



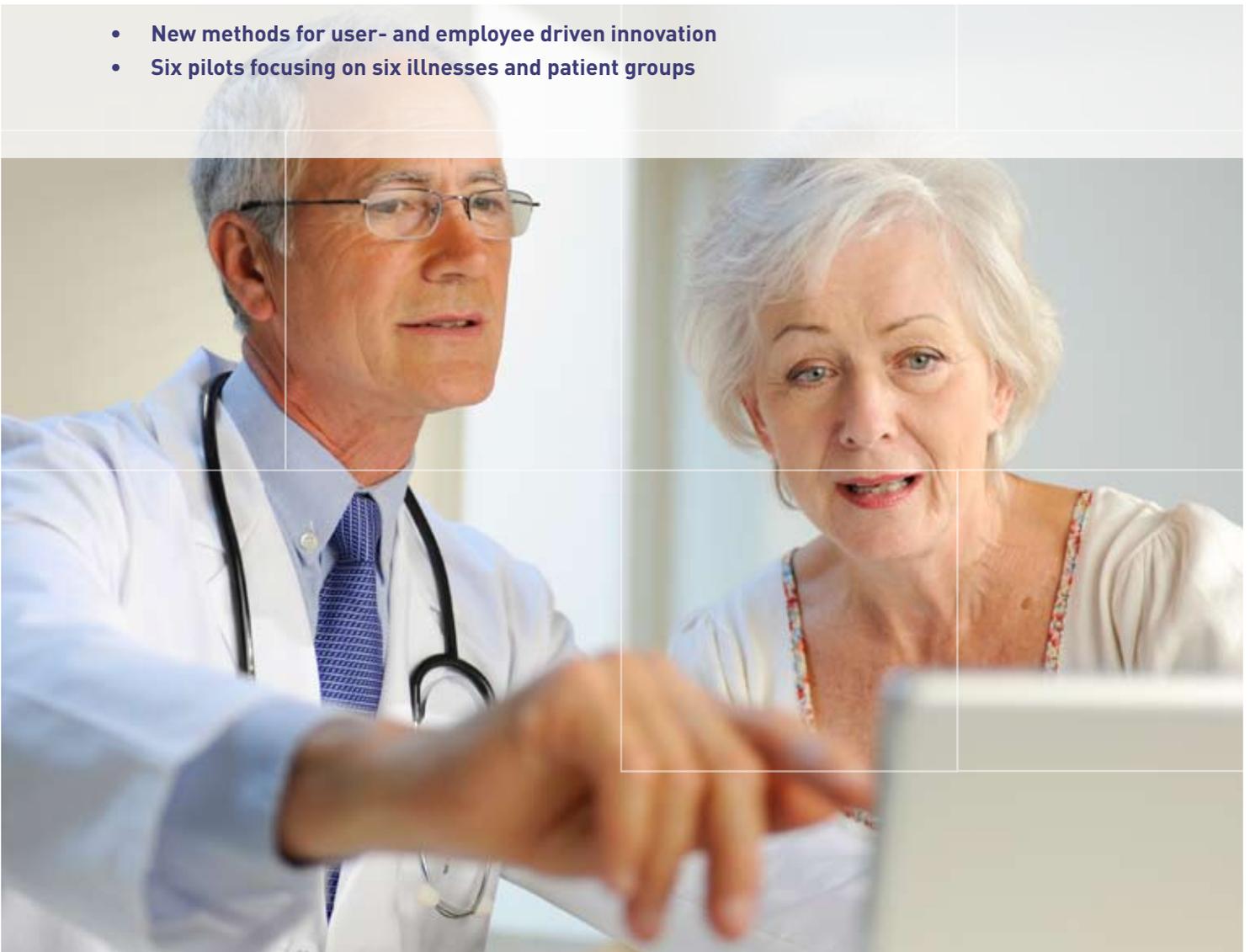
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New methods for user driven innovation in the health care sector

- New methods for user- and employee driven innovation
- Six pilots focusing on six illnesses and patient groups



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Abstract: <p>This project aims to draw attention to user driven innovation in the health care sector. The goal is to develop and test methods for user driven innovation in the context of health care. Methods which have proven valuable in industrial contexts may lack suitable counterparts within the health care sector. The report consists of an overview of innovation theory, hereunder user driven innovation directions, an analysis of the health care sector, the need for innovation and the specificities which have to be taken into consideration in innovation processes and a presentation of state of the art examples from the Nordic region and the USA. Most important, the study comprises six pilot projects which have been carried out during the study. The pilot projects are supposed to test various methods of user driven innovation and the results give an idea of where one has to put effort in order to make innovation processes in the health care sector as smooth, effective and successful as possible.</p>	
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1 Executive summary

Background

In the coming years, there will be a larger need for health care while the group of people financing the (mainly) public services will shrink. Demographic development in the western part of the world indicates that people will get older and birth rates remain low. As people get richer, the demand for high quality services and treatment is also increasing.

In the industrial sector incredible gains in efficiency have historically been brought about by technical and organisational innovation. Therefore it seems an obvious solution to the health sector's challenges. The question that arises is whether it is possible to transfer the industrial paradigm of innovation to the health care sector.

Problem statement

Few studies have examined the field of *user driven* innovation in the health care sector. This project thus aims to draw attention to the possibilities of user driven innovation in this sector. During the project, six pilot projects on user driven innovation in the health care sector have been carried out. Innomed, SINTEF Health Research and New Insight have conducted the pilot projects and Ferring, Herlev and Lund hospitals have participated in the projects.

The pilots have tried to identify barriers for user driven innovation in the health care sector and recommend solutions to overcome the barriers. Through active or direct involvement of the users in the sector – the patients or the personnel – the goal in these projects is to develop working tools and methods for user driven innovation.

Conclusion and recommendations

The six pilot projects have employed different methods, but have met some of the same methodological challenges. For all six projects, it was time demanding to find enough participants to workshops or informants to interviews as users are often (ill) patients. Some find it hard to talk about their illnesses, others (as dementia patients or children) can not fully express their needs. Some of the users in the pilot projects were even unable to describe their needs directly, because of either practical or ethical constraints.

Also, for ethical concerns, it is often necessary to apply to an ethical committee in order to be allowed to observe or interview these kinds of users. As for health personnel, their main concern is to get enough time for the patients, and as a consequence it is a challenge to make them prioritise innovation workshops.

The health care sector is different from other sectors with regard to the dimensions of user involvement. The innovation model of the pilot projects was largely based on direct user involvement concerning articulated and semi-articulated needs, with variations over the course of the innovation process and the methods employed in each phase. However, in many circumstances, it may prove difficult to find users who have time, capacity and are motivated for participating in an innovation process.

One of the primary learning points from the pilot project is that the users of the health care sector do not have the same characteristics as for example the lead users of von Hippels classics (e.g. 1988). Lead users are described as a group of users who are particularly interested in spending time on developing a new solution or product,

because the user himself can gain from it. This may not work as motivation for an ill patient. This is why it seems more fruitful to let the users in the health care sector *participate* in parts of the process, in stead of making the users lead the process. When the users are health personnel, time restraints and a busy work day can make it challenging to find people willing to be for example lead users.

Once the users are in place, it has proved crucial to find the right method in order to cover all aspects of the users challenges, articulated or non-articulated, without intimidating the user.

The primary users in all pilot projects were patients suffering from different illnesses. The boundary between user- and employee-driven - innovation in the health care sector is blurred because of the emotional and physical experience of the patients. The patients do not have full information about the “product” but can only refer to the process as an observer since knowledge about medical cause and effect is usually exclusive to the health care professional. The innovation potential does not lie in getting the patient well. The health care professionals and scientists are working hard on that part, but it is in the “surrounding” services that the potential seems the greatest. Services such as speed of diagnosis, information during the process, type of contact with health care professionals, optimizing of the treatment course etc.

Another important learning point was that the political nature of the public health care sector means that there is a fine line between proposing a new way of doing things that *creates value for the patients* and proposing a new way of doing things that *allows the patients to consume value* (i.e. by asking for more service regardless of its innovation potential). While the first is in perfect accordance with the projects’ definition of innovation, the second is merely a redistribution of the scarce public health care resources. One has to be aware that the patients have political interests in the health care system (by pushing for more public funding) and that they are not unbiased.

The pilot projects focus was to investigate methods and operated in the first phase of innovation. This means they have collected data and come up with concept ideas. This first WHAT phase is time demanding and important to carry out in an organized and thorough manner. There is a need for developing methods where users can be more involved – not necessarily as lead users, but as observers with experience from own or others’ needs.

To move over to the next stage, the HOW phase, where prototyping, testing and eventually implementation of a new service, method or process are taking place, several elements need to be considered.

First, there is a need for a strategic push. Both financial and organisational support is necessary to be able to develop the ideas. The process is long, especially if it aims at developing new products, which means that it is necessary to include devoted actors and make the projects part of a larger strategy.

Also, there is a need for methods to communicate ideas to industrial partners. Methods to include industry at an early stage without narrowing the window of opportunities are also required.

In addition, there is a lack of incentives for the industry to participate in processes like user driven innovation projects. Industrial actors may be reluctant because the buyer of a product often differs from the user. The risk in developing a new product especially fitted for the users is extremely high when you do not know if you have buyers for it. Also, the market for new solutions may be small, for example when it comes to

products for children. Here, public actors have an important role to play in order to secure good solutions for smaller patient/user groups.

The general learning from the pilot projects are also presented in the methodological toolbox (Appendix 1)

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2 Introduction

The Nordic health care sector faces a range of future challenges that put strain on available resources in the publicly funded system. The challenges point to a need for new ways of doing more for less. Increased innovation could be a possible solution.

In the future, more people will need health care while there will be less people to finance the (mainly) public procurement of such services. The demand for high quality services and treatment is also increasing, as societies get more prosperous. Innovation, not only in medical treatment and equipment but also in processes and methods, is therefore necessary in order to provide the best care for all citizens in an effective way. At the intersecting point between new technology, new knowledge and increasing demands of services and effectiveness in the health sector, there is a large potential for improving processes, methods, treatments and equipments.

In the industrial sector incredible gains in efficiency have historically been brought about by technical and organisational innovation. Therefore innovation seems to be an obvious solution to the health sector's challenges. But the next question that arises is whether it is possible to transfer the industrial paradigm of innovation to the health care sector.

This is the primary aim of the project. *New methods for user driven innovation in the health care sector*, to develop and test methods for user driven innovation in the context of health care. Methods that have proven valuable in industrial contexts may lack suitable counterparts in health care.

Few studies have examined the field of *user driven* innovation in the health care sector. This project thus aims to draw attention to the possibilities of user driven innovation in this sector. We will give examples of this kind of innovation in the sector today. Further, innovation studies have until recently focused mainly on the traditionally market oriented business sector. With reference to these studies, we will discuss the methods and concepts used in companies, and whether they are applicable when it comes to innovation in the health care sector.

Although a comprehensive literature on innovation exists, it seems that most of the focus is on branches quite distant from the health care sector. When we compare the health care sector to industrial and other high technological sectors, who are often the subjects in innovation studies, we find that the health care sector differs in some very important ways:

- Because the health care sector in many countries is a public responsibility, the sector is much less driven by market forces.
- In the health care sector, the buyer of a service/product is not the same subject as the user of the service/product. The users have no limitations in what they may wish for, whereas this is not the case for the buyer. What the users want may not be economically defensible, or cost-effective. Also, investments in new solutions might be expensive for one actor, but at the same time mean savings for other actors within the sector.
- As incentives for improving things among employees and patients in the health care sector may be missing, there is a lack of innovation culture.

Despite these differences, we will still argue that it is always in the interest of the health care personnel to offer better services to the users, and improve the cost-effectiveness in

the sector. This means, that although market forces are not so prevalent in the health care sector, the driving forces for innovation are present here as well. Therefore, we believe it is important to investigate whether the innovation methodologies from other sectors, are good tools for innovation in the health care sector.

The aim of this project has been to conduct six pilot projects in the health care sector, trying to identify barriers for user driven innovation in the health care sector and recommend solutions to overcome the barriers. Through active or direct involvement of the users in the sector – the patients or the personnel – the goal in these projects is to develop working tools and methods for user driven innovation.

We draw upon general literature on innovation in the private and public sector and on experiences from Innomed, SINTEF Health Research, New Insight, Ferring, and Herlev and Lund hospitals in general, and from six pilot projects in particular. The pilot projects are related to 1) bedwetting, 2) incontinence, 3) prostate cancer, 4) treatment at home for patients with chronic obstructive pulmonary disease, 5) identifying and suggesting new assistive hearing devices, and 6) identifying uncovered needs among people with dementia.

Projects 1-3 were conducted by New Insight (Denmark) in collaboration with Ferring, Herlev hospital (Denmark) and Lund hospital (Sweden). Projects 4-6 were conducted by InnoMed/SINTEF in Norway.

First in the report, we discuss how to understand innovation in general and present different types of innovation and the drivers for innovation. Second, we map specificities in the health care sector and identify barriers and drivers for innovation. Third, we give an overview of user driven innovation in the health care sector today, with examples from Denmark and the USA, showing good practice. Finally, based on experiences from the pilot projects, we evaluate methods and identify the important elements in order to increase innovation at all levels in the health care sector. We have also developed a methodological toolbox based on experiences from the pilot projects.

Initially, we would like to describe some key aspects of innovation in the health care sector, describing the range of future challenges that puts strain on available resources in the publicly funded system.

2.1 The health care sector needs more innovation

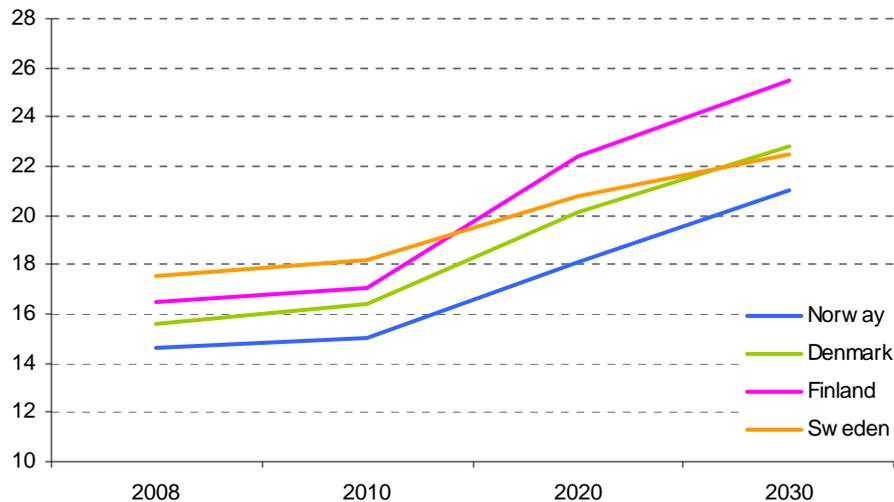
Traditionally, health care has mainly been the responsibility of the family. Still, in many parts of the world, the majority of health care services are produced within families. However, in our part of the world, the larger share of health care has long ago stepped out of the family sphere and is part of an institutionalized public care.

A combination of offer and demand determines the size of the health care sector. Health care today is mostly limited to a national market, but it is likely that this will change slightly in the future. Trade in services increases, also trade in health services e.g. when patients travel to another country for treatment. In addition, the EU directive on services in the internal market creates a single market for services and hence eases cross border trade with services.

When it comes to demand, two important elements can be identified: increased life expectancy and increased income. Medical development and better health care has increased the life expectancy of people in the western world. This probably means that a larger share of the population will need care over a longer period of time, which in turn will increase the demand for health care services.

As in most rich countries the ageing of the Nordic populations is the primary challenge for the public health care sector. As shown in Figure 1.1 below the share of people older than 65 years is projected to rise significantly in the next ten years. In absolute terms this corresponds to an increase in the 65+ population of around half a million in Norway, Finland and Denmark, and an increase of 700,000 in Sweden.

Figure 1.1 Share of the population aged 65 years and over, by country. Percent



Source: Population projections by Eurostat, 2008. "Ageing characterises the demographic perspectives of the European societies".

In addition, problems that were previously considered natural elements of ageing are now considered problems that should be treated, because they contribute to decreased life quality. Being healthy does no longer only mean absence of illness, but also in general having good life quality. Furthermore, medical development makes it possible to offer health care for conditions that were previously considered unthinkable (or economical unaffordable) to cure.

Increased income will also affect the demand for health care services. The general trend is that the richer you are, the larger is the share of services in your consumption. To the extent that a large range of health care services can be bought in private clinics or via other service providers, patients tend to become consumers and pay for health care. When consumers are willing to pay, companies can develop even better medical equipment. However, in welfare states, equality is an important keyword. This means that when private firms offer the newest and best medical equipment, people demand that the public sector should provide the same (Econ & Menon 2007).

Consumers also make greater demands on products and their relevance. Increased wealth and purchasing power in the West and several new growth economies generate a larger number of demanding consumers. In addition, consumers' expectations for a constant flow of new and improved variants of products and services have generally escalated; both because new and improved products are introduced constantly and because the variants increase in number for most product groups (DECA 2007).

At the supply side, changing demographic patterns influence the future of the public sector. An ageing population and birth rates which remain low in most European countries, means there will be less people to pay for the procurement of public services. A relatively smaller share of the population is of working age, while the share of persons relying on support of others is increasing (this support can be delivered through

publicly financed social benefits for the elderly or by private means. In the Nordic countries the first is a considerable public expense).

This means that the tax base of income taxes is shrinking, while expenses for social benefits are rising. Together this will put extra pressure on the public budgets leaving little room for rising health care costs.

Also, less people of working age leads to a low supply of labour force on the market. The health care sector will then have to compete more intensively for talents with the rest of the employers. This may lead to rising labour costs and even labour shortages.

The current economic crisis is temporarily countering the negative demographic impact on the labour market, but in longer perspective the problem remains unsolved.

We illustrate these trends with some examples from Norway, where the health sector is big – and growing. The growth in employment within the Norwegian sector since 1970 has been linear (Holmøy & Oestreich Nielsen 2008). In 2008, Norway spent 8.6 percent of gross domestic product (GDP) on health. The number in 2006, the latest year for which comparable OECD data are available, Norway spent 9.1 percent of GDP on health care services. This was similar to both Sweden and Denmark, and almost identical to the average among OECD-countries (9 percent). USA (11.6 percent) and South Korea (6 percent) represented the highest and lowest shares of GDP (OECD 2007).¹

If we consider health expenditures per capita, the situation is rather different. Average expenditures in OECD were 2759 USD per capita in 2006. At the top we find USA (6401 USD per capita, but mainly private expenditure on health), Luxembourg (5352 USD) and third, Norway (4364 USD, mainly public expenditure on health). The figures are 3108 USD for Denmark, 2918 USD for Sweden and 2331 USD for Finland (OECD 2007). USA represents a special case compared to the Nordic countries. Since most health expenditures in the US are private (contrary to the strong public health sector in Norway and Denmark), there are no limitations on the supply side.

