounds, incentives and motivations for participating in the design project.
This article is following the partners involved in a successful PPI, in their efforts to design 2 sensory delivery rooms at a Hospital in Denmark. The research revolves around the efforts of the lead designer from one of the private companies in building up the network around the new Sensory Delivery Rooms by drawing on previous experience and using various boundary objects at different stages in the design process.

Keywords: Design process, Innovation, Participatory Design, Knowledge management

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1 INTRODUCTION

The challenges and difficulties of handling different knowledge perspectives in complex design and innovation processes have in recent years been widely addressed in the literature. STS researchers points to the fact that, knowledge in innovation processes is used to build up and stabilise heterogeneous actor networks through translation processes (Akrich et al., 2002), and also authors from other scholarly disciplines highlight the importance of knowledge as a critical factor for the success of innovation processes (Nonaka and Takeuchi, 1995).

Studies have shown, that the challenges of handling various types of knowledge become evident when knowledge is shared across boundaries of functions, professions etc. (Carlile, 2004; Carlile, 2002). One way to span such knowledge boundaries is to use objects as a way to engage heterogeneous actors in a mutual dialogue. Within the American pragmatism tradition, authors such as Star and Griesemer (1989) and later Carlile have introduced and built on the concept of 'boundary objects' and their use, describing the characteristics of 'objects' that can be shared, negotiated and discussed across knowledge boundaries in different contexts. While Carlile focuses on knowledge boundaries between professional functions within companies, the design literature addresses knowledge sharing across boundaries between actors from different companies and entities (Gunn and Clausen, 2013) and across different competencies (Brandt, 2007).

Inspired by the translation perspective from Actor Network Theory (Callon, 1986), this article analyses the boundary spanning activities of translating knowledge across boundaries using diverse boundary objects. The specific backdrop of this analysis is Public Private Innovation Partnerships (PPIs) in a Danish healthcare setting. Denmark strives to be forerunners in developing and providing new services to support the Danish welfare state and to export products and services globally. The PPIs are currently seen as means for doing just that, as it is believed that collaboration between actors who are to interact with the technology, and developers of the technology, is bound to result in successful, innovative solutions. Building on this idea and understanding, in 2012 a PPI was initiated by the midwives of Hillerød Hospital in the Capital Region of Denmark, with the aim of designing two new flexible and relaxing Sensory Delivery Rooms.

The focus of the analysis revolves around the types of knowledge at play in this partnership, as it is somewhat representative of challenges encountered in similar PPI projects within a healthcare setting as well as in multi-disciplinary innovation projects in general. Special attention will be paid to how the different types of knowledge are translated across knowledge boundaries, using different boundary spanning objects, to build and stabilise a network of actors in a co-design process.

2 KNOWLEDGE IN INNOVATION PROCESSES

2.1 Sharing knowledge across boundaries

According to Carlile (2002), knowledge cannot readily be transferred directly from one function within a company to another (e.g. from R&D to marketing or sales). Instead it needs to be transformed and negotiated so both e.g. R&D and marketing can relate this knowledge to their own practices and professional language. This transformation of knowledge is exactly what is at stake in design and innovation processes, as design is about transforming and questioning existing knowledge, while building up stable networks around the new concept. Carlile introduces boundary objects as a tool to make this transformation happen, and highlights three characteristics that make a boundary object useful to communicate across knowledge boundaries: 1) the establishment of a shared syntax, 2) the ability to discuss different meanings and 3) facilitation of the process of jointly transforming knowledge. All 3 characteristics supports communication and knowledge sharing, however, since the transformation of knowledge has proved to be key in design processes and network building, the types of boundary objects supporting this transformation are of particular interest here. Mock-ups and prototypes are examples of such boundary objects that give meaning and makes sense to different actors in spite of their diverse professional practices and professional languages (Brandt, 2007; Rhinow et al., 2012). The fidelity and detail of such mock-ups and prototypes varies during the design process as the initial mock-ups such as hand drawings may be open to interpretation while the final

prototype is much more detailed and difficult to change. In both cases the materiality of such mock-ups gives the different actors something concrete and somewhat tangible to comment on and engage in. This paper will provide insight into how different types of boundary objects come into play in the design of the sensory delivery rooms at Hillerød Hospital.

