Innovation in the Medical Design Industry through the use of Thematic Framing

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Abstract

The healthcare industry struggles with the creation of radical innovations due to many different stakeholders with competing interests. This research project aimed at the development of a methodology that supports medical designers to create innovations by using deep human insights. As a starting point, we used a four-layer model of insights into human needs and aspirations, ranging from solutions ('what') and scenarios ('how'), to goals and themes ('why'). To transform this model into a design methodology, we iteratively developed and evaluated the methodology together with medical designers in a real world design setting. As a result, we distinguished five stages of a so called 'Thematic Framing' process: (1) current frame, (2) needs and aspirations, (3) themes, (4.a) new frames, (4.b) ideas for solutions, and (5) opportunities. The added value of the methodology is that the 'why' level is divided in why's on the goal level – within the design context – and why's at the theme level that will be analysed outside the design context. Moving outside the design context allows for mapping the pattern of the theme to solutions in other contexts; this can create metaphors that can subsequently form a bridge to new frames and solutions.

framing; themes; innovation; human-centred design methodology; medical design

Rising costs and demands in healthcare as well as fast technological developments – that allow, for example, highly personalised healthcare – ask for radical innovations in the healthcare system and in medical products and services. However, industry struggles with the creation and implementation of tangible solutions that are actually used by care providers and receivers. One of the main causes of this innovation struggle is the large range of

different stakeholders with competing interests (Herzlinger, 2006): patients, doctors, insurers, medical device distributors, etc.

Many researchers have concluded that insights into the needs and aspirations of people that have to use a (medical) device or service are important in order to develop and market successful solutions (e.g. Brown, 2009; Parameswaran & Raijmakers, 2010; Lang, Martin, Sharples & Crowe, 2013). However, gathering these insights from the wide range of stakeholders in the healthcare industry is a tough challenge. Currently, human-centred design (HCD) methods are often applied after the idea generation stage of the medical design process (Martin, Norris, Beverley, Murphy & Crowe, 2008) and focus on incremental innovations: small changes within an already existing frame of solutions (Norman & Verganti, 2014). Think of, for example, user tests to make sure that no errors are made whilst using a medical device. Radical innovations on the other hand – which are new, unique, and discontinuous – take place at the starting point of a medical design project. However, to date, information about the integration of human needs and aspirations in this early stage of the medical design process is scarce (Martin et al., 2008).

In order to support medical designers with the creation of radical innovations, we explored how human needs and aspirations can be integrated at the beginning of the medical design process. A possible solution that can be applied is the frame creation process of Dorst (2015). Dorst defines a frame as a specific viewpoint that has the potential to lead to the creation of solutions. Frame creation assumes that radical innovations can be based on a change of meaning and uses deep human insights to create new approaches to problems (van der Bijl-Brouwer & Dorst, 2014). Essential in this process of frame creation is an analysis of phenomenological themes. We recently showed that 'themes' constitute the deepest level of a four-layer model of insights into human needs and aspirations for design innovation (the NADI-model; van der Bijl-Brouwer & Dorst, 2014). This model shows that in a HCD process, designers can identify and analyse users' or other stakeholders' needs and aspirations on different levels of depth, ranging from solutions and scenarios, to goals and themes. We hypothesized that the level at which insights are gathered, influences the design process, and in particular that the thematic level contributes to radical innovations.

In this study, we explored the use of the four levels of human needs and aspirations in order to develop a practical approach towards radical innovation in medical design.

Human-centred design innovation

The four-layer model of insights into human needs and aspirations for design and innovation (NADI-model) was developed to specify what innovators mean when they talk about gathering 'deep customer insights' to support radical innovation (van der Bijl-Brouwer & Dorst, 2014). Based on an analysis of the kinds of insights that experts in design and innovation recommend to gather (e.g.: Hekkert & van Dijk, 2011; Bucolo, Wrigley, &

