Patient transition and circulating intermediary objects in healthcare

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AALBORG UNIVERSITY

STUDENT REPORT

MSc Sustainable Design,

Aalborg University Copenhagen

Master thesis, 2021

Supervisor: Christian Clausen

Hand-in date : 04/06/2021

Characters including spaces: 167.401

Pages in total: 69,75

The individuals that have signed below all agree with the content of this report.

Written by:

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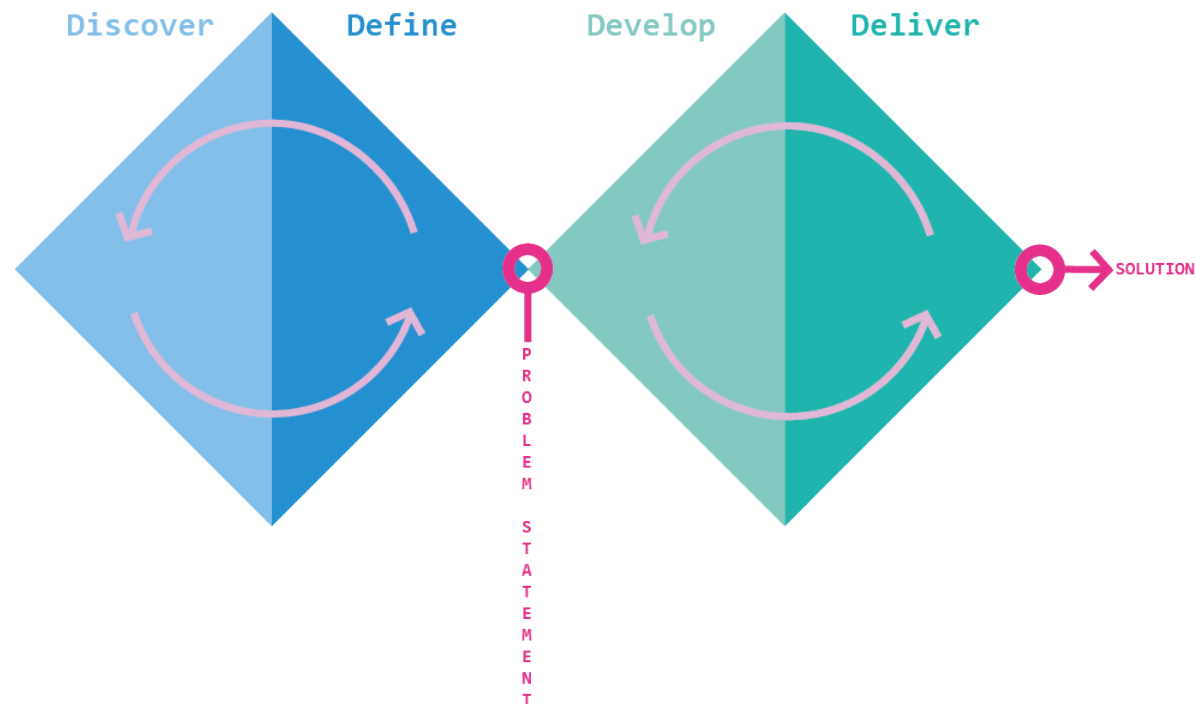Dorthea Smidt Boska Nylander: 20153559

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Abstract

This master thesis investigates innovation and development in the Danish healthcare system in the Capital Region. As Sustainable Design Engineers we are working with explorative socio-technical methods to investigate innovation. We have used Actor Network Theory and the notion of the Development Arena to make our analysis. Through our work we have focused on the need for a patient transition from a passive to an active role in the network. This transition can be achieved by allowing the patient to be more involved and self-reliant in the treatment either from their own homes or at the hospital. The thesis is written in collaboration with the innovation unit, VihTek, who work with test and implementation of welfare technology. VihTek can be an important actor in the patient transition since they can test and implement possible technology that might facilitate the patient transition. A barrier for the change and implementation of new technology is the parallel knowledge networks that limit the flow of knowledge between the different clinical disciplines. VihTek needs to take responsibility for the knowledge flow in the hospital ward to best start the implementation process in the hospital ward. We suggest a few communication concepts that take an offset in the intermediary object understanding to facilitate the knowledge flow.

Reading guide

This project follows the classic Double Diamond model of the design process, through iterations of convergent and divergent thinking in the four phases: discover, define, develop and deliver (Design Council, 2019). These phases are tackled in iterations, through a non-linear process, yet for the sake of creating a clearer narrative, we present them chronologically as they form the backbone for this report.

Furthermore, numurious Danish references as well as interviews and workshops conducted in Danish, are presented in this report. This empirical material is by the authors sought to be translated from Danish to English in a neutral and objective manner, reflecting the original wording and meaning.

Acknowledgement

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Chapter 1:

Introduction

The Danish healthcare system is changing. This change is brought on partly out of economic need to change to keep the treatments offered at the best possible level (Quality manager, 2021, int.), but also because the general public wants change and involvement at a different level than before (Region Hovedstaden, 2010). The initial investigation of this master thesis was to figure out how innovation and development is being handled in the Capital Region of Denmark in connection to the innovation and develop units that are trying to facilitate these changes. Through our initial research we found that the role of the patient is changing (Innovation consultants A, 2021, int.; Quality manager, 2021, int.; Læssøe, 2019; Region Hovedstaden, 2010). This change means that the Capital Region had to open the black box or rethink the role of the patient. This is done by changing how the healthcare narrative is surrounding quality and innovation. Today you cannot have good quality of treatment or good innovation if you do not involve the patient and the next of kin (Region Hovedstaden, 2010; Region Hovedstaden, 2013).

We are writing the master thesis with the innovation unit Research and Test Center for Health Technologies (VihTek). VihTek is one of many innovation units placed in the seven public hospitals in the Capital Region. Their center of attention is on introducing healthcare technologies in the clinical wards to make improvements for the staff, patients and next of kin (VihTek, n.d. A). VihTek and other innovation units are however not in direct contact with the patients. Their contribution to the patient role negotiation is therefore happening through the test and implementation of new healthcare technologies. One of the major issues that VihTek experiences in these processes is that the clinical staff is working within knowledge

silos where knowledge has a hard time passing from one clinical discipline to the next. This is both because of the different focus the different clinical disciplines have and because of the many work assignments that need to be dealt with during the shifts.

While VihTek has a large expertise within finding and setting up a test of welfare technology they are discovering how important the organisational structure is to succeed in an implementation or test of technology.

The patient wants to and needs to change for the purpose of making better treatments and a more future-proof healthcare system. The innovation and development units need to support this effort by facilitating change in their work with the healthcare professionals with the intention of them to change how they work with patients and next of kin. The innovation units will always be present in the function of the external consultant, it is therefore important to facilitate the process in such a way that the clinical staff works with the change and not against it.

Our research question is therefore:

How can we as Design Engineers best support VihTek in their navigation of the development arena to facilitate the needed patient transition in the Danish healthcare system?

To answer this question, we will both look towards scholarly articles and conduct interviews with different actors who are present in the

development arena. These interviews will be semi structured, and the dialogue is facilitated through Microsoft Teams software. The staging of the interviews is important to facilitate the knowledge flow in the conversation. We will use the notion of Actor Networks (Latour, 2005; Callon, 1984), Actor worlds (Callon, 1986) and Arenas of Development (Jørgensen and Sørensen, 2002) to help us sort and analyse the collected empirical data. Once the empirical data is analyzed we will make a workshop to figure out what VihTek can do to navigate the arena and help facilitate the patient transition.

Chapter 2:

Theory and Methods

2.1 Methods

2.1.1 Empirical collection

To study development and the development arena where innovation and ideas are negotiated in relation to the hospital sector, we have been using two different methods. The first is a review of available literature. We have been searching different databases such as PubMed, EBSCOhost and ProQuest. We have been using relevant search words such as *innovation, development, network, governance, hospital,* and *healthcare*. This was done to learn what other scholars might have learned working within the same arena. We also investigated authors we have used previously in other projects to see whether they had made some articles that could be of use in this master thesis. When finding good scholarly articles, we used Google Scholar to locate other articles that might have quoted the article in question. We also investigated the references used in articles. In this way we were able to locate older and newer articles to include in our research.

We also conducted desk research where we investigated what relevant actors have written on the internet. This was done to figure out what narratives the actors want the outside world to see and who they want to be. To get a more nuanced look into an actor or an organisation we invited several departments that work with development and innovation for an informal interview. To make the interviews seem informal we used the semi-structured interview (Davies, 2008) form so that it felt more like a dialogue than a normal interview. By keeping the interview semi-structured we let the interviewee talk about what they deemed relevant with us as the interviewer asking further questions and guiding the conversation back to the main topic when the conversations moved too far away.

2.1.2 Participant observation

This master thesis is written by the authors Ida Rye Gribsvad and Dorthea Smidt Boska Nylander. We have both been working with our collaborator VihTek before. We have worked with them on the third semester project and our bachelor thesis at the bachelor's degree in Sustainable Design. Dorthea has been a student assistant at VihTek since the third semester project and therefore has insight into what is happening within the organisation. For a long time, the relationship between Dorthea and VihTek was mainly collegial but with the focus on the education of Sustainable Design becoming more focused on organisational workings and transitions both the authors have become more aware of the workings within organisations. One could therefore claim that Dorthea has been conducting participant observation (Czarniawska, 2014) for around one year, especially since the introductions during the internship in the fall semester of 2020. *"In the case of organization research, participant observation means that an employee becomes a researcher, or a researcher becomes an employee (...)"* (Czarniawska, 2014, p. 7). In this way Dorthea was fully participating in the workings of VihTek while trying to decipher the narratives and stories that are embedded within the organisation. *"Basic narratives can, however, still carry a load of ambiguity and therefore leave openings for negotiation of meaning."* (Hansen, 2009). We have worked to uncover these ambiguities of narratives through interviews and workshops. Ida has acted as a

critic of the information given by Dorthea and has been an important asset in figuring out what to say and how. This was particularly important since Dorthea does not have any formalized material to back up claims, therefore Ida had to act as gatekeeper and critical friend. To structure and formalise this important task we decided that if a claim from Dorthea was not verified by our empirical findings or verified by actors within VihTek or from publicly available documents then the information would not be considered valid. Therefore, no claims made in this report come solely from Dorthea's knowledge, experiences, and view on the organisation.

2.1.3 Messy maps

Messy maps are maps that include heterogeneous actors that are present in the empirical data. *"Situational maps and analyses can be used as analytic exercise simply to get the researcher moving into and then around the data."* (Clarke, 2005, p. 84). Since participant observation can be seen as invisible work even for the researcher who is performing the work, the messy situational maps and analysis can help to navigate the empirical findings we know we have and articulate the data that is *'hidden'* inside some of the observations that are initially taken for granted (Clarke, 2005). We have used the messy situational maps to create relations with one actor in focus. This has allowed us to see which actors are closely connected and which are not. We have paired this analysis with more classical actor networks to see how the larger network functions. The messy situational maps have allowed us to start the dialogue about our data and have helped us to illuminate narratives and relations.

2.1.4 Double Diamond Model

We have used the Double Diamond model (Design Council, 2019) to help the reader understand how we have worked during the design project. While the Double Diamond model might seem like a linear model the design work has been an iterative process where we have used agile sub-goals (Christensen and Kreiner, 1991) which allows us to make changes in accordance with the development of our knowledge. The Double Diamond model shows the general four phases of the design process (see figure 1). *The discover phase* is a divergent phase where we learn as much as possible about the general subject of healthcare innovation. The next phase is *define* where we look at all the empirical data we have collected and narrow down to one problem definition which we will continue to work with in the *develop phase*. In this phase we develop different possible solutions to the problem. Once the solution space has been explored, we will choose one concept that we will define during the last phase.
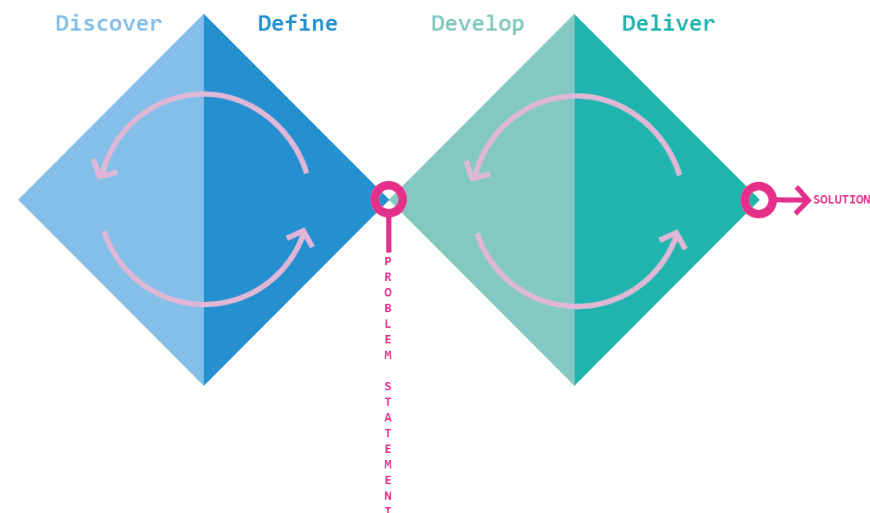
Figure 1: The Double Diamond Model (Design Council, 2019)

In the *deliver phase* we will present and make appropriate changes to the solution so that it will be the best fit possible to VihTek.

2.2 Theory

2.2.1 Actor Network Theory

Actor Network Theory (ANT; Latour, 2005; Callon, 1984) is a framework used to express the complexity of the real world in a more comprehensive manner. The networks are heterogeneous in nature and are made up of human and non-human actors who relate to one another (Olesen and Kroustrup, 2007). It is the relations that are interesting to study in the network. The actor network is not stable even though it might seem that way when looking at illustrations, but the networks are dynamic. Different actors have different agendas that they try to convince other actors to accept. This is done through a translation process (Callon, 1984). Callon (1984) describes the four moments of translation, *problematization, interestment, enrollment* and *mobilization*. For a translation process to succeed the actors who are being translated need to accept the roles and identities in the newly configured network. Therefore, any translation starts with actor-worlds (Callon, 1986). Actor-worlds are desired network configurations that are made by one or more actors that seek to determine the roles and identities of the actors involved. Because of this, actor-worlds are not always able to be translated into real networks because the other actors in the network will not accept this new proposed identity. Furthermore, many actors have an actor-world that might conflict with one another and thereby create possible conflicts and discussions because the networks and ideas of the future do not align.

We will in this report be looking at organisations and institutions. We will therefore use the notion of macro- and micro-actors (Callon and Latour, 2015 [1981]) to help break down the internal networks in these organisations. *"(...) macro-actors are micro-actors seated on top of any (leaky) black boxes."* (Ibid, p. 286). This means that macro actors like organisations are built upon ideas and narratives that are taken for granted (black boxed) but they are not set in stone.

The notion of intermediary objects becomes quite important for our understanding and work with networks and concept creation. An intermediary should be able to represent ideas, translate networks and mediate knowledge (Vinck, 2012). They are a useful tool *"to identify a large number of objects and, through these, to gain better access to actors as they engage in action. It also provides a better view of the relations, activities and practices that are otherwise difficult to pinpoint in the official and spontaneous presentations of actors where the focus is on rationales, challenges and epistemological considerations."* (Vinck, 2012, p. 94). Using intermediaries to provoke translations or to try to mediate knowledge can be risky since the intermediary cannot be completely controlled by the creator. *"The intermediary object cannot be reduced to its author's intention. When it is materialised, something new is introduced."* (Vinck, 2012, p. 96). We will try to use intermediaries as mediators in a workshop setting in the hopes that the participants will act on the grasp on to it and help it facilitate knowledge sharing; *"Finally, the notion of intermediary object teaches us that during research*

activity the materiality of objects, roughs, writings, samples or probes influences the emergence of knowledge." (Vinck, 2012, p. 98).

2.2.2 Innovation in ANT

"Innovation is the art of interesting an increasing number of allies who will make you stronger and stronger." (Akrich et. al., 2002 A, p.205).

Akrich et. al. (2002 A) also describes the chaotic nature of innovation. *"In the heat of the action, there is no architect but several, no decision-maker but a multitude, no single plan but ten or twenty which confront one another. The microcomputer is nothing other than this turbulent story, full of noise and rage, which leaves its own actors thrown into confusion."* (Akrich et. al., 2002 A, p. 194). They find that the main point of good innovation is not how well you know the user or the market but rather how well you can create interestment for the innovation. In this way the four moments of translation (Callon, 1984) and intermediaries become the centerpieces in the work with innovation. If an innovation or the thought of innovation is an actor-world (Callon, 1986) then the four stages of translation are the road map to get there. Of course, the road map might never be realised but the employment of good interestment devices becomes a key strategy for promoting innovation in accordance with this innovation perspective. *"To interest and to transform are two faces of the same reality."* (Akrich et. al., 2002 B, p. 209). Akrich et. al. (2002 B) argues that to adopt a 'new innovation' is to adapt to it and an important factor in this adaptation is the choice of spokesperson. *"To choose a spokesperson is to define, or implement, strategic orientations,*

but it is also to choose what is to be innovated and the problems which will need to be resolved." (Akrich et. al., 2002 B, p. 220). The choice of spokesperson and the interestment devices used to enroll and mobilize this person is defining for the implementation of a new technology. When we consider this in respect to the healthcare system and the knowledge we have in regards to projects that are performed in the clinical wards it becomes apparent that the first meeting with relevant staff has already laid out many of the cards in regards to the future implementation. *"Community life is not enough, nor is the circulation of good information, because success or failure is in fine hanging from the mobilised spokespersons and the unfolding of the negotiations which they introduce among each other."* (Akrich et. al., 2002 B, p. 220). The objects and meetings that are used as intermediaries and interestment devices are important since these circulate between the clinical staff and will be renegotiated by the mobilised spokesperson.

2.2.3 The development arena

In this master thesis we want to explore development in hospitals and are using the metaphorical notion of an arena in which the development is staged. We will then map the actors present at the development arena. The notion of an arena (Jørgensen and Sørensen, 2002) in which different actors work towards different *matters of concern* is connected to thoughts of networks. Jørgensen and Sørensen (2002) defines a development arena as a cognitive space where the following is present:

"A number of elements such as actors, artefacts, and standard that populate the arena, a variety of locations for action, knowledge and visions that define the changes of this space, and a set of translations that has shaped and played out the stabilization and destabilization of relations and artefacts." (Jørgensen and Sørensen, 2002).

The development arena has a matter of concern and each actor has their own opinion and solutions to this concern. Jørgensen and Sørensen (2002) are speaking of arenas of development as a cognitive space that help us, the sustainable design engineers, frame the development and forces acting within the arena. We are using the arena understanding to connect location to other heterogeneous actors. To dive further into the intents and conflicts within the arena we will use actor worlds to describe how the different actors perceive the future in the network. The actor worlds will help us to understand what competition or conflicts are present in the arena.

In this way we use Actor Network Theory and Arena both to analytically understand and sort our empirical findings. We are also using them as methods for sorting and mapping our findings and as tools to figure out where to go next.
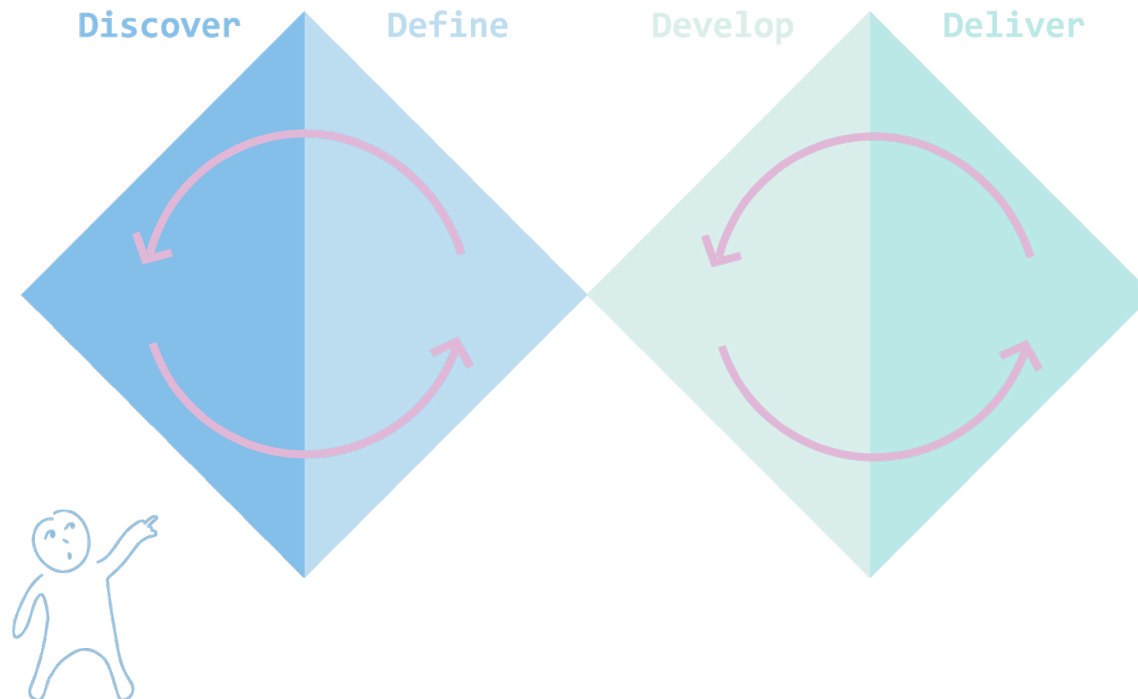
Chapter 3:

Discover

3.1 Empirical findings

3.1.1 Governance and innovation in the Capital Region of Denmark

The Capital Region of Denmark consists of seven public hospitals (Region Hovedstaden, n.d. A; see figure 2). The region takes on multiple tasks like transportation, education, environment etc. but the hospital remains the largest operation and 90% of the yearly budget is spent on healthcare (Brambini and Vang, 2018).
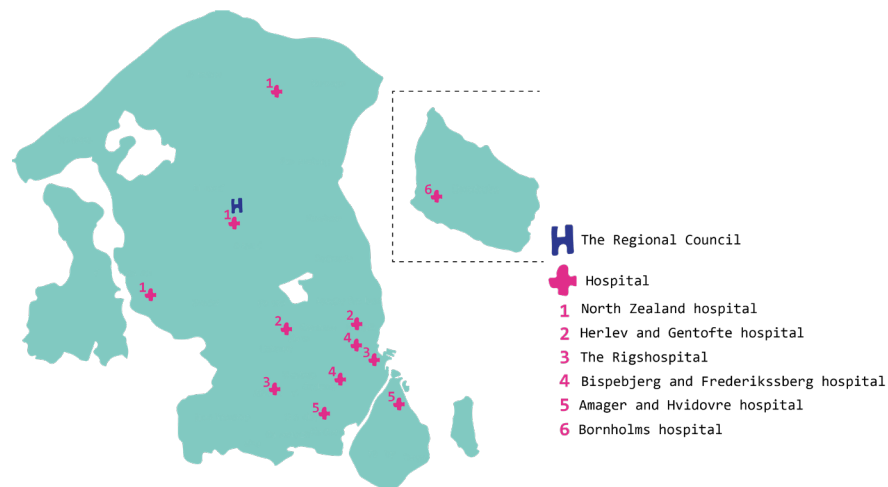
Figure 2: Shows the locations of the different hospitals and the Regional Council that is the main political body of the Region (the illustration is based on: Region Hovedstaden, n.d. B).

To gain an understanding of decision making within the Capital Region of Denmark we look to Brambini and Vang (2018). Through a series of interviews, they found that the Capital Region is governed according to new public management principles, but this is slowly changing to network governance which is mostly visible at the individual hospital level and not at the regional (political) level. With the move from New Public Governance (NPG) style to Network Governance the way to innovations is made possible but this requires trust (Brambini and Vang, 2018). NPG is a public governance version of New Public Management (NPM). In NPM the focus is on achieving specific results, whereas in NPG the focus is on co-creation (Greve, 2012). Governance is *"(...) this abstract sense describes patterns of rules and mechanisms of social coordination and decision making in which a group of actors regulates its collective issues and interests"* (Hollstein, Matiaske and Schnapp, 2017, p.1). Governance is in a sense a structure that only exists if and when actors choose to enact it. Enactment entails *"[...]strategically using agendas or identities to influence actors to engage in specific behaviors that result in a specific collective performance."* (Brønnum and Clausen, 2020, p. 140) Networked Governance is then defined as:

"A relatively stable horizontal articulation of interdependent, but operationally autonomous actors who interact through negotiations that involve bargaining, deliberation and intense power struggles which take place within a relatively institutionalized framework of contingently articulated rules, norms, knowledge and social imaginaries that is self-regulating within limits set by external agencies and which contribute to the production of public purpose in the broad sense of visions, ideas, plans and regulations." (Sørensen and Torfing, 2005, p. 197)

This way of governing where the style of governance differs in the different levels of the organisation makes sense when you view the hospital as a network. In the different hospital wards highly qualified staff with a lot of expertise are working on care and treatment on

specific diseases. This means that the clinical staff needs to have a high degree of freedom within the systemic structure (the electronic systems, schedules, physical spaces, journals and so on) made up by the network (see figure 3). From an organizational perspective those who practice the principles within the organization, typically *"embrace change, navigate organisational politics, and have intrinsic motivation to improve practice, policy or process [...]. This mindset creates a culture of continuous learning and positive engagement [...] which have obvious benefit to those working in fast-paced, transient healthcare settings, where staff are largely motivated by an altruistic desire to help others and constantly improve the matter of doing so"* (Day-Duro et al., 2020 p. 471).

When you move further up in the region you encounter unit and ward leaders who have a more strategic look on healthcare. This is especially the case when you move into the political layer of the hierarchy.

Political

Unit and ward leaders
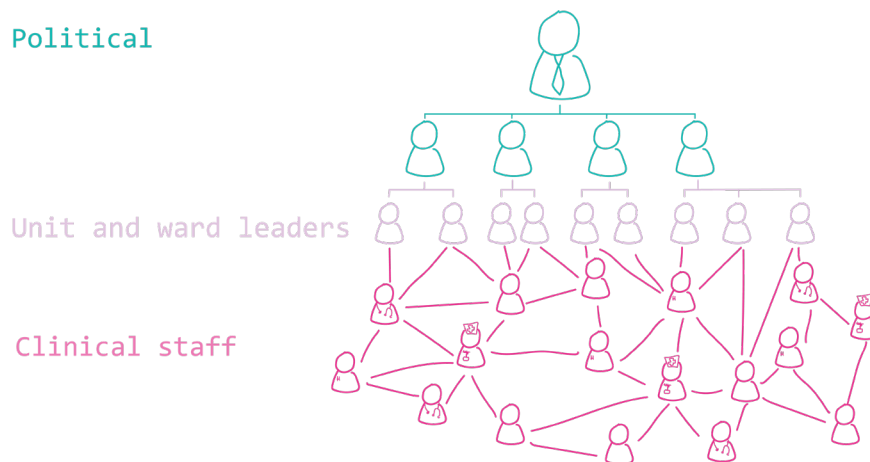
Clinical staff

Figure 3: Illustrates how the hierarchical structures (at the political level of the organisation) changes into networks the further down you move in the clinical wards.

At the political level, the employees are removed from the struggles of taking care of patients. Here you see a more top-down approach where orders and strategies are created. These strategies should then move down the system. In this movement a lot of negotiations are happening to translate the strategy into value and meaning that can be used in the day-to-day work in the hospital wards. In this way the 'high-levels' are standing at the rear of the ship and yelling directions in the hopes that the crew (the 'lower-levels') will correctly interpret this into appropriate action (see figure 4).

Sørensen and Torfing (2012) sees a need, like Bambini and Vang (2018), to create a better system/governance paradigm that improves the possibility for public innovation in response to identified wicked problems.

"The public sector is constantly changing and there are many small- and large-scale innovations. Nevertheless, there is an urgent need to develop a new strategic approach to innovation in the public sector since many public innovations have an accidental and episodic character." (Sørensen and Torfing, 2012, p. 3)

Through an interview with a Quality Manager (2021, int.) from the Rigshospital who is working with quality assurance we can see that the need for innovation is urgent and ongoing. The quality manager is an educated anesthesia doctor and has further educated himself to gain insights into leadership. He has been in the healthcare system since the 1990s and has witnessed the changes in the healthcare system firsthand. Innovation is not allowed in healthcare to be expensive and is not made to solve wicked problems but is

Political

Unit and ward leaders

Clinical staff
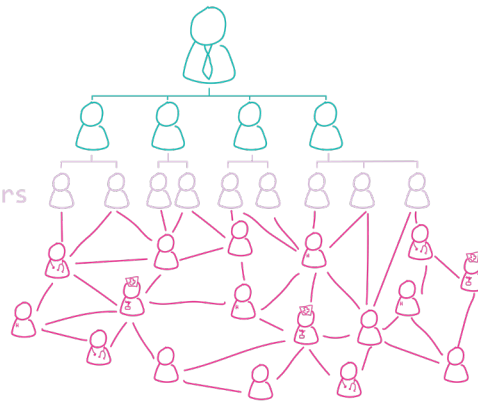
Figure 4: Illustrates the governance metaphor with a hierarchical structure at the top and networks at the bottom.

rather a series of small fixes and many different units working with the same problems and evaluating the same technologies without ever sharing their findings with one another. It seems that some trends are present in the devices that are introduced and tested but they are of episodic character and are hard to fully implement in a satisfactory way (Sørensen and Torfing, 2012; learned through observations). Another reason for more new development and innovation units is that the Rigshospital has a narrative that states that: *"The Rigshospital is Denmark's highly specialised hospital with treatment, research and education at the highest international level. (...) We are participating through strong partnerships with other hospitals, universities, and companies to achieve and share new knowledge. A large focus on innovation ensures that new treatments and results will benefit Denmark and the rest of the world."* (Rigshospitalet, n.d. A). This core story of the Rigshospital with the focus on innovation means that they are starting new units around the hospital even though other units already exist in the

Capital Region that do similar work. This can be seen in the new knowledge center that was announced in the internal intranet of the Capital Region that a new knowledge center for home treatment is to be started even though the Knowledge Center for Telemedicine (Region Hovedstaden, n.d. C) already exists and does the same work.