Health services are to a large extent left over to the market, and since people are willing to pay, we may claim that the demand for health services, are not price sensitive in the same manner as in the Nordic countries. Traditionally, politicians in the Nordic countries have been pushed to decide where to cut expenditures, when more health care services are purchased. The health care sector is growing, but it does not mean that governments can spend an unlimited amount of money. New investments have to be carefully considered in every case. Also, where the private market stands for the majority of health investments one can expect that the offer is broader, continuously coming up with new and more attractive solutions. In the Nordic countries, where the biggest purchaser is the state, it is likely that all demands are not being met. The purchaser has to go through time-demanding processes before coming to a decision. Also, the purchaser may seem unpredictable, as one can never be sure that the money will be granted for that specific purpose.

The pattern in pharmaceutical expenditures per capita shows the same: USA is on top (843 USD, mainly private expenditure) and Mexico is on bottom (182 USD, almost only private spending). The average among OECD-countries is 440 USD (mostly public spending), 427 USD in Sweden (mostly public spending), 389 USD in Finland (even

¹ Yearly changes in public spending as shares of GDP, are in Norway partly influenced by changes in oil prices, as a high/low oil price one year increase/reduce GDP that year, regardless of other changes.

between public and private spending), 384 USD in Norway (even between public and private spending), and 286 USD in Denmark (mostly public spending). Pharmaceutical expenditures in Denmark are lower than in all other OECD countries, except Mexico and Poland. Variations in spending reflect differences in prices and consumption as well as how fast and widely new and often more expensive drugs are put on the market (OECD 2008).

In 2006, health spending on average across OECD countries grew in real terms by just over 3 percent, the lowest rate since 1997. According to OECD², slower growth in health spending in recent years has in many countries been aided by a slowing in the growth of pharmaceutical spending. In 2006, pharmaceutical spending on average across OECD countries increased by only 2 percent in real terms, compared to 6-7 percent per year between 2000 and 2003 and 3-3.5 percent per year between 2004 and 2005.

The development in Norway can illustrate the development in health care spending. In 2008, Norway spent 217 billions NOK on health. 84 percent was publicly financed, which is a relative high share compared to other OECD countries. On average, every Norwegian spent 45 544 NOK on health in 2008 (mostly through paying taxes). This is more than double compared to 1977 (Statistics Norway: www.ssb.no/helsestat). The rise of prices aside, the growth has been 36 percent. This equals an annual growth of more than 3 percent.

Despite a relative stable public share of the financing in Norway during the last four years, health expenditures represent an increasing part of the total public expenditures. In 2008, 19.1 percent of the public sector expenditures were used for health purposes – compared to 18.6 percent in 2002 and 15.8 percent in 1997. However, there are relative small changes in the composition of health expenditures between 1997 and 2007. It is still inpatient stays in hospitals, outpatient activity and nursing home services that represent the largest expenditures. Between 1997 and 2007, the largest increase in expenditures was in home based health care services (Table 1.1).

Table 1.1 Health care expenditures in Norway (1997, 2002 and 2007)

	1997	2002	2007
Hospital care – inpatient stays	28.6	26.8	26.4
Hospital care – outpatient activity	2.4	3.6	3.8
Physicians	21.4	19.1	19.8
Rehabilitation – inpatient stays	1.6	1.5	1.5
Nursing homes – inpatient stays	15.6	16.8	16.6
Home care services	6.5	8.3	9.4
X-ray and laboratory services	3.7	3.2	3.7
Ambulance and patient transport	2.5	2.5	2.8
Medications and medical equipment/devices	14.9	15.3	12.9
Preventive medicine and health administration	2.9	3.1	2.9
Total	100.0	100.0	100.0

³ Source: Statistics Norway (www.ssb.no/helsestat)

² http://www.oecd.org/document/27/0,3343,en_2649_34631_40902299_1_1_1_1,00.html

To sum up, the health care sector is under pressure. We want more from it, we want it better, and there will be fewer of us to pay for the public provision of these services. It is therefore necessary to try to cut costs through products or processes that may ease the burden on the health care system, leading to e.g. higher effectiveness, higher quality and fewer employees.

3.1 User driven innovation leads the way

We have now seen that expectations, demands and possibilities in the health care sector have been steadily increasing, and will continue to do so. This is an economical issue of great concern in modern welfare states. At the same time, it is also an issue of great possibilities for those who have the creativeness and the willingness to improve products and services, or generate new ones.

Innovation is the key to growth in welfare. It plays an important part for improvements in the health care sector. Services and products are invented or improved in a high pace, and treatment, instruments etc., are getting better every day. Innovation in the health sector has mainly been research driven. Also in the future, R&D should play an important part. Nevertheless, it is useful with more emphasis on user needs. Managed well, user driven innovation may be a new strategic tool to the health care sector.

The Danish Enterprise and Construction Authority (DECA 2007) describes the rationale behind this as follows: The shorter life cycle of products and services in the market and the high costs associated with being the technological market leader make it more difficult to deliver satisfactory returns on investments in research and development. Therefore, it becomes increasingly important to structure the work on innovation so that it meets current and future needs in the market and is structured in an efficient and cost-conscious way.

Knowledge about conscious and unconscious need is an essential part of a user driven innovation process. However, it is not evident to obtain this information from all users in the health care sector. Due to a complex organizing of health care institutions, and a broad spectre of users, it can be difficult to discover all the user needs that may improve the quality and effectiveness of the health care sector. This challenge is intensified because the health care sector may be a rather closed and protected society.

In this report, we therefore ask: is user driven innovation also likely to succeed in the health care sector?

4 An overview of innovation

4.1 How does innovation happen?

The traditional story, also called the “linear model” of innovation, was introduced shortly after World War II. According to this model, one can identify a straight line from pure research via applied research to innovation (Fagerberg et al. 2004). This view was challenged by researchers during the 1980’s and the new approach states that innovation is a result of many factors, often hard to predict. An innovation may occur when an idea (a product, a process or a service) meets for example a specific market, distribution system or policy. During the process, many factors can be the cause of failure or success. Today however, the story is not that linear.

4.2 New ways of doing things in the way of economic life³

Innovation can be understood as the successful introduction of a new (and useful) product, method, technique, practice or service. It is the result of a process where an organization develops something new, and where this novelty is adopted by a market (Mckeown 2008).

An innovation may be incremental, such as an improvement of a product, process or method, or radical, like a totally new service or technique. Further, it is sufficient that the innovation is new for the organization; it does not necessarily have to be new for the entire market. This means that an organization may innovate by using available technology and knowledge which is well-known outside the organization.

Innovation thus refers to the continuous improvements and changes that both private and public sector entities must make in order to remain competitive, efficient and attractive (Tema Nord 2005).

However, innovation is not synonymous with change. Change is taking place continuously in every organization. For example, if the organization hires someone new, it is not an innovation unless the person is hired to introduce new knowledge or to carry out novel tasks. The same could be said about society. Establishing a new enterprise is not an innovation unless the company offers novel services or products or carries out the task in a smarter way (Cunningham 2005).

The last few years, innovation has become a trend phenomenon. Innovation has become one of the major focus areas of many companies, academics and policymakers. Since innovation is considered a major driver of the economy, the factors that lead to innovation are considered to be critical to policy makers.

It has been claimed that it has been used in the political game to make policy seem apt to the future, but that the word has lost meaning because it has been used to describe everything from ideas and inventions to new services and products. Innovation is a continuous and time-demanding process with different phases. If politicians wish to make the innovation policy concrete, it is important to know the triggers and drivers behind innovation.

³ Joseph Schumpeter’s definition of innovation from 1942.

4.3 Types of innovation

We here use the OECD definition⁴ of innovation. There are essentially four types of innovation identified in the Oslo Manual for measuring innovation: product innovation; process innovation; marketing innovation and organisational innovation.

Product Innovation

This involves a good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. In the education sector, a product innovation can be a new or significantly improved curriculum, a new educational software, etc.

Process Innovation

Process innovation involves a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. In education, this can for example be new or significantly improved pedagogical tools.

Marketing Innovation

Marketing innovation involves a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. In education, this can for example be a new way of pricing the education service or a new admission strategy.

Organisational Innovation

Organisational innovation involves introducing a new organisational method in the firm's business practices, workplace organisation or external relations. In education, this can for example be a new way of organizing the work between teachers, or organizational changes in the administrative area.

These innovations can be new to the firm/educational institution, new to the market/sector or new to the world.

4.4 Innovation drivers

If we look at the sources for innovation, three subgroups can be defined: Price driven, technology driven, and user driven innovation. This typology was introduced by FORA in 2005 in a series of reports on innovation and will be described closer in the following. The groups are not mutually exclusive. Firms and organizations may get inspiration from all three sources and innovators generally need to have competences within all three types of innovation. Competition based on price is an important element for many companies' strategies. Still, many firms in our part of the world experience that competition based solely on price is difficult because of competition from low-cost countries. To adapt to the global competition climate, companies now search for other strategies, in addition to focus on price.

⁴ http://www.oecd.org/document/10/0,3343,en_2649_33723_40898954_1_1_1_1,00.html

4.4.1 Price driven innovation

Companies who compete on price will try to deliver a product which is cheaper than competing products. The race for lower costs is thus considered to be the source of price driven innovation. This kind of innovation is most likely to happen in organization, structure, logistics, marketing and business practice.

Price concurrence is probably as old as market economy itself and the need to carry out all kinds of tasks more effectively, will continue. As a consequence, there is much knowledge on this field. The challenge is to improve practise (FORA 2005).

Inside the public health sector, the main motivation for innovating is rarely competition. Rather, the motives are to perform better, give better services and make the most of the available resources. Whatever the motives are, the way of thinking can be useful also in the public sector. However, companies who develop new products and systems for the health care sector will experience competition. Much of the innovation in the health care sector also comes from the industry who presents new solutions to the sector. There is a potential for innovating more if hospitals, social security systems and others open up for industry actors so that these can get access to user needs.

4.4.2 Technology driven innovation

The sources for research driven innovation is research. Firms who compete on new technology will always try to be ahead of competitors when it comes to technology in order to offer new and better products or services. The ability to translate new technology into unique products or services which can hardly be copied is crucial for these firms.

Also, research driven innovation has long traditions and competition on new technology became increasingly important after the industrial revolution. During the 20th century – and still – it is crucial for companies to master new technology. New technology may open up for new business opportunities; it may decrease production costs or result in new products.

Innovation policies have tended to focus on research driven innovation. Through grants and tax incentives, incubators and investments in relevant education, R&D has been considered a crucial step towards more innovation. However, although technology driven innovation leads to a new product, a market for the product has to be identified. This is the opposite of user driven innovation, which is ruled by the accommodation of newly identified user needs (FORA 2005).

4.4.3 User driven innovation

User driven innovation refers to innovations developed by or based on the needs of consumers and end users, rather than suppliers. This is not completely new; user driven innovation has been practiced for some time already. What is new is that more companies develop and consciously use methods to promote this kind of innovation.

The Danish Enterprise and Construction Authority (DECA 2007) describes the key element of user driven innovation as catching trends and future needs in the market rather than focusing on what is in demand or technologically possible today. User driven innovation is ruled by the accommodation of newly identified user needs. Not vice versa: that new technological possibilities leads to new products, for which a market has to be identified.

This is what happens today. This is what happens in a large share of innovative companies, and this is what has lately been introduced to the health care sector.

There are several reasons for the increasing focus of companies on users and opportunities in the market (DECA 2007):

- Greater insight into users' realised and non-realised needs increases the likelihood of the innovation of enterprises hitting the market with greater precision. User focus is thus also able to create better returns on investments in innovation.
- Insight into users' realised and non-realised needs offers the opportunity to launch solutions that provide obvious values to the customer and distinguish products from the competitor's offer. This is a contributing factor to enabling companies to charge a premium price for their products or services.
- And by giving the customer influence on the product design, it is possible to create ownership with customers of the company's products. This ownership can give the individual enterprise more loyal customers and thus improve earnings.

4.4.4 Shift within drivers of innovation

Nearly all economic sectors have experienced a shift from price competition to competition based on knowledge the past two decades. Much policy focus has been given to supporting science and engineering education, and research related to high-tech sectors. But a focus on only research-driven innovation will not secure a competitive advantage in the longer term. High R&D investment and lots of scientists and other knowledge-intensive personnel does not necessarily lead directly to high innovation performance. In addition, technology is turning more easily accessible also for low cost countries thanks to the large amount of talented scientists and engineers in countries like China and India where costs are lower (Tema Nord 2005).

4.5 Innovation trends – a short overview

In addition to user driven innovation, some other trends within innovation can be identified. These will be presented shortly in the following.

4.5.1 Open Innovation

The open innovation paradigm treats research and development as an open system. Open Innovation suggests that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well. This approach places external ideas and external paths to the market on the same level and importance as that reserved for internal ideas and paths to the market in earlier era (Chesbrough et al. 2006).

4.5.2 Universal design/design for all

It is possible to design a product or an environment to suit a broad range of users, including children, older adults, people with disabilities, people of atypical size or shape, people who are ill or injured, and people inconvenienced by circumstance. This approach is known as universal design. Universal design can be defined as *the design of products and environments to be usable to the greatest extent possible by people of all ages and abilities*. Universal design respects human diversity and promotes inclusion of all people in all activities of life.

4.5.3 Concept design

Concept design (Story et al. 1998) focuses on how design can be utilised together with other disciplines to create new solutions to the global challenges faced by public and private sectors. Concept design is thus the discipline of creating concepts that answer the question “what”. A new concept is a solution to a problem that has not yet been solved or which so far has been solved in an unsatisfactory way. A concept can be a single product, a single service, or a combination of different products and services.

New technology can be an important part of a new concept, but a concept can also be created by making surprising new solutions based on well-known technologies or non-technological knowledge.

Creating new concepts and carrying out concept design require at least three different competences that must be combined in a new and untraditional way. The required competences are business, design, and social science.

5 Innovation in the health care sector today

A general observation shows that innovation is not perceived to occur to the same extent within the public sector context as it does in the private sector. Nevertheless, Publin has found that there are a lot of innovation activities taking place in the public sector in the European countries (Cunningham 2005). Publin has been a research project under the EU Fifth Framework Programme, studying policy learning and technical and administrative innovation in the public sector. The research project has found that even if there is no pressure to generate profit, as often found in private companies, public employees try to improve their ways of doing things. One of the drivers is political push for more effective solutions in the public sector. They allocate resources, create support mechanisms for innovation and facilitate processes which can lead to innovative solutions. While general profit may be a guiding principle in the private sector, minimizing costs and maximizing cost-efficiency seems increasingly important in the public health care sector.

Also in the health care sector, innovations in process, products and methods are developed continuously. At the intersecting point between new technology and increasing demands of effectiveness in the health sector, there is a great value added potential for the industry sector.

However, performing innovation in the health care sector is very different from innovation in the private sector, for which most of the innovation literature is taken from:

- The health care sector is public in the Nordic countries, thus often making the user and the buyer different actors.
- Contrary to individual consumers, the state does not have an unlimited demand for new processes, services or products. Increased consume of new health care services or products must be at the expense of something else. These considerations will not be taken into account by patients in the sector.

5.1 What makes the health care sector different?

Factors like demography, increase in chronic diseases and high medical costs are drivers for change in the health care sector. However, to explain the innovation processes and the success or failure of these, a more detailed picture of the sector is necessary. The sector differs from other economic sectors and innovators must know the field well in order to succeed. The following sections highlight distinctive features of the health care sector which innovators must be aware of during the innovation process.

5.1.1 Big sector, complex structures

The health sector in Europe is big and ever increasing in size. It comprises large organisational entities which can roughly be divided into four groups (Cunningham 2005). All of the four groups of activities can be performed by private or public institutions.

- Hospital activities: Includes short or long-term hospital activities of general and specialised hospitals

- Medical practice activities: Includes medical consultation and treatment in the field of general and specialised medicine by general practitioners and medical specialists and surgeons
- Dental practice activities: General or specialised nature
- Other human health activities: May comprise nurses, midwives, physiotherapy, acupuncture, medical massage etc.

In addition we believe it is important to add a fifth activity in the sector:

- Other material health activities: pharmaceuticals, laboratory services, radiography/x-ray functions, assistive technology etc.

The health care system is also very complex. Its operation is based on a web of structures, processes and patterns where the relationship between cause and effect is often uncertain. The level of complexity means that health systems are often very resilient to pressure, even where that pressure is one for positive change.

The large number and range of people employed in the sector can also be a barrier for innovation. For example, effective communication and structures for knowledge management may be difficult. Also, the sector has several professional groupings with their own perspectives, beliefs and interests. Internal politics and power struggles often reduce the innovative capabilities of an organisation. Also, particularly medical professions must be assumed to show resistance to undertake changes which may result in an increased probability of risk to patients or others.

The wide range of stakeholders in the health care sector means that there is a strong requirement to consult and review planned changes or modifications. All potential consequences must be mapped out before taking action. The complexity of the sector complicates this process, and the implementation of new solutions becomes a major management issue.

Further, the sector is prone to entrenched procedures and practices. It is a common perception that what has worked in the past works today. The sector has no widespread tradition for thinking in economic terms (although increased use of activity-based financing of health institutions may change this). Innovation can therefore be seen as a perturbation to systems that work. As a consequence, the sector may have become “reform fatigued” by re-structuring already, and people working within it are reluctant to welcome further change.

5.1.2 Mostly a non-profit sector

The health care sector is mostly a non-profit sector in the Nordic countries. This makes commercializing of new products or systems difficult and may be a hinder for companies who try to convince a hospital that a new solution will make the service more profitable.

However, the health care market in the Nordic countries is developing and gradually gets more traits of a private market. More suppliers of health care are now private. The patient is to a larger extent considered a customer. For example, in Norway the patient can choose freely among all hospitals when he or she has to receive a treatment.