2.2 Innovation as network formation

In the science and technology (STS) literature innovation is seen as network formation where the network is built and stabilised through the enrolment and mobilisation of allies to speak and act on behalf of the network. *"Innovation is perpetually in search of allies. It must integrate itself into a network of actors who take it up, support it, diffuse it." Also "Innovation is the art of interesting an increasing number of allies who will make you stronger and stronger."*(Akrich et al., 2002: 203, 205)

Network formation plays an evident role in PPIs where heterogeneous actors from very different sectors and domains are to build up a common network. The process of enrolling and mobilising actors in building up the network, is often referred to as a process of translation, which consist of 4 strands: *problematization* (a problem/agenda is set forth), *interessement* (actors become interested in joining the network and starts negotiating the terms of their enrolment), *enrolment* (the roles of the actors are defined and interlinked) and *mobilization* (the actors actively work for the networks agenda) (Callon, 1986). This concept of translation builds on Carlile's (2002) concept of transformation by adding the concept of the actor network of practice that is part of this transformation (Chen and Huang, 2009). Hence the term 'translation' will from here on be used to cover both transformation and translation.

When going through the network building process of the Sensory Delivery Rooms, it is important to notice, that not all actors are enrolled in the same way. They each have their own motivations and incentives to be part of the project, and hence not all actors are enrolled based on the same types of arguments. My research points to the fact that some types of knowledge count more for certain actors than other types do. In the medical domain quantitative knowledge based on Randomised Control Trials (RCT) plays a crucial role, because the hospitals ask for solutions that have been thoroughly tested and validated. Turning to a quite different domain found in creative design companies, qualitative knowledge represented by e.g. drawings of patient flows and user quotes, is perceived to be more valuable. Needless to say, the merging of these knowledge domains, which is supposed to happen in PPIs, often proves tricky.

3 ENROLLING ACTORS IN CO-DESIGN PROCESSES

3.1 Participatory Design and Co-Design

PPIs are framed as a co-design process where the users of the technologies/concepts are involved in the design phase. Co-design activities can be traced back to the Scandinavian participatory design tradition, which is based on inclusion and democracy and has it roots in the 70'ies workers movement, where actors from the professions were taken into account and invited to influence the design of their work environments. (Sanders and Strappers, 2008). Sanders and Strappers have proposed the following definition of co-design, which is comparable with the situation seen in PPIs: "*We use co-design in a broader sense to refer to the creativity of designers and people not trained in design working together in the design development process."* (Sanders and Strappers, 2008: 6) This definition stands in opposition to the user-centred design approach where focus is on studying the users to discover and identify their unarticulated needs (Jensen, 2012). Also the authors carefully mention 'people not trained in design' instead of 'users' which is very much in line with STS describing 'a network of actors' and not only the users. PPIs are configured to involve actors from the public sector, who eventually is to be one of the main 'users' of the product, service or system to be designed. Hence, they are involved throughout the design process – also in the initial framing, staging and problematization of the project.

3.2 Framing and Staging the design process

Some authors argue that insights from political process theory can contribute to a reflexive understanding of design as the staging of socio-technical relations (Clausen and Yoshinaka, 2007). From a design perspective, 'staging' is used to illustrate how a project or activity is framed in terms of bringing together or connecting actors and perspectives in a design process by the means of different material objects and facilitation. The concept is inspired by the theatre metaphor, where you invite selected actors on the stage to enact existing frames of understanding, to selectively frame problems, solutions, events, and enact circumstances and conditions using props such as design games or mock-ups. Creating reflective conversations and interactions between participants and objects and then enacting stories of future use is seen as *"ways to put the design and arrangement of space, scenery and props, the staging, into play"* (Clausen et al., 2012: 2). In PPIs the projects are framed and staged very explicitly to bring together public and private organisations as part of the premise. However, from the beginning of these projects it is not at all explicit, which problems to frame and which props to use during the project. In some PPIs in Denmark groups containing a mix of public and private organisations have been formed based on the assumption that new innovations will automatically, once you connect people and organisations to one another – but so far none of these has succeeded. The story about the design of the Sensory Delivery Rooms provides insights into how the framing and staging of the process was the basis of the project's success.

3.3 Public Private Innovation Partnerships in a Danish context

The actors involved in PPIs in a Danish healthcare context, are private companies developing e.g. hospital equipment and public organisations, which could be hospitals. The general idea is that the public entities, here the hospitals, have a problem or a need for new solutions, and that the private companies have the expertise and the capacity to design these new and innovative solutions which solves the initial problem. Under normal circumstances the laws of public procurement rules out the private company as ineligible in the following tender process if they have collaborated with the hospital in development activities. In a PPI setup, however, this is not the case because the projects are defined as smaller pilot development projects. Hence the PPIs are arranged as pilot projects, later to be scaled up and sold to hospitals in Denmark and globally (see Figure 1).