Bambini and Vang (2018) believes that by integrating Networked Governance the problem is not solved but there are better grounds for innovation to occur. This change in governance style has come as a part of a political process to turn Denmark into one of the first countries that actively try to innovate in their public sector (Brambini and Vang, 2018; Sørensen and Torfing, 2012). Previously innovation has been seen mainly in the private sector where a company that failed to innovate could have fatal consequences for the company (Sørensen and Torfing, 2012). Because of this harsh private environment for innovation the public sector has been viewed

as a large and slow bureaucratic system. *"When it comes to the public sector there is a lot of skepticism with regard to the capacity for innovating public policies, organizations and services. Many people, and especially a good deal of those employed in the private sector, consider the public sector as a slow-moving bureaucracy characterized by red tape, inertia and stalemate."* (Sørensen and Torfing, 2012, p. 2).

The Capital Region published a report in 2013 stating their intentions for innovation. Here it was made clear that innovation should not be top down but that every department needed innovation employees. These innovation employees should be normal clinical staff who got some additional information on how to think about innovation (Region Hovedstaden, 2013). This plan was set to run until 2020. As far as we have been able to determine the plan for creating change agents in the organisation has been successful which makes a complete mapping of innovation units and agents very hard. We know that there is a very high probability that every hospital ward and unit have some people working systematically with innovation or development. We have therefore chosen to focus mainly on the units that work full time with either development, innovation, or improvements. We know that all clinical wards are important since it is here the innovation should be implemented and tested but the innovation units should have a lot of experience with implementation and testing that should benefit new projects and protocols. The test protocols become an important non-human actor in the transition from new technology to a fully implemented in the daily operation of the ward.

"The Capital Region values patient safety. Therefore, experimental rooms need to be clearly delimited so that no compromises are made regarding patient safety and the quality of the treatment." (Region Hovedstaden, 2013, p. 16)

Because there is a lot at stake both the hospitals, staff, patients and their next of kin every innovation and improvement need to be safe. A bad test can in the worst-case scenario with a high-risk technology lead to worsening of treatment or in worst case, death. A high-risk technology is in this case any technology that creates outputs which directs the actions of the clinical staff (Strålin, 2020; see figure 5).
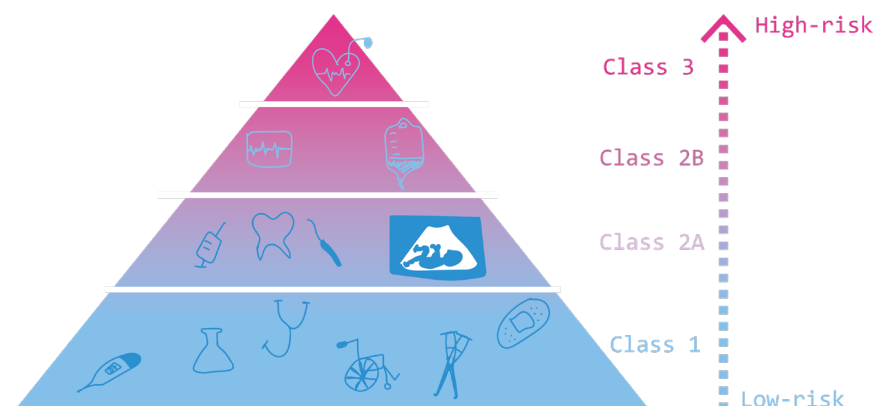
Figure 5: Shows the risk levels of different technologies (based on illustration from Stålin, 2020). Here you can see that thermometers and wheelchairs are low-risk while technologies like pacemakers are high-risk.

New European regulations are being made and implemented to battle these exact fears. The Medical Device Regulation (MDR) from the European Union has become an OPP for entering the hospital for private products. If a technological product does not live up to MDR then it has no place in a hospital setting.

There is therefore a significant difference in how easy it is to implement a high-risk technology compared to a low-risk technology. A high-risk technology needs more documentation, test, and research to obtain status as a medical device (European Union, 2017). Once the status as a medical device is achieved the implementation in a real-world setting can begin.

The implementation process is set in the clinical ward where clinical staff will be the most important actors to make a device a part of the day-to-day operation. The clinical staff is however not a monodisciplinary but rather a multidisciplinary group of actors who work together with different competencies and focus'. One of the challenges in innovative work is to break the monodisciplinary siloes and include multiple disciplines in all phases of an implementation (Innovation Consultants A, 2021, int.). For the different disciplines to work together as smoothly as possible, intermediaries are set in place to communicate important information from one clinical staff member to the next. This intermediary is crucial to communicate which patients should be treated for what and when. Intermediaries such as these are important in creating an overview of what needs to be done and when. When creating change in networks new intermediaries need to be in place to act as recruiters to the other staff members to accept the new role, they have been charged with in the new network configuration. The networks in the hospital sector can be hard to change because the staff is busy and therefore very focused on getting their tasks done. To understand this, we have researched behavioral science to learn more about this barrier and how we can work with it. According to que theory, which is applicable to workload, the max workload that you can put on a system for it to be flexible and fast moving is 70% of any given individual (Münster, 2020). When each staff member has a workload of 70% of their time there is a certain measure of *slack* is introduced into the system, and it becomes easy to react to new information and changes. When the system has no slack, the system will tire out the employees and they become resistant to new changes. Clinical staff at the hospital must work faster and we need to remember that while a new technology could be interesting and help to create a better work environment or treatment the staff is still, of course, expected to carry out the elementary tasks and functions they have always had. Furthermore, they might also be enrolled in other ongoing changes processes or tests that also require time and effort. This is simply an unavoidable barrier that the innovation units are obliged to deal with. The innovation units must seek to convince all staff members that they have found the answer to their problems and that the added time they need to invest in their project, test or implementation is important and worth their time. The first barrier is therefore the lack of slack in the workload of the clinical staff. Münster (2017) suggests a tactic to get around this: remove friction from desired behavior and/or add friction to undesired behavior. *"The easier, the more likely a behavior is. The harder it is the less likely the behavior is. (...) often we do not behave in accordance with our preferences."* (Münster, 2017, p. 137) It is not enough to think that writing rational explanations and making people more knowledgeable, no you need to make the desired behavior easier than the undesired one. As we move further from behavioral design we take away as a main point that the clinical staff and hospitals have a lack of slack in their systems. Therefore, to make an innovation or change thrive, it needs to be easier to do than what is done today with a higher level of slack.

The region has many employees working with innovation and development, but they are either highly specialized in one specific department or more generalized in innovation, implementation and evaluation but are external to a specific hospital ward. This external position can be an advantage in working with wicked problems (Buchanan, 1992). *"Innovation is central to the progression of medicine and the continued effort to find treatments and cures for human illness. In order to do so, clinicians and scholars must be bold enough to innovate in a system that is built on rules, regulations and procedures that mandate routine, structure and target-driven practice"* (Day-Duro et al., 2020 p. 471).

Both academia and clinical practice share commonalities in that they are composed of highly trained and specialised individuals, focused broadly on the advancement of knowledge for the benefit of society (Day-Duro et al., 2020). The collaboration of these skilled individuals in joint institutes has the theoretical potential to reduce the barriers of implementation and innovation through the enhancement of meaningfulness of clinical research (Sahs et al., 2017). However, inevitable challenges occur when combining the distinct hierarchical structures present in the organization, where different working practices, agendas, incentives, and cultures occur (Ovseiko and Buchan, 2012).

3.1.2 The patient

While Brambini and Vang (2018) allows us to gain insights into how the region is built up and the general movements within the thoughts of innovation and implementation their focal point is on the role of the patient. In their eyes the patient is currently moving from being viewed as a customer into an actor who is the main receiver of the healthcare system. The patient receives the care, and their voice should be heard when it comes to creating the system and solving the wicked or broader problems that occur between clinical wards and hospitals (Brambini and Vang, 2018). The potential of the patients is not being used to the fullest but is being implemented in the different wards. Here the patients are heard and included in small projects and betterments in the ward. In other words, the patient is being used as means for solving what is considered smaller problems within the wards and not wicked problems that occur between or across wards (Brambini and Vang, 2018). This use of patients is also seen by the Unit Leader (2021, int.) of Center for Patient Participation who explained during an interview that the patient is being included more also at an organisational level. This could be through a questionnaire after their time in the hospital where they are asked to give feedback. The Unit Leader (2021, int.) highlighted that the workflows that are highly integrated in the current healthcare system might not make room for the patient to be active. She exemplified this with a story of the daily doctor's visit to hospitalized patients. At these meetings, the doctor will listen to the patient for an average of 17 seconds and then the doctor will interrupt and overtake the conversation. This is not necessarily because of ill will but more a need for the doctor to go through all the things on their checklist within the allotted time

(Unit Leader, 2021, int.). This sort of time framed work does not seem to allow the patient to become more active in their treatment.

Through an interview with the Quality manager (2021) we learned that the role of the patient needs to change. The Quality manager (2021, int.) explained that a financial prediction had been made that said that if the healthcare system would continue to work as it did without change it would need 10% more funding every year (Det Etiske Råd, 2018). There is no drive to make the funding of the healthcare system grow that rapidly. It was therefore decided that innovation was needed, and that the system would not receive more money to achieve this goal of innovation (Quality Manager, 2021, int.). Because of the innovation strategy (Region Hovedstaden, 2013) innovation employees are scattered across all hospital wards and units. To help these employees make their projects larger scale a lot of innovation, development, knowledge, or quality units have arrived. These larger departments support and boost the innovative efforts that are locally in the departments. The Quality Manager (2021, int.) saw a trend happening in rethinking the role of the patient. The patient will no longer be a passive role, a person that receives care but rather a patient is to become a person that is a resource in the innovative efforts who can perform some part of the care by themselves (Quality Manager, 2021, int.; Brambini and Vang, 2018; Læssøe, 2019). This transition to this new role will be helped along by technology that will help the patient monitor themselves in their own homes. This trend is therefore happening mainly because having the patient at home with technology is a lot cheaper than having them in a hospital bed (Quality manager, 2021, int.).

The role of the patient seems to be changing both because of an economic push for more of the treatment to happen outside of the hospital to save money (Quality Manager, 2021, int.) but the tendency can also be seen in the narratives that are being shared both in the wider public but also between actors who are part of the network within the Capital Region (Region Hovedstaden, 2010). Narratives are a fundamental structure of human meaning-making and are widely used as vehicles for reporting organisational life and can be used as valid sources of knowledge (Dawson and Buchanan, 2005). As explained by Putnam et al. (1996, p. 386 - 387) narratives are *"ubiquitous symbols that are prevalent in all organizations. Also referred to as stories, scripts, myths, legends and sagas, narratives are accounts of events, usually developed chronologically and sequentially to indicate causality. (...) They are the vehicles through which organizational values and beliefs are produced, reproduced, and transformed."* Czarniawska (1997, p. 2) states that a narrative requires at least three elements: an original state of affairs, an action or an event, and the consequent state of affairs. Czarniawska also notes that narrative plots rely on human intentionality and context and are based on a chronology. Narratives make powerful tools in all endeavors of human interaction since narratives convey feelings and communicate ideas (Langer and Ribarich, 2008).

Læssøe (2019) describes one of these narratives of the changing patient role. Læssøe (2019) has connected the internet to the patient role. He describes the patient role changing from patient 1.0 to patient 3.0 with the help of the internet becoming more widely available. Patient 1.0 is a passive actor who receives care, patient 2.0 has a more active role because of the use of the internet.
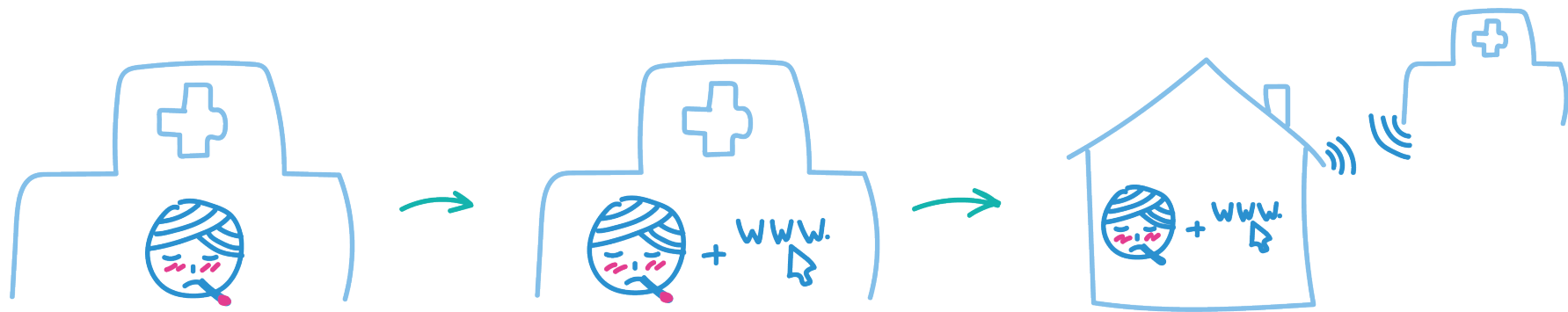
Patient 1.0   Patient 2.0   Patient 3.0

Figure 6: Illustrates the patient transition.

Patient 2.0 can search for and find information, and on that basis have a conversation about possible diseases with the clinical staff. Today we see that the patient has moved from patient 1.0 where the patient has traditionally been assigned with a passive role in the healthcare system into patient 2.0 whereby with the help of the internet the patient is able to find information and thereby break out of the assigned patient role (Læssøe, 2019). The future patient will be patient 3.0 (see figure 6).

Patient 3.0 monitors themself and is therefore an almost equal part of the caregiving system to the clinical staff. We accept this narrative and will use it to show the patient transition in the network in connection to the objects and intermediaries that are needed to sustain this new patient role. When talking about patient 3.0 we must also mention empowerment. Empowerment is in this case the move from a passive (patient 1.0) to an active (patient 2.0 and 3.0) role in the treatment. This feeling of empowerment can be seen in a study of home monitoring of heart patients made at Herlev- and Gentofte Hospital where a patient states that *"The freedom and*

flexibility that it gives to be in your own home is worth gold - I felt less sick and I had the possibility to continue my workout. It was easier for my next of kin and to maintain a normal life." (Gentofte Hospital, 2018). This patient had been told that she had to stay at the hospital for 8 weeks but because she participated in a study she could come home after 3 weeks. The study found that treatments that would normally be done in a hospital setting can be performed at the patient's home (Gentofte Hospital, 2018). What we can learn from this is that steps are being taken to get the patient out of the hospital and that in some cases it seems that it is beneficial both for the hospital, the patient and the next of kin. The transition is slow and ongoing. It is slow because we in Danish healthcare system are very cautious not to create harmful practices for the patient and staff. Every small step therefore needs to be studied and tested before it can be implemented. The Covid-19 pandemic has pushed the agenda for home monitoring and telemedicine and made it more acceptable to the Danish population (ATEA, 2020). This is an important factor in the transition since the Danish population needs to identify with the role of patient 3.0 for it to be implemented smoothly. It seems

that there is a window of opportunity for pushing the transition in the coming years.

The hospitals are trying to actively change to include patients. This has been on the political agenda for some time (Region Hovedstaden, n.d. D). This can be seen in the change in how they communicate wayfinding in the hospital. It has changed from being in medical language and instead they are communicating to the patient and next of kin by using more everyday language in their signs (Innovation consultants A, 2021, int.). This change is however not without controversy since some clinical staff have expressed that they feel that they lose some of the specification in the change from medical vocabulary to everyday language (Ibid.).

The external innovation units that work with facilitation rather than clinical caregiving, but they still have an important role to play in innovation and the transition in the patient role. The innovation units can never be the main source or driver for innovation since they rely on the hospital wards to identify potential problems (more on this later in 3.3). Their center of attention could be on connecting private companies who have the technology that can help fix the problems that have been identified by the staff with the hospital wards and facilitate the implementation and test. The innovation units need to accept the role of facilitator who is supporting the innovation, but they are not the drivers since they are most often an external consultant. This is also the role that most innovation units seem to have taken.

3.1.3 Sub-conclusion

The Capital Region of Denmark is a large organisation which consists of a network structure that can be seen as hierarchical at the top political layer and messier network based at the hospital ward. Innovation agendas seem to be present in almost all parts of the organisation with a few units that work full time with development and innovation. We have found that the role of the patient is up for negotiation which is both pushed from the general public and from patients, staff and from a political or strategic part of the Capital Region. Innovation units are often working as external consultants to innovation work in the hospital wards and are therefore working more with the staff and therefore indirectly with the patients. We will focus on the patient transition and how innovation units can work with this transition from their position in the network.

3.2 Sustainability

Sustainability is important in all aspects of development and innovation. Sustainability is however a term that has been interpreted many times by many actors. We choose in this report to begin our understanding of sustainability with the *"Our Common Goals"* better known as the Brundtland report (Brundtland et. al., 1987). This report defines sustainable development as:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland et. al., 1987, p. 41).

This definition gives the fundamental understanding of what sustainable development is. When we consider this definition in relation to the problems that the healthcare system has in the future with the cost of running the hospitals becoming much higher if it does not innovate it seems that the danish healthcare system could be looking for how to run a healthcare system sustainably. Brundtland et al. (1987) divides sustainability into three main aspects: economic sustainability, environmental sustainability, and social sustainability. You achieve sustainability as a whole when considering and fulfilling all three aspects (see figure 7).
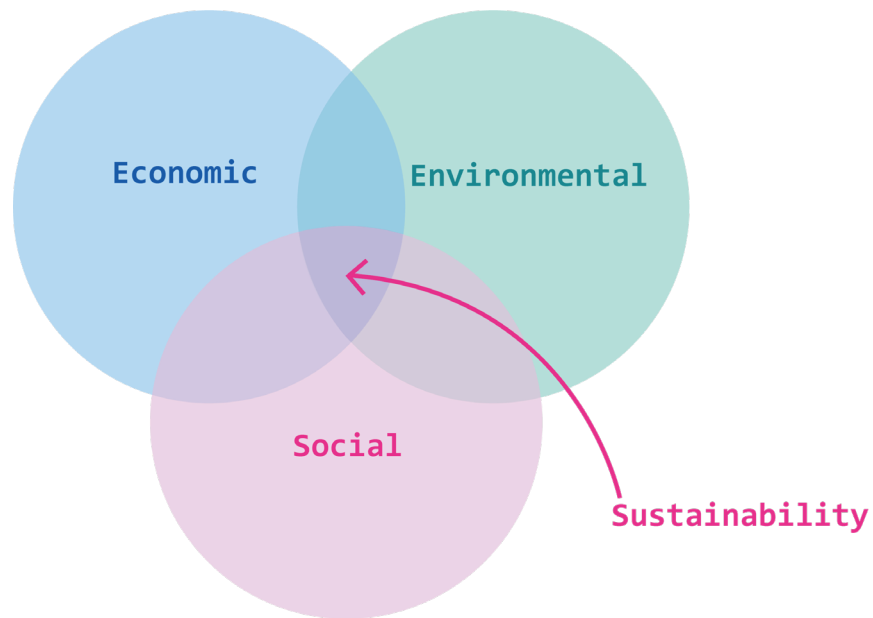
Figure 7: Shows the three aspects of sustainability shown in Brundtland et. al. (1987). Sustainability is found in the centre of the three overlapping aspects.

The economic factor of sustainability in a healthcare setting is important and is one of the main reasons for innovation (Quality Manager, 2021, int.). The economic factor of the future use of hospitals is pushing the need for innovation and rethinking of what best care is. The environmental aspect of healthcare is not seen as the main focus of our research and could be problematised as an unseen consequence of healthcare. We will discuss this later in section 6.3.2 of the report.

In this master thesis we will focus on the social aspects of sustainability since we are navigating the development arena in the Danish health care system. Capolongo et. al. (2016) argues that a hospital setting includes all three aspects of sustainability but that the social aspect is the hardest to define properly because of the often difficult situation that is the reason for people needing the hospital combined with the fact that the building and the objects inside needs to facilitate treatment, wellbeing and a good work environment. The World Health Organisation defines health as: *"health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"* (World Health Organisation, 1946, p. 1). With all of this in mind they have embarked on making a tool for measuring social sustainability. Capolongo et. al. (2016) found three sub-groups to the social aspect, *humanisation, comfort,* and *distribution* (see figure 8).

Comfort and distribution is mostly connected with the physical and architectural attributions of the hospital. In this master thesis we will focus on objects, practices, and the humanisation aspect of social sustainability.

3.2.1 Best care

When looking into social sustainability in a hospital setting one term that is being used by multiple actors is *'best care'*. Best care is of such a nature that we can all agree on its intention and nature, but what does best care insinuate? When looking into the Capital Regions idea of best care we find that it is hard to find a definitive concrete definition. Best care is a political goal

"We have a political vision in the Regional Council for development in health care that ensures the best care from the individual point of view. A more human health care system with a focus on care and presence." (Region Hovedstaden, n.d. A, p. 6)

The Capitals Region's understanding of best care is both the best treatment and human presence during the treatment period at the hospital and ambulant connection to the hospital. The Regional Council is deciding both political focus areas and use of resources.

Best care and innovation can be hard to disconnect because of this political and resource focus because *"There is generally a large pressure on the welfare state: there are more patients and more complex diseases, course of treatment and there is fast paced development and new technological possibilities become available. (...) Innovation is an absolute necessity to meet and find solutions to the many problems."* (Region Hovedstaden, 2013, p. 4). Best care therefore becomes a problem that can be solved and optimized through innovation and development. Best care is therefore not a stable state but always up for negotiation.

Best care is often spoken of as mainly valuable for the patient (Innovation PLUS, n.d.; VihTek, n.d. A; Region Hovedstaden, 2013). But the staff should also benefit from development and best care (VihTek, n.d. A). The staff is spoken of as important actors who can contribute to best care (Region Hovedstaden, 2013; VihTek, n.d. A). Through an interview with Innovation consultants from Copenhagen Health Innovation and an interview with the Quality Manager from

SOCIAL		
Humanisation	**Comfort**	**Distribution**
⊙ Safety and security ⊙ Social aspects ⊙ Wellbeing ⊙ Health promotion	⊙ Daylighting ⊙ Social thermal comfort ⊙ IAQ ⊙ Acoustic	⊙ Access and paths ⊙ Hospitalization blocks ⊙ Space flexibility ⊙ Departments' doctors offices
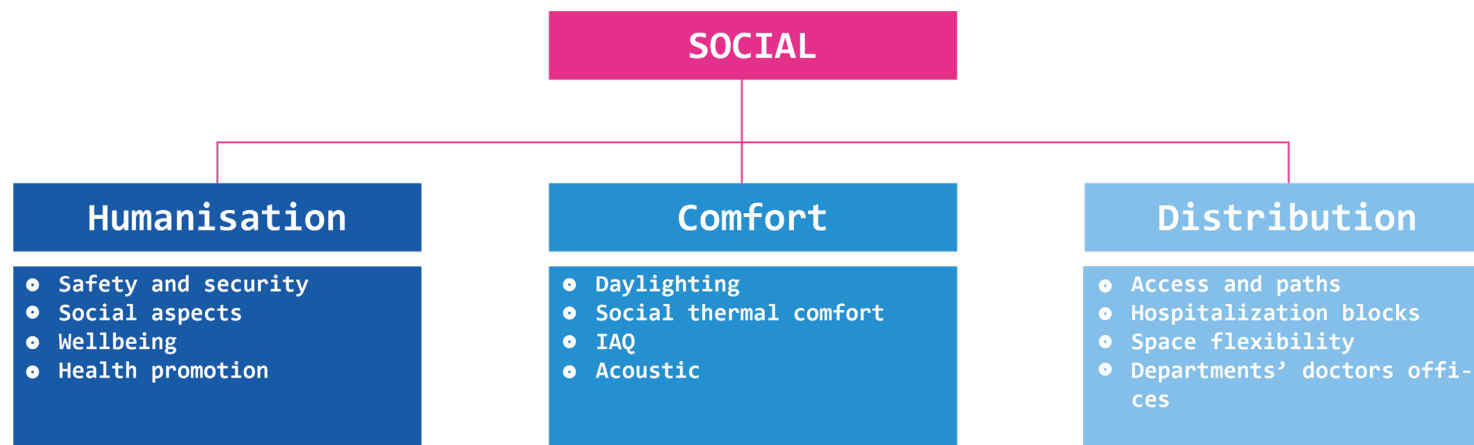
Figure 8: Sub-groups of social sustainability in hospitals according to Capolongo et. al. (2016, p. 18)

the unit for quality and patient safety we learned that there are very different ways of looking at the term best care. The Quality Manager (2021) talked mainly about how to qualify and measure best care. This contrasts to the Innovation Consultants (Innovation Consultants A, 2021) that described a more holistic view of best care with the patient in the center of the caregiving.

We will in our master thesis define best care as:

- The best practice for treatment and diagnosis.
- Best working conditions and overall well-being (both physical and psychological) for the staff, patients and next of kin.
- A sustainable use of resources that allows optimal value creation.

It can be hard to qualify whether the above-mentioned parameters have been achieved. Some speculation might be involved in deciding to what degree of success has been achieved in the different areas. What is important is that development and innovation should not hinder these focus points. If they do then they do not live up to the best care. We therefore need to understand the development arena and the networks present in development to understand what translations are happening in the development process.

3.3 The Development Arena

The arena is a metaphor for the complex reality in which development takes place. The arena is populated by heterogeneous actors and locations where matters of concern are discussed (Jørgensen and Sørensen, 2002). We have through our empirical data found that the patient is changing and that hospital actors, like unit leaders and innovation employees are working towards a redefined role for the patient as well (Quality manager, 2021, int.; Innovation consultants, 2021, int.; Læssøe, 2019; Brambini and Vang, 2018).

To map the development arena, we have used the messy map method (Clarke, 2005). A messy map or situational map shows all the human and non-human actors who are present in the arena. Once the actors are mapped an analysis needs to be made which will describe the relations between the different actors (Clarke, 2005). The strength of using this type of network illustrations is that it becomes apparent for the reader what actors have relations and which ones are not connected. The messy map is not the same as the actor networks and actor worlds. The messy maps show relations between the different actors in specific situations, in relation to the overall concern that is being negotiated in the development arena (Clarke, 2005). The messy maps only show the immediate relation between the actor from whose point of view we are observing the arena. We use the messy map mainly to learn who the different innovation units are in connection within their immediate work with innovation and development. Therefore, these relations do not say anything about what happens one step out from the actor's point of view. To better understand what happens when actors act in the development arena we will use actor networks and actor worlds. These relations are based on our empirical findings from interviews, scholarly articles, public reports from the institutions and their websites. To better understand what is at stake and the concerns that are present in the development arena for the different actors we

Quality

Data safety

Patient safety

Students / Universities

Work organisational objects

Private funding

Innovation PLUS

Beds

Nurses

Patients

State regulations

Regional funding

Porters

Health Research and Innovation

Rooms

Next of kin

Culture

Working schematics

Laws

Private electronic equipment

The hospital building

Hospital administration

Unit leader

Ideas of best care

Doctors

Physiotherapeuts

Journals

Ergotherapeuts

The Regional Council

VihTek

Signs / text / wayfinding

Software

Cleaning staff

Researchers

European parliament regulations

SP

Treatment procedures

CIMT

Medical equipment

Copenhagen Health Innovation

Workload

■ Human actors

■ Non-human actors

Social and health care assistants

■ Regulations and structures

Livskraft

■ Innovation units

Private companies

Figure 9: Messy map of all the actors who are present at the development arena.

will examine their actor worlds and some present actor networks. These networks are made up of information gained from interviews, public reports, and information from their website. The mapping of the concerns, networks, and messy maps from VihTek are also and other empirical material (see figure 9).