The health care sector’s performance is not valued in terms of effectiveness and economic targets. Rather, the sector has a professional and public duty to deliver the highest possible standards of care. As a result, health is a major political issue and eventual shortcomings, medical malpractices and maladministration are given much

attention by the media. Consequently, public service managers and politicians are very aware of sector changes that may result in negative outcomes. This, and the fact that the public health care sector is under the close scrutiny of both politicians and the media, contribute to risk aversion and may be a hinder for innovation. One feature which may change this slightly is that the hospitals sometimes are being rated on their performance so that patients can see where they can obtain the best treatment for a certain condition. Performance targets may encourage actors to find new solutions and be a driver for innovation.

It is also a possibility that patients will choose to seek health care in another country. Health care might be better provided in another state, for rare conditions or specialised treatment. This may also be the case in border regions where the nearest appropriate facility may be situated in another country. In a recent report published by the Nordic Innovation Centre (Oxford Research 2009), the potential and barriers towards an open market for health services in the Nordic countries is being explored. Based on four case studies, the report finds that the health care systems in the Nordic countries share a number of both similarities and challenges when it comes to financing, maintaining and developing a public financed system with equal access for all citizens. Also, the mobility of both personnel and patients is becoming more common. Moreover, the EU integration will probably affect the Nordic health care integration, as it is likely that Nordic patients will choose treatment in other Nordic countries, when receiving health care abroad. Equally, there is a general lack of capacity in the Nordic health care sectors. These features make up framework conditions for further Nordic cooperation in the field.

5.1.3 The buyer is not the same person as the user

The health care sector is a hierarchical sector, with a complex web of users and buyers at all levels. How can an innovation product get access in a system where the user, and even not necessarily the buyer make the decision on whether an innovation product will be purchased?

There is not one customer in the health care sector. The users are as diverse as the innovations accommodated for the sector. Doctors, nurses, patients with all kinds of needs, administrative staff are only examples of different users.

This makes the market screening a complex process. Further, some user groups constitute a critical mass, while others are few and need individually adjusted products and services. This makes it necessary for companies to coordinate different products so that the customers constitute a critical mass. Too small markets remain uninteresting for both companies and investors.

The variety of users gives rise to some interesting conflicts. We can imagine an owner of a hospital (not the hospital administration), e.g. the five regional health enterprises in Norway. They have established a joint company: Procurement Services for Health Enterprises (PSHE), whose job is to coordinate and conduct national tenders on behalf of the regional health enterprises. They apply a common procurement policy, trying to cut the costs in the public health care sector considerably. The tool is joint purchase agreements. This means that even when an innovation of some kind is wanted by a hospital, it is most likely rejected by PSHE if the innovator is a small company, not able to offer large quantum at a low price.

Similarly, in a hospital, what one department wants is not necessarily what another department wants. The hospital administration wants few and large contracts. It is therefore difficult for small companies to win contracts alone, without forming partnership with bigger suppliers. And even when all users/stakeholders in a hospital want a new product, the hospital administration may not find place for it in the budget. Hence, there is a difference between the “user” and the “buyer”. For the former part to give acceptance, does not necessarily imply acceptance from the latter.

If a person with diabetes is satisfied with a treatment and finds that it is better than existing solutions, it does not necessarily mean that he can envisage using it in the future. Most often, the buyer is not the same person as the user in the health care sector. When patients are users, they have no technological or economical limits in what products they want to cover their needs.

Successful innovators therefore need to understand the decision procedures and administrative structures, in addition to reimbursement systems. These procedures and systems may vary from one country to another, which complicates the task.

5.1.4 Specific demands

Another barrier for selling a new product to the health care sector is that even when the sector decides that the product is needed – and the budgets allow it – the sector is subject to strong regulations – and this may complicate the purchase. All products must go through an extensive approval process before they can be commercialised. These demands for testing and documentation are often underestimated by companies and thus constitute a barrier for successful innovation. Another problem with the user-innovation model is that it can run into intellectual property rights protections.

5.2 Need for user driven innovation

Today, innovation in the health care sector is mainly driven by R&D. This is an important part of development in the sector and will also be so in the future. However, focusing on user/market needs can be a valuable supplement to the traditional innovation methods. Best practices and experiences from market oriented companies can be applied on the health care sector in order to provide better services and make better use of the available resources.

Over time it has become evident that if innovation investments are to lead to the desired results, they need to respond to consumer/user needs. This is becoming increasingly difficult as the internet and global markets leave the customers’ choice almost unlimited. Advanced consumer demands, knowledge about market needs and consumer patterns are thus important drivers for innovation. Most innovation surveys confirm that ideas that lead to innovations come from contact with the customer/user (Doblin Group 2003: http://www.cheskin.com/view_articles.php?id=3).

6 What characterizes user driven innovation?

6.1 A Definition of User driven innovation

User driven Innovation is the process of tapping users' knowledge in order to develop new products, services and concepts. A user driven innovation process is based on an understanding of true user needs and a more systematic involvement of users.

7 Source: Wise and Høgehaven 2008

The focus is to meet the users' need, needs which can be revealed by alternative analytical methods, and by the users themselves. The ability to see market possibilities in uncovered user needs, as well as the ability to create services or products to cover these needs, is increasingly important for a company to remain competitive.

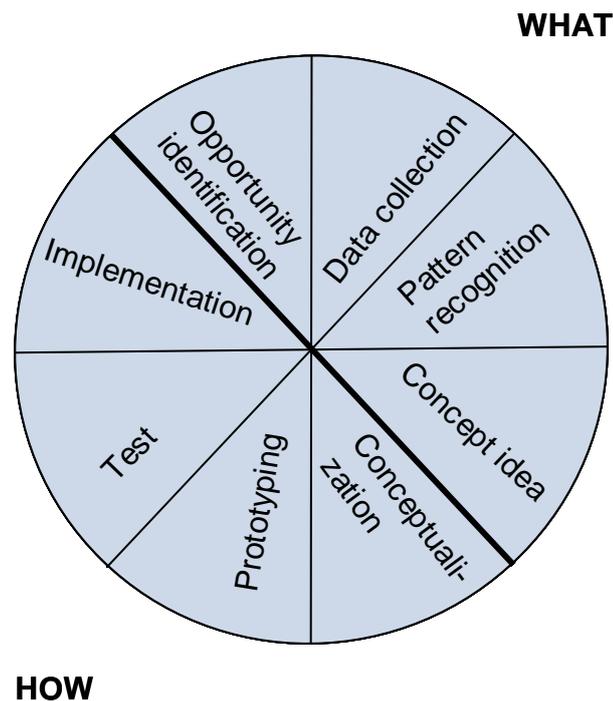
There are different theoretical perspectives on user driven innovation. However, there are several common features of this type of innovation which differentiate it from other types of innovation:

- **Strategic focus on consumer pull**, instead of focus on technology push. Companies strive to produce what the customer desires rather than only sell what they produce. The process aims at need-finding rather than problem solving
- **Revenue-enhancing activities** instead of cost-cutting activities by developing solutions that better meet consumer needs
- **Use of multiple skills and perspectives** in the innovation process. In addition to technical and business skills, ethnologists, anthropologists or designers can be incorporated in the team
- **More direct involvement of the user/consumer** in the innovation process through observation processes, user panels etc.
- **Requirements for an open and collaborative business environment** where flexibly structured companies allow usage of open source and multi-disciplinary methods

8 Source: Tema Nord, 2006

The Innovation Wheel (Figure 4.1) is a model for user driven innovation described by Wise and Høgehaven (2008), which can be used to describe a company's innovation process and the involvement of users throughout the process. We will later on use the wheel as a conceptual tool when we compare the methodological strategies and experiences from our pilot projects.

Figure 4.1 The Innovation Wheel



The Innovation Wheel divides the innovation process into two phases:

1. The WHAT phase: focuses on what to produce (opportunity identification, data collection, pattern recognition and finally a concept ideas step, where the patterns identified in the previous steps are transformed into new concepts (both physical and non-physical, new business models, an adjustment of an existing business model, or a new way of meeting users' needs).
2. The HOW phase: focuses on how to produce it (conceptualisation - i.e. describe ideas in detail in order to evaluate the economic potential – prototype, test – i.e. prototypes are tested by future users – and finally, implementation)

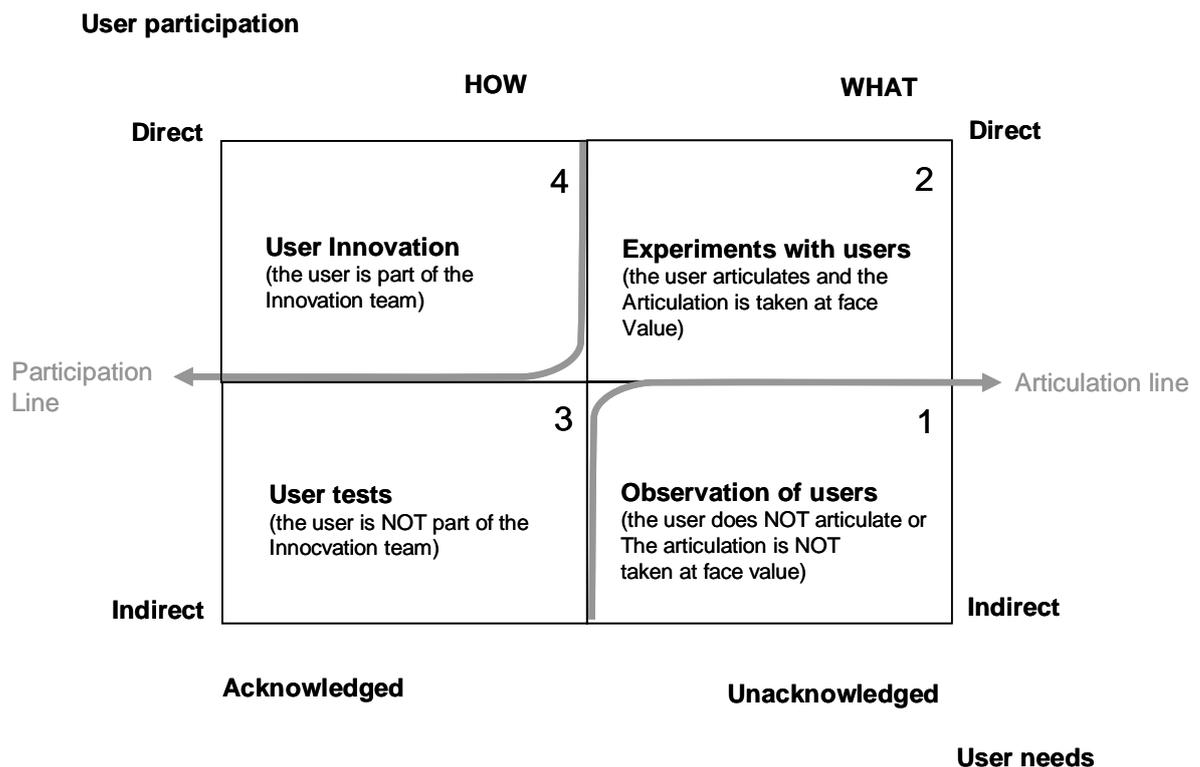
It is emphasized that all eight steps in the wheel are rarely included in an innovation process.

8.1 Two main directions in user driven innovation

Many methods have been developed and adapted to help designers to understand, empathise with, and quantify users' situations, through both direct user involvement and more indirect use of user data. These methods vary widely, with different goals and suited for use in different situations (Langdon et al. 2008).

Wise and Høgehaven (2008) describe a framework that can be used to map different user driven innovation processes. The starting point is that when users are involved in the process, it is important to distinguish between *acknowledged* and *unacknowledged needs* (i.e. there is often a gap between what people say they do and what they actually do in real life). It is also considered important to distinguish between whether the users are *directly* or *indirectly* involved in the innovation process. Finally, a third distinguishing is of great importance: whether the company is in the WHAT or in HOW phase. This is because companies employ different tools according to which phase they are in.

Figure 4.2 Framework for mapping user driven innovation processes



The two right-hand quadrants represent the WHAT phase, and the two left-hand quadrants the HOW phase. The upper-two quadrants represent direct user involvement, and the lower-two quadrants represent indirect user involvement. Likewise, the two left-hand quadrants represent acknowledged needs, and the right-hand quadrants unacknowledged needs. Later on in our report, after having presented the six pilot projects, we will identify where in this framework the different projects belong.

Quadrant 1 (observation of users) has users indirectly involved. Typical methods involving users here are ethnographic methods. Quadrant 2 (experiments with users) has users directly involved, but they are not part of the innovation team. Typical methods involving users here are personal interviews, role-playing and living labs.

Quadrant 3 (user tests) has users indirectly involved (they are not part of the team). Typical methods for involving users here are focus groups and different kinds of user tests. Quadrant 4 (user innovation) has users directly involved as company innovators or participants or team members. A method for involving users here is through lead users (von Hippel 2005).

The participation line distinguishes quadrant 4 from the others. In here, users are directly involved as innovators for the company or as a part of the company's innovation team. In the other quadrants, companies gain access to user knowledge by asking, observing or experimenting with users.

The articulation line distinguishes quadrant 1 from the others. In here, companies gain access to user knowledge without any articulation from users or without taking articulation at face value. Outside the articulation line, companies take articulation at face value (Wise and Høgehaven 2008).

Most approaches involve elements from all four quadrants in the figure. The users are involved in varying degree throughout a process. Anyway there are two main directions within user driven innovation, as it is implemented in the Nordic countries. The main

difference between these two directions, Lead-users and People-Centered Design, is the main drivers of innovation:

- A. **Lead-users.** In this approach the users themselves are responsible to articulate their needs, and to create new ideas and solutions. The project teams are facilitators in the process.
- B. **People Centered Design.** Several professions like anthropologists and designers are involved in the innovation process. The users are involved more as a valuable source of information than as a responsible creator.

8.1.1 Lead User Method

The Lead User method is built around the idea that the richest understanding of new product and service needs is held by just a few "Lead Users." They can be identified and drawn into a process of joint development of new product or service concepts with manufacturer personnel (Herstatt & von Hippel 1992)

Lead users are users whose present strong needs will become general in a marketplace months or years in the future. Since lead users are familiar with conditions which lie in the future for most others, they can serve as a need-forecasting laboratory for marketing research. Moreover, since lead users often attempt to fill the need they experience, they can provide new product concept and design data as well (von Hippel 1986).

Based on this Lead User methodology, von Hippel has also developed sets of toolkits that enable users to develop new innovations.

The toolkits are not the general purpose. Rather, they are specific to the design challenges of a specific field or sub field, such as integrated circuit design or software product design. Within their fields of use, they give users real freedom to innovate, allowing them to develop producible custom products via iterative trial-and-error. That is, users can create a preliminary design, simulate or prototype it, evaluate its functioning in their own use environment, and then iteratively improve it until satisfied (von Hippel 2001).

A Lead User method involves four major steps:

1. Specify the characteristics a lead user: Building an interdisciplinary team, defining the target market, defining the goals of the lead user involvement.
2. Identification of lead user criteria: Networking based search for lead users, Investigation of analogous markets, screening of first ideas and solutions generated by lead users
3. Lead user product concept development: Workshop with lead users to generate or to improve product concepts, evaluation and documentation of the concepts
4. Testing whether lead user concepts appeal to typical users

8.1.2 People centered design (PCD)

People centered design (PCD) has many names, and may e.g be referred to as Human centered design, User centered design. It has a long tradition, starting even before Henry Dreyfuss's seminal study *Designing for People* in the 1950s.⁵

⁵ Design Research, Methods and perspectives, Brenda Laurel 2003

PCD combines anthropology, sociology and design to identify opportunities and shape organisations, products and services to best exploit those opportunities.⁶

The methodology used is dependent on the task at hand, but the way the global design consultancy IDEO carries out the process, is loosely described with these five basic steps in “The Art of Innovation” by Tom Kelly, IDEO.

1. **Understand** the market, the client, the technology, and the perceived constraints on the problem
2. **Observe** real people in real-life situations to find out what makes them tick: what confuses them, what they like, what they hate, where they have latent needs not addressed by current products or services
3. **Visualize** new-to-the-world concepts and the customers who will use them
4. **Evaluate** and refine the prototypes
5. **Implement** the new concept for commercialization.

The users are involved in different ways depending on the task. According to a handbook made by IDEO⁷, the *observation* phase may include:

- Individual interviews and/or group interviews (experiments with users)
- Meeting people and immersing oneself in their context (observation and experiments with the user)
- Self-documentation (experiments with the user)
- Community-driven discovery where members of the community are researchers. (lead users)

The visualization phase may analogously include:

- **Participatory co-design** – The team co-designs with people from the community (Lead Users/Tests)

This method, which includes customers on the development team to participate in the actual design of a product or a service, is increasingly in use. Several companies now bring together designers, engineers, consumers and internal business clients to participate in co-creation exercises and activities.

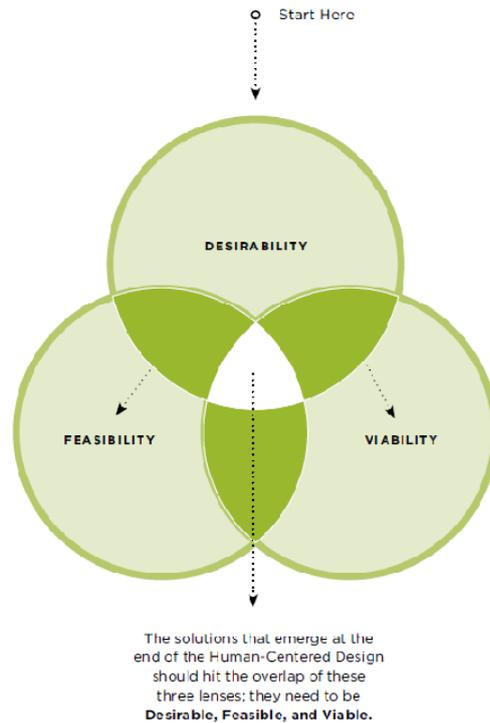
- **Empathic design** – The team creates solutions through empathy based on deep understanding of the problems and realities of the people they are designing for.

To succeed in user driven innovation, it is important to understand the following three factors: Uncovered needs, market possibilities and technology (FORA 2005). This is described as Desirability, Feasibility and Viability by IDEO⁸.

⁶ GLOBAL WATCH MISSION REPORT, Innovation through peoplecentred design – lessons from the USA, OCTOBER 2004

⁷ Human Centered design, an introduction 2.edition. IDEO

⁸ IDEO, Human Centered Design, An introduction. 2nd edition.