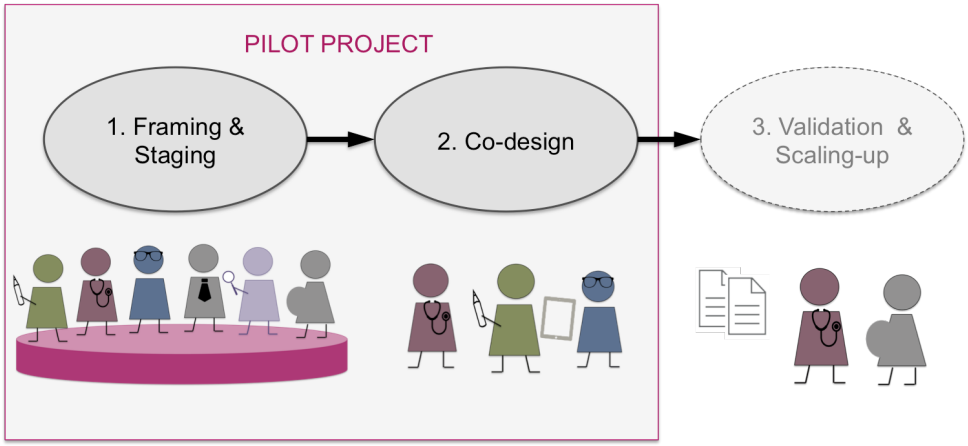

Figure 1. Illustration of the different stages of a PPI and the key activities within these

To date, more than 250 PPIs has been initiated in Denmark, and this particular PPI is one of the only ones where all project participants (both public and private) agree that it has been successful. Previous projects have proved successful for either the public *or* the private project participants and in some cases for none of the above. The following description will allow for further analysis of what made this particular project a success.

4 CO-DESIGNING THE DELIVERY ROOMS OF THE FUTURE

4.1 Framing and staging the PPI process

What follows is a look into the framing and staging, and hence the initial network building activities, of the co-designed new intervention at Hillerød Hospital.

The maternity ward at Hillerød Hospital was facing a project of building 9 new delivery rooms due to restructuring. In this process the midwives, who are the main 'users' of the delivery rooms working there every day, articulated a wish to have the rooms individually decorated to remove the clinical feeling they evoked and instead create a more relaxing environment for the women during delivery. Studies suggest, that fewer complications arise and less medicine is given when the woman is not too stressed and anxious. Also, when the women are more relaxed, the midwives can spend more time enhancing the experience by using her professional experience rather than comforting the woman. The midwives wished for a tranquil atmosphere to support their work and relax the women giving birth, but the delivery rooms also needed flexibility to accommodate different work practices. E.g. it was essential that the these 'special' delivery rooms could immediately be transformed into a 'normal' delivery room if any complications was to arise, and it was important that the equipment was standardised so the staff wound not have to use time trying to locate different instruments during such occurrences.

With these initial thoughts and wishes, the midwives approached an innovation consultant situated at Hillerød Hospital who's job was to initiate new PPIs. The project was of immediate interest for the consultant as this proposal was in perfect line with the new hospital strategy to attract more women to deliver here as well as to provide inspiring surroundings to attract new, motivated staff to the department. The idea that a relaxing atmosphere would lead to fewer complications during the delivery process corresponds to what Callon (1986) would term the *problematization* strand of translation in the building up of a new network. The midwives, the hospital management and the innovation consultant each had their own motives for being interested in the problematization and so did the companies once approached.