Data safety

Patient safety

Quality

Students / Universities

Work organisational objects

Private funding

Innovation PLUS

Beds

Nurses

Patients

State regulations

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Software

Signs / text / wayfinding

Cleaning staff

Researchers

European parliament regulations

SP

Treatment procedures

CIMT

Medical equipment

Copenhagen Health Innovation

Workload

Social and health care assistants

Livskraft

Private companies

■ Human actors
■ Non-human actors
■ Regulations and structures
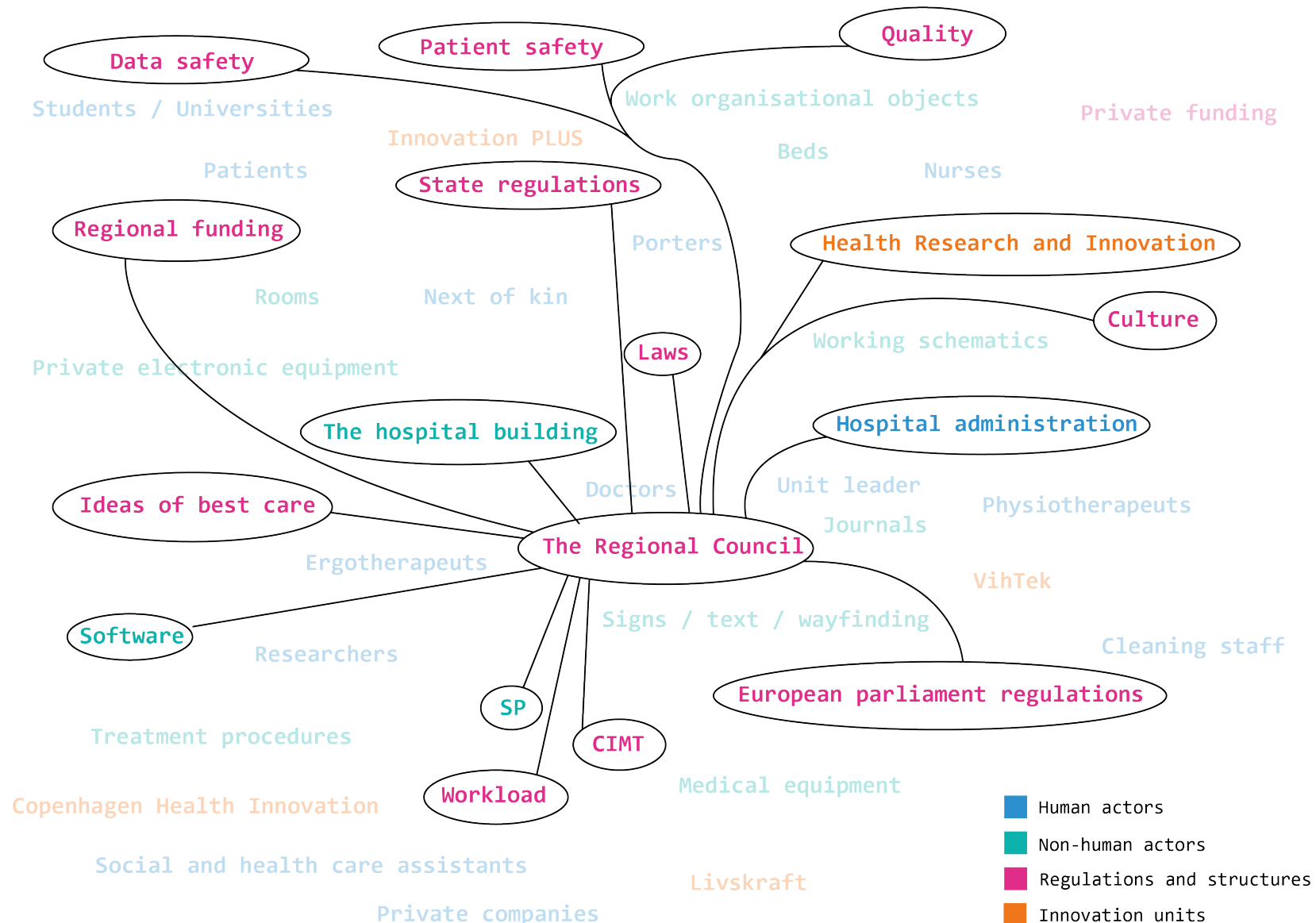■ Innovation units

Figure 10: Messy map showing the connections between the Regional Council and other actors.

The most widespread actor in the arena is the Capital Region since they work with both transportation, healthcare etc. The Capital Region is a large organisation that if seen through the eyes of ANT could be seen as a macro-actor (Callon and Latour, 2015 [1981]). A macro-actor is essentially a large heterogeneous network which is built upon black boxes (Ibid). The Capital Region is a large organisation which includes many different networks, we only look at the healthcare networks that are present within the organisation. And to narrow it down even further we will investigate and analyse the arena of development and the matter of concern which concerns itself with the patient role. We will study different networks within the Capital Region to understand the different positions and networks that are present within the overall idea of a Capital Region. We are therefore in a sense, mapping micro-actors that are part of another macro-actor. A micro-actor can both be an individual or smaller networks like families (Callon and Latour, 2015 [1981]). With the macro actor in mind we see that the Capital Region is built on black boxes or taken for grantedness of what healthcare and the patient is. We will therefore open the box for what a patient is and explore the negotiations and translations that are happening with the different heterogeneous networks that make up the macro-actor, the Capital Region.

To start the analysis we will use the messy map to look at the main political network. As the metaphor we used on page 20, figure 4 shows how the political agendas and strategies set the directions for the macro-actor. This direction is spread to other networks that are present in the hospitals, with the actors that actually perform the caregiving and who define the role of the patient in their daily operation. This political network is called the Regional Council. The Regional Council is in other words spreading narratives about the macro-actor that the other micro-actors (Callon and Latour, 2015 [1981]) can see themselves in and that they can then implement. The Regional Council is not directly connected to 'the man on the floor' but is connected to administrative actors from other networks and are thereby connecting much of the organisation through narratives and communication (see figure 10).

When considering the matter of concern for transforming the patient we see that the transformation was problematized by actors who are external to the macro-actor network. *"There has nationally come an increasing focus on quality as a parameter that should be considered at the same level as production and economy. (...) The Capital Regions quality policy is based on the national debate."* (Region Hovedstaden, 2010, p. 2). This focus on quality and the definition that the patient has an active role to play in the definition of quality is important in the transition of the patient's role in the network. *"This also means that the patient and the next of kin will be involved in the decisions surrounding the treatment and will take part in the responsibilities of the result with the needed support."* (Region Hovedstaden, 2010, p. 6). It is the same lines of reasoning that we can see when we look at the innovation strategy that the Capital Region has employed. *"The Capital Region will develop in cooperation with the patient and the next of kin about innovative solutions that puts the patient in the center and for example makes the patient and the next of kin able to take the treatment and their life in their own hands."* (Region Hovedstaden, 2013, p. 6). The overall narrative is then, that to make a more innovative hospital with better quality the

patient and the next of kin needs to become a more active part of the treatment. It seems that the translation which set this change in motion was a problematization by the general Danish public (Region Hovedstaden, 2010). An interestment device was then created in
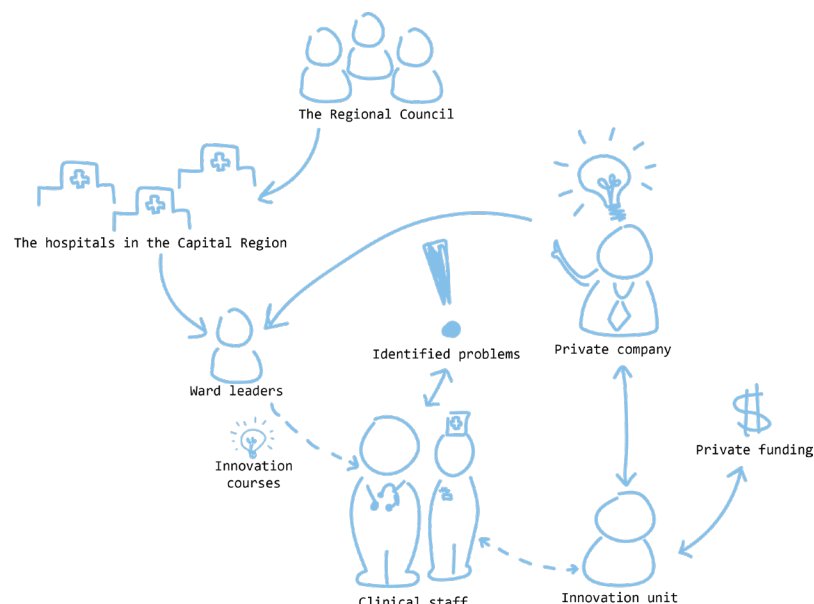
Figure 11: Illustrates the actor-world that the Regional Council has been working on releasing from 2013 (Region Hovedstaden, 2013).

the form of a narrative that laid out the premises for how to become innovative and how to raise the quality; involve the patients (Region Hovedstaden, 2010; Region Hovedstaden, 2013). To make this narrative happen the Regional Council started to teach clinical staff who were already working within the macro-actor and the future clinical staff who were still under education (Region Hovedstaden, 2013; Region Hovedstaden, n.d. A; Region Hovedstaden, 2010). To obtain this, they had to redefine the identity of key staff members so that they would identify possible problem areas and take change

into their own hands. They also had to redefine the role of private innovation and create ways for those innovations to enter the hospitals in a safe way. In this way the way to work with the matter of concern is by implementing new ways of doing treatment both through inclusion of the patient and next of kin but also through the inclusion of welfare technology that might enable this inclusion. And in this sense the empowerment of the patient can come through implementation of new welfare technologies.

With the intent to change key staff members, the region has given rather free rein for the individual hospital wards (see figure 11). The Regional Council suggests creating innovation groups that will help develop and identify innovation opportunities (Region Hovedstaden, 2013). They suggest that further work with innovation should be connected to Health Research and Innovation and Copenhagen Health Innovation (Region Hovedstaden, 2013). Since this political statement on innovation was published, many new innovation- or development units have been brought into existence.

3.3.1 VihTek

VihTek is a knowledge center and development unit designed to introduce, test, and implement new technology to solve existing problems in hospital wards all over the Capital Region (VihTek, n.d. A). The aim of VihTek is to secure the hospitals so that they can function the best way possible in the future, in other words to future-proof the hospitals (Ibid). VihTeks matter of concern is therefore *to find, test and implement welfare technology to empower both the staff, patients and next of kin.* If there is no welfare technology to find,

test or implement VihTek will say no to the project (Functioning Unit Leader, 2021, int.), so in this way VihTek is technology centered.

In an interview with the Functioning Unit Manager (2021, int.) we learned that VihTek is mainly working with projects and their main delivery is evaluations. The projects are most often rooted in real problems found in clinical wards with a few exceptions of VihTek

Figure 12: Shows a messy map over VihTeks relations to other actors in the development arena

'pushing' a test of a technology in a hospital ward to see if it solves anything. This can be seen in figure 12 that shows that VihTek has a stronger relation to what is happening in the hospital ward than what we have seen on figure 10 that illustrates the relations for the Regional Council. Tests and implementations are made at actual clinical wards with small research protocols and if possible, with patient participation. Because of this many complications arise during projects.

To understand how VihTek works with their projects and what is thought of as a *'good'* project we turned to their publication *Concept for Implementation* (VihTek, 2021). VihTek and more specifically the specialist consultant and the development consultant have written a concept for implementation based on their project *Physically active in neurorehabilitation* which has been going on for multiple years (VihTek, n.d. B). The specialist consultant has been working with the project process for years and has been a key actor in

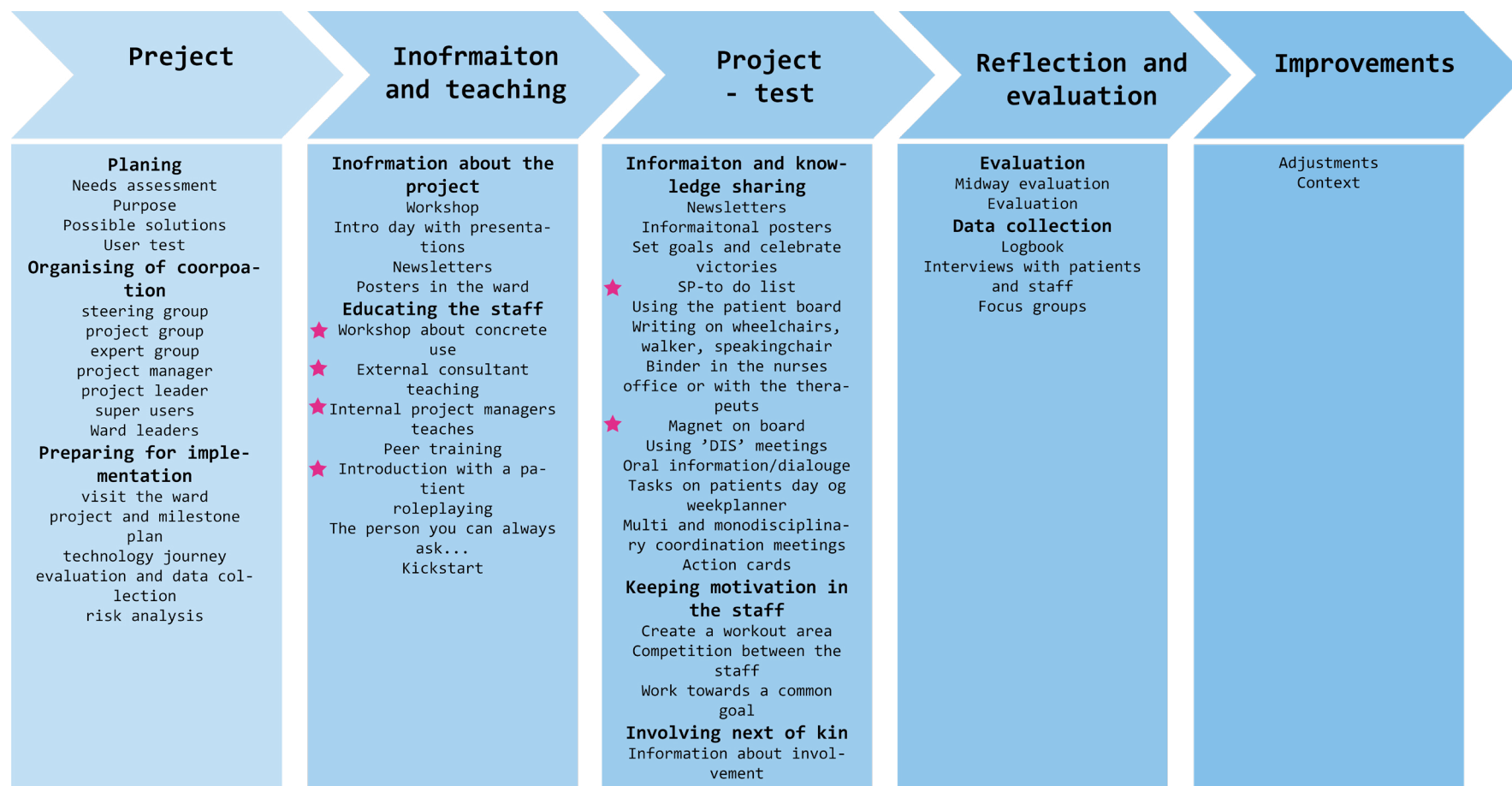| Preject	Inofrmaiton and teaching	Project - test	Reflection and evaluation	Improvements
Planing Needs assessment Purpose Possible solutions User test **Organising of coorpoation** steering group project group expert group project manager project leader super users Ward leaders **Preparing for implementation** visit the ward project and milestone plan technology journey evaluation and data collection risk analysis	**Inofrmation about the project** Workshop Intro day with presentations Newsletters Posters in the ward **Educating the staff** ★ Workshop about concrete use ★ External consultant teaching ★ Internal project managers teaches Peer training ★ Introduction with a patient roleplaying The person you can always ask... Kickstart	**Informaiton and knowledge sharing** Newsletters Informaitonal posters Set goals and celebrate victories ★ SP-to do list Using the patient board Writing on wheelchairs, walker, speakingchair Binder in the nurses office or with the therapeuts ★ Magnet on board Using 'DIS' meetings Oral information/dialouge Tasks on patients day og weekplanner Multi and monodisciplinary coordination meetings Action cards **Keeping motivation in the staff** Create a workout area Competition between the staff Work towards a common goal **Involving next of kin** Information about involvement	**Evaluation** Midway evaluation Evaluation **Data collection** Logbook Interviews with patients and staff Focus groups	Adjustments Context

Figure 13: Shows the different tools one can use when doing implementation projects according to VihTek (2021). The stars indicate methods that VihTek (2021) found to function the best during their project.
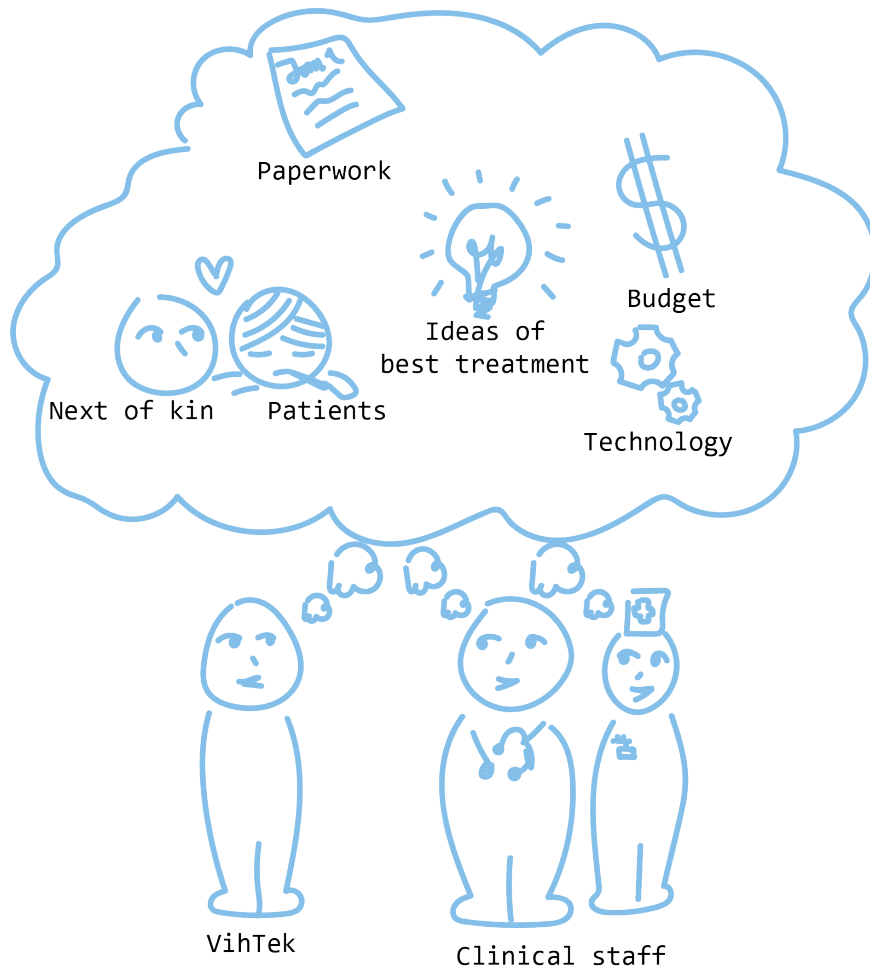
Figure 14: Illustrates the negotiations between VihTek and the clinical staff

creating the process we see today. The development consultant has a background as a physiotherapist and is now working with implementing new technology through the use and development of VihTek's project process. This project started in 2019 and has just ended. It was built on top of a previous project about self-training equipment (VihTek, n.d. B). As one of the deliveries promised to the fund that provided part of the funding of the project VihTek had to write an implementation guide. This report is that guide and it

shows the way to *'the good project'*. Concept for implementation is a 68-page long guide that shows the different project phases, what happens there at which intermediaries, structures and so on can be recommended to include in a future implementation project (VihTek, 2021; see figure 13).

Before any implementation project can start a *'preject'* (Darsø, 2007; see figure 13) needs to be made. The main purpose of the preject is to make a needs assessment, user test and more of the formal and structural work. During the needs assessment employees from VihTek will visit the hospital ward to learn about their way of working (VihTek, 2021). The preject is made in close relation to the hospital ward and is the first place where the project can be shut down. "*If a solution does not live up to the expectations we will return to the supplier with our demands and wishes for development. If this is the case the solution will not be implemented to begin with.*" (VihTek, 2021, p. 10). While it is rational to test whether a solution or a technology can deliver the needed service it is unclear whether the hospital wards are going to wait until the supplier further develops the device, whether they go and test a new device or if the preject is abandoned at this stage. It might be up to the collaborating parties to decide what can be done at this stage in the preject. If the device makes it through the initial test the larger planning exercise begins. Now all the groups need to be set, steering group, project group and all the different leaders and responsible actors will be found (VihTek, 2021). It is at this point the actor-world is created and all identities are defined (see figure 14).

Even though the many groups and actors might seem extensive they might consist of some of the same individuals who take on different responsibilities. There is a lot of emphasis on the role and importance of enrolling the ward administration in the implementation process. *"The local ward leaders play an essential role in implementation projects. Implementation requires permanent changes in existing workflows it will be the leader's responsibility to make these changes happen and especially to make sure that the prerequisites for change are in place."* (VihTek, 2021, p. 28). The way to realise the agreed upon actor world is a journey through the four stages of translation (Callon, 1984). The leaders are an important actor to mobilize in the actor-world since they decide what should and should not be prioritized in the daily operation. If it is decided on private funding for the project the private funding might strictly hold the project to different deliveries that is not creating much value for any actor in the network. By choosing private funding too early in the project the project leader/project group might need to do some work later that is not really relevant anymore (Project employee, 2021, int.). Private funding has the potential to lock the project in a specific trajectory that is hard to change once accepted. In this way private funding becomes a powerful actor in the negotiation since you apply for the private funding that fits the best to the project. It is the reality however that private funding is needed and is important for realising many projects and is making it possible to buy new and expensive technologies. Private funding should be used but it is important to think about any trade off that might come with it.

When we enter the information and test stage of the implementation project, we enter a new world of potential problems and barriers for translation. Now the actor-world has to actively work to change the current actor network. To do this in this setting information needs to be shared so that all relevant actors know and understand the change and the device that is being implemented. The project leader needs to create a learning space (Pedersen, Dorland and Clausen, 2020) using intermediaries to mediate knowledge of the new network configuration and the new roles the actors need to accept. The spaces that VihTek (2021) suggests are workshop and teaching spaces where the staff can use the device, ask questions, and try out different settings on the device themselves either with a 'teacher' with connection to the project or with a patient. These spaces are also negotiation spaces where the role and identity of the different actors can be negotiated before the device is taken into official use in the clinical network. *"During the workshop employees across different disciplines identify, formulate and make agreements as to how the workflows of the implementation will be done in relation to their everyday work."* (VihTek, 2021, p. 25).

During the project and test phase of the implementation many different types of intermediaries have been employed to try to keep the enrollment and mobilization fresh to make the border between actor-world and actor network as narrow as possible. Only two of the many apployed intermediaries have been marked by a star in the report, the magnet on the board and the to-do list in the Danish Healthcare Platform (SundhedsPlatformen, SP). *SundhedsPlatformen* is the software system used in the Capital Region to keep digital journals and so on. *"All the information is available to all the staff and every staff member can change the assignment as the patient develops."* (VihTek, 2021, p. 42). SP therefore becomes an important

intermediary to mediate knowledge between the different disciplines and staff members to coordinate the use of the new device with patients who might gain something from the use of it. The magnet on the board refers to the magnets and other objects that are used as intermediaries to mediate knowledge between the staff members in a less technological way. In most hospital wards large boards are hung either in the hallway or in the nurse's office containing important knowledge about the patients and their treatment (VihTek, 2021). These boards are essentially large intermediaries since they mediate knowledge between specific groups of people but not others. An additional magnet on this board makes a difference to the staff since they know which patients are included in the use of the device and who are not. While these intermediaries are important to keep the focus and priority of the new device in the minds of the staff, other external factors might change the focus and priority of the staff and ward administration during the implementation. If this happens it can be disastrous for the implementation process since the staff will most likely go back to their former 'stable' network rather than the actor-world that was trying to be built once the external factor is no longer of much importance.

In the reflection and evaluation phase the work is mainly being done at VihTek who are working on all the data collected during the test to see whether the technology made a difference or not. This data can be quantitative and qualitative in nature (VihTek, 2021). An evaluation and recommendations for future work will be made. When the project is done for VihTek it is far from over at the hospital ward; they have to continuously decide to maintain the proposed actor-world as part of their network. *"An implementation is rarely over the moment the project ends. It might be that the extra resources and the special efforts to convey information and encouragements fall short. But after the project is done the solution will still need to be used. It is therefore important that the administration and staff still are open for adjustments."* (VihTek, 2021, p. 66). Once the project is over and VihTek is done the work still continues for the staff at the ward and the hard work with the translation might be left to the administration and a few 'fiery souls'. VihTek therefore needs to be able to build an actor-world where they build up other key actors as OPP for the intervention. This is also seen in Jørgensen et. al. (2011) where the researcher from DTU tried to create a stable network in introducing textiles into new hospital development. Here the enrollment and design process and facilitation went well but when the researchers pulled back the network fell apart. They had become an OPP in the actor world translation. This is also sometimes seen in VihTek which means that while most of the employees find implementation to be very important it becomes too hard to figure out how to facilitate it in such a way that VihTek does not become the OPP in the network (learned through working within the organisation). Therefore, the main focus has for some time been on creating good knowledge and reports that can set the stage for the test in such a way that other clinical staff can determine whether that technology might be useful for them in their work and ward.

Some parts of this project description from initial test to implementation can when looking at it have similarities to the stage-gate-model (Copper, 1990) where the project is also taken up for consideration and it is discussed whether the work with this particular project will continue. To meet some of the future problems in a project VihTek

suggest a midway evaluation where it is discussed what is going well and what needs to change. *"During a project, the involved actors will always become more knowledgeable. (...) If the implementation is not going well while the focus and resources are available for the project there is a real risk that the implementation will not go well once the resources are no longer there."* (VihTek, 2021, p. 59).

3.3.1.1 Evaluations

VihTek's main delivery and the marking of an ended project is the evaluations. VihTek are working with multiple evaluation types like user tests, MAST, VTV and so on (VihTek, n.d. C). Figure 15 shows how the different evaluation types are related to each other in terms of what their main focus is and when they can be used. The figure only shows evaluations that VihTek makes with an exclusion of their annual report that summarizes the different projects and findings VihTek has found during the year and the reports filed under 'other reports' (VihTek, n.d. C).
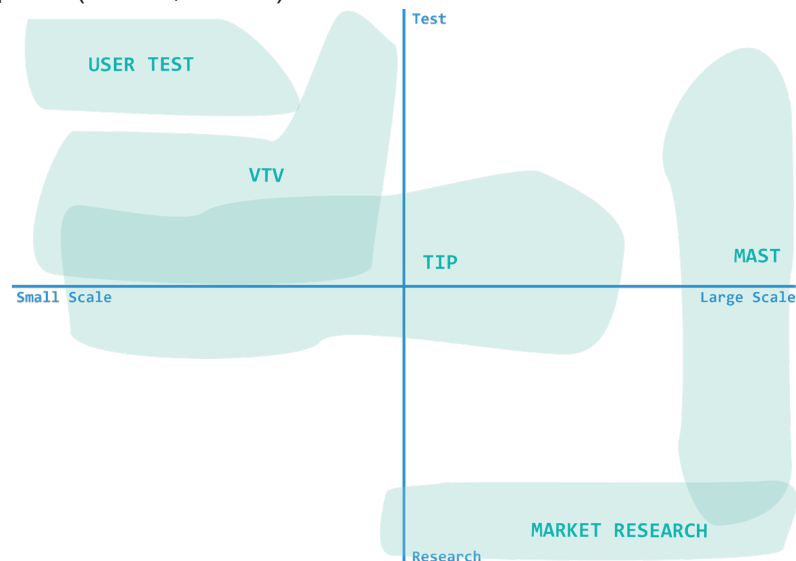
Figure 15: Shows how the different evaluation reports differ in focus.

Figure 16: Illustrates the six parts of the TIP evaluation (illustration from: VihTek, 2020 A)

Previously the most common report type was VTV or welfare technology assessment which was created by Teknologisk institut (n.d.). The main purpose of a VTV is to make an all-around assessment of a given welfare technology and to document its effect (Teknologisk Institut, n.d.).

VihTek has developed their own type of evaluation named Technology assessment in Practice (TIP). *"The technology assessment is based on a specific context and way to use the technology that is important for the user's experience using the technology. (...) TIP can be used to investigate if it is relevant to do further work with a technology or implement it in practice or it can be used to assess the potential for further technology development or change in the workflows."* (VihTek, n.d. D). TIP is an important tool for VihTek since it allows for six dimensions to be included in the evaluation; test, solution, context/organisation, user experience, economy, and technology (see figure 16).

It is always challenging to implement new technology in a hospital setting. *"At a hospital, a technology will always be implemented in a busy day-to-day operation and in a complex organisation. It therefore requires a big focus to set aside time for the new workflows that a new technology involves."* (VihTek, 2020 A). The movement from VTV as the main delivery for many tests to TIP as the new form for delivery shows that VihTek wants to focus more on the context and organisation that a technology needs to function in, since this is the hardest task to work with when implementing new technology.