8.2 Understanding possibilities in the market

Besides having a thorough understanding of user needs and desires it is necessary for the companies who compete within user driven innovation to understand the actual possibilities in the market. The company must be able to conduct analysis on market trends and tendencies and they must be able to calculate the critical mass. In addition, it is an advantage if the company is able to predict or see through competing firms' plans.

The health sector is often urged to change as a result of reforms, medical development and new concepts for health care. Companies and health institutions operating in this field must understand where the market is heading and understand what it means for the users. Innovators must thus be able to predict the future; which needs that have to be filled, who the users are and which products they will need.

Understanding the needs of the market, however, does also include understanding the accessibility of the market. Even though a new idea is needed by the users, there is not always a guarantee that the product may finally enter the market. There are several potential barriers regarding for example approval of the product and specific financial mechanisms that one must overcome in order to succeed. This is particularly important in the health care sector. Here, one must understand the interaction between hospitals, doctors, health care policy and plans, insurance regulations etc. For example, as will be discussed in section 3.1.3, the buyer of a new product in the Scandinavian health care sector is not the same as the user of the product (who may want or need the product in the first place). The implication of this is that an original product may not become integrated in the current public funding/reimbursement system (FORA 2005).

8.3 Understand new technology

Firms who focus on user driven innovation typically do not develop radical new technology. The need for research and technology competence is thus not that big.

However, it is important that the company scans all new research results and new technology on the relevant field, and that they know how to make use of it in new products. Also, when the company follows the players who develop new technology closely, it is easier to identify potential institutes or the like to cooperate with in order to create exactly the solution needed (FORA 2005).

9 Status: User driven innovation in the health care sector

In this chapter we use Denmark and The Centre for Information Technology Research in the Interest of Society (CITRIS) at Berkely in California, as examples of actors “leading the way” in user driven innovation. They are both good cases when we want to study how it is possible for an entire nation to put user driven innovation in the front seat (Denmark), and how it is possible to create a broad cooperation between academic and commercial institutions in order to promote user driven innovation (CITRIS). We define Denmark and CITRIS as state of the art examples of user driven innovation. This does not mean that we have evaluated the innovation-products that have been undertaken, but it means that we consider Denmark and CITRIS examples of how user driven innovation can be a result of a clear and thoroughly strategy, with a long-term focus and financial commitment from the sponsors.

In addition to a thorough description of the Danish case, we also present shortly the status in the two other Scandinavian countries.

9.1 Status in the Nordic countries: Denmark sets an example

According to Pro Inno Europe⁹ both Denmark, Sweden and Finland rank among the top innovative countries in Europe. Iceland also used to be leading in the field, but due to the financial crisis which has struck Iceland, the country now ranks middle, together with Norway, as a moderate innovator. When it comes to user driven innovation, Denmark has clearly followed the most determined path. Whereas the other Nordic countries increasingly see the importance of and include user driven innovation in strategies etc., Denmark has made user driven innovation national policy. The Danish initiatives have strong financial backup from the government and there is a push for user driven innovation from the state level.

In Denmark, user driven innovation is established as national policy. As the first country in the world, Denmark launched a targeted effort to promote user driven innovation in the private sector and the public sector. The aim of the programme for user driven innovation is to develop and test new methods for gaining improved insight into the needs of the users, thus contributing into making Denmark one of the most innovative countries in the world (DECA 2007)

The programme for user driven innovation has a yearly budget of DK 100 million and runs from 2007 to 2010. The programme is administered by the Danish Enterprise and Construction Authority (DECA), which is part of the Ministry for Economic and Business Affairs. The Ministry makes no secret of being inspired by the High Tech Industry in Silicon Valley, who has developed systematic methods for this over a long time, some of which are now slowly emerging in other sectors as well.

⁹ PRO INNO Europe is an initiative of Directorate General Enterprise and Industry which aims to become the focal point for innovation policy analysis, learning and development in Europe, with the view to learning from the best and contributing to the development of new and better innovation policies in Europe.

The Ministry of Economic and Business Affairs point at three challenges when Denmark will try to copy the practice of some of the world's leading agents in the field:

1. Danish companies have problems in recruiting newly-educated people with sufficient, good competence on working with user needs and user understanding
2. Danish companies cooperate to a lesser extent with scientific institutions about user needs and understanding, compared to what they do regarding technology. It is not because the companies believe such cooperation is not needed, but because there are no easy accessible and competent collaboration partners at reach
3. Foreign examples on advanced user driven innovation usually exist in large companies or in small "cutting edge enterprises" that take part in competence clusters where companies and scientific institutions take part.

The Danish Ministry of Economic and Business Affairs suggested 8 specific initiatives in order to confront the three challenges, and raise the work on use driven innovation to further heights. The initiatives can be categorized within three areas:

1. *Education and research that support user driven innovation:* establishing a new multidiscipline education supporting user driven innovation and a new research environment within disciplines supporting user driven innovation, teaching support user driven innovation in the entire education system (e.g. establishing user driven innovation courses in many business-related educational programmes and in advanced studies, establishing a supplementary education programme that supports user driven innovation), establishing an international innovation index, and actively work for an allocation of funds to building and spreading knowledge about user driven innovation in relevant EU-programmes (including the seventh framework programme).
2. *The spread of user driven innovation:* launching a major effort to optimize the use of resources in companies and spread knowledge about user needs and user driven innovation processes in the entire business community, and promote cooperation projects between public and private sector (including the establishment of a pool for co-financing of user driven innovation projects in the public sector).
3. *Establishing networks:* establish independent network organizations and smaller courses for network activities.

The activities in the Danish programme for user driven innovation are grouped in three areas: strategic, regional, and other important areas. *The strategic effort* concerns three broad thematic areas: (1) areas where Denmark has particular business skills, (2) cross sector issues relating to social problems with promising market potential, (3) welfare areas, in particular where the citizens interact with the public sector. Fifteen projects are currently running. Several of them are related to the health sector.

- *A coherent patient course:* The aim of this project is to optimize the patients' experience throughout the health care sector. This includes creating a coherent patient course, focusing on better information and communication. The starting point of the project is to conduct observations of the meeting between the health care sector and users at Odense University Hospital. It is not only about focusing on development of new technology, but more about development of new organizational processes in order to create a coherent patient course. The tools are tested in real-life treatment course, including cancer, diabetes and heart patients. The project was given 5.8 mill. DK. It is a joint project between Odense

University Hospital and Syddansk University, Dansk Sundhedsinstitut, Huset Mandag Morgen, Odense Kommune, Kræftens Bekæmpelse, Diabetesforeningen, Hjerteforeningen and NeoProcess. The commercial aspect is considered to be good as several private companies are included.

- *Disability – a resource of knowledge for better assistive technology:* Many disabled people are dependent on various forms of assistive technology in their daily life. But nurses, other helpers and family members must also handle these from time to time. Existing assistive technologies are often not used at their full capacity, either because the manuals are too difficult to understand, or because the assistive technologies are not optimally designed for the users' demands and challenges. The primary aim of this project is to involve users in the development of new assistive technologies, and to develop, systematize, document and pass on knowledge about new methods for user driven innovation. The project aims at showing the effect of user driven innovation in reference to strengthening companies' business development. What's new in this project is that the users of these assistive technologies at all levels and with all possible types of both physical and mental disabilities are actively and centrally involved in a coordinated and systematic effort, so that their implicit knowledge about these assistive technologies can be used in developing new and better products. The users are put together in so-called "user communities", where also the companies that develop the assistive technologies are invited to participate. The project is led by Alexandra Instituttet, and has 18 collaboration partners from all sectors of society. The project was given 6 mill. DK over a 2-year period.
- *Tele homecare technology for COPD-patients:* The aim of this project is to develop technology that will increase patient empowerment, and provide them greater freedom in everyday life. The rationale is that surveillance and treatment can be provided in their homes. At home, they shall be able themselves to measure values and answer questions that are transferred via an electronic journal from the homecare nurse to a common portal, where hospital staff has access. The starting point of the project is desire of the COPD-patients to contribute in their own treatment. The needs of patients, relatives, and health care professionals, will be investigated through ethnographic studies, including observations in the patients' homes. Aalborg University leads the project, with 12 collaboration partners from several sectors. The project was given 5.8 mill DK over a 3.5 years period.
- *Healthy meals to hospital patients:* Not all patients have the same needs and demands for meals. For example, kidney patients have special needs for certain nutrients and food types. This has so far not been taken into account in the food production in Danish hospitals. This means, effectively, that patients have not been given the food they should have during treatment. This is not due to lack of resources in the hospitals, but due to lack of knowledge about the patients' needs. In this project, the staff at hospitals (including kitchen personnel, nurses, nutritionists and physicians), relatives and home care nurses, are included. They shall find out what's good to eat for the patients. The project is led by Fyns Erhvervscenter/TCM Denmark and has four collaboration partners. The project was given 3.4 mill DK over a two-year period.
- *A good life in old age:* The aim of the project is to increase the quality of life for residents in nursing homes. The project will develop solutions to make life easier for the elderly. The majority of the elderly that moves into nursing homes are

physically and mentally bad functioning. They are often not capable of choosing how their everyday life should form itself, and are therefore depending on others to understand their need (and try to meet them). The project is conducted at Denmark's largest nursing home (Pleiecentret Sølund in Copenhagen), which has 350 residents. User needs will be investigated through anthropological field studies and qualitative analysis. The project will follow the residents and staff, and make daily life observations in the nursing home. Focus is on situations that involve nutrition, medication, physical activity and care. In addition, the study participants will be assigned to so-called "co-creation workshops", in which residents, relatives and staff will be present and involved in specifying new solutions. The project is led by Sundheds- og Omsorgsforvaltningen in Copenhagen county. Collaboration partners are Microsoft, Dansk Industri, LederForum, IT-brancheforeningen, Dansk Rehab Gruppe and Aalborg University. The project was granted 5.3 mill. DK over a 3-year period.

- *Healthy "roads"*: This is a "diet and exercise" concept for the transport sector. Employees in the transport sector are struggling with obesity. The project wants to disclose the thoughts and habits that are associated with meals during working-time. How is it possible to make the drivers eat healthier, and be more physically active? The aim is to use the results from this study to create new diet- and exercise products for the employees in the transport sector. The project will investigate the lifestyles of the transport employees through ethnographic studies, and also through interviews with stakeholders (e.g. drivers and transportation companies). These studies will document food habits and -patterns of transport workers. As part of the project, ethnographers will join the drivers in their work, and analyse their behaviour. By observing and exploring the drivers' behaviour on the roads, the ethnographers will identify the drivers spoken, as well as unspoken, problems in everyday life. The project is led by PrimusMotor with six collaboration partners. The project was given 1.9 mill DK over 18 months.

The regional effort ensures that knowledge of and experience with methods for user driven innovation is disseminated throughout the country. Regional actors in each of the country's six geographic regions organise a yearly project in their region. In 2007, several of these were related to the health sector. The third area of effort covers applications from projects that work with *any other important issues, businesses and institution*, not covered by the strategic or regional effort.

As we saw in the projects described above, the Danish projects are much in line with the guidelines from the innovation literature. Users are deeply involved in the projects, considered "experts" on their daily life and much of the treatments they can be given. However, professionals are also involved in most projects as users.

The newly launched programme for user driven innovation in Denmark does not represent something completely new. User driven innovation has for a long time been present in Denmark, forming a solid ground for Denmark to lead the way among the Nordic countries, representing the Nordic state of the art. We distinguish between two types of state of the art (or best-practice) user driven projects: established best-practice and new state of the art projects. The first refers to e.g. companies that have been working on user driven integration in innovation processes for a long period, and the latter refers to new research and/or development projects, that sets new standards and explores new ground for user-involvement and user driven innovation. Here are some examples of both types from Denmark.

Established best practice

- *Coloplast*: The users have always been at center for Coloplast. Ever since a nurse in 1953 invented the world's first ostomy bags for her cancerous sister, and another nurse later on persuaded her husband in putting money into the production of this, Coloplast's businesses have been driven by user needs, and have had tight relations to nurses as well as patients or users. This business culture has among other things, led to the involvement of ostomy nurses in the development of the company's ostomy bags. In Coloplast's 50-year anniversary in 2007, all 7500 employees in the company visited a user, and observed the everyday life for the user through anthropological methods. The intention was to identify new areas of innovation and/or business.
- *Radiometer*: The hospitals in Copenhagen county do not own the equipment they use when analyzing patients' blood. Rather than investing extensively in buying equipment, the county pays a fixed price per analysis. Radiometer Denmark is responsible for the instalment of machines, maintenance and education of hospital staff. A procurement agreement has been followed up by a cooperation agreement, leading the way for an extended collaboration between the county's hospitals and the provider, i.e. testing and developing new equipment. The employees of Radiometer are allowed to function as "interns" in hospitals, so that they can gather inspiration for development of new and improvement of existing instruments, in the same way that the company can demonstrate instruments for their customers at the county's hospitals. It is an advantage for Radiometer to have an ongoing dialogue with professionals at the hospitals, who are users of their equipment. It is an advantage to be able to demonstrate, test and develop the instruments in proper environments (FORA medico report).
- *The Danish Service Delivery System (Hjælpe midde linstitutet)*: The Danish Service Delivery System develops and passes on knowledge (e.g. through education, lectures or journal articles) on whether, and how, assistive technology and other technological solutions can contribute so that people with functional disabilities can exploit their full potential. The institute has a department that tests and try out products. They know the needs of users and nurses, and can test and offer guidance on security, durability, ergonomics and functionality. The institute can also do a preliminary test of a product and thereby spare the producer for the possibility that an almost completed product must be changed in any basic areas (FORA Medico report).

New state-of-the-art projects

- *ISIS-Katrinebjerg - Great investment in health care informatics, interactive buildings and software*: ISIS is short for Interactive Spaces, health care Informatics and Software development - the three target areas that ISIS aims at. Pervasive health care research is in focus, e.g. user-centred innovation methods are used. It holds two perspectives as research area: One is research and development of new health-technologies based on pervasive computing technologies. The other is research on new ways of organizing the delivery of health services in collaboration with citizens, the public health care sector and private companies. The purpose of ISIS is to create effective and innovative competence building (public and private) in the areas of interactive spaces research, health care informatics and software: 1) Interactive spaces, 2) Pervasive health care, 3) Software. The three target areas have been chosen on the basis of two factors: partly a business consideration, partly the research competence at

Katrinebjerg. Interactive spaces research and pervasive health care are based on a comprehensive fact-finding work by two think tanks set up by the regional IT council of Aarhus. The software development is a cross-sector target area developing underlying technologies, among other things for interactive spaces and pervasive health care research.

- *Centre for Pervasive Health care (CfPH) - applying pervasive computing within health care:* CfPH is an interdisciplinary research centre dedicated to design, develop, and evaluate pervasive computer technologies for health care (and is connected to the ISIS project). CfPH consists of a multidisciplinary team of computer scientists, physicians, nurses, information and media scientists, industrial designers, engineers, and ethnographers, all working towards developing smart technology and new working environments that may improve treatment and care of patients. The centre also engages and brings together companies in the health care segment, such as companies developing medical equipment, electronic patient records, and health care services.
- *maXi-project – ambient health care for diabetics:* maXi works with design of information services supporting diabetics' self-regulation in their everyday life. The overall research aim is to get knowledge on barriers and possibilities of delivering digital health services. The project works with development and testing of digital community services for diabetics in a 'living lab' in Skagen in Denmark. They try to understand community related barriers that are important for diabetics' self-regulation and quality of life and the possibilities and problems related to the e-support of such barriers. The project is organized as a co-operation between researchers from Aalborg University (from the Department of Communication, the Department of Development and Planning and the Department of Health Science and Technology), diabetics and their families (12 families participating actively in the development and testing of digital services), physicians, patient organizations, medico industry and software enterprises. The Project is sponsored by the Danish Enterprise and Construction Authority.
- *Design School Kolding (Robots: Blood):* A number of medical conditions require continuous monitoring with day patients returning to the hospital for regular check-ups. A possible solution to the future need for more blood tests is to introduce blood machines, or blood robots in hospitals. Students at the Design School Kolding are helping to develop ways that machines can take blood. This will free bio-analysts from a number of work related injuries and let them concentrate more on analysis and patient care. The project looks at how developing a user- and innovation driven teaching methodology can provide answers to some of the wider technological and ethical issues in design.
- *Odense University hospital - Everyday challenges as inspiration for innovation:* Besides the patients, a broad range of professionals are everyday users of facilities and equipment in hospitals. In a questionnaire, the administration at Odense University hospital asked the hospital staff for ideas for solutions of small and big problems in their everyday working life. 4000 questionnaires were received, and 300 of them contained tangible ideas for improvement. Based on this, 26 business cases were developed. One of the problems that the administration became aware of, was a large number of sick leaves among the hospital's service employees, based on strain injuries in arms and back, due to heavy work when transporting in-bed patients. A service-leader suggested inventing a bed with a motor, and the administration did just that. Interviews with nurses and social workers have been

performed with the purpose of identifying whether there are elements with the personnel's work by the bed that can be eased by changing present functions, or adding new ones, so that the patient care can be optimized. Different needs among professional groups have been categorized and prioritized, and as a result: the specification for the new bed (besides that it can drive by itself) also contains a demand for surface treatment with bacterial rejection materials. Another project involves a washing carriage for intimacy care for intensive care patients. At the intensive care departments, a bed is usually surrounded by machines and wires, with limited space for intimate care. Therefore, the hospital joined forces with Knud Holscher Design in developing a new washing carriage for intimacy care that could better deal with nurses' and patients' needs. In the project, it is focused on how the physical size of the carriage can be kept at a minimal level, due to lack of space by the bed.

9.1.1 Innovation in Norwegian health care sector

In December 2008, Norway got its first White Paper on innovation policy, called "An innovative and sustainable Norway". The main goal is to put innovation on the top of the political agenda. The headlines in the White Paper include:

- Knowledge and competence
- Innovative undertakings
- Start-up and growth
- Research and development
- Innovation in the public sector

The Ministry of trade and industry describes the White Paper as a way of setting out "the Government's aim of establishing favourable conditions for competitive enterprises throughout Norway and developing a society where we provide for our citizens' needs while maintaining a strong resource base for future generations. The key goal is to have an optimal level of wealth creation, while reducing the strain on the environment. The paper highlights the importance of focusing on innovation in both the private and the public sector".¹⁰

A new Norwegian health reform, the Coordination Reform

The Norwegian government, by the Minister of Health and Social Affairs, launched in June 2009 a new health reform, a coordination reform, for the health service.