Not surprisingly, networking and having a good reputation in the industry, is of huge significance when it comes to being invited to participate in PPIs. The innovation consultant from Hillerød Hospital had previously been involved in another PPI together with the small Danish design company Wavecare, that develops audio-visual interventions related to healthcare, and hence Wavecare was invited into the PPI based on this previous reference and their track record of working with relaxation in healthcare settings. Being a small and visionary company Wavecare are always interested in engaging in new design activities to gain novel knowledge to be used in future projects. Also Wavecare are well aware, that if they get the reputation of being a company that makes things happen, they immediately get good references, and are more likely to be invited into new project constellations in the future. Wavecare had on previous occasions worked with Philips, who is a strong player in the design and development of healthcare technologies and ambient experience. Philips had the innovative technology, which could potentially play a significant role in the final concept, namely the luminous textile invented by researchers at the Philips headquarters in Eindhoven, Netherlands. The luminous textile is a backlit 'screen' covered with textile that provides a somewhat blurry, low-resolution image of moving pictures. Being inventors of the luminous textile, and developers of lighting solutions, meant, that Philips was an obvious project participant. However, in this particular project Philips took on the role of supplier of the technology rather than designing the full intervention, which would normally be the case. Even though Philips in Eindhoven has many designers specialised in healthcare, it was a lighting designer and a key account manager from Denmark who became involved in this project because of the Danish context. Philips saw it as a nice opportunity to further develop the luminous textile and of being 'visible' in the Danish healthcare landscape to position themselves as providers of new solutions for the many super hospitals currently being build.

The innovation consultant from Hillerød hospital also knew Philips well and she thought that Philips and Wavecare would form a nice combination of expertise, experience and hardware and so the project team came to count one public and two private organisations. These were the parties selected to engage in a co-design process of the new delivery rooms, and the activities described above can be seen as part of the *interessement* where the involved parties agree that the concept should consist of light, sounds, and images on the luminous textile.

The rather heterogeneous actors constituting the network have different identities and motives (see Figure 2). Together these more or less articulated motivations form a collection or list of criteria (the *obligatory passage point*) that the concept should encompass to strengthen and stabilise the network. At this point, the innovation consultant has managed to interest Philips and Wavecare in the network, and hence she had reached her goal and was no longer part of the project.

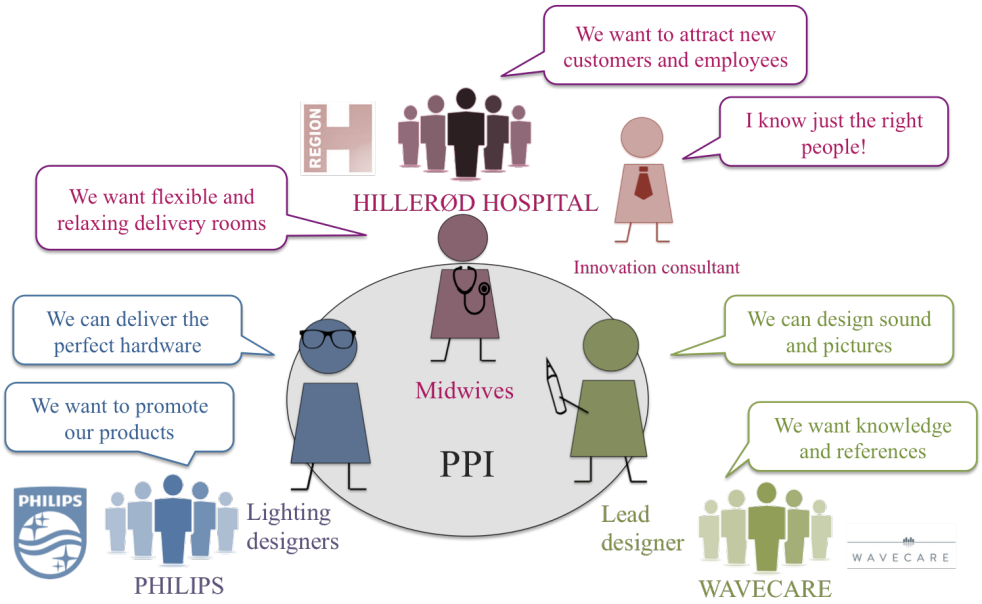

Figure 2. The PPI setup and the motivations and roles of the actors in the network

4.2 The vision of the Designer translates knowledge

One of the key actors in this project is the lead designer from the small Danish design company Wavecare. A few months before being asked to participate in the PPI, he was invited to Eindhoven by Philips to witness the unveiling of the new luminous textile. When introduced to this innovative technology, the lead designer immediately felt that it would be perfect for creating a peaceful atmosphere, and saw the project of designing the delivery rooms at Hillerød Hospital as a golden opportunity for doing exactly that. His vision was, that the luminous textile, in combination with his knowledge and skills in terms of audio-visual interventions, would make a perfect concept to match the wishes and ideas of the midwives of a calming and supportive delivery room. At one of the initial face-to-face meetings the lead designer presented his ideas to the midwives and to Philips by showing them a mock-up of the concept on his computer, to illustrate how it would look in the context of the new delivery rooms.