3.3.2 Innovation PLUS

Innovation PLUS is a newly established unit for innovation and development, aiming to create solutions for the Rigshospital 'in house' as their focal point but with a wish and desire to spread the solutions across the Danish healthcare system, the Capital Region and even on an international scale (see figure 17).
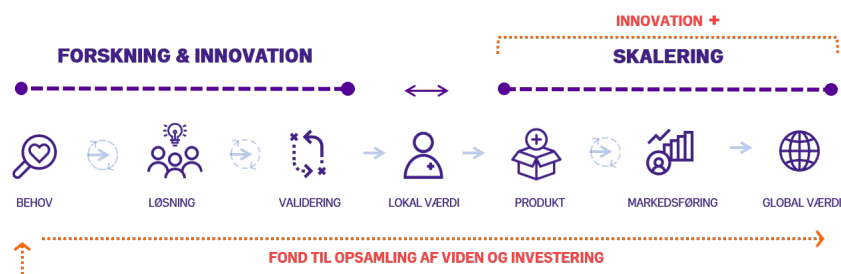
Figure 17: Innovation PLUS own innovation illustration. This illustration shows when Innovation PLUS is expecting to enter projects and what their main focus is (illustration from: Rigshospitalet, n.d. B).

Compared to other regional innovation departments, Innovation PLUS only works with projects with an offset in the development that takes place at and with the Rigshospital. This sets Innovation PLUS apart from other innovation units. This triple impact strategy also represents the unit's matter of concern that circulates around the creation and facilitation of *"The best new technological solutions that create value for the patient, staff, hospital and also on a higher societal level"* (Innovation consultant B, 2021, int.; see figure 18). The innovation and development is centered around treatment and diagnostic, and Innovation PLUS anchors projects and services in all hospital wards affiliated with the Rigshospital. The Rigshospital
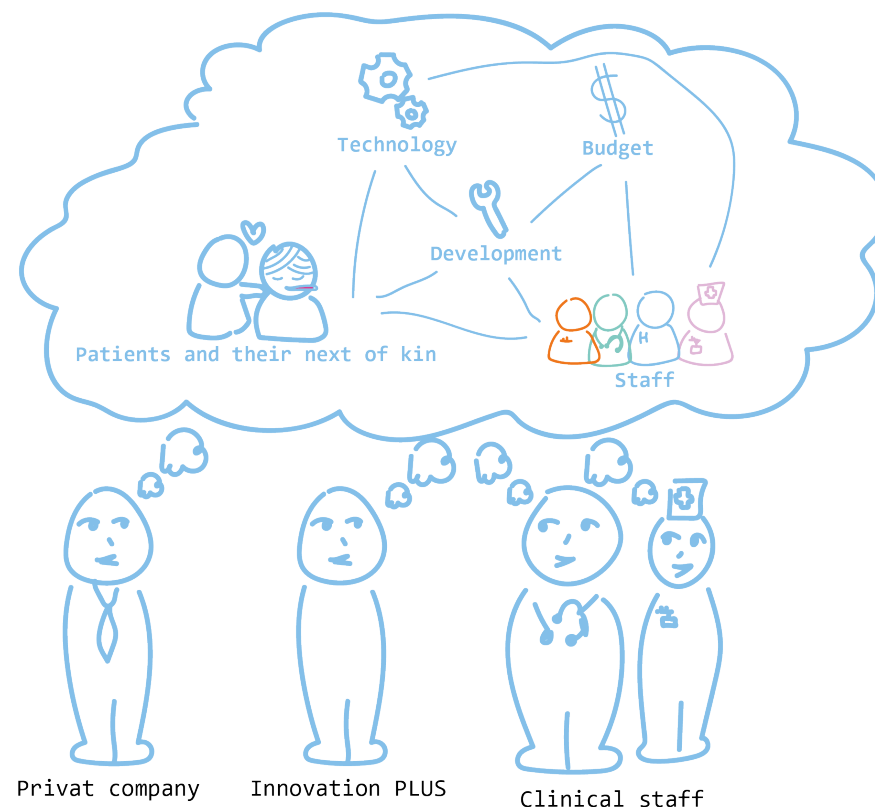
Figure 18: Shows Innovation PLUS actor world

is through their new innovation strategy aiming to position the hospital as a leading frontrunner hospital in research-based innovation and develop a world class innovation environment, where implementation of innovation is accelerated through the unit and concept of Innovation PLUS and a new innovation academy (Region Hovedstaden, 2020). In this way innovation and being in front of the development is the main narrative of the Rigshospital which has led to the formation of Innovation PLUS.

"The Rigshospital will greatly increase its focus on strengthening the collaboration between the hospital's excellent research knowledge environments and a number of external partners who can add new knowledge, technology and resources to innovation" (Hospital Director, Region Hovedstaden, 2020).
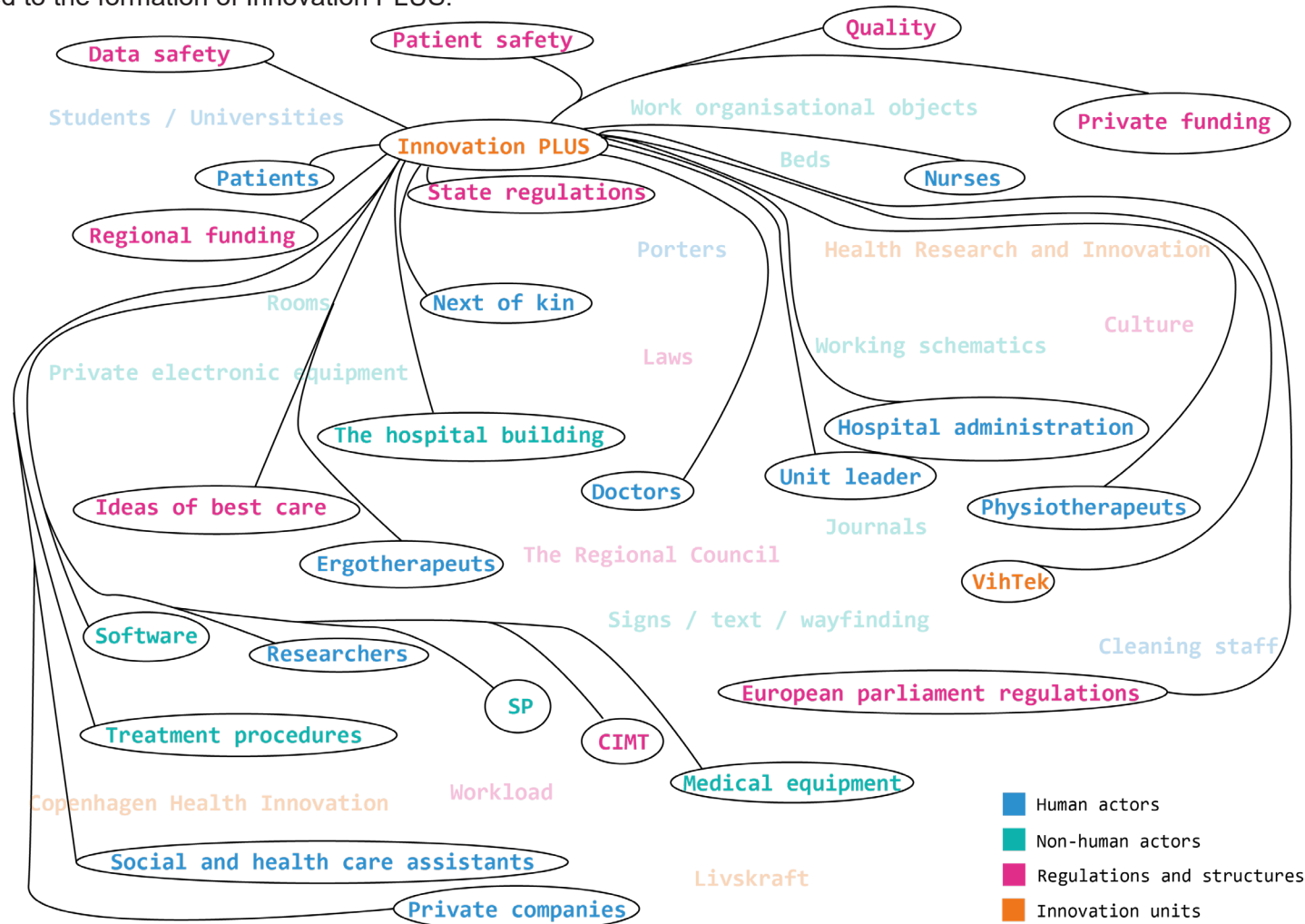
Figure 19: Shows the messy map of Innovations PLUS position in the development arena.

Through an interview with the unit's Innovation consultant (2021) it was clear and confirmed that a lot of research and innovation is already being carried out at the danish hospitals and in the healthcare sector in general. *"What we do is that we put innovation and development into formula and validate the impact of the project and consider the innovation potential and innovation height"* (Innovation consultant B, 2021, int.). Nevertheless, it was explicit that *"the innovation ecosystem in Denmark is very motley and there are an extreme number of actors"* (Ibid.). *"Too many innovation projects are currently being developed locally and we are learning too little from each other across hospitals in Denmark. [...] great results are achieved when we reach out and let others be a part of the equation"* (Region Hovedstaden, 2020). Therefore, the unit will collaborate with patients, relatives, the business community, knowledge institutions, interest organizations, municipalities and regions (Region Hovedstaden, 2020 ; see figure 19).

Innovation PLUS has no guidelines on what actors to include and exclude in a given project, but *"we try to use the best of all worlds in the best way possible"* (Innovation consultant B, 2021, int.). Furthermore, the team has a practice of constructing and expanding their team temporarily to create a new team dynamic containing the specific competences needed to carry out the projects in their portfolio. Therefore, the unit's internal organization is fluent with only a small permanent and fixed team gallery.

The newly established unit is positioning themself in the network, by working with more binding long term cooperation agreements, for example with Bio Innovation Institute and Health Tech Hub Copenhagen (Innovation consultant B, 2021). *"To put the clinical staff and the other actors into play together can be very fruitful, even though their mindset is very different"* (ibid.). Regardless of working with private or public partners, the projects are anchored to the clinic by ensuring clinical marking, clinical ownership, and a direct connection to the hospital (ibid.). Collaborative learning processes are enhanced when distinct teams and professions come together in cross-functional activities, these are proposed to be a primary vehicle for integration and are believed to bridge divides between different actor worlds (Day-Duro et al., 2020).

3.3.3 Health Research and Innovation

Health research and innovation is a part of the region's central administration and ensures citizens' health by ensuring a short way from research to possible treatment. The department has a great focus on the law aspect of healthcare, and approximately 50 percent of the employees are educated within law.

Through an interview with one of the department's chief consultants (2021) it was clear that one problematic aspect within the region is finding a common language when engaging different actors. This common language is tried and implemented in all aspects, ranging from students to employees that have worked within the field for years. Furthermore, the lack of established networking and collaboration within the region has made employees gather in smaller personal interest-based networks. These networks are formed aiming at both social interaction and professional interaction with colleagues from other departments and areas. Health Research and Innovation has a relatively close relation to the clinical staff because of these

networks and are trying to be connected to people *'working on the floor'* (see figure 20).

Health Research and Innovation is one of the units that are working actively with spreading the innovation narrative that is created by the Regional Council. *"I have colleagues that work with employee driven innovation, they make competence programs where you work with a problem and possible problem solutions and qualify the ideas."* (Chief consultant, 2021, int.).The quality consultant also expressed the need for bottom-up innovation instead of the top-down approach
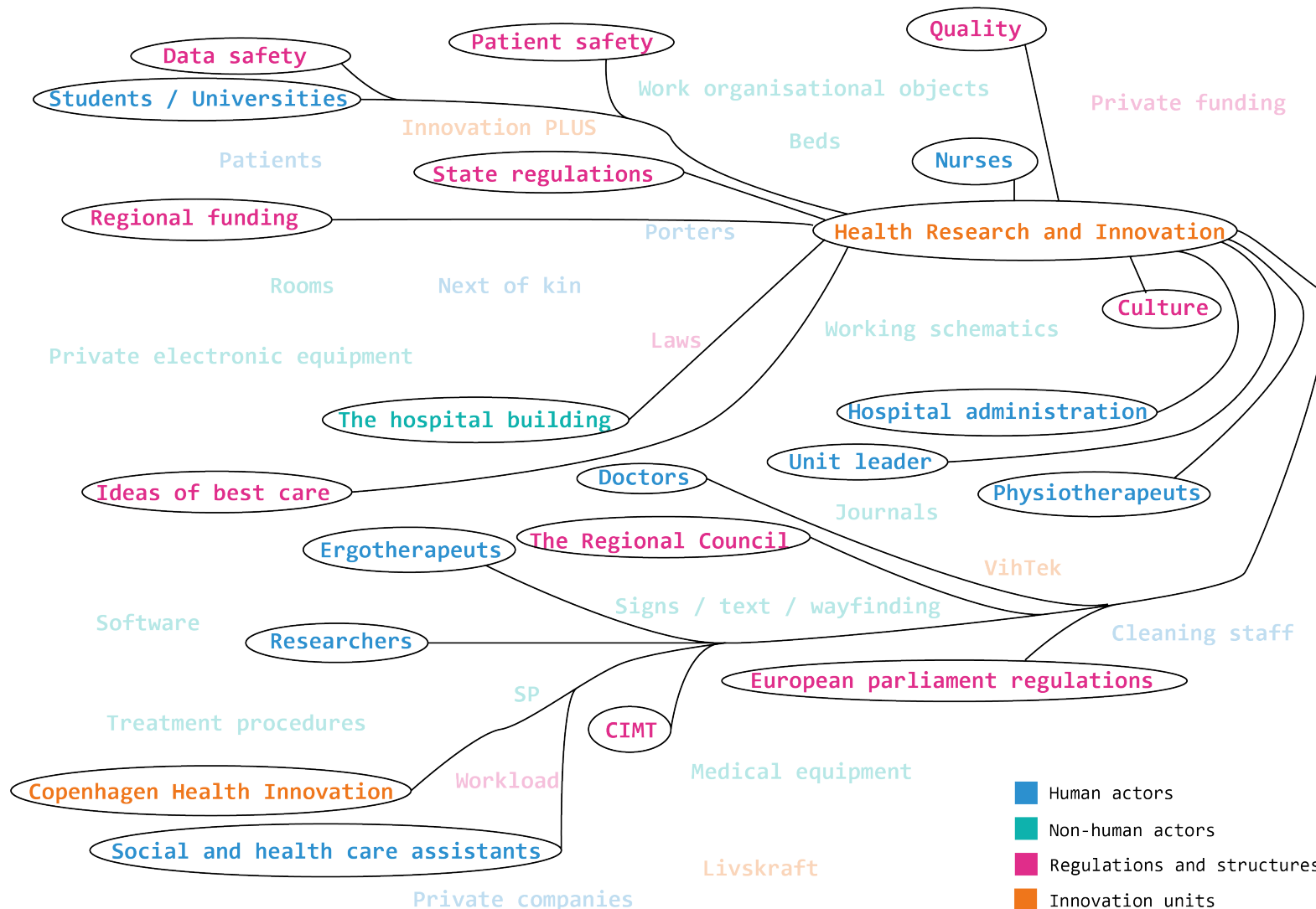
Figure 20: Messy map of Health Research and Innovation's position in the development arena.

which was initially tried. *"That was very much a top-down process. Can you centrally in the administration make sure that they have a common and shared approach to innovation, shared goals, and an economy where it is clear what layer decisions should be made? That did not work. The organisation was not mature enough. There was too much competition amongst the different units."* (Chief consultant, 2021, int.). The Chief consultant explicitly expressed that the regional innovation setup could benefit from a reestablishment and also, that the departments would probably have been arranged differently if one had to reconfigure today.

The Chief consultant (2021, int.) made it clear that the main problems were a lack of common language and no clear way of communication across the different innovation units and hospital wards. It was also stressed that the innovation should be bottom up, meaning that the clinical staff in the hospital wards needs to be the main driver for the innovation.

3.3.4 Copenhagen Health Innovation

Copenhagen Health Innovation (CHI) aims at introducing new ideas into the healthcare sector while simultaneously creating interestment for healthcare in students (Copenhagen Health Innovation, n.d.). CHI mainly facilitates meetings between students and hospital wards with specific problems. The main delivery from CHI has been to show that they could connect as many students with healthcare staff as possible, but this is changing (Innovation Consultants A, 2021, int.). One of the main problems that they have found in the facilitation of these student projects is that there are monodisciplinary siloes in the hospital sector that are hard to break

down and they are still trying to figure out how to tackle this problem the best way possible (Innovation Consultants A, 2021, int.).

CHI has a close relation with the innovation unit 'Health Research and Innovation' (see figure 21). This is because of their organisational position in The Capital Region, CHI has to make sure that they are not doing double work or working on projects that do not fit into the topics Health Research and Innovation are working with. To make this easier they are planning on getting office spaces closer together (Innovation Consultants A, 2021, int.). CHI are mainly focused on facilitation and connecting clinical staff with students; this means that they do not have much connection to the non-human actors who are in the different hospital wards.

Like Health Research and Innovation CHI has also identified the issue with sharing knowledge both across the clinical disciplines but also in between the different innovation units.

3.3.5 The patient

The role of the patient is up for negotiation. It is being negotiated by many different actors, both inside and outside the network of the Capital Region. The patient is in contact with many different actors in the arena (see figure 22) who all work together to establish the identity and role of the patient. During the establishment of the identity of the patient different actors become spokespersons for the patient. This can both be the next of kin who speaks on behalf of the patient to the staff or the staff communicating the needs of the patients to innovation units on behalf of the patients.

Figure 21: Shows the relations between CHI and the other actors in the arena.

The identity and role of the patient has evolved since the internet and technology has become more widely available (Læssøe, 2019). Patient 1.0 was highly reliant on the staff since the patient did not have easy access to the internet that could introduce the patient to the idea of best care. Since the internet and smartphones have become widely available in Denmark the patient's role has changed. The internet provides us with expert knowledge at a moment's notice. This means that the clinical staff now phases a new world where the patient shows up with some symptoms and a possible diagnosis, the patient has a much stronger relation to the idea of best care, the patient has become patient 2.0. We are now moving towards patient 3.0 (see figure 23).
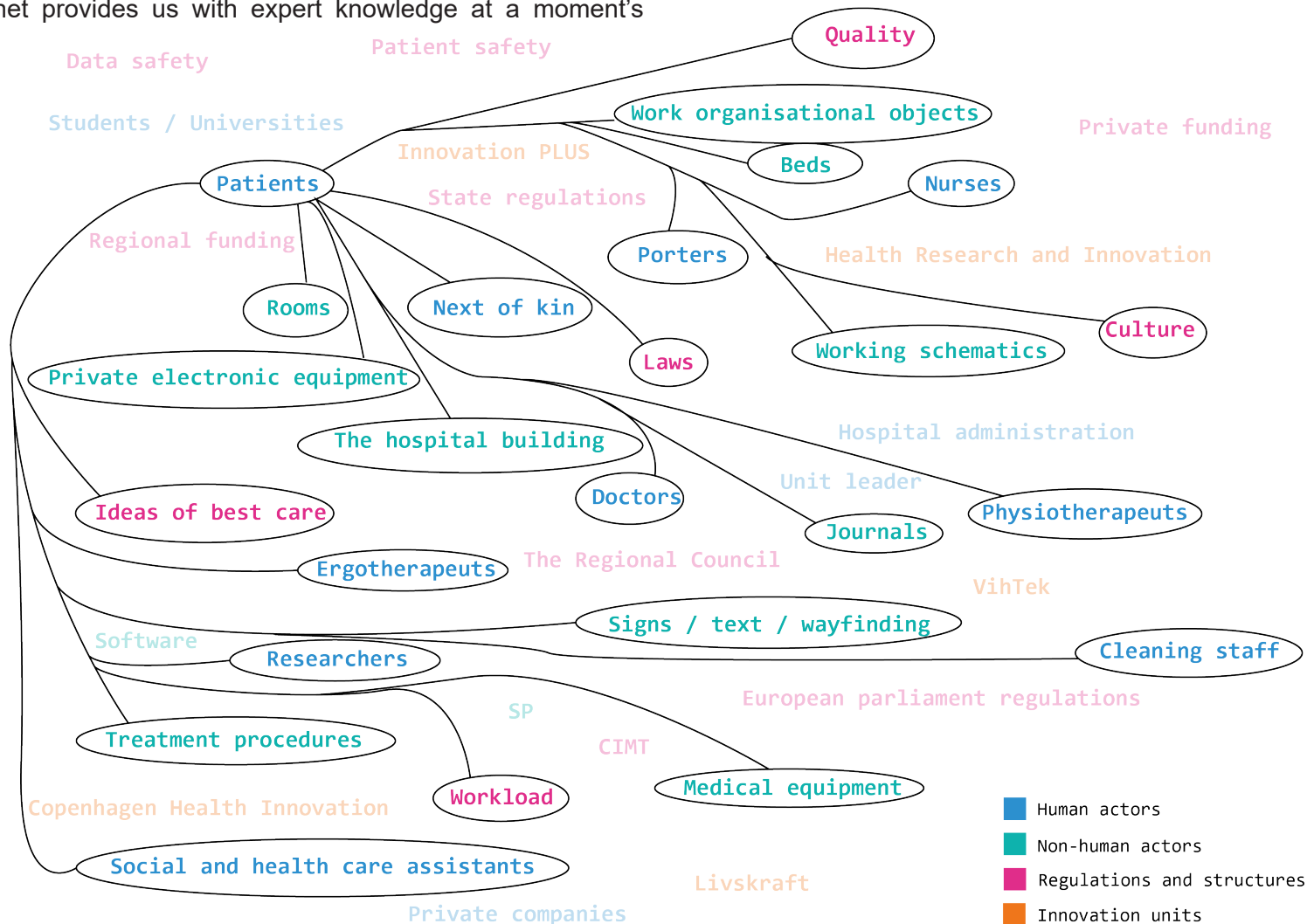
Figure 22: Shows the messy map and the relations the patients have in the arena
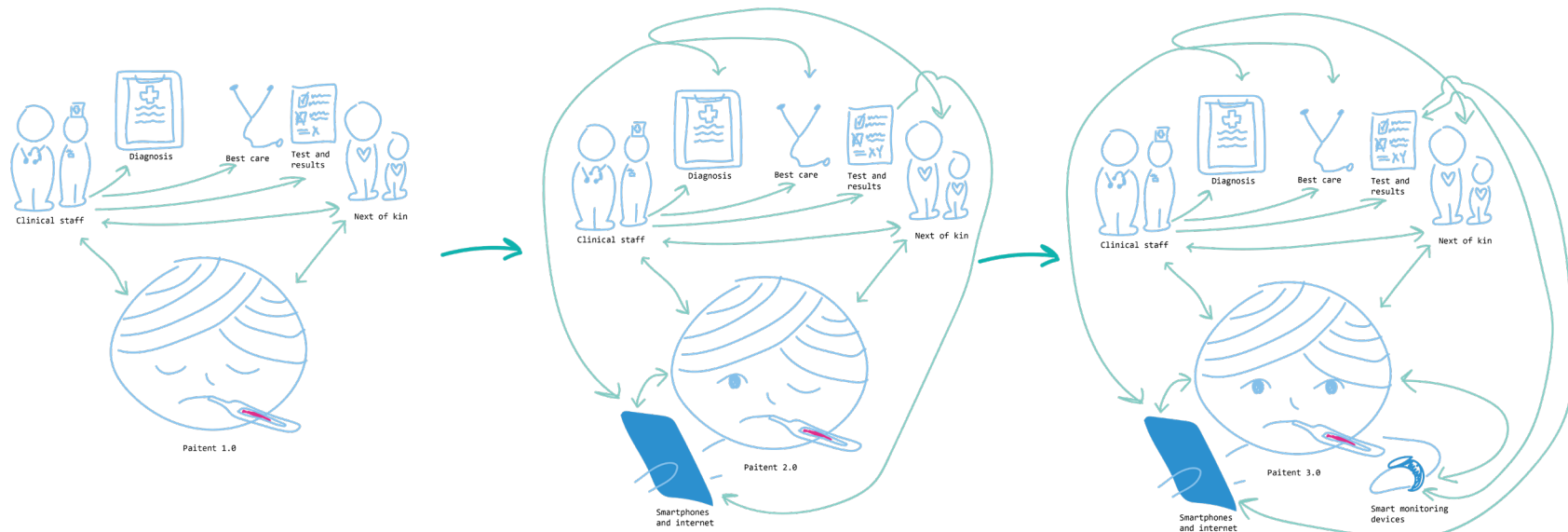
Figure 23: Show how the different technologies that are made available for the patient changes the relationships in the meeting with healthcare professionals.

Patient 3.0 cannot come to pass without the staff also accepting and leaning into the idea of home monitoring. Many people already use home monitoring, this is both built into our smartphones but can also be bought separately in smartwatches and the like. According to the Quality Manager (2021, int.) this form of monitoring is much more extensive than the monitoring the clinical staff would like to use during a period of treatment. These smart devices allow the patient to gain insights into their own body expressed by numerical numbers that they learn to interpret and react to (Quality manager, 2021, int.). These numerical values have previously been reserved for the doctor's office with the use of expensive equipment. By getting the numbers through smart technology we can learn new things about our health and bodies (Owen et al., 2010). The technology that allows home monitoring is therefore a tool that can help create representations of the patient's health while the patient is removed from the hospital environment. The patient role is changing because of factors that are external to the healthcare sector, making them ready to embrace more technology use in private. This is of course not the case with all patient-age-groups, but technology is becoming a more integral part of modern life. The change in the patient role will not be applicable on all patients across all hospitals. But according to the unit leader of Center for Patient Participation there is a strong group of patients that wants to be patient 3.0 while some still want to embrace the role of patient 1.0. This is good since it will allow the staff to spend more *'live'* time with patient 1.0 in a hospital room and more online time with patient 3.0 who wants to be a more active actor (Unit leader, 2021, int.).

When patient 1.0 is hospitalized most of their time will be spent waiting. *"The patient's time is not their own when they are hospitalized"*

(Unit Leader, 2021, int.) they spend most of their time waiting for the clinical staff to get to them. While they are hospitalized their normal family-life continues but they are for the time not able to bear the responsibilities they are used to. This means that their next of kin will have to stand-in and take over some of these responsibilities while also being worried on behalf of the patient (Søndergaard, 2020). If the patient is able to be home during their treatment that would normally be taking place while hospitalized, then the strain on the family dynamics might be smaller.

Based on this our research question is:

How can we as Design Engineers best support VihTek in their navigation of the development arena to facilitate the needed patient transition in the Danish healthcare system?

3.3.6 Sub-conclusion

Through the mapping of the development arena we found that the way that most innovation units work with the changing role of the patient is by trying to change the clinical staff. This is done mainly through tests and implementation of welfare technology. The reasoning for these tests and implementations is that by including more technology the patients will be able to get better treatment since they can be a larger active part of that treatment. The technology is then supposed to support the clinical staff in their effort of including the patient. The idea of including the patient is in line with the new narrative for what quality and innovation is, if the patient is not included then there is poor quality and innovation in the hospital ward. Moving onward we will look more closely into how VihTek works with their projects and how these tests and implementations are working and what controversies arise out of these projects.

Discover Define Develop Deliver
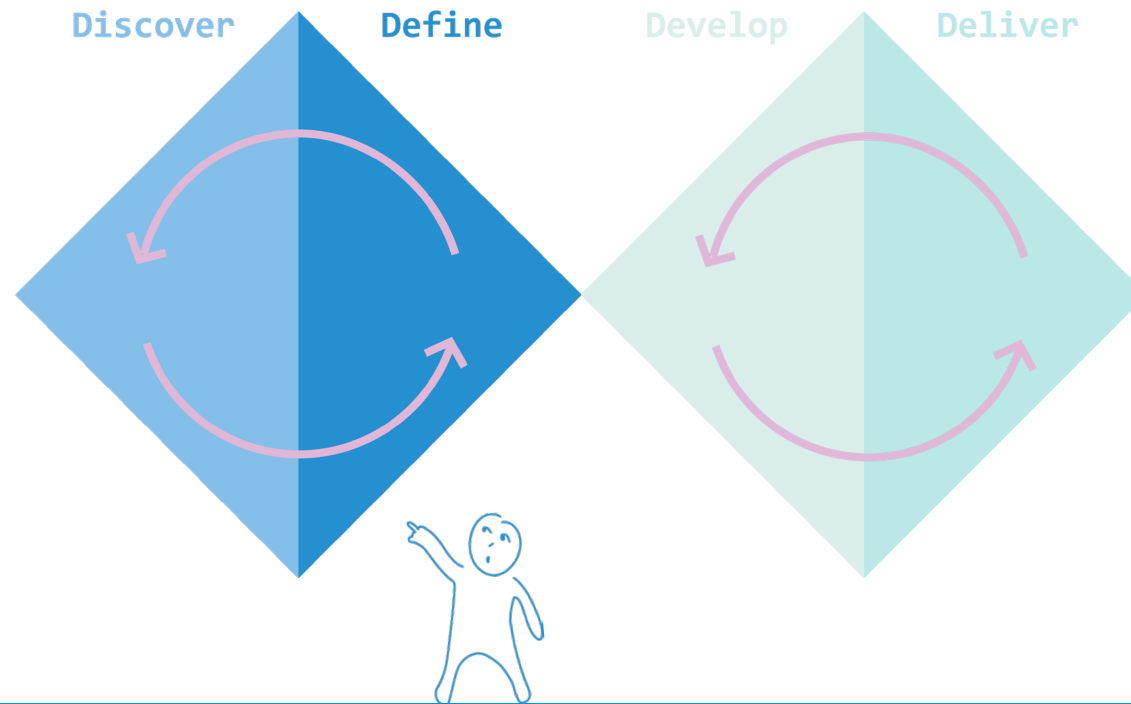
Chapter 4:

Define

We will now dive into VihTek and how they work with welfare technology and change. To do this we will explore three cases. Two cases are ongoing projects where we have talked to the project leaders to gain more insight into how VihTek works with the technologies, clinical staff and patients through their projects. The third case is a finished VihTek project that has been evaluated according to VihTek's own *'technology assessment in practice'* evaluation. We will conclude the chapter with a look at the different evaluations and what happens after a project and a look into VihTek's project process and their use of intermediaries.