In Norway there is a lack of contact between hospitals and local authorities. This forms the principal obstacle to making the health service even better. The new reform aims at solving this and at coordinating the health care on the basis of existing systems, not in spite of them.¹¹

Need-driven innovation program

The Ministry of Trade and Industry and the Ministry of Health and Social Affairs have launched a joint ten-year programme for need driven innovation. The aim of the joint effort is to strengthen public-sector research and development in the health sector. With

¹⁰ www.regjeringen.no

¹¹ <http://www.regjeringen.no/en/dep/hod/kampanjer/the-coordination-reform.html?id=524777>

its more than 300 000 employees and investments of over NOK 150 billion, the health sector may well be Norway's most important potential source of innovation.

The Regional Health Authorities (RHF), puts innovation at the agenda

Based on The Ministry of Trade and Industry and the Ministry of Health and Care Services cooperation for needs-driven innovation, the Regional Health Authorities have established an action plan due to innovation and industrial development in the norwegian health sector.

Innovation facilitators

Technology transfer offices (TTO) - encourage entrepreneurship and support spinoffs from the university hospitals through grants, advisory services, pre-seed funding and equity investment. The TT offices connect researcher with market-oriented partners.

InnoMed - is Norway's competence network for needs-driven innovation in the health sector. The network is firmly rooted in the sector. InnoMed is established and located under The Directorate of Health, by the commission the Ministry of Health and Social Affairs. The Directorate of Health is a specialist directorate and an administrative body under the Ministry of Health and Care Services and the Ministry of Labour and Social Inclusion.

9.1.2 Innovation in the Swedish health care sector

In Sweden, Vinnova has been given a special responsibility in supporting and encouraging need-based research and innovation. Need driven innovation is a main theme in the whole organisation. When it comes to health care, two important programmes focus particularly on solving tomorrow's challenges for the sector – based on need driven methods.¹²

New Tools for Health

New Tools for Health is a programme which involves cooperation among people with sound knowledge of needs and future markets, researchers and the business sector. The idea is to bring together people with demands, problem-solvers and individuals who are good at commercialising ideas. This way, support is given to the whole process from needs to ideas, development and commercialisation until the finished products and services reach the market. The programme yearly finances projects for six million SEK.

In particular, the projects within the New Tools for Health programme seek to:

- Support need driven research in home-based health care and community care
- Create innovative encounters between care providers with knowledge of future challenges, researchers with the ability to devise solutions and businesses that can commercialise them

¹² For more on the Swedish case, see Wise and Høgehaven 2008.

- Capture solutions to common problems in health care and community care from people who are confronted with them every day¹³

Innovation for the future health

The programme Innovation for the future health has been initiated by Vinnova in order to make use of Swedish research with high scientific or technical quality by financing new and innovative ideas. The points of depart are expected needs within the health care sector: What needs will there be for prevention, diagnostics, treatment and care? What characterizes the future patient/user/client? Which new products and services will be needed?

The programme will continue until 2013 and has an overall budget of 600 million SEK.

Exploring Crowd Sourcing

At the time of editing this report, there is a Nordic sister project running, also focusing on exploring user driven methods. The project is run by Medicon Valley in the Örestad region and has cooperating partners in Norway, Sweden and Denmark. This parallel project has a slightly different approach. Instead of evaluating the use of different methods in a range of pilot projects, it investigates how the method crowd sourcing can be used within the health care sector. This method has been applied in several pilot projects in various parts of the sector to see how it works and to map out the adaptations that have to be made in each particular case. The project is expected to end in autumn 2009.

9.2 Other countries leading the way: Berkeley – CITRIS - Delivery of Health Care

The Danish strategy for user driven innovation is inspired by the High Tech Industry in Silicon Valley. But to the best of our knowledge, the most comprehensive work within user driven innovation for the health care sector in the US is found at Berkeley, University of California, in cooperation with their public and private cooperation partners.

The Center for Information Technology Research in the Interest of Society (CITRIS) “creates information technology solutions for many of our most pressing social, environmental, and health care problems”, the center states at their homepage.¹⁴

CITRIS facilitates partnerships and collaborations among more than 300 faculty members and thousands of students from numerous departments at four University of California (UC) campuses (Berkeley, Davis, Merced and Santa Cruz) with industrial researchers from over 60 corporations (e.g. BroadVision, Ericsson, Hewlett-Packard, IBM, Microsoft). Together the groups are thinking about IT in new ways. They see solutions to many of the concerns that face all of us today, e.g. simplifying health care delivery and developing secure systems for electronic medical records and remote diagnosis.

By the late 1990s, engineers within the UC system realized that the real opportunities for impact in research lay not just in *developing* new and innovative technologies, but in

¹³ <http://www.halsansnyaverktyg.se/en/about-us/about-us>

¹⁴ http://www.citris-uc.org/research/health_care

applying these technologies to areas of society where they were most likely to improve people's quality of life. The result was a multi-disciplinary institute that would, literally, use information technology research in the interest of society. Below, we provide some examples of the health related innovation projects at CITRIS.

The innovation activity at CITRIS is more product and technology based than the efforts in Denmark. Lead users, defined in line with von Hippel's definition, are to a higher extent employed, and the patient's themselves (although considered the end consumers of new products) are kept at a more distance than in Denmark.

Under we have listed some examples of user driven innovation projects conducted at CITRIS:

Telemedicine: Bringing Health care to the patient

The project is aimed at helping improve medical access for those in remote regions (or at accident scenes, prisons, and in the homes of the patients) through telemedicine. The first institute that participated in the project was a small hospital in Colusa County that had nearly lost its obstetrics department when doctors were no longer comfortable practicing without the backup of specialists in emergency situations. CITRIS linked a fetal-monitoring device in the Colusa hospital to UC Davis and then later added a tele-ultrasound so that in difficult cases obstetricians could get real-time advice from on-call specialists in Davis. Apparently, this linkup gave the obstetricians the confidence to keep delivering babies in Colusa County.

Since then, the technology of telemedicine and remote health care has come a long way. High-resolution images zoom out to include the patient's entire body, or zoom in to magnify a small part of it, have permitted physicians at a distance to do comprehensive exams, and even surgery. CITRIS researchers are now developing a number of devices that will bring doctors, data, and labs closer to the patients who need them. For example: cell phones are developed, that will eventually allow for magnification of a sufficient enough resolution for the examination of single red blood cells and potentially the identification of malaria-infected cells. Such a device would allow medical professionals and others who are far from any health care facility to send in data that could result in an inexpensive and nearly instant diagnosis. Bringing the health care services to where the patient is, will be especially important by the baby boom generation, which wants to age at home and not in nursing homes or in the hospital.

Serious play: Using games to screen for fragile X

The aim of the project is to make a fun game that will screen pre-school-age children for fragile X syndrome (FXS) and provide therapeutic intervention targeted at improving visual attention in those children. FXS is the most common form of inherited mental impairment; its symptoms range from mild learning disabilities to severe mental retardation and autism-like behaviours. DNA testing methods are available, but FXS is often undiagnosed until the age of 2 or later unless family history of the disorder exists. Administering the tests that reveal FXS requires professional oversight, which can be difficult to obtain in underserved communities – children here often go undiagnosed until elementary or middle school. If identified earlier, these students would qualify for intervention services and medical help that could make a big improvement in their lives and the lives of their families.

The method that is used in the project is to use infrared eye tracking technology to examine the development of these abilities in infants with and without FXS. Research has shown that attention-based position tracking is impaired in infants with FXS. In

November 2008, a fun-to-play computer game that could be distributed at low costs should be introduced into a pre-school in East Oakland's Foothill Square Shopping Center. The game will be played on a large touch-screen monitor. Young children who cannot keep track of the character in the game, or who do not make progress as they practice, should be checked for developmental delays, including FXS.

The project staff (including a professor/media artist and a paediatrician) is collaborating with an author/filmmaker, who will help weave culturally relevant narratives into the game.

In this case, the users are the children and the teachers who run the games in their classrooms. The children will use the game for a week, then the project staff will work on development for a week, then back to school for a week, and so on. This back-and-forth collaboration is called "co-design" or "participatory design". The game could be used as a "screening tool", not a formal "diagnostic test". Those identified as potential FXS cases by the game would be referred for further testing.

Another game under development is Balance FX, directed towards adults with FXTAS, a condition that develops in some older carriers of FXS. The game requires a mixture of yoga-like physical control and mental attentiveness. The game was originally developed as a fun work of art – not as a diagnostic or clinical tool. However, during a lecture at UC Davis, the inventor of the game, recognized its potential to help older fragile X carriers.

Bloody small microscope on a phone

The CellScope is an ordinary cell phone with an optical microscope attachment, which would allow it to serve as a necessary device in remote medical clinics.

The project has its background in a paediatric haematologist's work with young patients undergoing chemotherapy treatment for cancer. For these children, frequent trips to the hospital to monitor their blood levels can increase an already huge burden – especially for families living far from their doctors and medical centres. And a blood test visit to a hospital can expose immune-suppressed chemotherapy patients to dangerous pathogens, risking their health to further dangers.

A group of bioengineers at UC Berkeley is developing a simple instrument that can easily and inexpensively monitor patients' blood from home. The device fuses two straightforward technologies – a camera-equipped cell phone and a basic optical microscope – into one powerful tool: a portable microscope that can send annotated images of blood cells to labs or medical centres for analysis.

Hopefully, in the future, patients will be able simply to prick themselves for a blood sample, insert the sample into the microscope, and push a button to send a microscopic image to the lab. After doing blood counts and other tests, the lab would send relevant information back to the patient and to the patient's doctor. This means that chemo patients can see whether or how soon they need a transfusion and how careful they have to be to avoid potential sources of infection.

All the pieces used in the project were already there: cell phones, microscopes, and cameras are all ubiquitous in society as ordinary technologies. But put together, something completely new emerges.

9.3 How can market principles be adapted to the health care sector?

User driven innovation can be a useful supplement to research driven innovation in the health care sector. However, the public sector in general and the health sector in particular differ in important aspects from private sector and we need to investigate how the concepts and tools for innovation presented above can be applied in the best manner. By using the notions and methods from the private sector innovation literature, we can better understand public sector innovation. But to what extent can the results be applied in the health care sector? Which considerations have to be made in this particular sector? What are the innovation dynamics? What are the drivers and barriers, and where are the bottlenecks? Which methods are the best suited to scan users' and patients' needs?

These are all important questions which must be addressed in order to take advantage of user driven innovation in the health care sector.

10 What can we learn from six Nordic pilot projects?

In order to get a better understanding of how user driven innovation can be exploited in the health care sector, we have conducted six pilot projects within the field. The pilot projects will also be used in order to develop a “tool case” for user driven innovation which other actors working in or for the health care sector can make use of.

The pilot projects and experimenting activities have been rooted in InnoMed (Norway), Ferring (Denmark), Herlev hospital (Denmark) and Lund University hospital (Sweden), with support from SINTEF (Norwegian pilot projects) and New Insight (Danish and Swedish pilot projects). Econ Pöyry has supported all pilot projects, but the health care organizations themselves have been responsible for implementing the pilot projects.

The pilot projects have focused on different illnesses and patient groups. The common denominator has been attempts for active or direct involvement of the users – the patients or the personnel. In the next sections we describe the pilot projects, with our main focus on 1) who the users were, 2) what methods that were adopted in involving the users in innovation processes, and 3) results/learning points from the projects. Moreover, we will investigate how the experiences from these projects are compatible from the theoretical approach to user driven innovation from chapter 2, where we described the Innovation Wheel and a framework for mapping user driven innovation processes.

There is a great variety of needs and types of users. Some projects aim at improving present products, other at putting existing tools into new high technological products. Others are more focused on identifying new ways of conducting treatments, e.g. more process-related.

It is the latter that has been the main focus in the Norwegian and Danish/Swedish pilot projects that we describe in this chapter. In the six pilot projects that have been conducted, there is only one project that has resulted in new technical devices. However, the goal in the pilot projects has mainly been to test various methods and explore the use of these within the health care sector.

The state-of-the-art projects also differ as regards users: in some projects, the users are technological experts, in other projects the user is more the common man: an obese truck driver or an old person in a nursing home. The users in the pilot projects have been a combination of three groups:

1. People suffering from a given disease (e.g. hospital patients, patients provided treatment at home, or people who use a form of assistive devices)
2. The professional staff providing these services to the users
3. Other people who are indirectly affected by a health problem: family members, colleagues, employers, etc.

In all the pilot projects, the primary users are the patients themselves. However, because some patient groups (e.g. children and people with dementia) have difficulties raising their opinion (or because it is ethically problematic), the voices of the secondary users have sometimes been used as substitutes for these groups. Therefore, approaching the “lead user” concept of Von Hippel is difficult. Another difficulty with the “lead user” concept in health care innovation is that although the users are represented in the

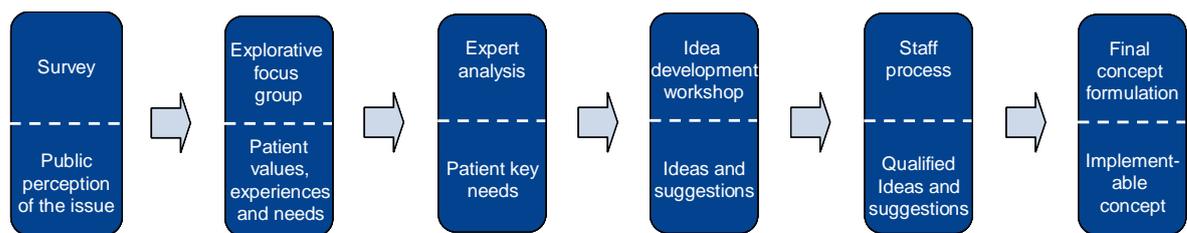
WHAT phase of the Innovation Wheel, e.g. the creative phase/opportunity window, technological constraints as well as what we may label the “window of realism” make it difficult for these groups to participate in the HOW phase, where a product goes from idea to implementation.

10.1 The Danish/Swedish pilot projects

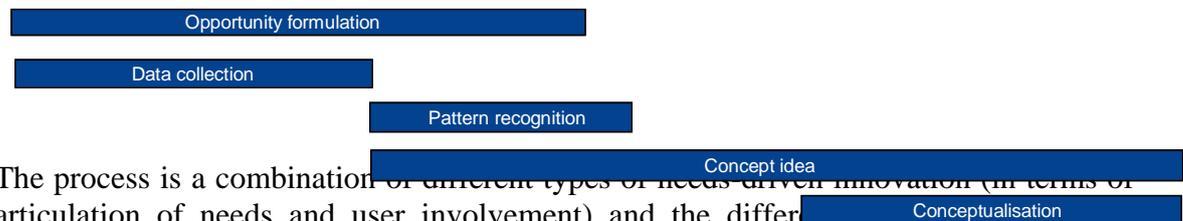
The three Danish and Swedish pilot projects were structured by the same innovation model – a model first developed in the context of the “citizen-driven innovation” project *Borger 2030* (www.borger2030.dk). The model was redeveloped to be tested in the context of the health care sector and then further adapted to suit the characteristics of the specific user groups and organisational circumstances in the three pilot projects. In the following sections, each of the three pilot projects are described in further detail followed by a presentation of the results from the projects. Finally, two models for good practice in user driven innovation in health care are presented based on the learning points.

The common innovation model of the pilot projects may be outlined as follows:

Figure 6.1 Project innovation model and methods



“Innovation wheel” phases



The process is a combination of different types of needs driven innovation (in terms of articulation of needs and user involvement) and the different phases of the innovation wheel shown below. The innovation model was designed to have a very broad focus allowing the users to define not only their needs in relation to specific themes, but also the actual themes themselves. In this regard, the process design is very democratic in its open-ended nature. This means that there is no specific product development focus from the outset of the project - this was defined by the patients themselves in the idea generating workshops.

The innovation model utilised in the Swedish and Danish pilot projects deals mainly with the WHAT phase of the innovation process in the Innovation Wheel (cf. Figure 4.1). Issues related to the HOW phase of the innovation model, were only included in the later stages. It then focused mostly on the first phase related to conceptualisation.

The projects were conducted in a partnership involving Herlev Hospital (Denmark), Lund University Hospital (Sweden), Copenhagen University Hospital, New Insight and Ferring Pharmaceuticals (see the project description below for details).

10.1.1 Bedwetting

The pilot project was carried out by three New Insight participants with an educational background in the humanities and societal studies in collaboration with a doctor (Ph.D) from Tørdokken, Copenhagen University hospital, which is a small ambulatory unit based in the department for growth and reproduction. Tørdokken receives severe child bedwetters (enuresis nocturna) that have been bedwetting for longer periods and who are referred to Tørdokken by general practitioners.

The project ran from the autumn of 2008 and finished in February 2009. It was delayed a few weeks due to recruiting difficulties for the patient workshops.

Children's bedwetting is very common and is not seen as a problem or illness until it represents a problem to the parents or child. This often happens when the child starts school and becomes more aware of the bedwetting being abnormal. Usually, most children stops bedwetting at age 5-7, when a natural hormone reduces the amount of urine produced in the bladder. If the hormone is not produced, the child continues to wet the bed during the night. There can be other factors attributed to the illness such as a small bladder, but the hormone deficiency is the most common reason.

10-15 per cent of all children at the age of 7 suffer from bedwetting (approx. 1-3 children in a class). By the age of 16-18 it is reduced to 1-2 per cent of children that are still affected. A total of 50,000 children in Denmark suffer from bedwetting, thus representing a considerable problem. About twice as many boys as girls suffer from the illness. It is not a fatal illness, but it reduces quality of life through social marginalisation and difficulties caused by the mental burden of the problem for the child. For the parents and family as a whole it can represent a long-lasting burden because of continually having to wake up in the middle of the night to change the sheets and clothes of the child.

The illness is taboo laden, as are other incontinence illnesses in adults. Open communication and dialogue between parents, schoolteachers, kindergarten personnel etc. about the illness therefore represents one of the greatest challenges. This also happened to be a central issue of the focus group in this pilot project.

The pilot project was initiated by the Borger 2030 panel survey which was the same for all three pilot projects. It involved general questions indicating how the public views the three illnesses bedwetting, incontinence and prostate cancer.

The users

The users in this pilot project were – ultimately – the parents of the bedwetting children. The boundary is blurred because it depends on who perceives the condition as problematic. If the child does not see the bedwetting as a problem but the parents do, then the parents may be perceived as the users - or vice versa. This illustrates the complexity in defining the user in this context. Often the related family can be more demanding users, than the patients actually receiving treatment.