This mock-up served as a boundary object as it was concrete or robust enough for everyone to grasp the meaning, and 'plastic' enough for it to adapt to different contexts and knowledge domains (Star and Griesemer, 1989). Everyone was impressed by what they saw, and immediately all was on board with the overall idea. The visualisation of a concept in a use context represented a concrete solution that everybody could convey, as they could relate this idea to their own practice and motivations/incentives for participating in the project. Hence this particular concept became the solution to span organisational boundaries and knowledge domains. The designer draws on knowledge from previous experiences as well as on his knowledge about the luminous textile and translates this knowledge into a concept, relevant for this particular setup, because it speaks to all of the involved actors. Furthermore, the designer has dealt with public health institutions before related to the same topic of relaxation in stressful situations and environments, which enables him to speak the professional language and hence, *enrol*, and *mobilise* both the midwives and Philips to each contribute to and stabilise the network. The midwives provide insights, Wavecare design the solution and provides sound and images and Philips supply the hardware.

4.3 Detailing the intervention - and the difficulties of enrolling the luminous textile

From this point on, the character of the project shifted towards focusing on detailing the agreed concept. Rooted in experiences and work practices of the midwives, three different 'programs' was developed and introduced to support the delivery process: a welcoming program, a relaxation program and a breathing program. The development of these programs had an iterative nature where the midwives explained to Philips and Wavecare what was important to them in their work and to the women in labour, and between meetings the companies would go back to the drawing board, and come up with sub-solutions to improve the concept accordingly.
It seems as if all involved actors was enrolled in the network at this point in time, as each plays their well-defined part. However one actor was still only in the process of being enrolled: the luminous textile. When the lead designer initially presented the computer-based mock-up, both the midwives and Philips was enthusiastic, and trusted the designer to make the concept work in a real life setting. The first time a prototype of the installation was introduced to all project participants, was at a health care conference in Copenhagen. When the installation was turned on and revealed for the first time, the disappointment was very readable in the faces of the midwives. The real-life use of the luminous textile was not as easily handled as initially thought and planned. This was a crucial setback, and the lack of corporation from the luminous textile almost broke the entire network down. However, the lead designer went back to his workshop and re-designed the programs to fit the concrete, real-life luminous textile, and eventually came up with a solution that satisfied the wishes of the midwives and restored their trust in the designer as well as in the luminous textile. The crisis was averted and the network remained stable.

Already in the beginning of the project, all three partners felt strongly about rapidly installing a working prototype at the maternity ward to quickly see the fruits of their collaboration. This prototype eventually served as an even more tangible boundary object than the mock-up, and gave the midwives the opportunity to see how the intervention would work in practice and enabled them to suggest improvements. Also the speedy introduction of a working prototype would initiate the testing and hence the validation of the concept, which was essential in order to enrol and satisfy the buyer (the hospital management) who are mainly valuing quantitative data. This was an interesting moment in the project, as a 'new' actor was to be interested and enrolled in the network around the Sensory Delivery Rooms – the women giving birth. Until now the midwives had represented them throughout the design process, but now they were interviewed and asked to give feedback by filling in questionnaires to comment and rate their experience.

4.4 Installation, modification and test of the intervention

However, before starting the validation process the prototype was to be tested and adjusted accordingly. The luminous textile, the lights and the sound were installed at two Sensory Delivery Rooms, and the prototype was initially tested for two weeks. Then the concept was evaluated and re-designed based on the chosen midwives experiences using the rooms. After the trial period it was clear to the midwives that several changes had to be made. The breathing programme, to support the women breathing correctly during contractions, included visuals on the luminous textile of waves rolling onto a beach at a specific pace and frequency. However, this frequency was so quick, that it took the breath out of *any* woman in labour. Hence the lead designer went to another beach and shot new footage of different waves, and then sat in his workshop trying to breathe like a woman in labour to match breathing and footage until it was just right.