4.1 Case introductions

4.1.1 Motivating children with cancer to workout while hospitalized in isolation

This project focuses on creating motivation for physical activity for children who are hospitalized during cancer treatment. As part of this treatment the children need stem cell transplantation (SCT) is a procedure used to treat and potentially cure several medical conditions, including leukemia, lymphoma, and myeloma (Steinberg et al., 2015).

Figure 24: Illustrates the normal journey for a patient undergoing SCT (Steinberg et al., 2015 & Børnecancerfonden, 2016).

The typical process for stem cell transplantation in patients with cancer can be seen in figure 24. First the stem cells are harvested, either from the patient or a fitting do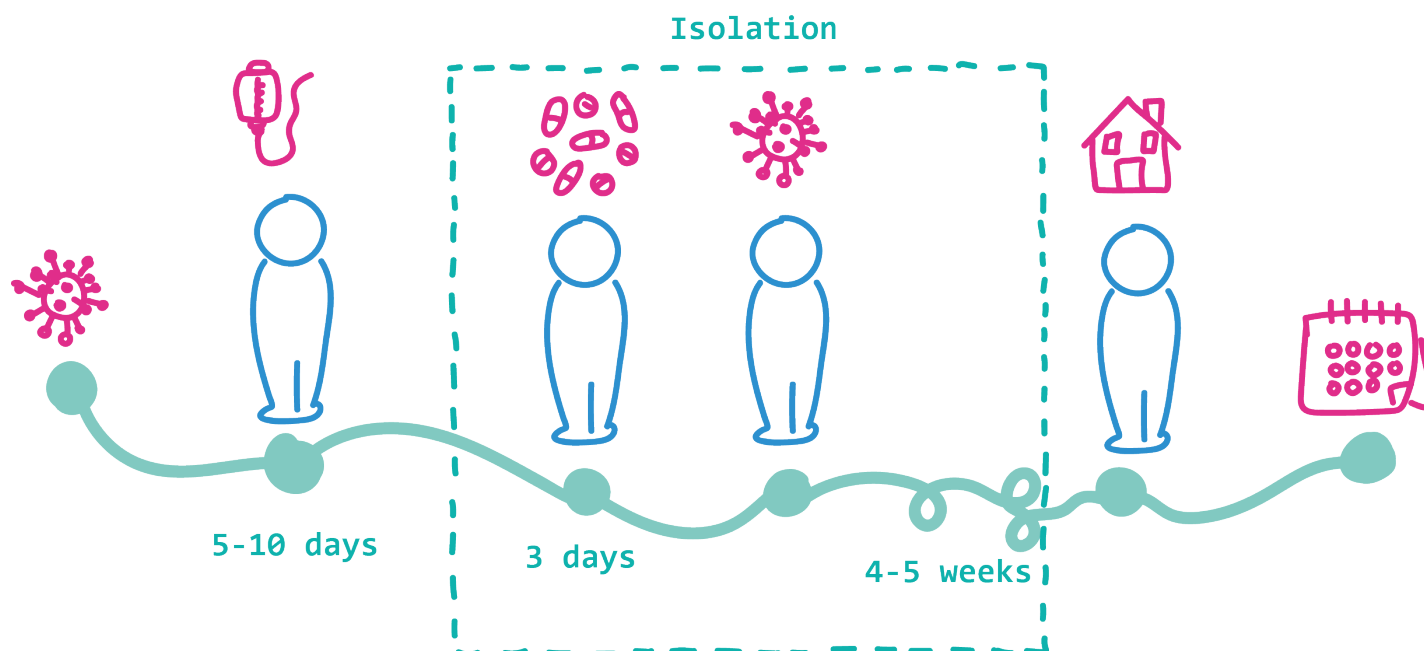nor. The stem cells are then kept frozen. Thereafter the patient receives a harsh high dosage of chemotherapy that damages the patients' ability to produce blood cells. Three days prior to the transplant, the patient is isolated and placed on immunosuppressants to weaken the immune response to the stem cells. When the time is right, the stem cells are introduced to the body. The patient must stay isolated till the stem cells are working and the side effects have taken off. Finally, the patient is ready to go home, but has appointments at the hospital once a week. (Steinberg et al., 2015 & Børnecancerfonden, 2016). This treatment is very harsh and can cause some very uncomfortable side effects like nausea and overly sensitive skin (learned at the first workshop with clinical staff).

The promotion of health was problematized by some physiotherapists that work with these children. The children need to exercise while undergoing treatment. The tools available today for this exercise are weight and a piece of paper showing different exercises chosen by the physiotherapists.

Physical activity is important for the general health of all beings. Since the introduction of entertainment technology physical activity is no longer something that people do naturally but is more often seen as a hobby (Ramírez-Granizo, 2020). This is a problem since exercise is linked to many health benefits. It has been shown in mouse trials that exercise is directly linked with how well the body can fight diseases like cancer tumors (Pedersen et al., 2016).

Physical activity is also beneficial when you look at cancer survivors who have a larger chance of not experiencing cardiovascular events if they are physically active regularly (Jones et al., 2014). Previously the only way to determine how active individuals were for them to recall how much time they have spent on sport activities, but with the availability of accelerometers that can be put on the body it has become apparent that when you look solely on the time spend on sports you do not acknowledge the importance of smaller movements in the day-to-day life (Owen et al., 2010). This means that any small period of physical activity is important when considering the future health of these children.

The clinical staff had found a solution that they wanted to create more motivation for physical activity. They wanted a technology that gamifies physical activity. They therefore contacted VihTek who arranged a meeting to figure out what sort of technology might be relevant. During this meeting it was also discussed to make a feasibility study to figure out whether a technology would make a difference for both motivation for physical activity but also for how much time was spent out of bed. VihTek then researched the market for a technology that lived up to the demands presented at the first workshop. This was then run through the project leader for the feasibility study who has a background as a physiotherapist. The remaining technologies were presented to the clinical staff using text and pictures to help convey what the different technologies could offer (VihTek, 2020 B). In the end the best fitting technology was Rehaboo (see picture 1)

Picture 1: Shows the Rehaboo technology consisting of a yellow iron 'totem', a gaming computer, a large screen and a motion sensor. On the picture on the right you can see the totem in action.

Once Rehaboo was chosen a negotiation began to create an actor-world around a feasibility study. To undergo a small study a protocol needs to be made to ensure that the focus and the data that is being documented fits the purpose. This was particularly enforced by the lead nurse who was also in charge of the budget for the ward. They had money to buy new technology, but they do not have the time and manpower to develop a new technology, they need something that works now. They did however accept to test Rehaboo which is a technology from a small Finish company that is still developing the technology. The main negotiation was on how to create a feasibility study and how to incorporate both the extra assignments made by the study and the day-to-day operations needed for the Rehaboo technology (see figure 25).
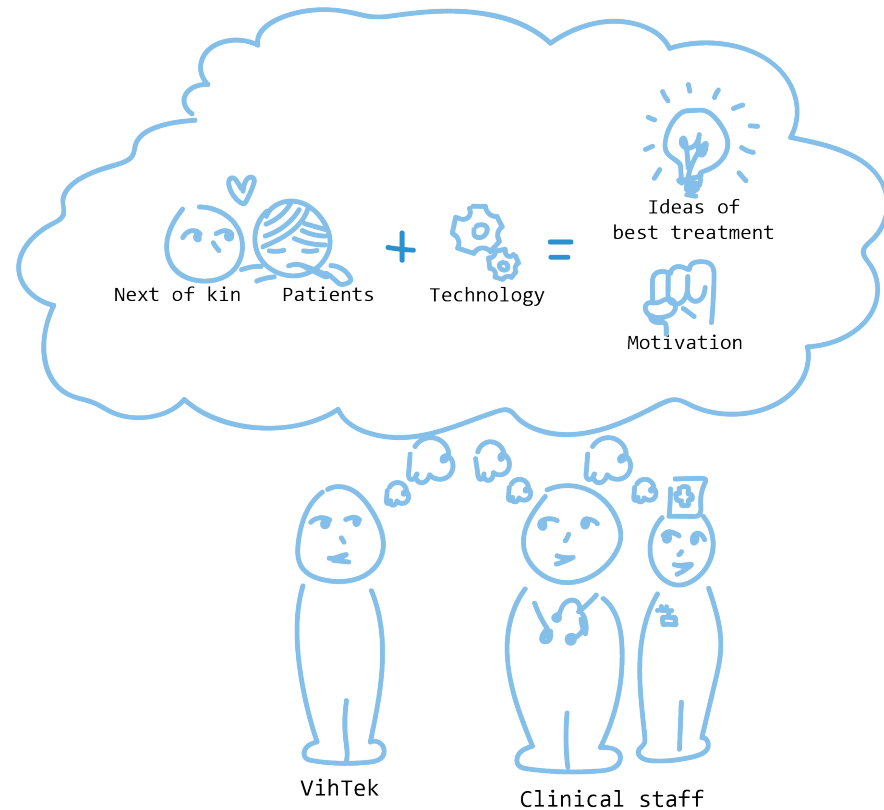
Figure 25: Shows the basic negotiation and construction of arguments for implementing Rehaboo in the treatment of children going through SCT.

Not long after the testing period started it was clear that the technology could not live perfectly up to the role it should have in the original actor-world (see figure 26). In the original actor-world the technology should include fun games that required the patient to do some exercises that were being coordinated with the physiotherapist, it should be able to function in a hospital/isolation environment and should be easy to use. It was especially important that the technology should be easy to use since the clinical staff had expressed quite clearly that they were not tech savvy. To make the use of the technology as easy for the staff as possible VihTek went

there to install and teach the clinical staff and patients how to use the technology. This was however not enough since there was both trouble with the coding and the physicality of the technology. The clinical staff has expressed to VihTek that they would have given up on the technology the first time there was a problem if they had not been there to help.

In regard to the Rehaboo technology and the test to see whether it would motivate children with cancer to be more physically active it was clear that VihTek went along with the vision from the clinical staff. The choice of technology was completely in line with the staff's specifications, but it failed to deliver on some design aspects that makes it too hard to work within the day-to-day work at the ward. The technology is creating friction in the use making it easier to not
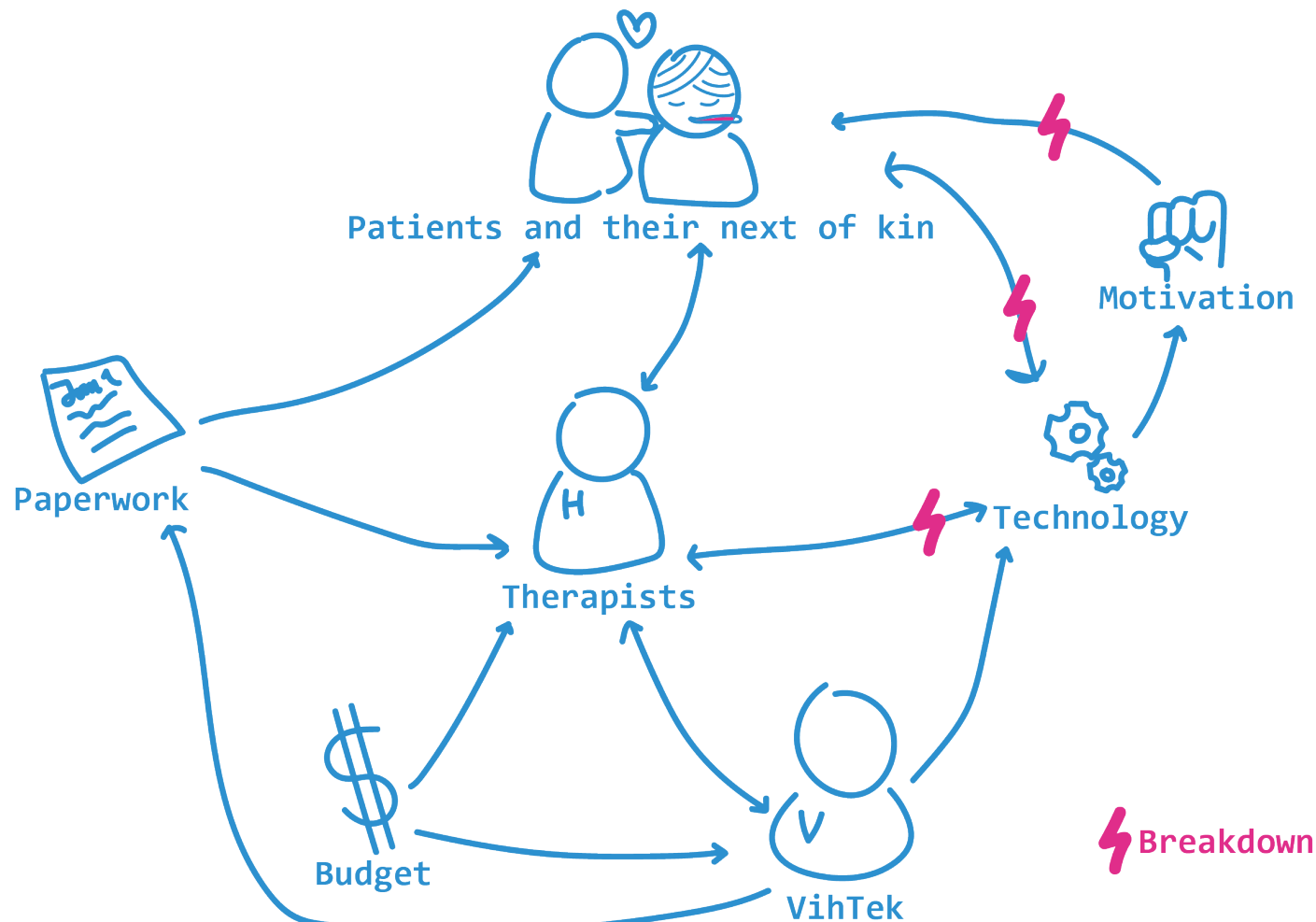
Figur 26: The actor world for the feasibility with breakdowns.

use. There is a small fix for this problem: make an 'on' switch on the outside of the technology. Today if you want to turn the Rehaboo totem on you need to screw out 4 screws on the back of the technology and then turn the computer on that run the program. Once this is done you need to reboot the computer. Once the reboot is done the program will start and work as intended. This friction needs to be fixed to make the technology truly useful in a hospital setting. The company had made up an actor-world where the computer would never be shot down but with it being in a small isolation room it is nice to be able to turn the technology off occasionally. Furthermore, we found that it was desirable if the screen embedded in the Rehaboo could be used for other things as well.

The need for the technology to be easy to use cannot be stressed enough. We often hear in the news that clinical staff at hospitals are overburdened which leads to breakdowns and staff members crying while at work because of work overload (DR, 2021). There is therefore not much time left to spend on any given technology or for troubleshooting. The implementation and adaptation of a new day-to-day operation of the best care with a new technology requires a lot of resources and energy from the ward, if the technology does not function properly then the actor-world will probably break down.

4.1.2 Measurelet scale - fluid balance at home

In partnership with the hospital ward for stomach, intestine, and liver diseases at the Rigshospital a test has been set up to see if patients are able to home monitor their fluid balance. A fluid balance is an
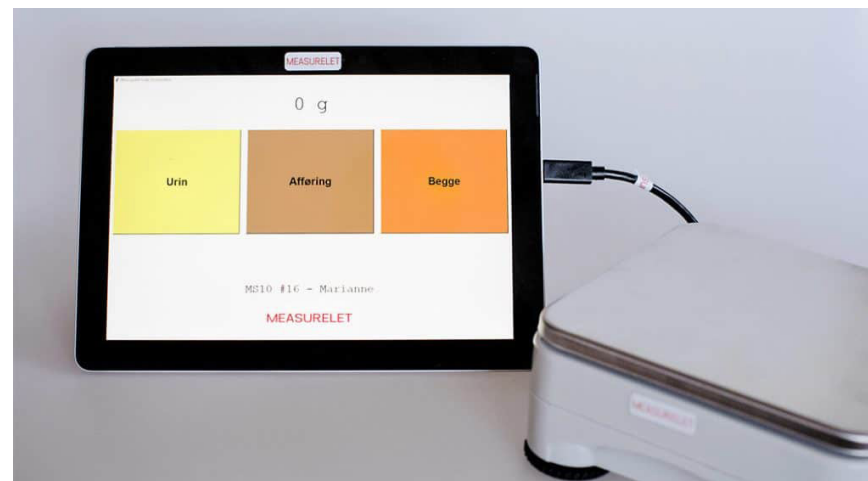
Picture 2: Picture of the Measurelet scale with the tablet connected to it (Picture is from Measurelet, 2020).

account of how much urine and feces has left the body (VihTek, 2020 C). To make this account at home the patient will use the technology, Measurelet which is a scale with a tablet attached to it (see picture 2).

This technology can enable or empower patients to become patient 3.0 since this home monitoring technology will make them able to deliver results to the clinical staff and make them a more active part of best care. This technology requires a lot of trust between the clinical staff and the patient since a task that had previously been theirs is in the hand of the patient (VihTek, 2020D). The fluid balance is quite important, if there is fluid imbalance it can lead to longer hospitalizations, complications or in worst case death (Measurelet, n.d.; Unit leader, 2021, int.). The test is therefore as much a test of the clinical staff and their willingness to hand over this important task to the patient as it is a test of the technology and patient.

Through an interview with a project employee (2021) at VihTek who is working as project leader for the Measurelet test we learned that this project has been in the planning phase for a long time. The project initially started in 2019 with the first dialogue between the founder of Measurelet and VihTek. The founder wanted a test to show that Measurelet could be used in a clinical setting to remove most of the hassle that the founder had found and observed in her own work with doing these measurements. The founder of Measurelet had been employed at the hospital ward for stomach, intestine, and liver diseases at the Rigshospital, the same place that VihTek ended up partnering with for the home monitoring test. Initially the founder wanted to know how much time could be saved using this digital scale system rather than pen and paper to make a stronger business case. This was however not necessarily an interesting angle for VihTek to research, since a project should be more focused on implementing technology in a clinical setting to fix a problem
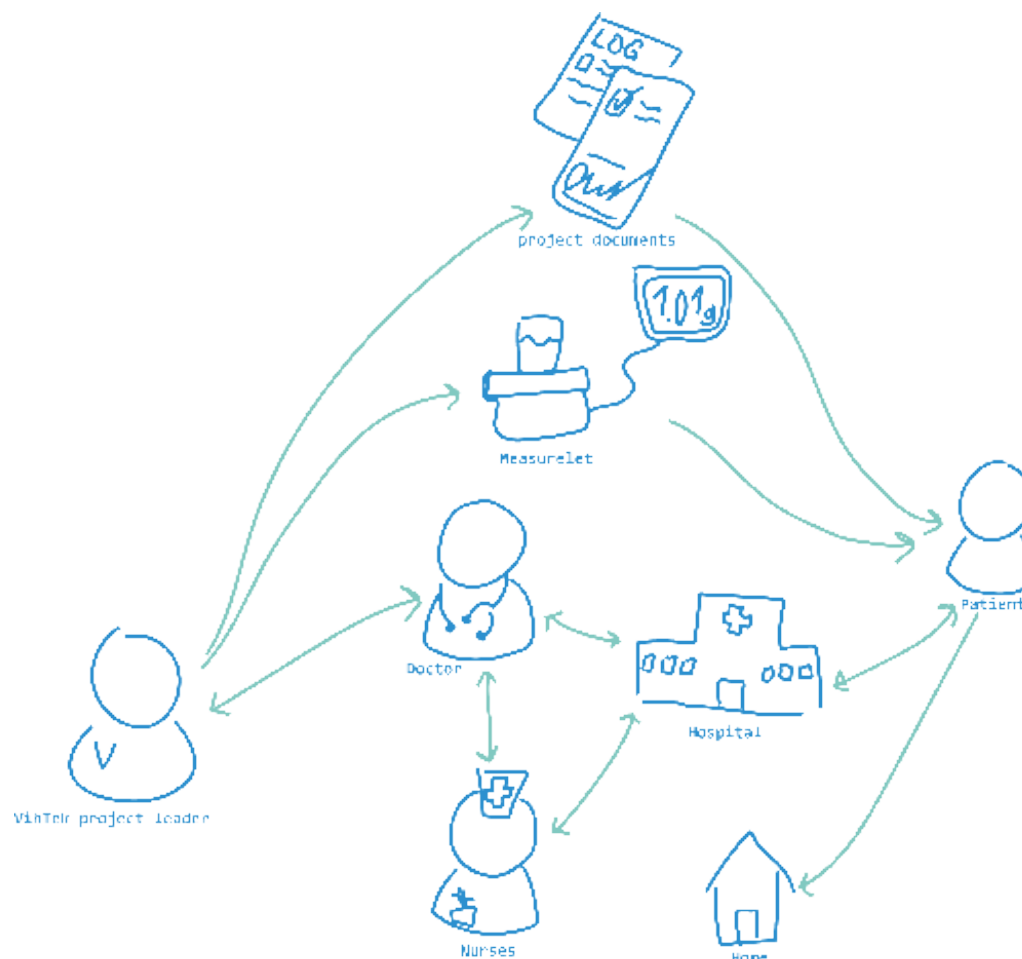
Figure 27: The proposed actor-world of the Measurelet project

that would be preferable over supporting a product and its business model. The Covid-19 pandemic then hit Denmark and it became interesting both from a savings and patient perspective to kick-start the home monitoring project that came to be. A project description was created that both highlighted the problem area and the day-to-day operations surrounding the fluid balance. All descriptions were accepted by the hospital ward, and they were positive that it would be easy to include five patients in a trial where they would be home monitoring their fluid balance for one to two days from home. The proposed actor-world had made what seemed like rational connections between showing up for a visit with the doctor at the hospital, receiving the Measurelet, taking it home for a few days and then returning it at the next visit to the hospital (see figure 27). The project employee had gained an understanding of the system that they would sometimes hospitalize patients specifically for the purpose of doing the fluid balance and that many patients were able to do this from home.
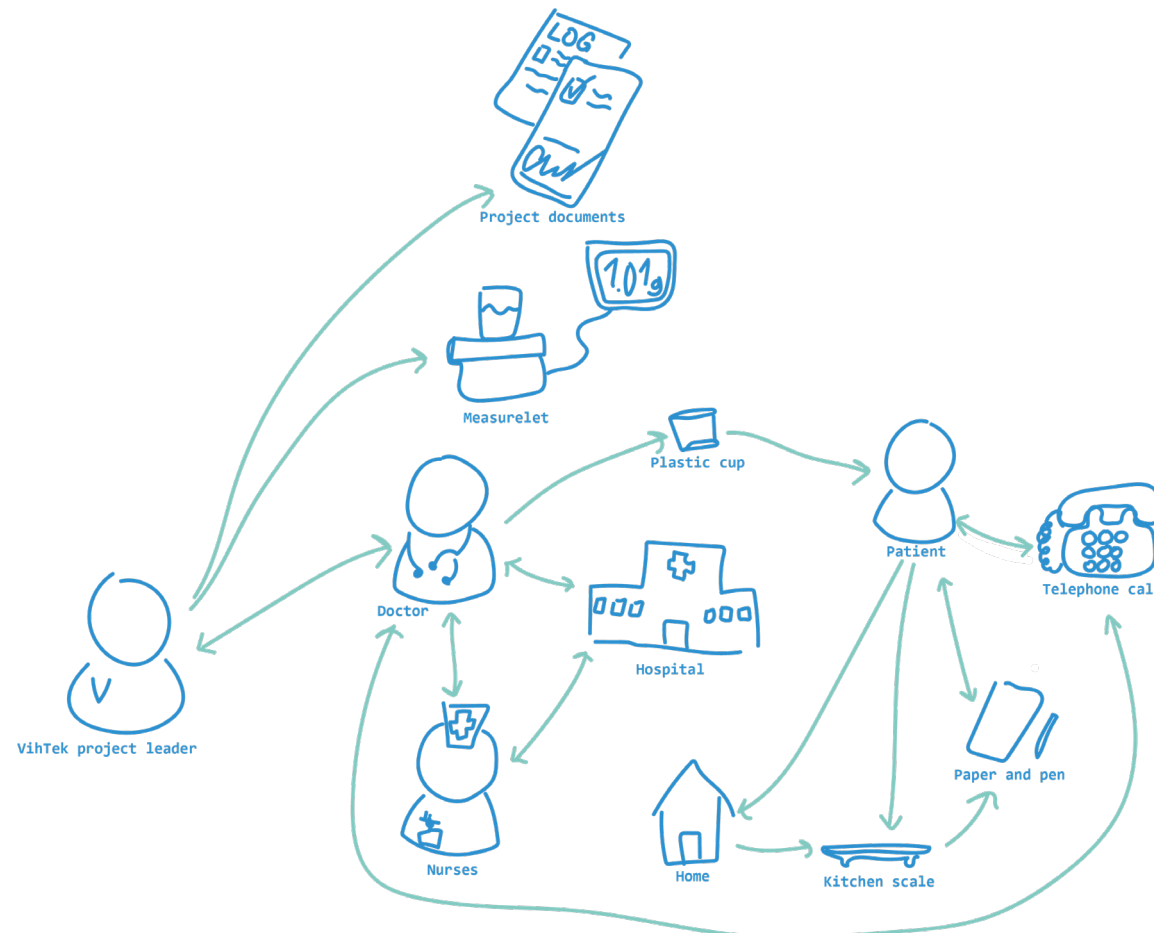
Figure 28: Shows the actual actor network present at the hospital ward during the project.

The test started up in December 2020 - over one year after the initial talk about doing the project. When the project employee had not heard anything from the hospital ward for a few weeks he then contacted them to figure out how the project was running. Nobody had been sent home with the device yet, there had only been a few new patients assigned to treatment, and they were sure that after new years there would be a lot of possible patients. This was however not the case. The first patient went home with the device at the end of February 2021 and so far, no other patient has taken the device home for testing. It seems that while the technology might be smart, the need for such a device is not that apparent and it is hard to say why the inclusion of patients has been so much harder than first thought. One reason however is that it was hard to get any patients to go and pick up the device. This was a surprise for the project employee since he was under the impression that they would pick up and deliver the device during a routine visit to the hospital. There simply is not any connection between the patient and the physical hospital (see figure 28).

The actor world shown in figure 27 illustrates that there was no direct connection between the patient and the hospital in many cases. This was not known according to the project employee who was under the impression that the Measurelet technology would be picked up at a visit to the hospital (Project employee, 2021, int.). Part of the explanation for the missing connection between the hospital and the patient is the Covid-19 pandemic and this new situation might not have been reflected in the project description that was passed around. It seems that the clinical staff found a low fidelity solution to the problem without any need for extra technology to be applied. It

turned out that the trip to the hospital was problematic and therefore a technology like Measurelet seems to be mainly applicable to patients who live relatively close to the hospital who are mentally and physically capable of using what is for them, previously unknown technology. This group seems to be relatively small.

4.1.3 Physically active in Neurorehabi-litation

The aim of the project is to create the needed framework to facilitate physical activity at Neurological hospital ward (VihTek, n.d. D). The implementation of the different technologies is done at five different hospital wards in the Capital Region (Ibid.). Each ward has chosen their own individual technology that will make the framework for the facilitation in their own individual ward based on the clinical staff's knowledge of the patient group (VihTek, n.d. E). The project is built on the knowledge from a previous project about self-training where the patient gets the opportunity to do workouts on machines in the afternoon and evenings after their normal rehabilitation with therapeuts (VihTek, n.d. F). The project process which we analysed earlier in section 3.3.1 is based on this project.

The project is built around the concept of process evaluation (Linnan and Steckler, 2002; VihTek, n.d. G). The process evaluation allows VihTek to make the project process more measurable which allows them to discuss what is going on at any given time in the project in relation to the different measurement that has been agreed upon before the project (VihTek, n.d. G). This can help to make appropriate changes in the actor world and network reconfiguration

so that the project can keep on track. The process evaluation is therefore a tool to create concrete intermediaries which can help the actors involved understand what is happening and act on it (Ibid.). *"The process evaluation is based on a series of workflows made by the staff about inclusion of patients or rather what effect the patient gains from the workout."* (VihTek, n.d. G). If the clinical staff do not perform these workflows, then the process evaluation cannot be an effective intermediary other than to conclude that the documentation for the implementation process is lacking.