The needs identification in this pilot project ultimately focused on the parents, since the methods chosen to uncover user needs were through workshop participation and reflective dialogue. To involve the children as a specific group of users would require the use of a different set of the methods which would be outside the scope of the general innovation model of the process.

Since Tørdokken is a specialist unit at the university hospital, the patients have more severe types of bedwetting. The patient group was the parents of children at the age of 7-14 - mostly boys. Only the parents participated in the workshop.

Methods

The pilot project used almost the same methods as the two other pilot projects. The process was as follows.

- Input from a Danish survey on bedwetting
- Two planned workshops (due to recruiting problems only one was carried out)
- Staff idea qualification and idea generation process

Because of the limitation of one workshop, some interesting themes were pointed out prior to the workshop. The pharmaceutical company Ferring and the representative from Tørdokken pointed out potential problem areas. The problem areas concentrated on the common diagnosis and treatment process for bedwetters. Concerning how patients (both children and parents) perceive different aspects of the process (weighing diapers, use ring-alarm sheets, treatment with hormone pills, social obstacles etc.). These were tested at the workshop, but it was still important to have an exploratory approach.

At the workshop two persons from New Insight, a representative from Ferring and one from Tørdokken participated. The patients had prior to the workshop received a list of questions to reflect upon before participating in the focus group. The focus group had to incorporate both an explorative identification of problem areas and a development of specific ideas and concepts, since it was not possible to recruit enough users for two sessions.

The guide for the first workshop was to let the patients tell their individual stories focusing on problem areas. The workshop was set to last two hours and the setting for the workshop was very casual and relaxed. The participating parents received gifts (wine or chocolate).

The role of the participating New Insight staff was to guide the parents in telling their story but to take on a passive role. The staff from Tørdokken and the representative from Ferring took an observatory role.

Through this storytelling process different problem areas were identified. Problem areas were identified only if the patients put them forward as such.

Since we chose to involve parents only, we have received input relating to one side of the story. We chose to exclude children from the process because of the methods involved, but it would have been fruitful to include the children's stories and perceptions about living with bedwetting. Such methods could be more interactive and observatory since the children's reflections and communication about bedwetting could be biased and coloured by taboos and moral ideas about right or wrong.

Results

At this time results are preliminary but the process has already generated a series of interesting problem areas and also ideas on how to address these. As is the case of the prostate cancer project these are primarily taking the form of service and process innovations.

Examples of these problem areas are:

- Aids such as diapers and ringing devices

- The social taboo about bedwetting
- Non-appearance of patients at Tørdokken
- The role of teachers

At the staff process new ideas to avoid non- appearance was developed – including new mailing procedures and a concept for SMS-notification.

The ideageneration was most fruitful concerning more information and dialogue in schools and among children in order to cast light on the taboo-laden subject. Information to school teachers, chat rooms at the Danish Kontinensforenings webpage, information material at GPs etc. Some of the good ideas were generated by the parents.

10.1.2 Pilot project about Incontinence

The pilot project was carried out by three New Insight participants with backgrounds in the humanities and social sciences. The pilot project was carried out in collaboration with UroGynCentrum at Lund University Hospital with two main participants. One is a professor and doctor in urology and the other a nurse, both specialised in incontinence. UroGynCentrum is a department specialising in women's urology (where incontinence is the greatest subject area).

Lund University Hospital hosted all the events with patients and employees from the department. The patient events were held at the patient hospital adjacent to Lund University Hospital.

The pilot project ran from spring 2008 and finished in the autumn of 2008. It was delayed a few weeks due to a strike by the health care workers in both Denmark and Sweden during the early summer of 2008.

Incontinence¹⁵ is an increasing problem due to the demographic development and the ageing population in western societies. As we get older, our muscles in the lower regions (bladder etc.) weaken and our ability to retain urine diminishes. Incontinence can also occur due to trauma such as spinal injuries and injuries to the bladder and the like. Women are especially subject to incontinence, because they are more prone to losing muscle power in that region after giving birth. In Denmark almost 10 per cent of the population lives with some form of incontinence and that percentage is rising due to the demographic development.

Incontinence greatly reduces quality of life, because of the constant uncertainty of leaking urine. Many incontinence patients are marginalized and have reduced social mobility because of their uncertainty and their fear of being embarrassed in front of family, friends and other relations. It is not a fatal illness, but the quality of life is reduced and as the demographic development leads to more chronic patients in this group, they represent a great challenge for the health care sector in coming years.

The users

The users in this pilot project were ultimately the patients. The needs identification focused on patient needs primarily. The exploratory method was targeted at the patient flow through the health care system from before they acquired incontinence and to the present.

¹⁵ Incontinence involves mostly urinary disorders such as urge and stress incontinence

Since Lund hospital is a research and university hospital, the patients admitted here are usually long-term patients with severe or chronic types of illnesses (which is also the case of the incontinence patients).

The patient group chosen for this pilot project was female, aged 50 years or more. 2-3 women were older than 70. All patients were Swedish and lived in the nearby community of Malmö (except one who had moved to Malmö recently). It was important to have this female group involved in order to have different ages and genders represented in the project as a whole.

Methods

The pilot project used almost the same methods as the other two pilot projects. The process was as follows.

- Input from a Danish patient survey on incontinence (using a Borger 2030 survey panel)
- Swedish survey carried out during the project
- Two workshops with patients in Lund
- Staff idea qualification and idea generation process in Lund assisted with computers.

Lund University Hospital was responsible for carrying out a supplement survey in the spring of 2008 and recruiting patients to the two workshops in late summer the same year. Since the Danish survey was only sent to Danish respondents, the Swedish survey should supplement the Danish results. Also, the Swedish survey respondents were all patients, which was not the case in the Danish survey.

The pilot project's goal was to involve female patients that have long experience with incontinence and to involve them in a reflective and explorative process to uncover needs retrospectively and ahead. No theme was to have main priority. Rather, the process was led by an open approach.

The two health care professionals involved in the workshop were also open to different themes and did not decide which themes were more important than others. This was important to keep the process as user driven as possible.

The pilot project was initiated by two surveys. Firstly, the Borger 2030 survey, which was the same for all three pilot projects and involved general questions indicating knowledge about the three illnesses etc. Secondly, a separate survey was conducted by Lund University Hospital to supplement the other survey and had the objective of providing more insight into the patients' experiences with the health care system. The survey was sent by post to approximately 100 patients. The response rate was approximately 60 per cent.

The core methods used were the same as the general project innovation method. Prior to the exploratory workshop the patients had received a "tool kit" with a few questions to reflect upon before participating in the first workshop.

The guide for the first workshop was to let the patients - one by one - tell their individual patient history chronologically from when they encountered the illness up until the present. The workshop was set to last two hours with a break for dinner. A very casual and relaxed setting was the frame of the workshop.

The role of the participating New Insight staff was not to guide the patient in telling her story but to take a passive position. The two staff from Lund University who participated took an observatory role.

At a follow up meeting between New Insight and Lund University staff, the problem areas identified were qualified and classified in two groups according to how easily they could be addressed. These themes were discussed at the second workshop with the patients. The follow up meeting to qualify the problem areas was very important (across the three projects) in order to verify if the problem areas really were problems or could be examples of egocentric unrealistic problem focus with the patient.

The idea development workshop was also set for two hours and the themes were discussed in order to generate solutions and ideas that would solve the problems identified.

After problem areas were identified, and solutions generated through the workshops, a seminar was held with a wider range of staff from the Lund University Hospital urology department. There were eight participants with different background (urotherapists, nurses, urology doctors and midwives). The duration of the seminar was two hours, and the goal was partly to qualify the ideas, and partly to generate new ideas for the identified problem areas.

The seminar was computer-assisted with one computer per participant and was held as a collective brainstorm process, using software designed for the purpose.

Results

The results of the pilot project have been both the identification of problem areas, and ideas and solutions to these problems. The problem areas identified have typically centred on the lack of information and transparency about the illness, and the need for better medico-technical solutions that keep the patients dry and help avoiding accidents.

The generated ideas and solutions have ranged from small scale (information adjustments in brochures, changes in information processes) to large structural scale solutions such as establishing a central helpdesk and an information centre for incontinence patients, where they can seek advice without contacting their general practitioner first.

None of the solutions have been implemented yet, but the problem areas generated have been a great eye-opener to all staff involved and that knowledge will be disseminated to other relevant staff and organizations.

The medico-technical solutions generated will be presented to the right companies for further development and commercialization. One of the ideas consisted in a discrete travel tool-kit in which a range of medico-technical appliances could be stored.

10.1.3 Pilot project about Prostate Cancer

This pilot project was carried out at Herlev Hospital with prostate cancer (PC) patients. The project team consisted of a head doctor and professor at the Department of urology at Herlev, two participants from New Insight and an expert from Ferring. All of them had their backgrounds in the humanities and social sciences.

The hospital hosted all the activities for both patients and employees. This ensured that the patients were in more familiar surroundings compared to other possible locations.

The pilot project ran from spring to autumn 2008. As the Swedish project it was delayed a few weeks due to a strike in the health care sector in both Denmark and Sweden during early summer 2008.

The users

Given the epidemiology of PC the users were all male patients aged approximately 60 years or older. All participants in the workshops were recruited by the hospital staff during their daily contact with the patients. This led to an explorative focus group of six persons and an idea development workshop of 20 participants.

The fact that the disease is potentially fatal raised ethical challenges in involving the users. The primary concern was to ensure that the patients did not find the focus groups emotionally stressful or felt prompted to talk about any issues they did not wish to. Many PC patients suffer from erectile dysfunction which is a taboo-laden topic for many. This was addressed by carefully designing the interview guide to leave it to the patients if they wished to talk about the sensitive topics. The focus group ended up dealing with a host of sensitive issues, but not until the participants felt comfortable enough to bring it up themselves.

Methods

The pilot project followed the overall innovation model of the project by starting out with a survey about PC to the Borger 2030 panel.

- Survey
- Exploratory focus group
- Idea generation workshop
- Online staff process

Although the survey results were interesting to the project partners at Ferring and Herlev, they were of limited value in pointing out problem areas for the innovation process.

The explorative focus group went well and resulted in the identification of ten problem areas which were used in the idea development workshop. The identified problem areas were:

- Pre-diagnosis information
- Waiting time
- Choices related to treatment options
- Issues related to adverse effects like incontinence and erectile dysfunction
- Talking to others about the disease
- Future expectations

At the explorative focus group, two doctors from Herlev and a representative for Ferring participated as observers along with two moderators from New Insight. The problem areas concerned both “soft and hard” areas. On one hand how to deal with the emotional stress that cancer patients perceive and on the other hand what information material the patients receive in different points of contact in the process.

One of the most beneficial aspects about the pilot project was the insight that the medical staff from Herlev experienced by gaining access to the values and views of the

patients. This led to a strong motivation to implement the resulting ideas and raised an important trade-off: on the one hand, staff participation is important to ensure the anchorage of the resulting ideas. On the other hand, there is a risk that the patients will feel overwhelmed and uneasy in the setting if outnumbered by non-patient participants in the focus groups. In the case of this project a good balance was struck, but there are potential pitfalls on both sides.

The following *staff process* used the Borger 2030 web platform to qualify and further develop the concepts proposed by the users at the idea development workshop. A group of medical professionals participated in this process and added valuable insights to the users' ideas even though the participation rate was low (despite gifts offered to the participants). This can be attributed to the general scarcity of time on the part of the employees, in some cases the participants used their spare time to contribute to the project. The primary learning point is that a thorough organisational anchorage is necessary to motivate the employees to participate. Compared with the experiences from the Swedish pilot project it seems that recruitment is easier for non-web events.

Results

The primary result was process innovation concerning the use of information materials. Even before the project was finished, some of these had been implemented. The department of urology implemented new guidelines ensuring that all patients receive an educational video on prostate cancer right after their diagnosis. This is a response to a great patient need for information in the emotionally turbulent time of the cancer diagnosis that was generally perceived as very problematic by the patients. Also, measures have been implemented to encourage the patients to bring some of their closest relatives with them when talking to doctors to alleviate the emotional stress that might result from negative messages and to ensure "two pairs of ears" to better understand the more technical information. Furthermore, a set of implementable concepts has been developed. One of these is a follow-up dialogue with a doctor after the PC diagnosis. This was a concept popular with both patients and doctors. Again the aim is to strengthen the patients' capability to cope with the emotional stress associated with the diagnosis.

10.1.4 General learning of the Danish Pilot Projects

Surveys

The survey to the Borger 2030 panel consisting of respondents recruited from the general public presented interesting results in itself, but was not of any direct value to the workshop process, because the questions were not specifically relevant to the patients.

The survey to the incontinence patients was of greater value, because all respondents were patients and the answers more relevant to the issues in question. They were of great value in the preparation of the focus groups and provided a good sense of the patients' view on the matter, albeit in a non-explorative manner. This enabled the focus group moderators to ask more specific questions concerning possible problem areas in order to facilitate the workshop process.

Despite the value of the surveys, the learning of the project is that the surveys could have been put to better use in a more traditional setup with initial explorative focus groups followed by a survey to test the reliability of the focus group results. In this

setup, the ideas of the focus group participants could have been tested on a broader group of people – and also elaborated via a crowd sourcing-like approach.

Explorative workshops and analysis

The explorative focus groups were very successful both for patients and doctors and in generating problem areas. The amount of patients (5-8) was very suitable for this type of process. On the one hand it was small enough to allow speaking time for all of the participants and also large enough for the patients to be able to share experiences. The duration of approximately two hours was long enough to build mutual trust among the participants and create a relation between participants and moderators and observers.

The patients showed great willingness to share experiences and views and this is an important prerequisite to a successful outcome.

The ethical challenges are considerable in this kind of focus group and one must be aware of the complex illnesses and situations the patients have been through. The “product” that the users in this sector receive is a product which is very sensitive for the users’ emotions and physical wellbeing. Therefore, the experience is very individual and rests more on emotions and intuition than logical thinking. This must be taken into consideration when initiating a dialogue with the patients in a meeting, workshop or other setting.

Because we involved patients that suffer from illnesses, the settings of the workshops had to be intimate and discrete as well as the interview methods used. In all pilot projects we attempted with the greatest care to make the patients comfortable with the situation. This involved the right surroundings, offering dinner or other tokens of appreciation (gifts at Tørdokken) and finding the right match in relation to the representatives from the analyst team. As mentioned, it is important to keep non-user participation at a minimum to avoid that the patients feel uncomfortable and subject to “inspection”. They were clearly informed about the aims of the workshops and who would be using the material afterwards and they were granted full anonymity.

A very explorative method was employed in regard to the moderation of the workshop. The purpose was to open up the field and let the participants tell their stories. The moderator continuously sought to focus on the stories and specific examples. Whenever a participant articulated something problematic, the moderator focused on the specific context of the problem to gain a thorough understanding of the issue. In this phase it is important to avoid a narrow focus on solutions to any articulated problems (this is addressed in the following idea development workshop).

The material was subsequently analysed by team members from New Insight, the relevant medical staff from the hospital and Ferring’s experts. With this multidisciplinary approach the output of the focus groups was analysed to formulate specific problem areas. In this way the statements of the participants were not taken at face value but analysed to extract the unacknowledged needs of the users. In this respect, the focus group method applied resembles the anthropological approaches used in observation studies.

This part of the innovation process turned out to be a key tool in three ways. Firstly, it guaranteed the authenticity of the problem areas that served as a point of departure in the following idea development workshops. This was important to secure a fruitful process. Secondly, it allowed the team to some extent to address the unacknowledged user needs. Finally, it allowed the medical staff to gain access to the patients’ social situation and their perception of the health care services they receive. The last point

turned out to be very important because it inspired the medical professionals to implement some smaller innovations on the basis of these insights alone. This shortened the path around the innovation wheel from pattern recognition to implementation considerably. This positive experience was the inspiration for the second good practice model (presented later).

Staff process

The staff processes have been different from pilot project to pilot project. Generally, health care staff is very busy, and does not have much time for other activities than servicing the patients. If a successful staff seminar or involvement is to be held, one should involve leaders at the highest level in the organization. This should secure both staff motivation for turning up and the following implementation of ideas. This underpins the need for a strong user driven innovation focus at the relevant management levels to ensure the necessary support for the innovation activities throughout the organization.

The computer facilitation of the staff process is useful in generating a broad spectrum of ideas and involves all participants. In a normal seminar or workshop there is a risk that the same few participants dominate the discussion and leaving out other relevant suggestions and views from less outspoken colleagues. With the computers involved, all participants are heard.

Overall learning points

In relation to the innovation wheel, the potential for involving users in the innovation processes for the health care sector lies in the early and final phases of the process. Because of the individual experiences, that can indicate structural problem areas, the patients have greater potential for contributing to uncovering problem areas. The pilot projects have also had success in some idea generation, but at this stage many other factors contribute to the potential solution. Therefore, if the ideas are to be implemented relatively quickly and without great costs, the potential for involving patients in idea generation must focus on problem areas that are close to the patient and which do not involve radical structural changes. With regard to the degree of novelty in the innovation, the potential for involving patients seems to be greatest in incremental innovations. These pilot projects have not involved users in the final phases; however, the potential for involving them seems logical but rests on theory.

When conducting an innovation project with a broad scope it is important quickly to narrow down the focus to work with the most promising ideas as early as possible in the process. Especially when you involve users or employees directly in concept development, it is important to be able to guide the process by focusing on a few promising themes and ideas.

Models for good practice user driven innovation in health care

The overall learning of the three pilot projects points to less direct user involvement in the HOW phase because of the limited ability of the users to contribute to the direct generation of specific concepts and ideas and the success of the indirect exploratory focus groups. Good results have been obtained by using multidisciplinary expert teams in these parts of the innovation process. The teams were composed of doctors, sociologists and experts in other social science disciplines. The medical expertise was supplied by the hospitals and the social science competence by New Insight and Ferring. This indicates a need for these kinds of skills in the health care sector. One

approach to ensure that these are available to the user driven innovation aspirations of the sector could be a competence centre at the regional level focused on health care.

This also indicates that an even stronger focus on the anthropologically inspired methods would be fruitful, although this has not been tested in the pilot projects. In particular, different forms of user observations seem appropriate in this respect.

Based on the learning points of the three pilot projects the ideal model for user driven innovation in health care would exclude the initial surveys and use more anthropological methods in the data collection phase as a supplement to exploratory focus groups. The development of concepts and ideas would be left to the multidisciplinary team of experts and then surveys could be used optionally to test and improve the concepts among a larger group of users (e.g. with the use of crowd sourcing).