Furthermore there was video of a cosy, burning bonfire on the luminous textile, which was nice and calming for the women in labour and her relatives. However, this artificial bonfire made the light in the room flicker immensely and consequently it became almost impossible for the midwives to concentrate and focus. Once again the lead designer went back to his workshop and adjusted his work to match the expectations of the midwives. This iterative process of optimising and re-designing the intervention to fit the on-going practices in the delivery rooms, proved challenging for the Philips representatives. They were eager to finish the process as they had already spent all the time allocated to this project by the Philips organisation. As Philips in Denmark do not usually focus on design, employees are normally evaluated, and their performance measured, by how many light fixtures they sell and not by how much new knowledge they contribute to the organisation by participating in new

and interesting design activities. This challenged the iterative nature of the process and the stability of the network, as Philips pushed for the final design to be decided upon as quickly as possible.
Eventually the midwives felt very satisfied with the modifications and optimisations and started evaluating and measuring the indicators they knew were important to validate the impact of the installation. In total 102 women were randomly chosen to participate in the evaluation process, answering questionnaires producing quantitative data, and participating in qualitative interviews. The result of this evaluation process was published in a report, which came to serve as a boundary object where the midwives and the women were represented by both quantitative and qualitative data. The combination of statistics and quotes made the result very robust and enabled the report to 'speak' to different actors such as hospital managements, nurses and pregnant women in a process of deciding on which hospital to give birth. 95% of the women who had delivered their babies in the Sensory Delivery Rooms vas very happy with the experience, and this quantified information contributed to the strengthening and stabilisation of the network and the success of the project.

5 DISCUSSION – REPRESENTATION AND TRANSLATION OF DIFFERENT TYPES OF KNOWLEDGE

So what made this PPI a success for the midwives, Philips, Wavecare and for the women giving birth altogether? There are several explanations. First of all, the midwives, who are also the main users of the Sensory Delivery Rooms, had articulated a problematization, which focused on a concrete desire for flexible and calming delivery rooms. Secondly, the lead designer was able to speak the professional language of both Philips and the midwives, which helped him in his efforts to handle and translate both qualitative and quantitative knowledge during the project. And thirdly, boundary objects with varying types of fidelity and detail allowed for shared understandings and specific negotiations of the concept. These 3 elements deserve further elaboration.

5.1 Involvement of the primary users throughout the co-design process:

This PPI project was indeed a co-design process according to the definition introduced by Sanders and Strappers (2008) presented in the beginning of this article. The project was framed and staged to ensure active involvement of the midwives throughout the design process from problem identification, through conceptualization, and to evaluation and testing of the final installation. The midwives initiated the project and put forward an agenda, which provided the focus of the project. They also acted as experts in their own work practices at the maternity ward, and worked together with a trained designer in the design process, although not being designers themselves. The iterative nature of the involvement of the midwives truly qualified the designs put forward by the lead designer from Wavecare and by the Philips employees. This indeed illustrates the value of actively involving actors who are not trained designers in a co-design process.

5.2 Handling different types of knowledge to translate the network:

As the case have illustrated, the handling of diverse types of knowledge is a valuable skill in the process of co-designing with actors from very different backgrounds and professions.
The lead designer had previously worked with both Philips and healthcare professionals, so he was accustomed to the syntax or language used by the midwives, as well as the business jargon of Philips, which eased the sharing of knowledge (Carlile, 2002)

Both qualitative and quantitative knowledge is equally important but may be used in different ways and at distinctive stages in the design process. Already from the beginning of the project, qualitative knowledge in the form of statements and explanations from the midwives about their work practices and experiences, were translated into the three different programs of light, sound, and image by the designer and Philips. This particular knowledge was available to the designer because the midwives were active co-designers in the process. Later on quantitative knowledge came into play, as the concept was tested and validated by the midwives and the women giving birth. Being able to statistically 'prove' that the concept indeed supports the work of the midwives and makes the delivery process a nice experience for the women and her relatives is paramount in the scaling up activities following the pilot project.

Based on this case, it seems that qualitative knowledge is of particular relevance in the beginning of the project whereas qualitative knowledge becomes essential by the end of the project, because it involves communicating knowledge between different types of actors with different motivations.

5.3 Boundary objects as a means to facilitate translation of knowledge and co-design:

Neither qualitative nor quantitative knowledge is readily translated into the design process to build up the network. But this case also illustrates how different types of boundary objects enable dialogue and translation of knowledge to heterogeneous actors with diverse motives, during different stages in the design process. The midwives want a concept that supports their work, and are able to give qualitative inputs to the design process. Once the pilot project is it it's final phases, there is an increasing focus on scaling up activities. Philips wants to validate their products so they can sell them to the hospital management who also values quantitative data, and Wavecare want to have a good track record and hence nice references for future projects (see Figure 3).