Physically active in Neurorehabilitation is based on a series of tests made in different hospital wards of technologies that should make patients able to work out outside of their normal rehabilitation time (VihTek, n.d. F). Multiple technologies have been tested to see whether they would facilitate the extra workout time for the patients. In regard to one technology it was stated in the VTV evaluation that *"[...] since it has not been clear what rehabilitation aim the solution has been performing it has not been anchored broadly in all clinical disciplines in the two hospital wards."* (VihTek, 2019A, p. 8). This could possibly be caused by the lack of knowledge sharing across the borders of the clinical disciplines. Some of the technologies also require help from the staff to use which makes the need for all staff members to understand what rehabilitation aim they are working towards when they use the machine (VihTek, 2019B).

4.1.4 Overall findings

One common thing that seems to happen in all three of these cases is that VihTek is presented with a problem from a clinical staff member. VihTek then accepts both the staff members ability to correctly represent both the other staff members' opinions but also that the staff member is right to problematize this particular thing. This can for example be seen in the measurelet project where a previous staff member wants to sell a product and convinces VihTek to test it at her old workplace. It seemed all the way up to the beginning of the test period that the problem was genuine and that there was a real opportunity in making the fluid balance from home. What VihTek did not know was that they already had a more low-tech way to do these measurements at home and nobody had thought to say this at any point before the test. It seems that there could be a possibility to do fewer tests and thereby take up less of the staff's work time with projects that did not correctly represent the actual problems in the hospital wards.

The private companies have an influence on whether the actor world can be realized in terms of whether the technology can live up to the role it has been given. There are however often many different companies to choose from and all the technologies are probably with their own specific problem that will need to be solved during the initial test and implementation. This problem will be handled by VihTek and the hospital ward together. VihTek often takes on the responsibility to train and learn as much as possible about the technology, but the clinical staff still needs to say whether the technology is working or not. It is therefore still in the relation between VihTek and the hospital ward that is of the most importance to nurture during the project period. If the information flows naturally and is shared then the problems can be handled swiftly in a collaboration between VihTek, the hospital ward and the private company. We will therefore focus on the relationship between VihTek and the hospital ward.
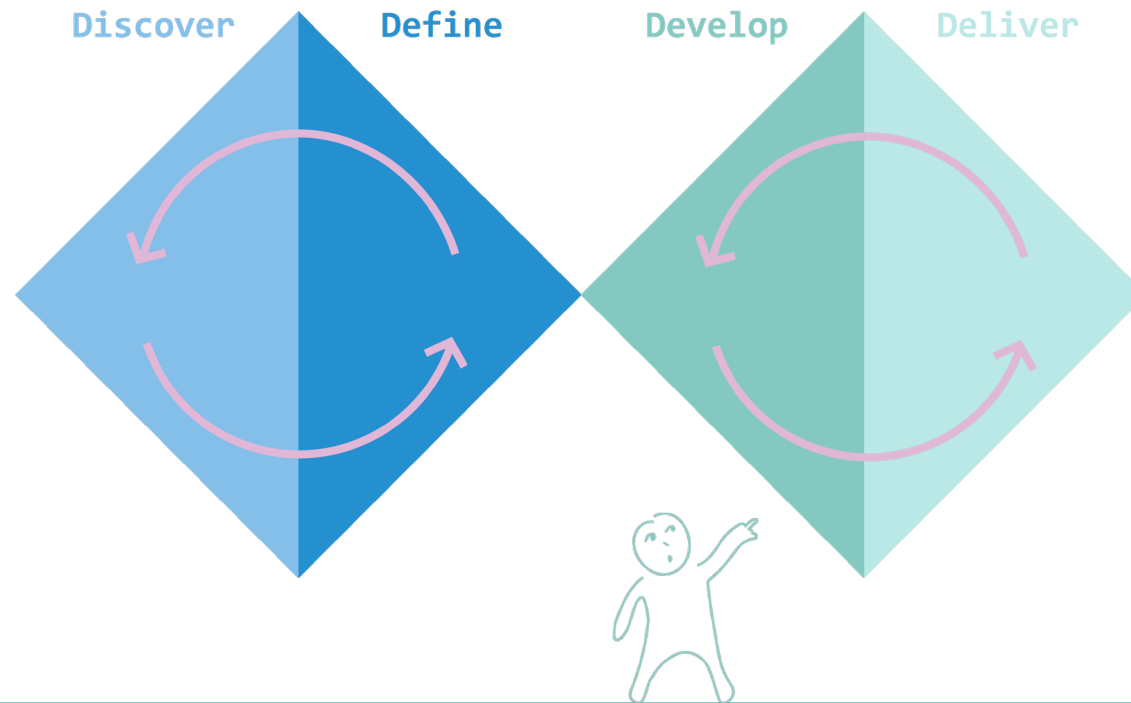
Chapter 5:

Develop

In the develop phase we stage a meeting between us and VihTek to learn about their thoughts on their project process and to co-create a solution space. To create the solution space, we have set the stage so to speak by inviting all VihTek employees to an online workshop.

5.1 Staging

Staging is a theater metaphor that has been used to describe the work of a design engineer in creating spaces where a 'performance' takes place (Pedersen, Dorland and Clausen, 2020). These 'performances' are the participatory design workshops and the like, it is where actors meet in an orchestrated space that is set up by the designers. Pedersen, Dorland and Clausen (2020) speak of micro and macro actors. Micro actors at the individual level while the macro actors are large networks that are perceived like actors. In this case The Capital Region is a macro actor which is built up of heterogeneous networks and actors. *"Ontologically an organization is thus brought into being as it is performed"* (Pedersen, Dorland and Clausen, 2020, p. 27) this means that all the actors who participate in the heterogeneous network are part of the dynamic network that is forever in the making (Ibid.). By this logic, any small actor will make changes in the network and thereby the organisation if they choose to. When we then set the stage and invites Vihtek's employees for a workshop we are trying to set the stage for small changes in the project processes that are happening within a small part of the Capital Region network in the hopes that these small changes could become important for a broader audience over time. We, the design engineers *"(...) are then people with strategic intentionality in shaping events to reach specific outcomes, to configure the*

resulting action-net of an organization in certain ways." (Pedersen, Dorland and Clausen, 2020, p. 27). We act with the knowledge that to make a change we need to set *"[...] up a space for innovation or sustainable transition in an organizational context depends on the political support that can be obtained from internal and external actors and networks."* (Yoshinaka and Clausen, 2020, p. 255). Our solution therefore needs to work both internally in VihTek and externally in their work with the hospital wards. This needs to be represented in some way in our staging.

When setting the stage we will need to work as stage directors who direct and facilitate the negotiation between the employees at VihTek (Pedersen, Dorland and Clausen, 2020). The negotiation space will be set up in a virtual space where we will build a design game (Brandt et. al., 2008) that should work as an intermediary to mediate knowledge between the actors present. The design game stems from the participatory design tradition where actors are invited into the design process (Brandt et. al., 2008).

We have chosen to invite only VihTek employees since the matter we want to negotiate is their project process and more specifically their relation to the clinical staff in the initial stages of the project. In order to set the stage and create an appropriate design game we have to understand what sort of people we have invited, what their competencies are and how we get this into play (see figure 29). To set up this negotiation we will continue with the use of the stage metaphor and look at what happens backstage and the different *'acts'* of the *'play'* we have planned prior to the workshop. We will then discuss how we can work as facilitators to make the workshop as successful as possible.
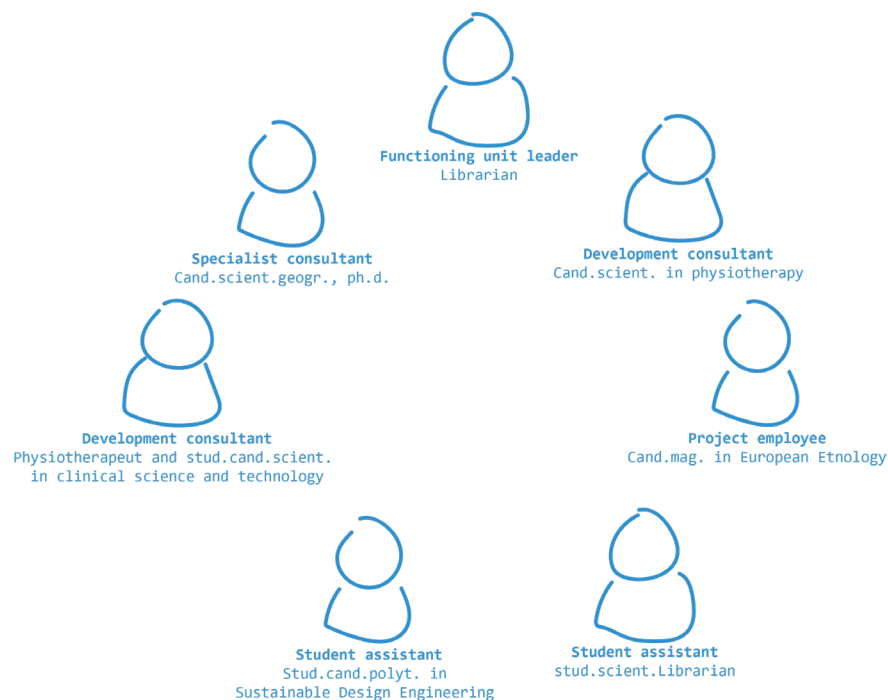
Figure 29: Shows the different employees and competencies there are present in VihTek

The main purpose of the workshop is to create a solution space for future concepts. The main point is then to collect insights into what needs and wishes are present to create a marginally better project process setup. Before the workshop we prepared the acts, investigated what sort of actors will be present and created the intermediaries that will help the facilitation. While VihTek can feel like the structure of the heterogeneous network is rather flat, there are heiratical structures embedded in the decision making. Some actors have more power bestowed upon them than others. This is mainly due to their contracts. Three employees are full-time with no end-date stated on their contract; this is the Functioning unit leader,

the Specialist consultant, and the Development consultant. These three are the most powerful within the network and two of them have also been employed at VihTek for the longest amount of time. The remaining two full-time employees have project contracts with an end-date that will be renegotiated when the end-date draws closer. The last two employees are student assistants who are easily replaceable but who also have long lasting contracts that only run out when the person is no longer a student (see figure 30). The aspect of power is mostly shown in what negotiations/meetings the different employees are invited to.

Before the workshop we had asked the participants to send us their ideas on how to create the worst 'implementation' project (see Appendix 1). The reason for the use of the word implementation stems from the fact that VihTek most oftenly describe their projects as implementation projects even when they have a form that fits better into the idea of feasibility studies. We are therefore trying to speak into their narrative of what they do in order for the participants to identify better with the workshop. The first act of the workshop or 'play' is to establish a general project process that fits into what VihTek are doing today. We expect this process to reassemble the classical stage-gate-model (Cooper, 1990). We will then introduce the participants to a plus and minus scenario (Bødker, 1999). A plus and minus scenario exemplifies with the help of narratives or stories a situation or end goal which is either desirable or undesirable (see figure 31).

Other Innovation unit leaders

Economy

Functioning unit leader
Librarian

CONTRACT

Specialist consultant
Cand.scient.geogr., ph.d.

Development consultant
Cand.scient. in physiotherapy

Project management

X → y
CONTRACT

Development consultant
Physiotherapeut and stud.cand.scient.
in clinical science and technology

Project employee
Cand.mag. in European Etnology

X → STUDENT
CONTRACT

Student assistant
Stud.cand.polyt. in
Sustainable Design Engineering

Student assistant
stud.scient.Librarian

Research

Figure 30: Shows the different connections between the employees at VihTek

Scenarios

The hospital ward contacts VihTek with a problem and an idea for a solution

VihTek researches and finds possible technological solutions

The solution is presented to the hospital ward and a technology is chosen. The test period and protocol is agreed upon.

The technology is not a perfect fit despite the initial support. This results in the technology not being used.

After an ended test phase the technology ends up being stored away. VihTek compiles an evaluation that describes why the technology was not successful. The hospital ward still experiences the given problem, but does not know how to fix it.

The hospital ward contacts VihTek with a problem and an idea for a solution

VihTek researches and finds possible technological solutions

The solution is presented to the hospital ward and a technology is chosen. The test period and protocol is agreed upon.

Technology is used in accordance with the intention and it makes a difference in the hospital ward.

After the test the ward keeps the technology. It is used in the day-to-day operations. The hospital ward recommends VihTek and the technology to other hospital wards.

Figure 31: Shows the scenarios the workshop participants were presented with.

"Scenarios are very little in themselves. Good scenarios are not a detached description of user tasks and actions. They are selective scripts or stories that stage user actions with a future artefact. They are a means of holding on to situations, and how they may be changed because of a design. They represent the reflection over situations, problems or solutions and facilitate action, such as hands-on prototypes or simulations." (Bødker, 1999, p. 72).

We will then instruct the participants to translate the ideas for how to make the worst project into ideas for making an amazing project. In order to make this as realistic and grounded as possible we will ask one of the participants to take on the role of the critical friend. This participant tries to apply logic to the ideas to debunk unrealistic ideas or identities of actors. This discussion might lead to new ideas of how to achieve otherwise unrealistic and fantastic ideas. The goal is to identify needs and wishes that we can use to expand the

solution space. We will of course also use the discussion to find possible solutions to the research question.

5.2 The workshop

At the workshop almost all employees in VihTek Participated. To facilitate the workshop, we had created 4 slides (see appendix 1) in Google Slides which we shared with the participants and made sure that they could edit the slides if they wanted to. The facilitation worked partially well, and the online intermediary worked to help facilitate the dialogue. We mainly used the created slides to steer the conversation back to the topic when needed to. The slides were not perfect but all participants who work with projects in their daily work were engaged and got their time to say their opinion. In the end the right choice for the facilitation was to partly depart from the slides themselves and let the participants steer some of the discussion.

Of all the participants one was especially talkative. The Specialist consultant has created of most of the project processes that are currently being used in VihTek was present. While she contributed with many important points it was also clear that she was a bit defensive when it came to include more *'complex'* parts of a project in the formal project process. These complex parts were mainly whether any strategy on how to deal with clinical staff who works against the aim of the project or questioning whether a problem that is proposed by the department is in fact a problem in reality. *"It [the problem definition] is not a democratic process, it is something that the administration decides."* (Specialist consultant, 2021, workshop). The point of acceptance of any problem definition stated by clinical

staff or managers was brushed off with the notion that they had of course done some workshop or the like that would prevent this issue. It was furthermore concluded that interviewing or hearing more opinions on whether a proposed problem is actually a problem, it was concluded that the proposed problem from the clinical staff would be accepted and that it is the clinical administration who decides what is and is not a problem. *"You would most likely not find a ward where they say in one voice that yes or no this is a problem. [...] If you ask all the clinical staff members then you would get a cascade of answers and opinions that you would have to figure out where they come from and how do we handle this and that is just incredibly complex. It would be almost impossible to run a project if it were that democratic."* (Project employee, 2021, workshop). In other words, the perceived problem and solution is not a democratic process but rather a top down approach which is moved along by a few individuals, and mainly the administration. It was quite clear that this was a topic that would not be met with particular enthusiasm by most of the employees at VihTek. One comment was made by the Development consultant that was very interesting: *"One could also turn it around and say okay the administration addresses this problem. Then we could do a couple of workshops with different representatives from the clinical staff and hear how they perceive the problem and how they think the problem can be handled in practice. Or something like that"*.

From this we can see that VihTek seems to have experiences that point them to the conclusion that implementation of a welfare technology cannot happen without a top-down approach. We learned that the Specialist consultant had run a project where they

had been using the follow the actor method (Latour, 2005) following different therapists around learning about how they work and how this relates to the problem of inactive patients. Once the project started running, which had the aim of activating patients through the use of technology, they found that the therapeuts was not part of the practice that was important for motivating the patients outside of their normal prescribed workout. It was the nurses and other caregiving staff who had this role but who were not knowledgeable about how to correctly adjust the machine to the patient's needs (Development consultant, 2021, workshop).

Immediately after the workshop one participant, the Development consultant, decided to give us a call to elaborate and speak further about the complications any project leader from VihTek face during an implementation process. The Development consultant has previously worked with implementation and was therefore interested in talking more about his thoughts on how to make this process better. Through this informal conversation we learned that the project about self-training that led to the project Physically active in Neurorehabilitation ended with the clinical wards explaining that the technologies did not fit the patients, but the Development consultant believes that this is not the whole truth. The truth is more complex and many elements influence this. One thing is that the project, test and implementation plan was set up according to the therapists work but they were not the ones who were actually thought to use it, it was actually the nurses and other caregiving staff. Another problem was that the implementation plan was too informal which led to it not being followed and therefore the overall implementation failed (Development consultant, 2021). After this project a new

project was made with the same purpose but now, they were using a more formal and structured way to talk about the implementation plan. They are not using a process evaluation (Linnan and Steckler, 2002) which forces the steering group and project group to make more measurable goals for the implementation of a new technology. The process evaluation method states that the implementation effort needs to be measurable to keep focus on the goals set both by the project leader but also stakeholders (Ibid.). The group will then sit down together every month or so and talk about how the implementation is going and whether old plans need to be changed. This allows for the project and steering group to learn and adapt to newfound knowledge during the implementation. It also forces the groups to find money and resources that are needed to make a successful implementation (Development consultant, 2021, through informal conversation). This has improved the success rate of the implementation projects, but the Development consultant thinks that more can be done and achieved by finding ways to communicate more efficiently with all the disciplines to make sure that everyone has the correct knowledge about the project. The Development consultant exemplified this problem of miscommunication with a story from a project where nurses did not want to start using the welfare technology because they believed that VihTek owned the devices and would take them back after two months. The clinical ward had in fact bought the technology and would keep it after the implementation project. Communication is therefore an important barrier for any new welfare technology that wishes to enter the clinical network. It seems that while the different clinical professions work together to perform sometimes highly complex treatments, important knowledge is not always shared across the barrier of

profession (Development consultant, 2021, informal conversation; workshop, 2021; Innovation consultants A, 2021, int.). All the clinical professions have very specific skills and observe different things (Development consultant, 2021, through informal conversation). They do not know in detail how other professions work. Knowledge flows quite easily within the different clinical professions. It seems that there are different existing parallel networks that only meet up in specific intermediaries like meetings and through objects that are designed to mediate knowledge (see figure 32).

When we consider these findings in relation to our theoretical framework we find that the descriptions we heard during the
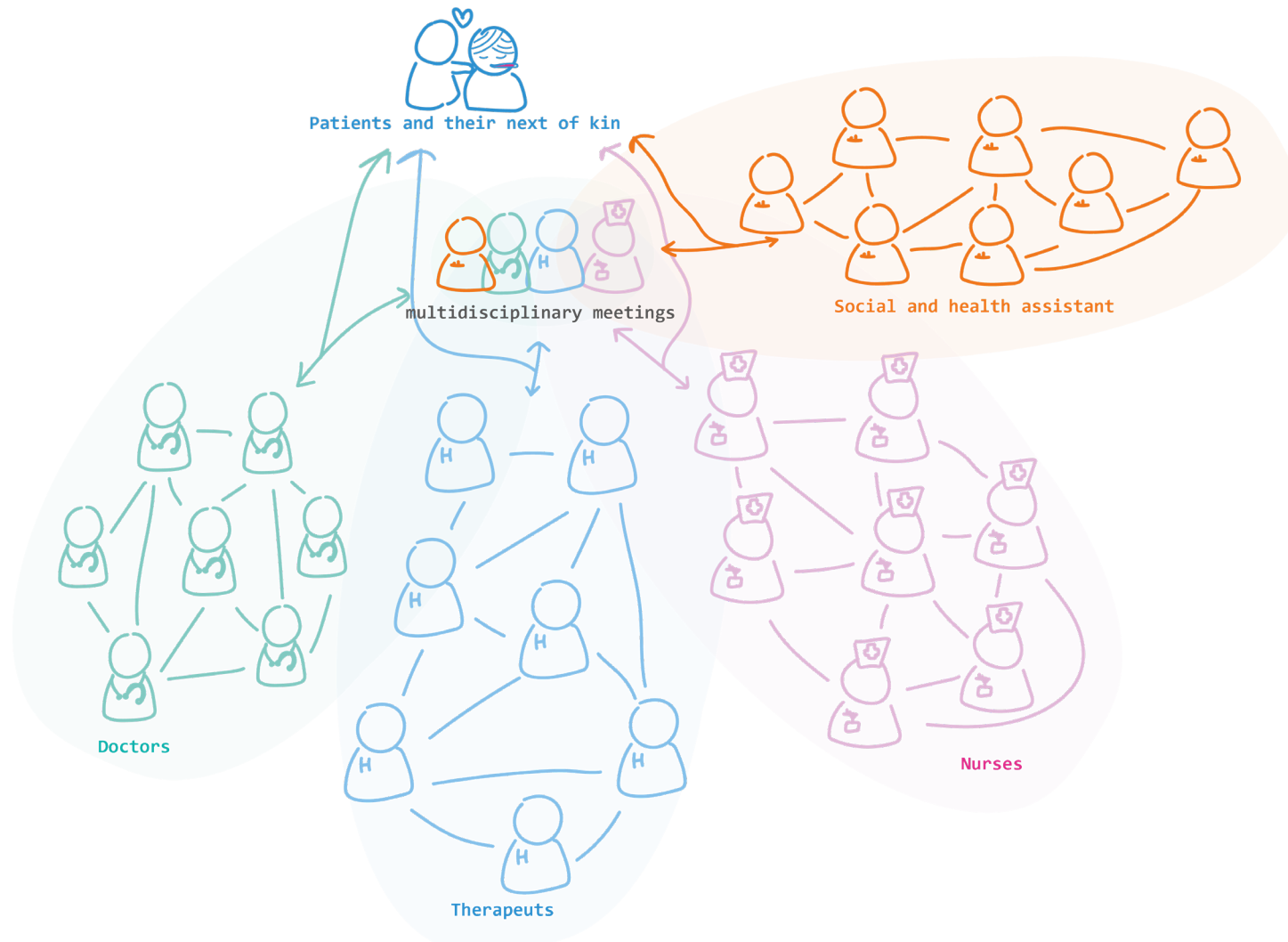
Figure 32: Shows the parallel knowledge sharing networks for the clinical disciplines.

interview fits with the findings of Akrich et. al. (2002 A). In their article about innovation the main takeaway is that navigating the arena in real time is hard and unpredictable. It seems that interestment devices or intermediaries and spokespersons are a key to success in innovation (Akrich et. al., 2002 A; Akrich et. al. 2002 B). We have been talking a lot about implementation during the workshop mainly because this is what VihTek attempts to do in their larger projects and because for a new technology to become part of the daily operation an implementation effort needs to happen. The patients

are changing by their own efforts in becoming more active (Quality manager, 2021, int.) but if the patients should take on the role of patient 3.0 more welfare technology needs to be accepted in the daily operations by the staff. Introducing something new in a network where all the actors are busy and have a high workload is hard and unpredictable.

From the project process that the VihTek employees have used to frame a test or implementation it seems that when they are
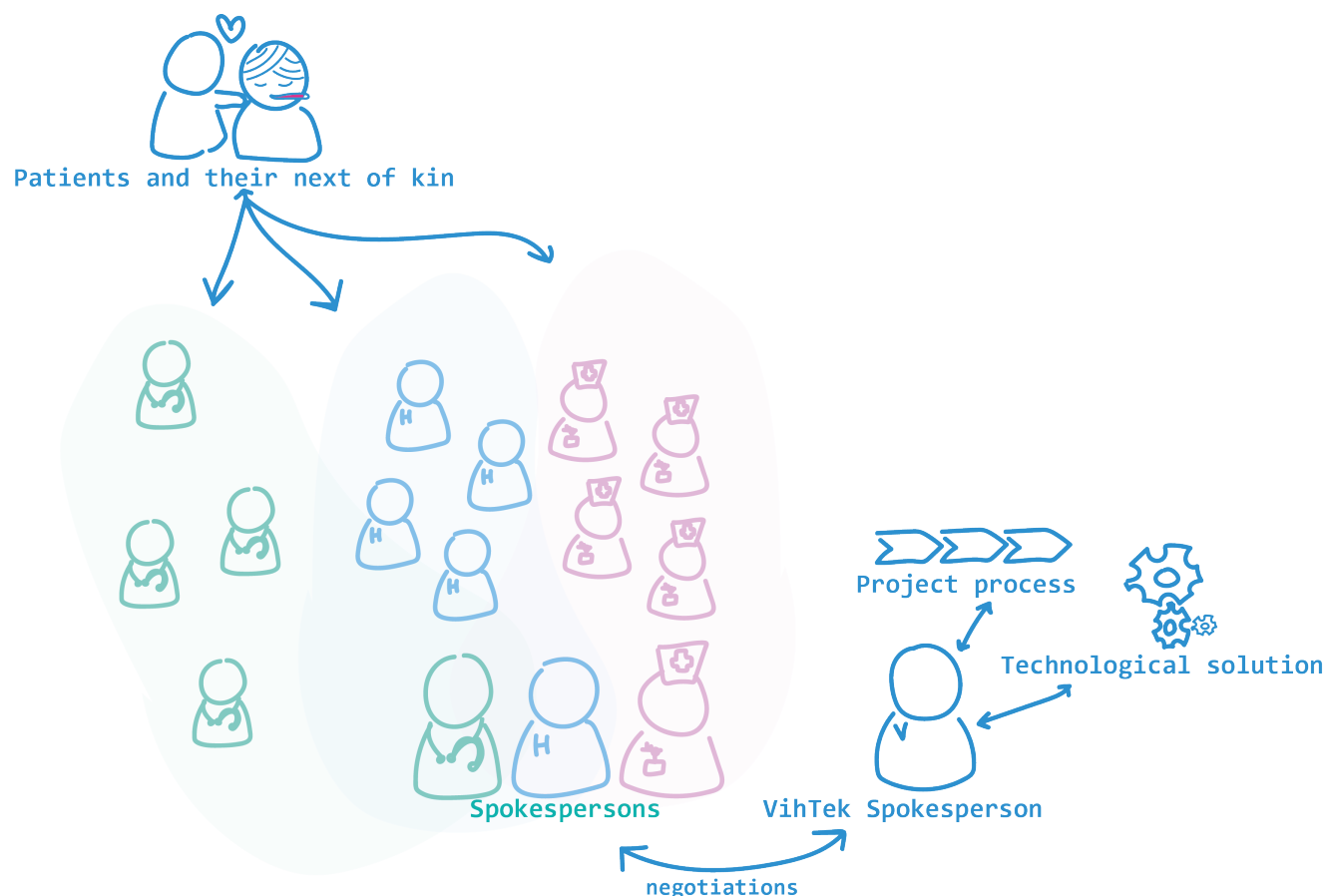
Figure 33: The negotiation network present in the initial project discussion

contacted by some clinical staff members, they and the hospital ward's leaders become spokespersons for the identified problem. The spokespersons are accepted as representations of the entire clinical staff and the problem (see figure 33). VihTek then takes on the role as spokesperson for the project process and for possible solutions. The two groups of spokespersons then meet up to use rationalities to create an actor-world which represents the future network configuration. The solution object needs to work as an intermediary that can represent the different uses of the object, media knowledge between different actor groups (like between patient and clinical staff members) and transform the network into the new network configuration. It seems that a possible breakdown that was identified in the workshop is that VihTek mainly focuses on the staff that acts as spokespersons and think that the early enrollment of other staff would make the project process too complicated. There might be a potential in creating an intermediary that can work as a mediator between VihTek and unenrolled clinical staff members. When the testing starts the technical object (the chosen solution to the problem) needs to act as an intermediary for the different clinical professions in such a way that it works with the parallel networks. In order to do this, other intermediaries might need to be employed to keep focus on the new network configuration. The design object is then the project process and the objects needed to have a successful network reconfiguration. These objects will take the form of intermediaries.

We will therefore create some possible solutions that focus on intermediaries that create relations and mediate knowledge between the heterogeneous actors within the network in order to make an easier transition to the reconfigured network.

5.3 Ideation

We now enter the ideation phase where we will work with conceptualising intermediaries that can be used in the initial stages of the project process. We will start by making a design specification to expand the solution space. We will use the design specification as a tool to mediate and keep track of our knowledge and our findings. The design specification is not a 'correct answer' or set in stone but rather an intermediary that we have created to work within our group dynamic. We will then, based on the solution space and our findings, create some possible intermediary objects, and use these in a feedback session with the Development consultants from VihTek. We have invited them specifically because of their background as physiotherapists and their current work with tests and implementation projects.

5.3.1 Design specification

This design specification is made in accordance with the description made by Cross (2008), but it is used as an intermediary between the authors to mediate knowledge. It will be used multiple times to define and redefine the solutions space for the design object; the project process. With each problem definition and an accompanying design specification a number of solutions becomes possible. When we take these to VihTek they will be negotiated, and a more specialized problem might come to be which offers new solutions. This process of problem and solution iteration (see figure 34) should hopefully

lead us to a solution that will be useful for the employees at VihTek. The problem is the concept synthesis. *"Concept Synthesis is the phenomenon of creating a kernel of insight and ideas in the form of concepts. This provides the answer to need and intension and is a proposal of the probable tractability and success in its development realisation, sale and use."* (Andreasen et. al., 2015, p. 141).It is made up of multiple phases that we found in discussion with the staff at VihTek to resemble the phases VihTek goes through in a normal project (see figure 35). It differs a bit between the phases that was described in the report *Concept for Implementation* made by VihTek (2021) which just shows that the project process is hard to capture in words. A project leader needs to be able to act and react to unexpected events happening in the project. It is therefore important that the project process should not be followed to the letter but rather be a guideline that can work as inspiration for the project leader.