When the strain on the resources in the public health sector is considered, this model is relatively costly in terms of time and manpower. Therefore, it would be beneficial to develop more lightweight approaches for user driven innovation and user involvement, which can be employed by health care professionals without expert assistance and without having to provide additional financial resources specifically for that purpose. Such an approach could serve as a supplement to larger user innovation initiatives.

10.2 Norwegian pilot projects

The Norwegian pilot projects in the NICE program are related to InnoMed, an organization established and owned by the Norwegian Directorate of Health. This organization aims to improve health care services through development of new solutions that cover unmet market needs. InnoMed is working to become a centre of expertise for user driven innovation, and in order to achieve so they are cooperating with SINTEF Health Research. Together with SINTEF, InnoMed will evaluate methodologies for various phases in the innovation process during a five-year project.

Three InnoMed projects were used as case studies in the NICE program on user driven innovation: impaired hearing, chronic obstructive pulmonary disease (COPD) and dementia.

The Norwegian pilot projects were not structured by a common innovation model in the same way as the Danish projects, see section 6.1. In the projects about impaired hearing and dementia, semi-structured interviews were used as a method to uncover user needs. In the COPD-project, interviews were supplemented with indirect and direct observations in the form of diaries and role-play in controlled environments. In the project on dementia, dementia patients were only indirectly involved in the study by indirect observation. The users were families and health personnel.

In the following sections, each of the three pilot projects are described in further detail followed by a presentation of the results and general learning points from the projects.

10.2.1 Assistive hearing devices

Hearing impairment is a relatively widespread condition in the general population, and is a natural part of the ageing process. Some 14.5 percent of the population (children, young people, adults and the elderly) suffer from hearing loss to a greater or lesser degree. In other words, a large portion of us either has, or will have, a hearing impairment. The consequences of hearing loss primarily affect our possibilities for

communication and social inclusion, and increase the chance of passivity and social isolation.

The latter may be health detrimental by itself, as it has consequences for self esteem, identity and self-respect, thus increasing the susceptibility to depression and anxiety, and eventually somatic diseases.

InnoMed has carried out a pre-study with the aim of identifying areas in which it could stimulate improvements in the situation of hearing-impaired persons by launching development projects or innovative measures in the health sector. The results of working with users in this study showed that even with modern digital hearing aids, there are still many cases both in work, leisure and social situations where there is a need for additional aids to enable people to function well. Hearing aids will never provide full compensation for hearing loss.

The principal objective of the pilot project has been to identify areas in which there is a significant likelihood that new innovation projects could meet important needs of people with hearing-impairments.

Another aim of the project was to develop concepts for technical aids that would help persons with hearing impairment to fully achieve equal opportunities and to participate in all aspects of life. Yet another goal has been that technical aids should help people with hearing impairment not to be dependant upon making daily special efforts due to their hearing loss. Improved quality of life and lower rates of sick-leave would be among the desirable consequences of better technical aids to hearing.

The background of this project was an identified need for new technical aids to hearing. For this reason, the project has focused on finding ideas for new *products* or *product systems*. However, services are closely related to products, so a survey of needs will also reveal a potential for the development of services.

Examples of tasks/situations that can be problematic for the hearing impaired include:

- Participation in normal conversations with several people
- Communication in meetings and conferences
- Telephone conversations
- Alarms and warning systems in the home (telephone, alarm clock, doorbell, smoke alarms, baby alarm, etc)
- Listening to TV and radio
- Information in public spaces (travel and shop announcements, alarms/sirens, etc)
- Access to the media and cultural life

In order to function effectively in everyday life, persons with hearing impairment will frequently need various types of technical aids to hearing. The pilot study has revealed that such aids are difficult to operate, particularly where elderly people are concerned, which means that they are often left lying in a drawer. The quality of the available equipment also varies. The study also showed that there is a need for more detailed studies of how the diagnosis of individual needs, allocation of equipment and follow-up take place.

The project was conducted by SINTEF Helse, with financial support from InnoMed and Innovation Norway. Two researchers from SINTEF (with expertise from industrial design) contributed in the current project. The project started in September 2007 and

ended in December 2008. This was longer than intended, because the final phase, involving contact with the industry, took longer time than originally planned.

The users

In this project, a distinction between primary and secondary users was made. *Primary users* were those with hearing impairment. *Secondary users* were those that are in contact with the hearing impaired, e.g. family, friends, teachers, colleagues, personnel in the care sector.

Other users come more sporadically into contact with such equipment and can thus be described as *tertiary users*. These include the NAV¹⁶ Orthopaedic Equipment Centre, organisations and resource centres for the hearing-impaired that offer guidance in the use of equipment, technical managers in the public sector, and employees in the retail and service sectors.

Methods

The project focused on identifying needs and generating ideas for new project or product systems. However, services are closely related to products, so the survey of needs has also revealed a potential for the development of services. The project has adopted a strongly need-driven approach that focused on gathering information on a wide range of user needs.

In order to identify both acknowledged and unacknowledged needs, users were directly involved through semi-structured interviews. Observations made in connection with the interviews were also an important source of information. Users were thus also indirectly involved in the survey, i.e. in the mapping of needs.

The activities in the project were restrained to the WHAT phase of the Innovation Wheel (see Figure 4.1): opportunity identification, data collection, pattern recognition and concept ideas (who were presented for a selection of users, who evaluated them).

An important actor in the project was the manufacturing industry, and they were presented the results after the concepts were completed and evaluated by the user group. The reason why they were not involved before, was because it was considered useful to only concentrate on what the users needed in the early phases - not to have the manufacturers worry about what is technically possible, thereby reducing the “solution space” in the creative phase.

The project’s first phase was the *opportunity identification*, cf. the Innovation Wheel. The needs for better technical aids to hearing for elderly people were identified in the course of a series of interviews with users and producers in connection with other InnoMed surveys. Based on this, a pre-study was conducted, where a literature study on needs and a manufacturer mapping was conducted in addition to the interviews.

Then, the project set up a total of 23 interviews or meetings, involving a total of 33 informants. A large sample of primary users was interviewed, covering both small children and old people, with various degree of hearing loss. Interviews with secondary users (parents) and tertiary users (psychologists and audiologists) were then conducted. These interviews were semi-structured (duration: approximately 1-2 hours). Both individual interviews and group interviews (2-4 participants) were conducted. All study participants gave their written consent to participate in the project.

¹⁶ The Norwegian Labour and Welfare Administration (NAV)

In addition, observations in the homes of two users were conducted. This provided the opportunity to study the users in their daily surroundings. Small children and their parents were observed when they participated in a meeting for families whose children suffered from hearing impairment.

Communication was one of the topics dealt with by the project, and all of the interviews therefore also comprised observations of how conversations were conducted. It is important to know that the users consider their impairment stigmatizing, which means that it is not easy to make observations by accompanying users throughout the course of a day.

All user expressions and items of information were analysed with the aim of identifying unmet user needs, cf. pattern recognition in the Innovation Wheel. At this stage of the project, the users were no longer involved.

A working-group consisting of product designers discussed the needs expressed by the users, and generated new ideas, cf. concept ideas in the Innovation Wheel. These were presented to the users for evaluation and discussion. The feedback that was received here, however, only led to minor changes in the concept proposals.

Results

The project ended up with a set of proposals for new solutions in technical aids to hearing. Since the project group was able to take a wide range of needs as its point of departure, and was not bound to specific industrial partners or technologies, the concept proposals were “total solutions” that would integrate the everyday life of a hearing-impaired person better than the many products that currently solve problems individually.

The concepts have been presented to NAV’s Centre for Technical Health Resources and to Norwegian industrial partners, one of which wishes to take parts of the project further. A challenge facing this manufacturer is that the development of products for purchase by NAV is extremely unpredictable.

10.2.2 COPD Home

Chronic obstructive pulmonary disease (COPD¹⁷) is a collective term for conditions in which the chronic constriction or collapse of minor airways causes increased resistance in the airways. Sufferers from this condition have difficulty in breathing even when they are at rest. The limitation of airflow is poorly reversible and usually gets progressively worse over time. Its final stages lead to pulmonary failure with chronic lack of oxygen than can lead to problems in concentrating, dizziness, chest pain, and finally, heart failure. In Norway there are about 1.2 million smokers, of whom around 250.000 suffer from COPD. It is one of the most frequently occurring and rapidly increasing diseases. Every year, some 9000 people in Norway acquire COPD.

On the basis of these disease statistics, and the constant pattern of relapses and hospitalisations of COPD patients, the Department of Pulmonary Diseases at St. Olavs Hospital has long since noted the need for innovation.

Patients with serious COPD and incipient lung failure require advanced treatment and follow-up. In 2005, more than 15.000 patients were hospitalised for COPD. Most of these were 65 years old or more, an age group that is increasing in its number. These

¹⁷ KOLS in its Norwegian acronym.

patients also often suffer acute attacks with deteriorations in their condition – called acute exacerbations - in many cases more than twice a year. Patients, whose disease is serious and at an advanced stage, may suffer from four to six acute exacerbations per year. During these attacks, the patients become seriously ill and must be hospitalised immediately for advanced medical treatment. These acute relapses are often caused by viral or bacterial infections of the airways, but they can also be triggered by reactions to allergens, non-specific irritants, changes in the weather, atmospheric pollution, etc.

The frequent deteriorations, with repeated long stays in hospital affect their life situations. In 2005, the average length of stay for such patients was 7.9 days, while the average for other pulmonary patients was 5.3 days. After hospitalisation, patients need from eight to 12 weeks of convalescence. Patients with COPD are one of the lung department's groups of "revolving door" patients, and are major consumers of health services. The Department of Pulmonary Diseases at St. Olavs Hospital has 700 inpatients with COPD relapses every year, half of whom are "repeaters".

The principle objective of the project was to reduce the number of hospitalisations of patients with COPD. It would be desirable to improve the home-based treatment of such patients, as it would raise the efficacy of the health services while improving the quality of life for the patients themselves. The aim for the project was to bring about earlier mobilisation, better treatment in familiar surroundings with greater security, and finally, a higher level of competence in the local health care services.

The project was initiated by the Department of Pulmonary Diseases at St. Olavs Hospital. The project application was dealt with by InnoMed's steering group, which decided to launch the project. It was conducted by InnoMed in cooperation with St. Olavs Hospital and the Trondheim County. The Norwegian Health Directorate and Innovation Norway financed the project. It was started in primo 2008 and ended in medio 2009.

Two persons from SINTEF (one researcher with expertise within product development, and one person with expertise from industrial design) were responsible for conducting the project.

The users

The project had several groups of *primary users*. The project is defined as a coordination project. *Primary users* are COPD patients, the local authority health personnel who diagnose COPD patients and the COPD Centre personnel at the Department of Pulmonary Disease. *Secondary users* are friends, family, managers of district offices in the local authority health service, and managers and other personnel of the specialist health care sector. These include the hospital's coordination unit, its IT-department, the procurement department at the hospital, etc.

Methods

The project has focused on identifying needs and generating ideas for new products or product systems, services and organizational forms. Development of new services and new organizational form, however, will be closely linked to the possible development of new products.

The project has adopted a strong needs-driven approach that has focused on surveying the use of methods with various degrees of user involvement. Both direct and indirect user involvement utilised semi-structured interviews and questionnaires, with the aim of identifying both recognised and unrecognised needs. Direct user involvement also

focused on identifying unrecognised user needs through drama work shops, i.e. role-playing in a simulated environment. The project also tried to employ the method known as “Cultural Probes”, which directly involves the user in order to identify unrecognised needs.

In this pilot project, SINTEF went through the three first phases of the Innovation Wheel, i.e. remained in the WHAT phase. In the *opportunity identification* phase, InnoMed’s steering group decided to carry out a pilot study from a general point of departure regarding this disease. Based on the results of the pilot study, contact was established with the Department of Pulmonary Disease at St. Olavs Hospital, who had initiated COPD Home at first. No users were involved at this stage.

Data collection was conducted through semi-structured interviews among a wide selection of COPD patients, home care nurses and specialists at the hospital (i.e. primary users). Interviews with family and friends (secondary users) were also performed. These activities were based on good experiences of the method as a means of obtaining rapid, reliable information about need areas. It is time-consuming, but considered very useful.

Direct observations in controlled environments were also used, i.e. direct observation of home care services in controlled surroundings and role-playing, where the home-care service employees acted as patients. The project team could not document filmed and photographed observations in their homes, due to ethical regulations. They therefore performed a role-play where the home care staff acted patients. Four series were performed, followed by semi-structured interviews. The chosen method was time-consuming, but was considered a good substitute for real-life observations.

Cultural probes (an indirect form of observation) were tested. This is a method that allows users themselves to document their needs. But it proved to be difficult to find users capable of performing the method correctly. In all methods that were taken into use in this project, the users were involved.

In the *pattern recognition phase* of the Innovation Wheel, all user statements and items of information were analysed with the aim of identifying user needs and requirements for solutions. This was done by sorting the users’ statements and activities that the methods generated. These topics were then evaluated in terms of their importance and relevance to the solution, and the result was a series of activities with their associated requirements. The users were not involved in this phase.

In the *concept ideas phase*, ideas were generated that were individually capable of dealing with the challenges related to each activity. These ideas were evaluated in terms of how well they were adapted to the four user groups, and the solution that was best adapted to all the requirements was selected for further study. The users were not involved in this phase.

Results

The project established a pilot project for home-based treatment. The establishment of such a line of treatment at an early point in time was done in order to gather advanced experience of the need for new, improved solutions. The pilot project has established the following products and services:

- A COPD-school: developed to serve the local government home-care services; whose nursing staff were given training in diagnosing the progress of COPD.

- A COPD-book: this is the patients' own diary of the progress of the disease, and is kept at home by the patients.
- A COPD-central: this is a reception apparatus that has been set up at the Department of Pulmonary Disease at St. Olavs hospital. The local authority's home care service visits the COPD patients regularly to follow up the progress of the disease, which is recorded in the COPD-book. In the event of relapse, the central is contacted by mobile telephone, and the centre decides which extra measures need to be set in motion. Optimal basic treatment of this patient group is vital, and intervention must be possible at an early stage if their symptoms show signs of worsening. Today, this intervention is not of adequate quality, is given too late, and it is important that knowledge about it is better understood by the home care services.

The project is at the time of writing not finished. A thorough needs identification among patients and various levels in the health care sector has been conducted. Based on this identification, an overview of the need areas is now accessible. From the need areas, several scenarios illustrating hypothetical situations have been developed, and industry partners who can become suppliers of services to meet these needs have been screened.

The results of these efforts have been presented for COPD Home working group, which will prioritise further activities. InnoMed's future role in the project will be to launch a development project as a collaboration between St. Olavs hospital, Trondheim county and a supplier. This has been a pronounced expectation throughout the project.

The project has been defined as a coordination project between the primary and the secondary health services. If a fully developed solution is to be successful, both parties will need to perceive clear cost reductions from adopting the concept. One conceivable situation, and a possible problem, is when the costs related to the introduction of the concept are brought upon one party, whereas cost reductions are foremost benefitting the other party. Measures to prevent this from happening are being sought via the Government's Coordination Reform.

10.2.3 Dementia pre-study

Dementia is the disease that leads to the highest number of years of reduced functional capacity in old age, and which requires most resources from the local primary care services. Dementia often coincides with other diseases or losses of function, and presents a complex disease panorama, where several different services are needed.

Norway currently has around 66.000 persons with dementia, and this number is increasing. It is expected that the number of dementia patients in Norway will double to about 135.000 within the next 30 years.

The project is a pilot study carried out on behalf of InnoMed, with the aim of detecting ideas in which InnoMed can stimulate improvements in the situation of dementia patients, their families and/or the care-sector staff who work with them. The pilot study was intended to survey all phases in life of dementia.

The aims of the pilot project were to survey needs and identify areas in which innovation projects could contribute to:

- Improve the quality of life of dementia patients, enable them to cope better, and offer them security and meaning in their everyday life, despite their reduced function.

- Meet important needs and tasks for dementia patients, their families, service suppliers and the health apparatus.

The project was initiated by InnoMed, who had carried out a survey of the future housing for elderly people. In the course of the survey it emerged that dementia patients are a particularly demanding group, who need a more thorough study of their domestic needs.

Researchers at SINTEF, in collaboration with InnoMed, launched a pilot study of dementia. InnoMed's steering group wanted the study to be broadly based, but with a focus on potential innovation projects that would be capable of improving the domestic situation of dementia patients. Three persons from SINTEF (one researcher with expertise within cybernetics, and two persons with expertise from industrial design) conducted the project. It started in December 2007, and ended in September 2008.

The users

The *primary users* were persons with dementia and their families. The latter was included because many of them are strongly affected by the disease. The *secondary users* were nurses, care personnel and nursing auxiliaries, doctors and ergotherapists at activity centres, nursing homes, in the home care services and in resource- and competence centres.

Methods

The project has focused on identifying need areas in which there is a potential for developing new products or services. Much emphasis was put on involving the users, and gathering a wide selection of user needs.

The primary users in this project were people with dementia. It was therefore necessary to apply the Regional Ethical Committee for approval. The first application was turned down, and since this was intended to be a general survey, the project group decided to concentrate on families, care personnel and professional expertise. By conducting interviews with these, SINTEF hoped to identify the needs of dementia patients and the relevant service apparatus around them.

Direct involvement of informants through semi-structured interviews was used to identify both acknowledged and unacknowledged needs. Simple observations in nursing homes at the time of the interviews were another source of information. Dementia patients were thus also indirectly involved in the study.

The three first phases of the Innovation Wheel were conducted, i.e. from opportunity identification to pattern recognition. One conclusion of the "Future housing for the elderly" pilot study was that if a product is created to suit a dementia patient, it will also be suitable for a wider group of elderly people. It also turned out during the course of the project that the number of dementia patients is steadily raising at the same time as this is a resource-intensive group. Several needs of dementia patients were identified, and these formed the background for launching a pilot study of dementia.

The data collection in the pilot study began with semi-structured interviews with family members, care providers, personnel at activity centres, health personnel in the primary and specialist health care sector, in nursing homes, and volunteer workers. A total of 13 interviews were conducted. The purpose of this was to obtain knowledge of important user needs as a basis for the development of new product ideas, solutions and/or services to dementia patients.