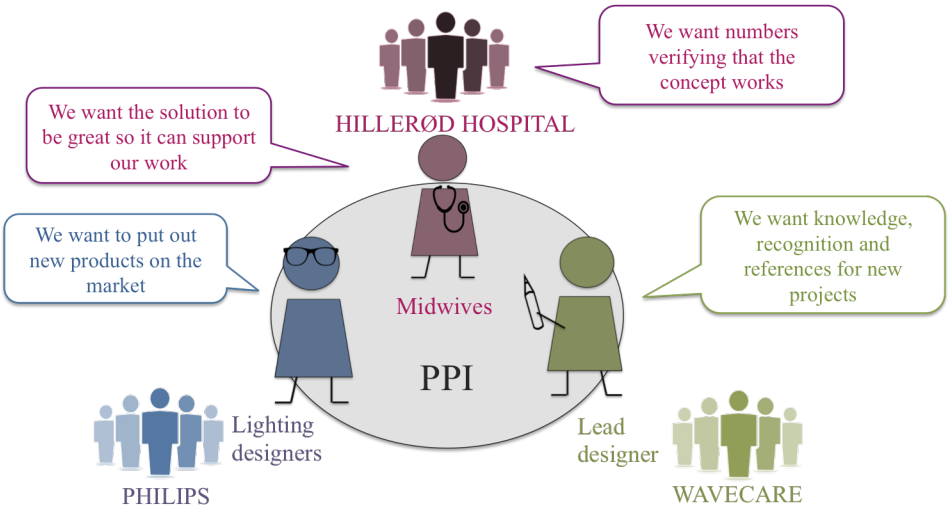

Figure 3. Each actor has different motivations and values different knowledge

Different types of boundary objects satisfy the diverse motivations and identities of the actors:

1. The hands-on knowledge and experiences of the midwives are translated into three programmes to support the midwives in their work and the woman during delivery.
2. Knowledge and ideas are shared in face-to-face meetings with mock-ups e.g. illustrations of how the intervention would present itself visually and how it would work.
3. Ideas and knowledge are quickly translated into a working prototype to illustrate the proof of concept and serves as a basis for the study of testing and validating the intervention.
4. The evidence provided by the final study and the report is needed for scaling up purposes.

During the initial face-to-face project meetings, the qualitative 'hands-on knowledge', embedded in the practices of the midwives, was explained by the midwives and then translated into the concept of 3 supportive programmes by the lead designer from Wavecare.
In the co-design process, mock-ups and the working prototype was used as boundary objects which often united the project participants making the network stronger, while at other times almost broke the network down. The computer based mock-up made all project participants see the vision of the lead designer, but it did not contain the materiality and hence the properties of the initial prototype presented at the conference proved to be a big disappointment, and made the other participants momentarily doubt the designer and his visions.
For scaling-up purposes the evidence-based knowledge is crucial. The report based on this study will eventually be the ultimate boundary object that speaks directly to the hospital managements and potentially persuades them to buy the solution so that scaling-up activities can begin and more hospitals can benefit from the concept.

We see an evolution with the boundary objects as they start as rough mock-ups on a computer and eventually increases in fidelity and detail towards the concrete prototype installed in the delivery rooms. This illustrates that the requirements to the boundary objects, change throughout the design process to support the different phases and the type of knowledge present. In the beginning they should open up for new ideas and concepts and eventually be very tangible so they can be tested and the final iterations and improvements of the concept can be done.

6 CONCLUSION

We know it is difficult to cross knowledge boundaries in co-design processes, but also that it can be done. The case of the Sensory Delivery Rooms exemplifies how there are different motivations and types of knowledge at stake for the involved actors in a design process, which means, that they, need to be addressed and translated in different ways to build a stable network. This case has also illustrated how boundary objects can support this translation process, and that the nature of boundary objects changes during the design process to become increasingly tangible, detailed and relatable according to the knowledge needed by the heterogeneous actors.

Furthermore, the PPI setup encourages involvement of the main user throughout the design process. Obviously involvement of main actors in design processes is not unique for PPIs but is likewise seen in many other project constellations. In most co-design processes different types of knowledge will need to be shared and translated between people from different professions and with different motivations. Even though PPIs in healthcare settings are quite particular, I will argue, that the handling and sharing of both qualitative and quantitative knowledge is also relevant in other contexts as well, and that boundary objects such as mock-ups and prototypes can play a valuable part in all co-design processes where knowledge is shared and negotiated.

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