The design specification is reflecting the plus scenario from the workshop (see full design specification in appendix 2). The aim of the specification is to help us discover where intermediary objects can be useful in the project process.

Table 1 shows two examples of need to haves included in the design object (the project process). The project leader or team needs to know how the different actors in the clinical ward feel towards the identified problem. This is important knowledge in the sense that it

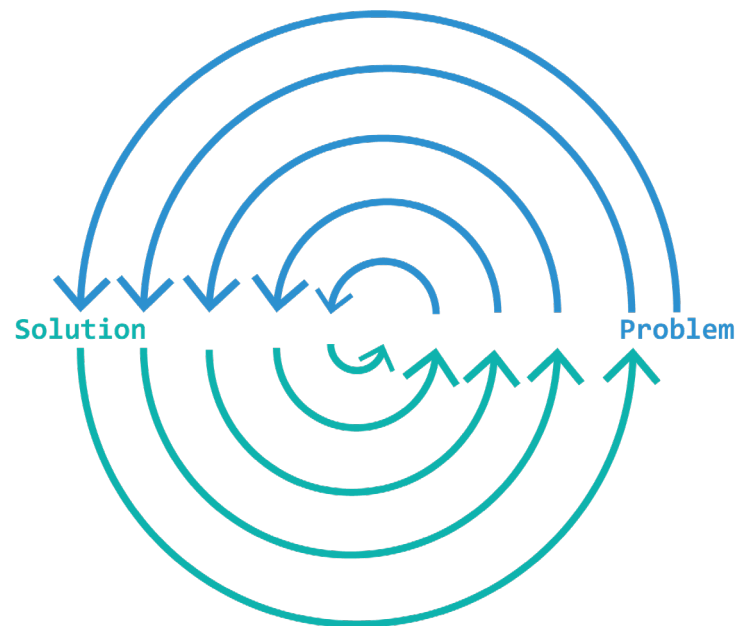*Figure 34: Shows the spiral from problem understanding to solutions that leads to a new and better problem understanding.*
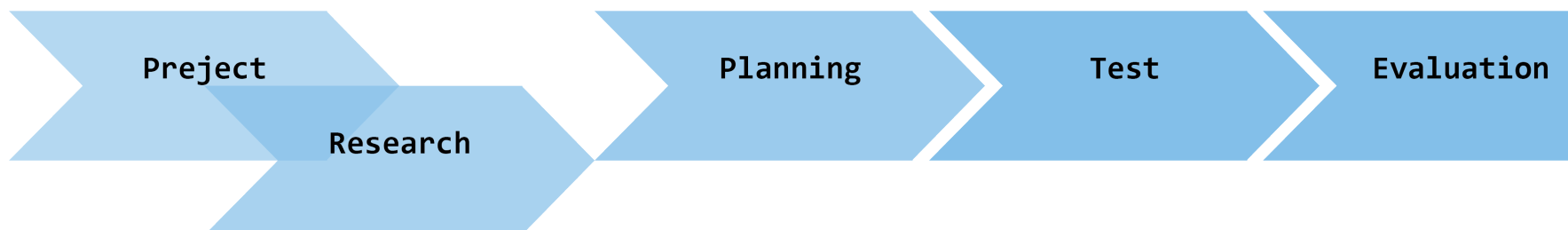
Figure 35: Illustrates the phases of the project process used in the design specification.

is easier to navigate the arena when you know the different actor worlds and network configurations that are in play. VihTek do not need to agree with the different opinions, it is okay to mobilize themselves in one particular way of problematizing they just need to be aware of the choice they have made. We therefore see the need to create an intermediary object that can help VihTek navigate these different opinions and further mobilize actors to their cause.

Project phase	Need to have	Nice to have	Notes
Preject	Learn about the context - speak to at least one person from each clinical discipline.		
	Identify which groups agree and disagree with the proposed problem		

Table 1: Outtake from the design specification.

Learning about how different actors work and how information is normally spread in the specific hospital ward is an important tool in this phase.

The intermediary object needs to be able to help navigate the rationalities that are employed in the creation of the actor world. When making a partnership with the hospital ward it is important to agree on how responsibilities are shared in the group. An intermediary needs to make all the questions that need to be thought through before the start of the project concrete (table 2). An intermediary cannot remove all the ambiguity from the start of a project and rationalities does not make up a good actor world but by making these thoughts and ideas concrete in an object that

Project phase	Need to have	Nice to have	Notes
Planning	Who is responsible for what?		This is where the actor world is born.
	Make plans for regular meetings.		When you want to do this in a hospital world you need to plan in good time. These meetings allow for a discussion of what is working and what needs to be solved.
	Discuss how to maintain knowledge sharing internally in the hospital ward.	VihTek should play a part in this, with being present during all the different kinds of shifts at least once.	It is important that all staff members have correct knowledge about the aim and technology.

Table 2: Outtake from the design specification.

object can then work to represent the project later in the project process. This intermediary will then be of help both in the preject and planning phase but also later in the test phase.

Finally, an intermediary or a small army of intermediaries need to be created to maintain knowledge and knowledge sharing internally in the hospital ward. It is not a given that the all staff remains the same group of actors throughout the project and knowledge is not stable but dynamic. Your brain knows what you repeat (Hjernesagen, n.d.). Therefore, continuous information needs to be available about the aim of the project and the goals with the use of the technology. All the clinical professions have an eye for different things so therefore they need different intermediaries to represent, transform and mediate knowledge.

5.3.2 Initial object descriptions

We have identified three important objects that should work at different times in the project process.

5.3.2.1 Object one: Initial Checklist

Object one is designed for Vihtek to allow a process of problematization and interestment amongst Vihtek and the hospital staff. The object should be materialized as a physical object, intermediating knowledge through a professional and natural conversation in the initial phase of the project, the preject. The object should be used by Vihtek to clarify and enroll themself in the given projects possible problems to hopefully ease and avoid pitfalls in the forthcomming project process. Furthermore, the object must have the ability to concretise the overall focus of the project and make a clear explicit division of responsibilities for collaboration amongst the extended project group.

It is desirable and highly important for the success of the project outcome for VihTek to gain access to the given hospital ward to make their own discoveries and observations of the given practices surrounding the subject. The idea of object one is for it to be a part of a deeply rooted praxis in VihTek's handling of new projects to ensure alignment, smooth cooperation, and their own knowledge base to draw on considering practises carried out in relation to the treatment or other tasks at the hospital ward, whether the use happens in private homes or in hospitals.

5.3.2.2 Object two: Backstage object for actor analysis

The aim of this object is that it should help VihTek understand which actors are mobilized in the project and which are not. This intermediary object should be an internal object. The information in an object like this can be hurtful if seen by the wrong eyes but it can be a good tool for the 'behind the scenes' work happening during a project.

Since the aim of the intermediary object is to convey how different actors 'feel' about the project and VihTek is already familiar with the use of an interestment analysis we will start by changing this type of analysis to fit our new purpose. We propose an object which has two axis' one showing how close the actor group is to the technology and one how much knowledge they have about the aim and use of the technology (see figure 36).

There is still however the question on how we can be sure that the groups are correctly represented in the actors whom VihTek gets to speak to. We therefore still believe that to make a real cover of the current network configuration in the hospital ward then both VihTek and the hospital ward needs to spend time and resources on the initial stages of the project. The intermediary should be a living object that should be renegotiated behind the stage multiple times during the project process. It could for example be negotiated after every meeting with the ward. The aim is that the project leader or team can use the knowledge mediated by the use of the object to navigate the arena.

Has great insight in the use and goal of the technology

Works far removed from the technology

Works very closely to the technology

5 = do agree

3 = do not agree
    or disagree

1 = do not agree

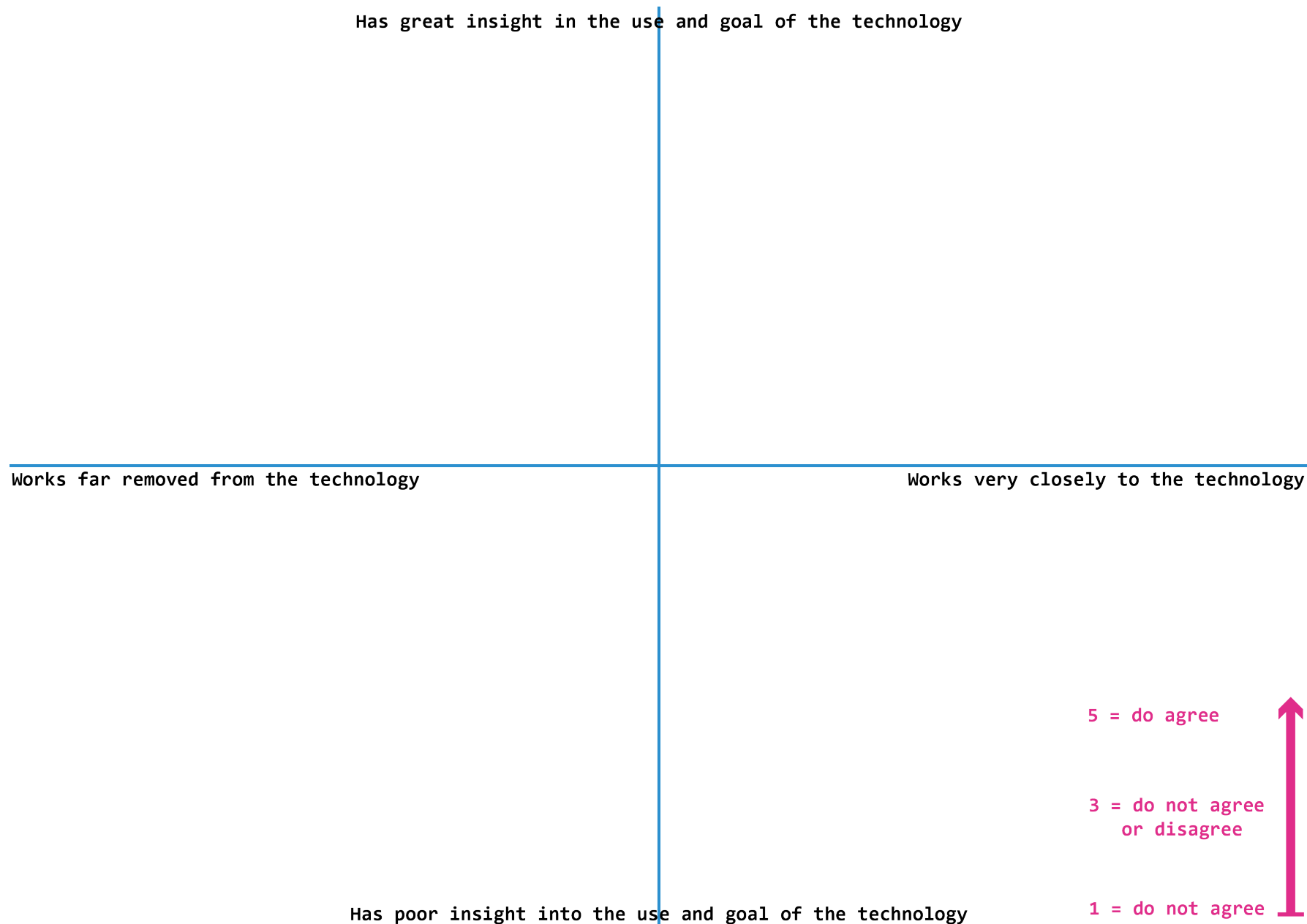Has poor insight into the use and goal of the technology

Figure 36: Shows a mock-up of the intermediary object.

5.3.2.3 Object three: Army of intermediaries

Object three concerns itself with how to communicate and interest specific actors at specific times. Object three would therefore maybe be seen as more of an 'army of objects' that all serve the same goal, to represent the project, transform opinions and to mediate knowledge. It should therefore be a catalogue of objects which under the right circumstances should function as intermediaries. VihTek (2021) has already thought of many different forms of objects such as posters, newsletters, meetings, workshops and so on. However, only a few of them seem to be working as intended. We will therefore leave this object rather open before the feedback session to learn more about why the Development consultant believes some objects worked and some did not.

5.4 First feedback on the intermediary objects

We chose to invite the Development consultant to a small feedback workshop. We decided to invite them specifically because we wanted their point of view since they have both been working as clinical staff, physiotherapists, and they are now working on the other side of projects. They therefore have specific knowledge that we would like to get some insights into in regard to the proposed intermediary objects. We also wanted to make sure that the small feedback workshop would make space for a free conversation about the intermediaries. We did not invite the Specialist consultant mainly because she is very invested in the current design object, the project

process, we are not sure that we will get the same honest feedback if she is present in the first feedback workshop. We will need to get her feedback and allow her to make her mark on the objects before we show the 'final' objects to all employees in VihTek.

Unfortunately, only one of the Development consultants had time for the feedback workshop. This is the same Development consultant that called us after the first workshop. He has a large interest in implementation and has now been working with it for the past couple of years. He is highly qualified to come with feedback on the intermediary objects. The meeting takes place physically at VihTek with the two authors and the Development consultant present. To create the dialogue between us and the Development consultant we brought our visualisation of object two. This was with the aim for the object to become an intermediary by representing our thoughts on simple tools to facilitate communication, transforming, and mediating the Development consultant's and our idea of what communication to make a foundation for further development of the objects.

From the feedback workshop we found that the initial phases of a project process are extremely important and has consequences that reach into all the following phases. Meaning that the better foundation for correct knowledge sharing is in the network, the easier the wanted translation will come to pass (Development consultant, 2021 B). This was exemplified through the use of a narrative describing a VihTek project where nurses believed that the technology that was meant to be implemented was only supposed to be there temporarily. In reality, the hospital ward had bought the technology and was supposed to stay there permanently. This

meant that the technology was not implemented in the period where the ressources and time was allocated to this effort. The correct information about the technology did not travel far in the network partly because the parallel knowledge sharing networks were not able to share knowledge across the borders. When asked if the Development consultant had ever in his work as a member of the clinical staff experienced good interdisciplinary communication he answered: *"No, I have not. [...] even though we do not have our daily work at the hospital ward in the project [VihTeks projects] can we still see that the communication is hard.".* It is therefore important that our objects work in the initial phases of the project process to help facilitate good communication.

In regard to object two that is supposed to facilitate the sharing of knowledge internally in VihTek we found that the Development consultant already has a tool for this purpose. They use the notion of a *technology journey*) to explore which actors are interacting with the technology at different times. This method seems to be similar to user journey mapping (Optimizely, n.d.). The Development consultant (2021 B) states that these technology journeys are used as an intermediary to mediate knowledge between the clinical staff and VihTek at workshops facilitated by VihTek. However, the Development consultant (2021 B) made it clear that this method is not widely integrated amongst VihTek employees as a project management tool. Every project leader has their own way of dealing with the complexity from the clinical wards. We believe that there could be a use for a simple object that might be used by these employees to help express their embedded knowledge of what is happening in the field of study.

The Development consultant (2021 B) expressed that he believed that VihTek and the project leaders could and should take on a larger responsibility for the communication flows in the initial phases of the planning and the testing of a project. He believes that VihTek could decide to spend more time and effort trying to share the information firsthand to the clinical staff rather than expecting the information to flow in and between the parallel knowledge networks. The VihTek employee should therefore function as an intermediary actor that should mediate correct information in the different parallel knowledge networks that are present at the hospital ward. The Development consultant (2021 B) also made it clear that it is not just important how well VihTek can inform the clinical staff at the hospital ward, the clinical staff also needs to contact VihTek whenever they might encounter problems with the technology. All in all, it seems that there is a need for creating ownership in the clinical staff towards the project. This could be done through the use of intermediaries placed strategically around the clinical ward and through introductions and live information sharing. Sometimes the clinical staff does not know that the proposed solution/technology solves anything because they did not know that it was a problem to begin with. Therefore, all intermediaries need to help the translation process from actor world til new network configuration by both problematizing and interesting the actors.

Both object one and two work towards knowledge sharing internally both within the larger project group and internally in VihTek. These objects can never stand alone and other objects that look like these already exist in some form in VihTek. You could say that object one mimics the project protocol that explains the agreements that

are made. Even though these agreements have been made in the larger project group it seems that it does not translate into action and actors taking on responsibilities. This might partly be because of the barrier we discovered from our look into behavioral design where we found that people do what is easiest even if they do not find it to be their preference (Münster, 2017) and that if there is no slack in the workflow then change is almost impossible (Münster, 2020). These barriers are present and hard to get around since most of these agreements mean that actors must do things differently even though it is easier to just do it the way they are used to. Therefore, the information can be vital in creating local rationalities that might be translated into action.

Our main goal with our objects is therefore mainly to make VihTek discuss how to make these changes and what extended responsibilities might fall on them. VihTek cannot take on too much responsibility throughout the entire project process since they should not become an OPP in the network reconfiguration. But it seems that it is exactly what some hospital wards want them to be (Development consultant, 2021 B) the project leaders therefore need to figure out ways to change the ownership to the hospital ward and not VihTek.

Discover   Define   Develop   Deliver
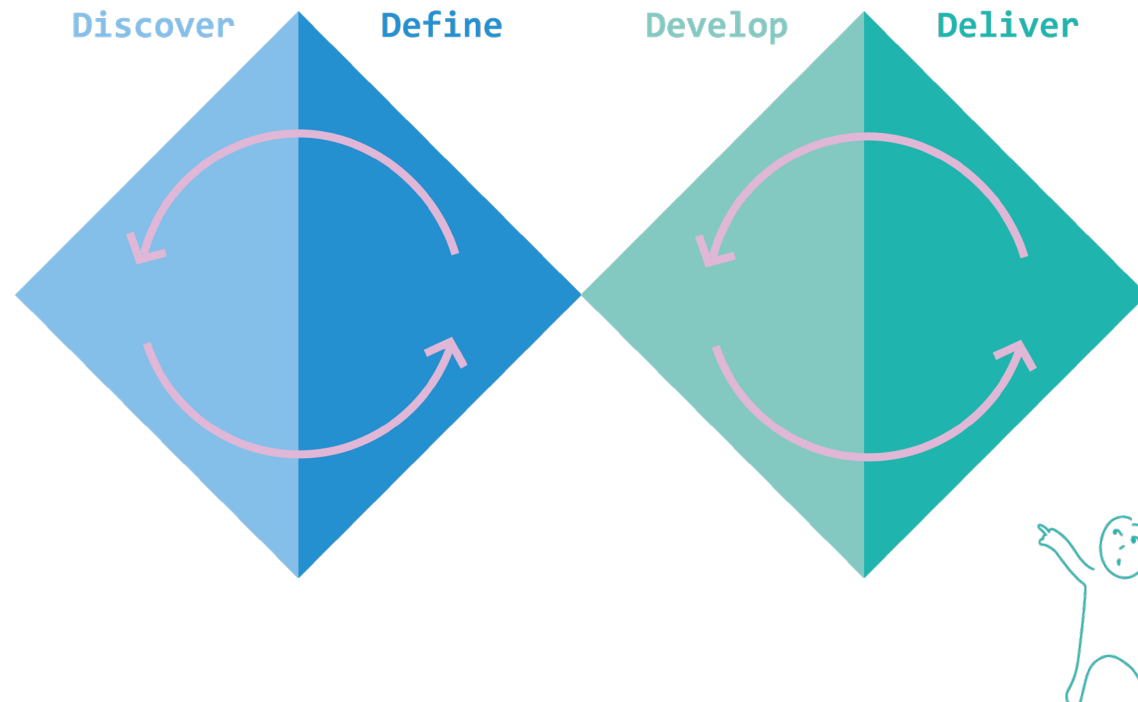
Chapter 6:

Deliver

In the deliver phase you work toward realising the 'final' product. We will examine our learnings of what these intermediary objects should look like and use this in our second iteration of the objects. We will then discuss different aspects of our master thesis and whether communication intermediaries like these are a full solution to our research question. Finally, we will look into what further work will be done before the exam.

6.1 Design specification for project communication

As a result of the workshop and the feedback given by VihTek's Development Consultant regarding the initial intermediary objects, it was clear that an iteration of the design specification was needed in order to accommodate the new findings. The scope had shifted towards a focus on communication in the initial phases of the projects carried out by VihTek. This sharp explicit need for communication in these phases is therefore reflected in the updated version of the design specification (see appendix 2). This was done to make the demands and needs designable, so our solutions and recommendations lived up to and could be traced to the finds and

statements in the design specification. As a result of our findings, we chose to solely focus on the first three phases of a VihTek project and leave out the test and evaluation phase (see figure 37). Despite being aware that communication is important before, during and after a project (Development Consultant, 2021 B), we found that a successful project is highly dependent on good communication from project kick-off to create ownership and interestment, knowledge sharing and network configuration.

Table 3 represents an outtake of the full design specification for project communication. The aim of the specification is to help us discover where intermediary objects can serve as useful

Project phase	Need to have	Nice to have	Notes
Project	Inform about the aim of the project to all the clinical staff members.		Inform about who owns the technology, time frame, what is the goal and who benefits from it.
	Create interestment and ownership for the project in the clinical staff.		

Table 3: Outtake from the design specification for communication..
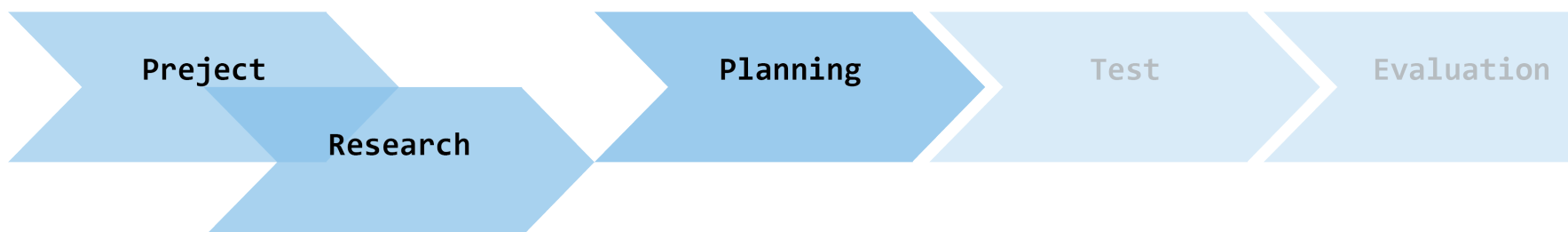
Figure 37: Illustrates the three phases of the project process used in the new design specification.

Preject

Research

Planning

Test

Evaluation

communication tools in the initial phases of the project process. These communicative intermediaries aim to ease the phases of the project leading towards a better founded implementation resulting in more successful projects - both in VihTek's perspective but also seen from a clinical point of view. It is of high importance that the aim of the project is communicated to all clinical staff members with the purpose of creating interestment and ownership. Furthermore, the implementation and physicality of intermediary objects need to be created and made visible to maintain knowledge and knowledge sharing internally.

6.2 Final communication in-termediaries

6.2.1 Communicate the aim of the proje-ct

The first line of communication intermediaries are based on what we have found to be a more general problem. It seems that not all hospital wards want to or are able to include staff from the different clinical professions in the project or steering groups. This means a possible breakdown since it seems that even though the clinical professions work side by side, they have an information bias. The information bias means that the therapists believe that it is easy to change the settings on a training technology. This might not be the case for the nurses that do not know what goal the patient is working towards with the machine or whether some complications might come from a change in the setting (Development consultant, 2021 B). When the project group is not a mix of the clinical professions the information about the project will likely only spread within the clinical professions that are represented in the groups (see figure 38). This is again an example of the parallel knowledge networks that are very much alive in the clinical wards. When we asked the development consultant whether he had ever experienced information flowing across these parallel knowledge networks, he said that he had not experienced that yet (Development consultant, 2021 B). He has previously been working as a physiotherapist, he has done research and is now working in VihTek with testing and implementing new technology.
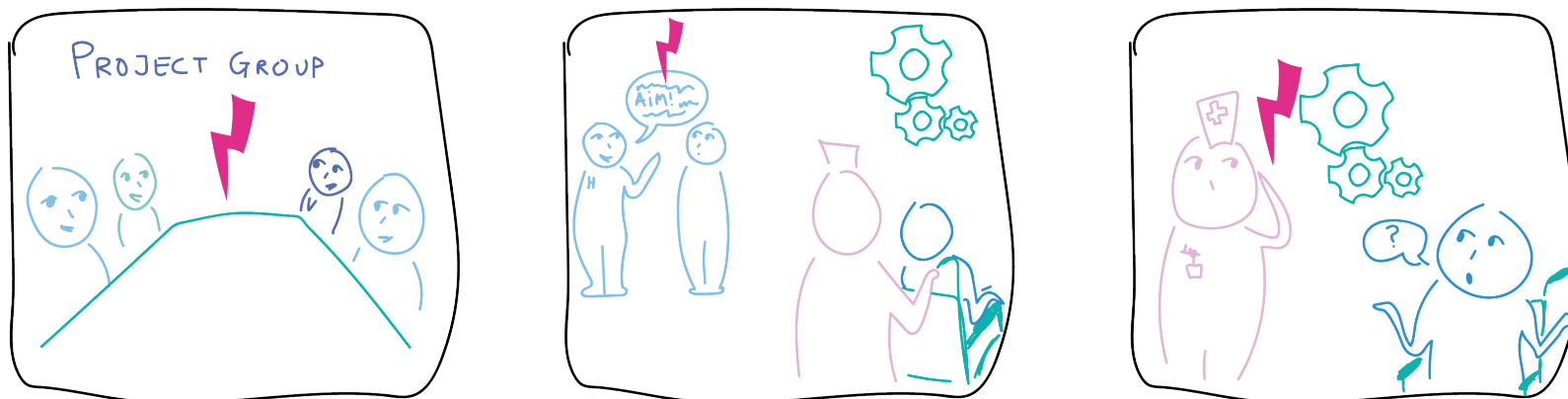
Figure 38: Shows what seems to be the current way of doing things with breakdowns (indicated by a pink lightning).

We want to highlight the need to break down the parallel knowledge barriers. However, we might need to accept that the best thing we can do from VihTek's position in the development arena is to make sure that all staff members have the same knowledge. The knowledge should be concerning the concept of the project and not necessarily the technology. The concept of the project is in this sense the whole idea, the goal of the project. By focusing mainly on the concept and the idea of the implementation we are focusing on the value that might be won by the employees and the patients if they do the work. We know however through behavioral design theory that people do not always do what they believe to be right we therefore need to find ways to connect the staff with the technology in their day-to-day work. Part of this is of course that the leaders in the ward decide to spend time and resources on the technology and to teach how to use the technology. Another thing is to use nudging methods to try and remind the staff of the technology with
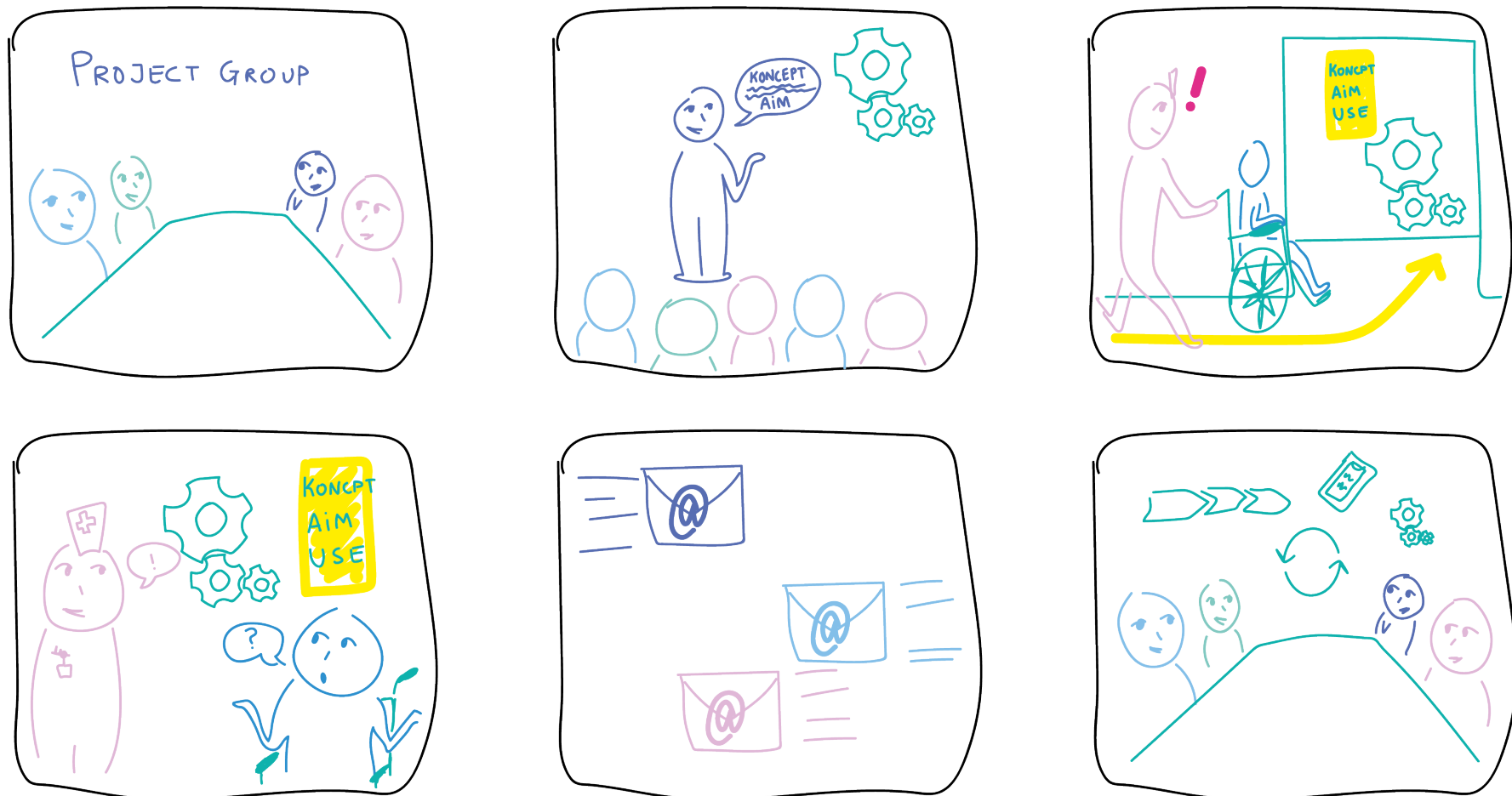
Figure 39: Shows some of the needed changes to better the communication plan.

the addition of information that is mainly concerned with the concept and the goals (see figure 39). We believe that an important part of the implementation or test period is for VihTek to keep reminding them of what value they are fighting for in the implementation/test period. They need to know that this value can only be realized if they own the solution and the concept. VihTek needs to take responsibility for keeping the contact through mail, phone calls, meetings and being present at the hospital ward. Regular meetings should be held to figure out what objects work, is it mail, posters, crazy colors, talks or other efforts that are making the difference?