The following guidelines were followed in the survey of needs:

- Semi-structured interviews with duration of 1-2 hours, including both individual interviews and group interviews (2-4 participants).
- Two separate interview guides were developed: one for family members and one for health care personnel and others who provide services and support for dementia patients and their families. It was important to be open-minded in the interview settings and avoid making hypotheses about what one wanted to hear. It was therefore made an effort to adapt questions to each individual informant.
- Written notes were made in all interviews. In these, all information was taken at face value, without any form of interpretation or re-writing. The informants' own experiences were not questioned, but questions for clarification were asked when it was necessary in order to get more in-depth information.
- A total of 15 interviews/meetings were conducted, including a total of 36 informants.

SINTEF wanted to interview early-phase dementia patients, but this was postponed as the application to the Regional Ethical Committee had not been finally answered by the time the pilot project came to an end. This aspect was followed up in the continuation of the pilot study, in the pilot project "Aids for physical activity adapted for dementia patients". Permission was given for the latter project to interview early-phase dementia patients.

Most interviews were carried out in nursing homes or day-care centres. Participating in these interviews also enabled SINTEF to make simple observations, and to study the participants' milieu and the products available to them. Thus, the users were involved through both interviews and observations.

In the *pattern recognition phase*, all user statements were sorted by topics that had been brought up naturally during the interviews. An internal working group of product designers generated proposals for new innovation projects based on the need areas revealed by the survey. A list of seven potential projects was presented. Most topics were related to daily tasks. Results from the need identification were presented to the project's resource group, so they could quality assure findings and conclusions. Users were not involved in the pattern recognition phase.

Results

The project identified many needs and possibilities for new innovation projects. The following areas were found to be of most interest:

- Dementia and health, focusing on physical activity and movement
- Security and safety, covering security alarms, warning systems and alarms (falls, fire, water etc), locking/opening doors, identifying and registering movements outdoors and indoors
- Social contact and communication
- Entertainment and encouraging memories (reminiscence)
- Finding lost items in the home and in institutions
- Knowledge and training concerning diagnosis, information dissemination, attitudes, etc

- Systems for communication and spread of information between users, families, health care personnel, private and public sector service providers

As a result of the pilot study, two new projects related to dementia have been launched: "Physical activity for dementia patients", and "Finding lost items". The other five topics may also be followed up later.

10.2.4 General learning of the Norwegian pilot projects

The importance of selecting a wide range of informants

The project about impaired hearing focused on gathering information from a wide range of users. The researchers at SINTEF therefore interviewed hearing-impaired persons in all age groups, suffering from various degrees of hearing loss. This gave a differentiated picture of the needs involved, and provided a good point of departure for the brainstorming sessions.

Afterwards, however, the researchers came to the conclusion that geographical diversity among the informants should have been included as well. The informants in the project came from the Trondheim area, and their experiences were conditioned by the equipment that the local Centre for Technical Health Resources recommended and distributed. Hearing-impaired persons from other parts of the country would probably have had other products and would thus have faced different challenges.

Recruiting informants is a time-consuming process

The hearing impaired project required an application to be made to the Regional Ethical Committee, and approval was given to recruit informants via the National Association of the Hearing-impaired¹⁸ and Møller Competence Centre. It was not easy, however, to access the youngest informants, because contact with them had to pass through several links, to their parents, who might be worn out, and wanted to protect both themselves and their children. The SINTEF researchers were still lucky in the end, and got the informants they needed, but the process was time-consuming.

The industry should be involved at an early stage in the process

SINTEF spoke to industrial partners at an early stage in the hearing impairment project. Results, however, were only presented to the industry at the final stages of the project. SINTEF wanted to keep the industry at arm's length in order to focus on the needs of the users (which would eventually shed new lights on the issues that the industry appreciated to receive). Still, one lesson that was learned was that the industry should have been involved earlier and to a greater extent throughout the project. The ideas that were generated may well be no more than concepts for the future when the industry is not involved. SINTEF experienced that it is important not to let go of these concepts, because by bringing them along underway in the project, short-term solutions benefitting everyone can be obtained.

Semi-structured interviews is an important source for unacknowledged needs

Semi-structured interviews are known to be useful when you are trying to find a specific area of needs, and want to identify unrecognised needs. This was confirmed through interviews with health-care personnel and COPD patients. They could seldom say what

¹⁸ Hørselshemmedes landsforening (HLF).

they needed, or make constructive suggestions as to what the solutions should consist of. The useful information emerged when they spoke of activities related to the registration of their state of health, and they often spoke of specific episodes that were important for themselves.

Conducting interviews may be a heavy burden on patients

Interviews can be a heavy burden on patients. The interviewer in the COPD project had her background from product design. Since the patients were severely ill COPD patients, the interviewer often found it difficult to ask questions about their health status. Some of the patients mentioned that the interviews made them stressed and nervous, and that they had not looked forward to it. Interviews with patient groups of this kind should therefore be carried out with sensitivity, and it is important to follow ethical guidelines (e.g. the Helsinki declaration).

Observations from field studies is a simple and useful tool, and may be as useful as observations in a lab

Observations in the form of field studies are a simple, but important tool, and in this case, provided at least as much information as laboratory observations would have done.

Interviewing COPD patients and home nurses in relation to home visits, made it possible to combine an interview with observations of how a home visit with registration of patients' health status was carried out.

Most activities during these visits are verbal, and it turned out that it was not important to document the observations by means of film or stills. The most important thing was to note down the dialogue, and that all members of the project group attended one or more of the interviews.

Because it was difficult to obtain permission to film, the researchers decided to carry out observations in the form of drama workshops that were filmed in a lab. The home-care nurses dramatised a home visit – which according to them was extremely realistic. This was considered a useful supplement to real-life home visits, but will most likely be more useful in scenarios involving more movement and less speech.

Indirect observations through diaries (Cultural Probes) are difficult to conduct with ill patients

The researchers at SINTEF wanted to involve the COPD patients to a higher degree, and brought along a diary in which the patients were to write down their own thoughts and observations.

At first, the researchers had in mind that COPD patients are very physically inactive (i.e. sitting still most of the time) and that it would be ok for them to take notes in a book. This was tried on several occasions, i.e. the patients were interviewed first, and then given the book where they could write down supplemental information. This did not happen, because the patients were always too ill.

Important to involve all interested parties, and scientific expertise

The needs of COPD patients and the home care services are not always identical. For example, many patients want frequent visits, of long duration, from the home care services. However, the home care services do not have the capacity to meet this request. Hospital staff, on the other hand, could confirm that it was necessary with closer follow-

up than what the patients were given today. It was first when all of these needs were collected that it was possible to generate ideas that could deal with these challenges so that the system would function well for everyone.

An expert reference group is useful

The project group in the Dementia project consisted of researchers and designers who had knowledge about processes and methods in innovation processes, but had very little knowledge about dementia. Thus, it was useful to have an academic reference group helping the project team to understand dementia issues, and which could quality assure the results. The combination of expert knowledge and user needs was used to select topics. For example, the users mentioned needs related to physical activity. They described situations in connection with this aspect that will be of importance for the subsequent development of solutions. Expertise confirmed the need for physical exercise, and pointed out that this is important as a means of postponing the development of dementia. This gave a good basis for selecting this topic as a prioritized area in future projects.

Difficult to get permission to interview users who do not have competence of consent

Most users in the dementia project were not able to give their own consent. Only persons in an early phase of dementia could therefore be involved as informants. Permission from the Regional Ethical Committee to interview persons with dementia was applied for early in the pilot project. But permission was not given, because it had not been specified that it was only persons in an early phase of dementia that would be interviewed. It was also a weakness in the project that the project leader was not a medical doctor. However, information from families and health personnel was considered sufficient to get a general picture of the needs involved.

A project about physical activity for people with dementia has now been launched. The aim of this project is to develop products and/or services which stimulate physical activity, and the aim is to involve people with dementia. An application was sent to the Regional Ethical Committee, who approved the project, on condition of a protocol that ensures that the informants are competent to give their permission to be interviewed.

11 General learning from all pilot projects

In this chapter, we present the general learning from the six pilot projects on user driven innovation included in this project. We also reflect upon the main challenges for this type of innovation in the health care sector, and we discuss how user driven innovation projects can be completed, i.e. how they can move from the WHAT phase to the HOW phase in the innovation wheel.

Methodological challenges

The six pilot projects have employed different methods, but have met some of the same methodological challenges. For all six projects, it was time demanding to find enough participants to workshops or informants to interviews as users are often (ill) patients. Some find it hard to talk about their illnesses, others (as dementia patients or children) can not fully express their needs. Some of the users in the pilot projects were even unable to describe their needs directly, because of either practical or ethical constraints. In the case of e.g. people with dementia, their points of view had to be captured indirectly by interviewing either secondary or tertiary users, and external expert panels.

Also, for ethical concerns, it is often necessary to apply to an ethical committee in order to be allowed to observe or interview these kinds of users. As for health personnel, their main concern is to get enough time for the patients, and as a consequence it is a challenge to make them prioritise innovation workshops.

The health care sector is different from other sectors with regard to the dimensions of user involvement. The innovation model of the pilot projects was largely based on direct user involvement concerning articulated and semi-articulated needs, with variations over the course of the innovation process and the methods employed in each phase. However, in many circumstances, it may prove difficult to find users who have time, capacity and are motivated for participating in an innovation process.

One of the primary learning points from the pilot project is that the users of the health care sector do not have the same characteristics as for example the lead users of von Hippels classics (e.g. 1988). Lead users are described as a group of users who are particularly interested in spending time on developing a new solution or product, because the user himself can gain from it. An IT developer who needs a particular data chip, would voluntarily share his experience and knowledge to get this new product. So would a snowboarder, if it meant he could get exactly the snowboard boots he dreamed of. Such processes demand a lot of time and motivation from the user, and ill patients may not have the same capacity to participate. This is why it seems more fruitful to let the users in the health care sector *participate* in parts of the process, in stead of making the users lead the process. When the users are health personnel, time restraints and a busy work day can make it challenging to find people willing to be lead users.

Once the users are in place, it has proved crucial to find the right method in order to cover all aspects of the users challenges, articulated or non-articulated, without intimidating the user. The learning from all the six pilot projects is that the moderator/interviewer should take a passive position and let the user tell his or her story. An eventual interview guide should therefore be semi-structured. Also, it is important to let the user decide which themes to touch upon, as some may be taboo laden.

The primary users in all pilot projects were patients suffering from different illnesses. The boundary between user- and employee-driven - innovation in the health care sector

is blurred because of the emotional and physical experience of the patients. The patients do not have full information about the “product” but can only refer to the process as an observer since knowledge about medical cause and effect is usually exclusive to the health care professional. The innovation potential does not lie in getting the patient well. The health care professionals and scientists are working hard on that part, but it is in the “surrounding” services that the potential seems the greatest. Services such as speed of diagnosis, information during the process, type of contact with health care professionals, optimizing of the treatment course etc.

This became clear in the idea development workshops which relied on the users’ involvement in the actual conceptualisation of the ideas. While the users were highly motivated, the limited insight into the structure of the health care sector made it challenging to develop new realistic concepts that met the patients’ needs.

Another important learning point was that the political nature of the public health care sector means that there is a fine line between proposing a new way of doing things that *creates value for the patients* and proposing a new way of doing things that *allows the patients to consume value* (i.e. by asking for more service regardless of its innovation potential). While the first is in perfect accordance with the projects’ definition of innovation, the second is merely a redistribution of the scarce public health care resources. One has to be aware that the patients have political interests in the health care system (by pushing for more public funding) and that they are not unbiased.

The WHAT phase is time demanding and important to carry out in an organized and thorough manner. There is a need for developing methods where users can be more involved – not necessarily as lead users, but as observers with experience from own or others’ needs.

From WHAT to HOW

The pilot projects included in this project are all situated in the WHAT phase, meaning they have mapped out the needs and come up with some ideas to solutions. The aim of the projects has been to explore different methods and how they apply in the health care sector. Some of the pilot projects will nevertheless be driven forth in order to come over in the HOW phase. In order to get to the prototyping, testing and implementation of new solutions, there are some crucial elements which need to be considered.

First, there is a need for a strategic push. Both financial and organisational support is necessary to be able to develop the ideas. The process is long, especially if it aims at developing new products, which means that it is necessary to include devoted actors and make the projects part of a larger strategy.

Also, there is a need for methods to communicate ideas to industrial partners. Methods to include industry at an early stage without narrowing the window of opportunities are also required.

In addition, there is a lack of incentives for the industry to participate in processes like user driven innovation projects. Industrial actors may be reluctant because the buyer of a product often differs from the user. The risk in developing a new product especially fitted for the users is extremely high when you do not know if you have buyers for it. Also, the market for new solutions may be small, for example when it comes to products for children. Here, public actors have an important role to play in order to secure good solutions for smaller patient/user groups.

The general learning from the pilot projects are also presented in the methodological toolbox (Appendix 1)

12 Litterature

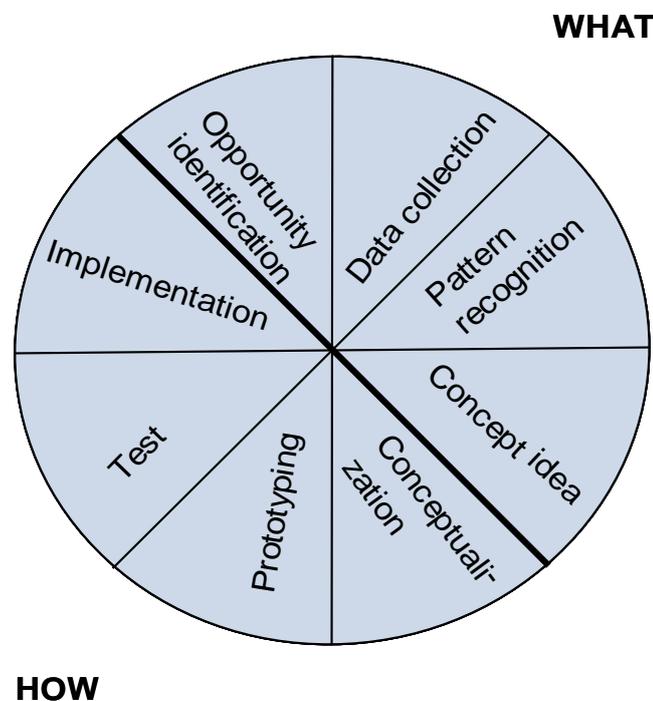
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Appendix 1: Methodological Toolbox for User Driven Innovation in the Health care Sector

In this project we have conducted six different pilot projects, all employing different methods of involving users in the innovation process. In this appendix we group the learning from the pilot projects in order to provide a tool box or a list of ingredients which are important for succeeding in user driven innovation in this particular field. We have mapped the activities of the pilot projects and found that they all belong in the “what” side of the innovation wheel c.f. Figure V.1 (Wise and Høgehaven 2008). This side focuses on *what* to produce or develop, while the other side explores *how* to produce or develop the new product, system or process it. The toolbox therefore applies in the phases “opportunity identification”, “data collection”, “pattern recognition” and “concept idea”. It is important to remember that the innovation process rarely includes all the steps described in the innovation wheel.

Figure V.1 The Innovation Wheel



Opportunity Identification

The opportunity identification phase refers to when new opportunities are discovered by users within the health care sector – meaning doctors, nurses, patients, relatives or others. From our experience, it seems fruitful to:

Involve actors from the industry at an early stage

It may seem restraining on the innovation process if one includes the industry at the very beginning because manufacturers can limit ideas to what is technically possible. Nevertheless, if the ideas are to develop from concepts to real solutions, the industry needs to be involved from the beginning and throughout the process. This is also important to step over from the “what” phase of the innovation process to the “how” phase.

Data Collection

In this step, the opportunity is examined by collecting data about the users. Various methods exist to develop a better understanding of the users' articulated and unarticulated needs. From our experience it is important to:

Include a large range of users

This is particularly important in the health care sector, where users of one system or product may be several actors. In some cases the patient may be too ill to explain what he or she needs. Or, the patient may be the one receiving a treatment, but a nurse or a family member may be the one operating the device, for example. Also, the buyer, who has an interest in the design (and price) of the new solution, may not be the same person as the user. It is therefore important to include all involved actors from specialists via health bureaucrats to patients and relatives – depending on the theme of the innovation process.

Prepare questionnaire/workshops carefully

As the users in innovation processes in the health care sector often are patients or relatives, it is important to prepare interviews or workshops carefully. The questions must leave it to the patient to decide which themes to bring up.

Start finding users at an early stage in the project

It may be difficult, or at least time-demanding, to find enough participants to workshops or informants to interviews as users are often (ill) patients. Some find it hard to talk about their illnesses, others (as dementia patients or children) can not fully express their needs. Also, for ethical concerns, it is often necessary to apply to an ethical committee in order to be allowed to observe or interview these kinds of users. As for health personnel, these are often very busy at work, and as a consequence it is a challenge to make them prioritise innovation workshops.

Pattern Recognition

After having collected data about user needs, the process enters an analytical phase where the aim is to understand unsolved problems. The users are seldom involved in this part of the innovation process. From our experience it is important to:

Extract key information

A Data Collection phase will result in a huge amount of information. Our experience is that this information may be effectively sorted by extracting key observations, and describing those by a quote, and if possible an illustration/photo. This makes it easier to share the information within an innovation team.

Involve different competencies

It is very important to involve health staff in this process in order to verify "real" problems from biased ones that are irrelevant. It is also important at this stage to involve competencies that can prioritise which problem areas that make most value for the patients AND the health care sector. The solution to be developed has to suit the existing organization in some way in order not to be counterproductive.

Concept Idea

In this step, the patterns unveiled in the previous phase will be transformed into new concepts. These concepts will constitute the outcome of the “what” phase. The outcome can be physical or non-physical, it can be a radical innovation or an improvement of an existing product or system.

Here some lead patients can be involved but mainly health care professionals and technology actors. From our experience it is useful to:

Make Scenarios

A set of scenarios may be made by a design team, describing the needs, the context and the actions discovered as key information. These scenarios make it easy for the user groups to discuss the relevance of the results. When the scenarios are verified, they may be used by the design team and the users, to generate concept ideas.



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Nordic Innovation Centre

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The Nordic Innovation Centre initiates and finances activities that enhance innovation collaboration and develop and maintain a smoothly functioning market in the Nordic region.

The Centre works primarily with small and medium-sized companies (SMEs) in the Nordic countries. Other important partners are those most closely involved with innovation and market surveillance, such as industrial organisations and interest groups, research institutions and public authorities.

The Nordic Innovation Centre is an institution under the Nordic Council of Ministers. Its secretariat is in Oslo.

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