6.2.2 Renegotiate the actor world

In this line of intermediaries, the initial scenario is that the proposed actor world does not work. The rationales used to create the actor world in the initial project meeting are for one reason or another not grounded in reality. This can be exemplified in the case of the Measurelet technology that should make patients able to do their fluid balance from home (figure 40). Here the proposed actor world did not work and was not able to start a translation in the current network configuration. The technology was offered to some patients but both because of corona and long distances from the patient to the hospital it was just easier to tell the patients to buy a plastic cup at the local pharmacy and write down the numbers. This low-tech solution has more steps and requires more of the patient. It seems that the project will continue in the original plan until enough people have used the technology to make a report.

Alternatively, the unsuccessful translation process could spark the curiosity to learn what is actually happening at the hospital ward. This might currently be limited due to the Covid-19 pandemic but maybe a more realistic mapping of the current networks might be able to be found through new rationals (see figure 41). When the actor world is not realised the actors in the network might make up a negative narrative about the technology, a reframe will therefore be necessary to remind of the concept and value that might be achieved through the use. The main aim should be to make the most value in the hospital ward and to help the patients become more active in their treatment. Therefore, the use of any form of object to help make this happen should be highlighted as a success. If a more low-

Figure 40: Shows breakdowns in rationales made in the actor world.

tech solution might be preferable then maybe an evaluation could help highlight this tip to other hospital wards? If it is necessary to test the technology either because of private funding or contracts, then we suggest being more present in the hospital ward and use the technology as an intermediary to discuss the concept and goals that might be won by the ward if the clinical staff will start using the object. Other intermediaries like email, conversations at the coffee machine, phone calls, nudging, posters and so on will be important to keep the focus on the use and the value.
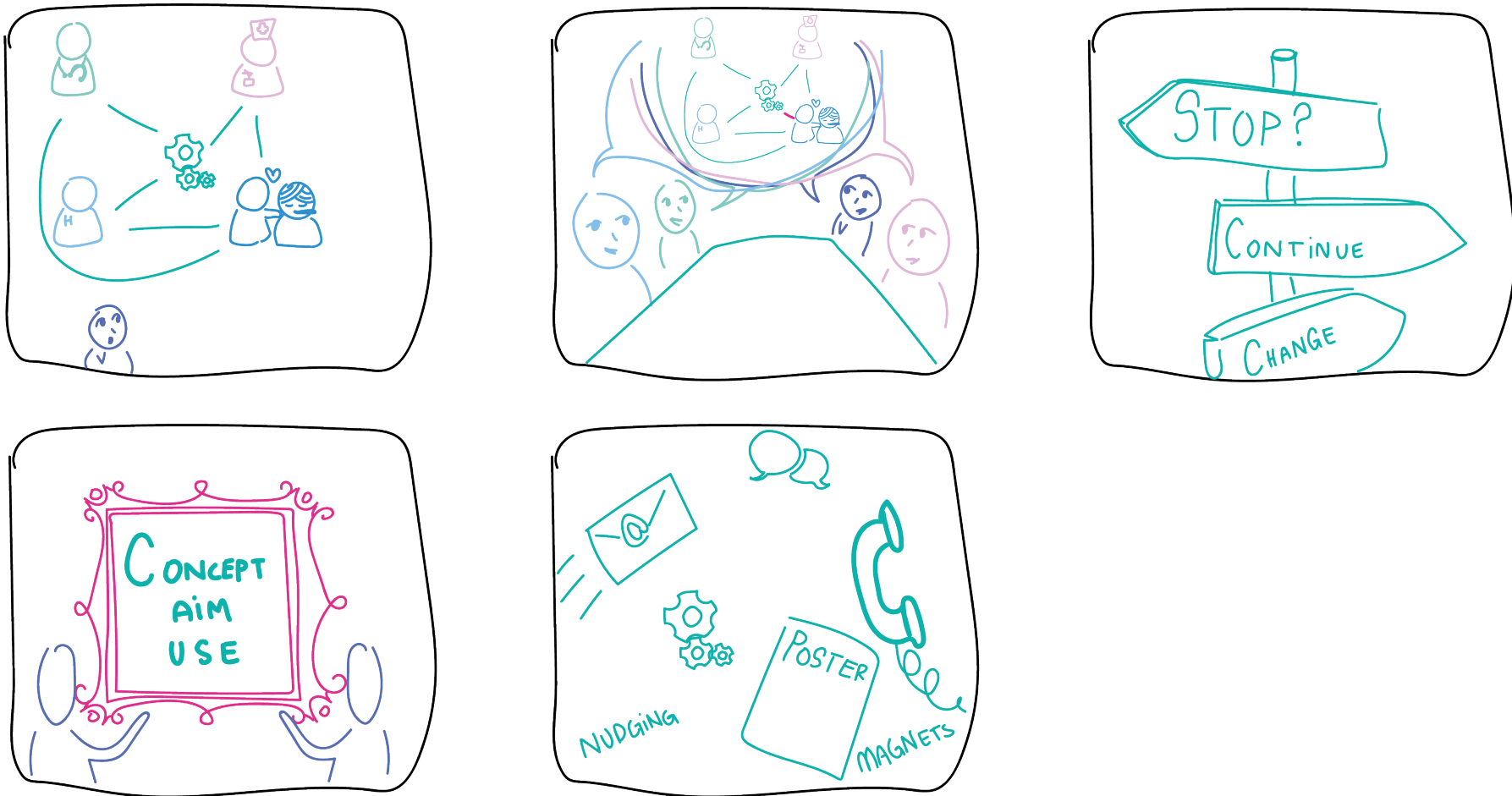
Figure 41: Shows some of the ways change can happen in this given problem.

6.2.3 Staging negotiation spaces

We have previously been highlighting that VihTek is taking for granted that the problem they are being introduced to is in fact a real problem that is present in the hospital ward. We have during the workshop been trying to problematize this but many of the employees seem hesitant to question this in any way. The barrier

Figure 42: Shows the breakdowns.

seems to be the idea of complexity that might be introduced into the project if you have to figure out whether it is an experienced problem by other members of the clinical staff (see figure 42).

We suggest making a workshop that includes members from all the different clinical disciplines to discuss what and how to better the proposed problem. This will help the project leaders to pinpoint possible future problems and work with them up front. There will of course be other problems that might arise later in the project because it can be almost impossible to think of everything up front (Development consultant, 2021 B). We suggest a workshop that is held over an intermediary that will keep the participants focused on the proposed problem while they are still able to come with insights that the project leader would maybe not think to ask (see figure 43). After the workshop we suggest the use of our initial object to place the different clinical disciplines and their relation to the problem and solution.

Figure 43: Shows the possibility of doing a workshop with backstage work after the workshop.

6.3 Discussion

We will in our discussion touch upon wicked versus local problems, sustainability, choice of theory and the consequences of the choices of inclusion and exclusions that have been made during the project.

We will start the discussion by looking into *wicked problems*. Wicked problems are often described as complex problems where standard solutions are not applicable (Brambini and Vang, 2018). Rittel defined wicked problems as a *"class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing."* (Churchman, 1967, p. 141). This can in many cases be the reality designers face when starting a new project or looking into new problem areas (Buchanan, 1992). Buchanan (1992) argues that designers are always confronted with indeterminate problems which implies that there exists no clear limit or conditions to the design problem at hand.

"Design problems are 'indeterminate' and 'wicked' because design has no special subject matter of its own apart from what a designer conceives it to be. (...) But in the process of application, the designer must discover or invent a particular subject out of the problems and issues of specific circumstances." (Buchanen, 1992, p. 16).

This quote quite accurately describes the process of this master thesis. We started with a general question as to how innovation and development is being handled in the Capital Region of Denmark and ended up through a series of discoveries and choices that the patient transition should be in focus. We then narrowed it further into communication in the design object which has ended up being the project process in one development unit. In this definition anything can be wicked because there will always be underlying agendas, issues and other factors that make the problems and solutions seem hard to define. It is through the work of the designer that the limits and conditions are defined and thereby the problem is made concrete. Buchanan (1992) also states that wicked problems are symptoms of other *'higher level'* problems.

IIt seems that the focus on the patient transition is a wicked problem since the limits and conditions of the problematic nature of patient transition can be hard to define. We know through our development arena analysis that this transition has something to do with economic factors (Quality manager, 2021, int.), the internal understanding of what innovation and quality is (Region Hovedstaden, 2010; Region Hovedstaden, 2013) and movements in the way we interact with technology. The patient transition needs to happen in all parts of the healthcare system that deals with the patient, and we do see movements. An example for this can be the online platforms made available for the Danish public so that they can review their own medical journal. The transition often shows itself as local problems or opportunities and are only *'higher'* up in the hierarchical structure of the organisation perceived as wicked. To tackle the transition, we have chosen to limit our scope to communication and thereby localizing the problem and removing part of the wickedness.

Communication seems to be wicked in nature since all the parts of the networks are moving and dynamic and all of the actors influence each other. We have chosen to localize the communication to how VihTek is tackling this topic to make the solution space more concrete and to limit the scope. However, by doing this we have also chosen to externalize the actors whom VihTek are communicating with. By diving into the communication strategy that is made in connection with the design object which has become the project process we have opened for a whole new box of wickedness at a point in time where we were not able to or allowed to (in these Covid-19 times) go and figure out what the reality in the hospital wards are like. Our scope and knowledge of what is happening at the hospital wards are limited but our understanding of what is going on in the development unit, VihTek, is rather well rounded. We therefore made our recommendations for future communication strategies with the use of both humans and objects acting as intermediaries mediating knowledge and interestment. Is working in VihTek to help them make a better communication strategy solving the wicked problems of patient transition? Well, it does not solve the whole problem but this local effort can maybe start the discussion of what is needed in a communication strategy that might spread in the network when VihTek employees interact with other actors in the development arena.

6.3.2 Sustainability reflections

In our sustainability section (see section 3.2) we made it clear that our focus was mainly on the social aspect of the three pillars of sustainability (Brundtland et al., 1987). With our focus on the patient transition from a passive to an active role we can see from our empirical data that there seems to be an economic win associated with this transition as well. If the patient is becoming more active in their treatment through the use of home monitoring, then the social aspect and the economic aspect goes hand in hand. We want to reflect on whether this patient transition has some effect on the environmental aspect of sustainability. We will not be able to make calculations on the pros and cons of this transition because it can take many different forms, but we can speculate what could be saved by having the patient mainly at home and using mainly telemedicine practices to be in contact with the doctor. Telemedicine is in its essence that all actors or some of them participate in meetings over some technological device (Region Hovedstaden, n.d. E). If a patient can be home monitors instead of being in the hospital, then you might save:

- A hospital bed (less tare on the bed and less cleaning)
- Cleaning (use of chemicals)
- Use of electronic equipment.
- Staff time (the staff can spend more time on other patients and other tasks)
- Transport (the next of kin will not need to travel as much, assuming that they will show up to visit the patient)

However, the use of electronic equipment in the individual home might go up slightly both because the patient is more at home during the treatment period and therefore might use more than when that person is also spending time at work. The patient also needs to spend electricity (presumably) on the technology used for home monitoring.

You might argue that what you are saving in the hospital outweighs the extra use in the individual home. We cannot know for sure since we have not done the formal calculations, but we might guess that the use of resources will not be greater than if the patient was hospitalized.

6.3.3 Theoretical reflections

The choice of theory frames the findings and understandings found in the project. We have chosen to use actor network theory to frame our findings with the notion of development arena as a tool to distinguish between different actors and their positions and concerns. Actor networks and actor worlds have allowed us to maintain a level of complexity in the empirical data and analysis that reflects and represents the complexity in the *'real world'*. The arena of development and messy situational maps allowed us to figure out which actors were immediately connected and what was included, excluded or black boxed in the different actors' actor worlds and networks. We have used it to discuss internally in our group what our position in the network and arena meant for our opportunities as change agents. This is also the reason for our solutions being mainly focused on VihTek. We would maybe, based on the analysis, have chosen to do some more political changes like formalizing knowledge sharing between the units and the political layer but we were not really positioned well for that sort of project. We have been continuously negotiating what sort of problems and solution spaces we were in and have made a few different analyses to highlight different aspects of the development arena and ended up the patient transition as a matter of concern instead of the broader concern about best care that we had initially been investigating.

We could have chosen to use other theoretical frameworks to frame our data and thereby make different limitations in the data and maybe define a different problem and a different design object.

We could have chosen to use practice theory and communities of practice to see how knowledge is flowing in the organisation and through which practices and material. But with most people working from home during the Covid-19 pandemic this theory, while being very interesting, did not seem to work as well as it would if we could observe live. When we look at where our framing with ANT leads us we believe that practice theory would have led us to similar issues but for different reasons.

6.3.4 Reflections on inclusions and exclusions in the project

When framing the issue and limiting the area of interest choices will be made in regard to who are included and who are excluded from the design process. One larger group of actors whom we have excluded was the clinical staff. The clinical staff has been represented through development and innovation staff. The exclusion was made because it was very hard to gain access with the staff and our focus was on the development and innovation staff for a long time. When it became apparent that the clinical staff could be important to include, the time was up for making agreements with them in time for the project. We therefore made sure to include the staff from VihTek who have experiences as clinical staff. Both Development consultants have a background as physiotherapists and their point of view

from both sides of a test or implementation project was important to gain some understanding and representation of the clinical staff as an actor group.

We chose to exclude the Specialist consultant from the feedback session mainly because she is in some ways represented through all of the writing done about the project process from VihTek (2021 B). It also seemed that we would get different answers from the staff if she was not present. The Specialist consultant sort of represents the project process internally at VihTek. We therefore need to include her in future feedback to make sure that we are not on her wrong side. If we are, then the findings we present will have a hard time being discussed in the VihTek network as a possible reconfiguration.

We found that the best way for an actor like VihTek to navigate the development arena that has a focus on the patient transition needs to focus on communication in their project process. Thereby making the project process the design object. We narrowed the design object further by excluding designs made for the last two phases of the project process. This was done mainly because of the theory that if there is good information and intermediary object work done in the beginning of the project it will make the later part of the project easier to maneuver. This is probably not completely true since every project has its own problems and keeping the translation process rolling in a network where actors may come and go is hard and needs work all the way through.

6.4 Future work

In the time between the delivery of this master thesis and our oral exam we will do further work on our communication intermediaries. We will use the figures shown in section 6.2 to facilitate a feedback session between us and the Specialist consultant. After that feedback session with the Specialist consultant, we will have a feedback session or workshop with the four employees who are working with the project process within VihTeks network.

Chapter 7:

Conclusion

This master thesis started with the aim of figuring out how the Capital Region of Denmark is working with innovation and development in the healthcare system. Through insights from scholarly articles, interviews, websites, and strategic documents we found that the patient transition is an important topic both for the healthcare system and for the patients. We therefore decided upon the research question:

How can we as Design Engineers best support VihTek in their navigation of the development arena to facilitate the needed patient transition in the Danish healthcare system?

In the development arena we found that the patient is used as a measure of what good quality and innovation is within the Region. Innovation is being performed in almost all parts of the organisation but only a few units work with it full time. These units have expertise in development and project leadership and are therefore called in to help facilitate the development in the hospital wards. We are working from VihTek's position in the development arena and are therefore most often called in as external consultants. VihTek will always be in a dilemma of how much responsibility they can take on in the project process since they must never become an OPP in the translation process.

To avoid the OPP and too many failed translation processes, we have found that VihTek will need to take on the responsibility of making sure that information flows within the hospital wards. The different clinical professions do not manage to share knowledge across profession borders. Therefore, VihTek has to act as the bridge that lets knowledge flow within the organisation. We believe that this flow of information will happen if VihTek employees work as mediators and use a small army of intermediary objects to lead the staff attention to the goal and value they are trying to incorporate in their future network reconfiguration. Keeping an eye on the goal and concept of the change rather than on the technology will help the staff through the translation process and add value to their interaction with the patients. The patients should benefit by getting a more active role in their treatment.

Our job as design engineers is therefore to facilitate the needed negotiations within VihTek's network to change the way they think about communication and their role and responsibility in it.

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List of interviews:

Innovation consultant B (2021). Innovation consultant at Innovation PLUS. Interview through Microsoft Teams. Interviewed by Ida Rye Gribsvad and Dorthea Smidt Boska Nylander on the 8th of March 2021 at 11:00 - 11:30.

Chief consultant (2021). Chief consultant at Health research and Innovation. Interview through Microsoft Teams. Interview through Microsoft Teams. Interviewed by Ida Rye Gribsvad and Dorthea Smidt Boska Nylander on the 23rd of March 2021 at 10:00 - 10:30.

Quality Manager (2021). Quality Manager at unit for quality and patient safety. Interview through Microsoft Teams. Interviewed by Ida Rye Gribsvad and Dorthea Smidt Boska Nylander on the 30th of March 2021 at 10:00 - 10:45.

Functioning Unit Leader (2021). Functioning Unit Leader at VihTek. Interview through Microsoft Teams. Interviewed by Ida Rye Gribsvad and Dorthea Smidt Boska Nylander on the 1st of March 2021 at 13:00 - 14:00.

Innovation consultants A (2021). Innovation consultants at Copenhagen Health Innovation. Interview through Microsoft Teams. Interviewed by Ida Rye Gribsvad and Dorthea Smidt Boska Nylander on the 12th of April 2021 at 10:00 - 10:30.

Unit leader (2021). Unit leader for the center for patient participation. Interview through Microsoft Teams. Interviewed by Ida Rye Gribsvad and Dorthea Smidt Boska Nylander on the 19th of April 2021 at 15:00-15:30.

Project employee (2021). Project employee at VihTek. Interview through Microsoft Teams. Interviewed by Ida Rye Gribsvad and Dorthea Smidt Boska Nylander on the 26th of April 2021 at 10:00-10:30.

List of workshops:

Workshop (2021). Participants: Functioning Unit Leader, Specialist Consultant, Development Consultant, Project Employee, Student Assistant. Workshop through Microsoft Teams. Workshop facilitated by Dorthea Smidt Boska Nylander and Ida Rye Gribsvad on the 5th of May 2021 at 13:00-14:00.

Development consultant (2021 A). Development Consultant at VihTek. Informal conversation just after the workshop. Conversation between Development Consultant and Dorthea Smidt Boska Nylander on the 5th of May 2021 at 14:08-14:28.

Development consultant (2021 B). Development Consultant at VihTek. Feedback session at VihTek's office. Session was facilitated by Ida Rye Gribsvad and Dorthea Smidt Boska Nyalnder on the 17th of May 2021 at 9:30 - 10:30.

List of picture references:

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Appendix

Appendix 1: Workshop material

Appendix 2: Design specification 1

Appendix 3: Design specification 2

Det dårlige projekt

- Sørg for ikke at have udført et ordentlig forarbejde – kontekst, behov, eksisterende arbejdsgange etc.
- Søg for ikke at have klare afrtaler før projektet går i gang – hvem gør hvad, ansvar etc. (skriftligt)
- Sørg for ikke at lave klare aftaler undervejs i projektet
- Demonstrer ikke løsningen på forhånd
- Sørg for ikke at følge op på aftaler
- Sørg ikke for at tænke drift efter projekt
- Sørg for ikke at inddrage alle relevante aktører
- Ingen midtvejsevaluering!
- Sørg for at teknologien ikke passer ind i klinisk praksis
- Sørg for ikke at formidle projektets formål til involverede parter og personale generelt
- Lav ikke en feasibilitytest inden det store projekt
- Sørg for ikke at have en plan for hvordan implementeringen gøres målbar
- Undlad at oprette en styregruppe
- Sørg for ikke at have en overordnet plan for hvordan projektet skal forløbe
- Sørg for ikke at være tydelig i din skriftlige og mundtlige kommunikation
- Sørg for ikke at have en plan for møder med projektgruppe og styregruppe
- Undervis ikke i brugen af velfærdsteknologien
- Sørg for ikke at justere arbejdsgange/tiltag, hvis de ikke virker efter hensigten
- Ingen workshops
- Afdæk ikke behov
- Sørg for ikke at stille krav til samarbejdspartnerne
- Undlad løbende at orientere om projektet på afdelingen
- Fokuser kun på 1 faggruppe
- Lav ikke en afdækning af relevante løsninger
- Ingen info på afdelingen om projektet
- Sørg for ikke at lave tiltag der kan forankre projektet hos samarbejdspartnerne
- Sørg for ikke at lave tiltag så samarbejdspartnerne får ejerskab over projektet
- Lav ikke en samarbejdsaftale der afklarer ansvarsområder

Process phases: Behovsafdækning · Research · Planlægning · Test · Evaluering

Sticky notes:
- Søg for ikke at have klare aftaler før projektet går i gang – hvem gør hvad, ansvar etc. (skriftligt)
- Demonstrer ikke løsningen på forhånd
- Sørg for ikke at følge op på aftaler
- Sørg for ikke at lave klare aftaler undervejs i projektet
- Sørg for ikke at inddrage alle relevante aktører
- Sørg for ikke at formidle projektets formål til involverede parter og personale generelt
- Lav ikke en feasibilitytest inden det store projekt
- Sørg ikke for at tænke drift efter projekt
- Sørg for at teknologien ikke passer ind i klinisk praksis
- Sørg for ikke at have en overordnet plan for hvordan projektet skal forløbe
- Sørg for ikke at have en plan for møder med projektgruppe og styregruppe
- Sørg for ikke at have en plan for hvordan implementeringen gøres målbar
- Sørg for ikke at have udført et ordentlig forarbejde – kontekst, behov, eksisterende arbejdsgange etc.
- Sørg for ikke at justere arbejdsgange/tiltag, hvis de ikke virker efter hensigten
- Sørg for ikke at være tydelig i din skriftlige og mundtlige kommunikation
- Afdæk ikke behov
- Sørg for ikke at stille krav til samarbejdspartnerne
- Undlad at oprette en styregruppe
- Undervis ikke i brugen af velfærdsteknologien
- Lav ikke struktur for Gentaget undervisning
- Ingen workshops
- Lav ikke en afdækning af relevante løsninger
- Ingen info på afdelingen om projektet
- Fokuser kun på 1 faggruppe
- Sørg for ikke at lave tiltag der kan forankre projektet hos samarbejdspartnerne
- Sørg for ikke at lave tiltag så samarbejdspartnerne får ejerskab over projektet
- Lav ikke en samarbejdsaftale der afklarer ansvarsområder
- Ingen midtvejsevaluering!
- Undlad løbende at orientere om projektet på afdelingen

Scenarier

Scenario 1 (rød):
- Afdelingen kommer til VihTek med et problem og en idé om en løsning
- VihTek afdækker og finder mulige løsninger
- Løsninger præsenteres for afdeling og der vælges en, test periode fastlægges og protokol.
- Teknologien passer ikke rigtig ind, til trods for opbakning bliver den ikke anvendt.
- Efter endt test ender teknologien i et skab hvor den samler støv. VihTek udarbejder en evaluering der beskriver hvorfor det ikke gik. Afdelingen oplever stadig problemet, men ved ikke hvordan det skal løses.

Scenario 2 (grøn):
- Afdelingen kommer til VihTek med et problem og en idé om en løsning
- VihTek afdækker og finder mulige løsninger
- Løsninger præsenteres for afdeling og der vælges en, test periode fastlægges og protokol.
- Teknologien bliver brugt efter hensigten og den gør en forskel på afdelingen.
- Efter endt test beholder afdelingen teknologien. Den bliver anvendt i normal drift. Afdelingen anbefaler VihTek og teknologien til andre afdelinger.

Det gode projekt

Skriv her

Skriv her

Skriv her

Skriv her

Skriv her

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Behovsafdækning

Research + testopsætning

Test

Evaluering

Appendix 2: Design specification 1

Project phase	Need to have	Nice to have	Notes
Preject	Learn about the context - speak to at least one person from each clinical discipline.		
	Identify which groups agree and disagree with the proposed problem		
	Follow multiple actors to learn about the network configuration and problem.	Learn about what happens before and after the proposed problem in the current network configuration.	Follow both the actors who have identified the problem and made it clear but also some staff that is not part of the formal project groups.
	Make a statement containing the AIM of the project.		What are we testing, what are we trying to achieve?
	Inform about the aim of the project to all the clinical staff members.		
	Inform about the project, both aim and relevant actors within VihTek		Include knowledge that is already embedded within the organisation.
	Formalisize project structure and responsibilities.		Ex. form a steering group

Project phase	Need to have	Nice to have	Notes
Research	Find the important functionalities.		Not the proposed technologies only.
	Remove technologies that seem too far removed from the proposed actor world in terms of it being included in the daily operation.		Send emails, talk with relevant actors. Keep them interested.
	Maintain communication		This is where the actor world is born.
Planning	Who is responsible for what?		When you want to do this in a hospital world you need to plan in good time. These meetings allow for a discussion of what is working and what needs to be solved.
	Make plans for regular meetings.		Make plans for how to get the needed knowledge. Decide who collects what.
	What are we testing and how do we make sure to get these data?		It is important that all staff members has correct knowledge about the aim and technology.
	Discuss how to maintain knowledge sharing internally in the hospital ward.	VihTek should play a part in this, with being present during all the different kinds of shifts at least once.	

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Project phase	Need to have	Nice to have	Notes
	Discuss whether it is realistic to get the amount of patients needed in the times frame.		
Test	Relatively soon after the test has started, a meeting should be held to discuss how the network reconfiguration is going.		We need to learn what rationals are not working in the actor world.
	Teaching how and when to use the technology.		
	Keep information flows going.		Use intermediaries to share correct knowledge.
Evaluation	Take information from all phases of the project and convey this is the evaluation.		
	Be aware to whom you are communicating.		Is the vocabulary too project specific? If so then you need to inform the reader how to understand and use the vocabulary.
		Find ways to spread the knowledge and your findings	Make sure that the report is not forgotten as soon as it is released.

Appendix 3: Design specification 2

Project phase	Need to have	Nice to have	Notes
Preject	Learn about the hospital ward and make a statement containing the aim of the project based on this information.		What are we testing, what are we trying to achieve?
	Inform about the aim of the project to all the clinical staff members.		Inform about who owns the technology, time frame, what is the goal and who benefits from it.
	Inform about the project, both aim and relevant actors within VihTek		Include knowledge that is already embedded within the organisation.
	Formalisize project structure and responsibilities.		Ex. form a steering group
	Follow up on agreements and remind the staff about the goal or concept they are trying to achieve with the technology.		Hold them accountable for the change.
	Create interestment and ownership for the project in the clinical staff.		
Research	Maintain communication		Send emails, talk with relevant actors. Keep them interested.
	Create ownership for the solution to the problem.		

Project phase	Need to have	Nice to have	Notes
Planning	Who is responsible for what?		This is where the actor world is born. How do the ward include the needed patients to fulfil the project scope?
	Schedule regular meetings with clear agendas.		When you want to do this in a hospital world you need to plan in good time. These meetings allow for a discussion of what is working and what needs to be solved.
	Discuss how to maintain knowledge sharing internally in the hospital ward.	VihTek should play a part in this, with being present during all the different kinds of shifts at least once.	It is important that all staff members has correct knowledge about the aim and technology.
Test	Relatively soon after the test has started, a meeting should be held to discuss how the network reconfiguration is going.		We need to learn what rationals are not working in the actor world.
	Teaching how and when to use the technology.		
	Keep information flows going.		Use intermediaries to share correct knowledge.

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