Matthews, 2012), we found that we can distinguish four levels of insights: needs and aspirations which are related to solutions, scenarios, goals, and themes (figure 1).
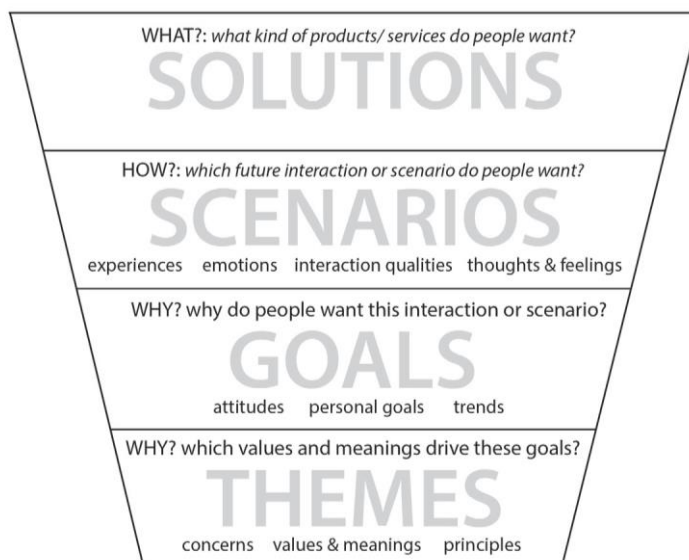

Figure 1: NADI-model (van der Bijl-Brouwer & Dorst, 2014)

On the highest level, the solution level we find the insights that are related to *what* people want, such as products and services. One level deeper, the scenario level describes *how* they want to interact with a solution. The deepest levels of insights are the goals and themes levels, which describe *why* people want certain solutions and scenarios. The difference between goals and themes is that goals describe what people want to achieve within the context of a certain design problem, while the themes describe the underlying needs and aspirations that can be analysed independently of that context. For example, the design of a sports car might be based on the themes 'identity' and 'independence'; both of which are also relevant in situations outside of a sports car. The goals, in the context of a car, could be that someone likes to have a car all to him or herself and that the car should fit that identity of independence. The scenarios that achieve these goals are 'getting attention while driving' and 'driving a car by yourself'. The solution could be a two-seater (just for yourself) or a convertible car (being visible).

The term 'theme' is derived from phenomenology. Dorst and Tomkin (2011) found that the explorations that designers engage in to be able to reframe problems are a subtle process of analysis that is very close to methods used in the creation of phenomenological descriptions of 'lived experience'. Just like phenomenologists, designers analyse the situation by discerning the 'themes' in the life and world of the stakeholders (Dorst & Tomkin, 2011). Phenomenological themes may be understood as the structures of experience. So when we

analyse a phenomenon, we are trying to identify the themes: the experiential structures that make up that experience (van Manen, 1990).

Dorst (2015) furthermore found that as the reframing practice of designers is similar to the practice of phenomenologists, we can borrow methods from phenomenologists to support reframing problems and through that design innovation. To identify and analyse themes we can use the method of hermeneutic phenomenology (van Manen, 1990). So far, the Design Innovation Research Centre at the University of Technology Sydney has applied hermeneutic phenomenology in design innovation projects for addressing complex societal problems through design innovation in various case studies. First, existing HCD research methods are used to gather insights into stakeholder needs and aspirations at the scenario and goal levels of the NADI-model. Next, themes are identified by searching for common patterns in those insights across stakeholders. To move from the themes to reframe the problem, it is useful to look at how the elements of the theme are dealt with in domains outside the problem context (Dorst, 2013). Through using metaphors, a frame can then be created which forms a bridge between problems and solutions.

Although we have shown in previous studies that a thematic analysis is beneficial in solving complex societal problems, the thematic analysis has not been used as a tool for opportunity seeking in a field in which not necessarily a problem is identified. Moreover, we have not used the complete NADI-model to guide a design process. For that purpose we would need to translate the NADI-model into a methodology that aims at identifying opportunities. As the medical design industry is in need of this and is characterised by many different stakeholders with competing interests – just like social problems are –, we selected this domain to explore the usability and success of such a design methodology.

Design research approach

The main objective of this study is to explore the usability and success of a design methodology based on the NADI-model within the early stages of the medical design process. Our research question is defined as follows:

How can insights into human needs and aspirations support the generation of ideas for radical innovations in the medical design industry?

The Design Research Methodology (DRM) of Blessing and Chakrabarti (2009) was chosen as a guiding research framework for the development of the design methodology. In the first stage, we performed a literature study and a participatory design session to gain insight into the existing situation and to define a desired situation. Second, we iteratively developed a new design methodology – called the 'Thematic Framing Methodology' – by applying it in three real-world case studies. Finally, the impact of the developed methodology was investigated by reflecting back to the defined desired situation. Figure 2 summarises these three stages and shows which research methods were used in each stage.
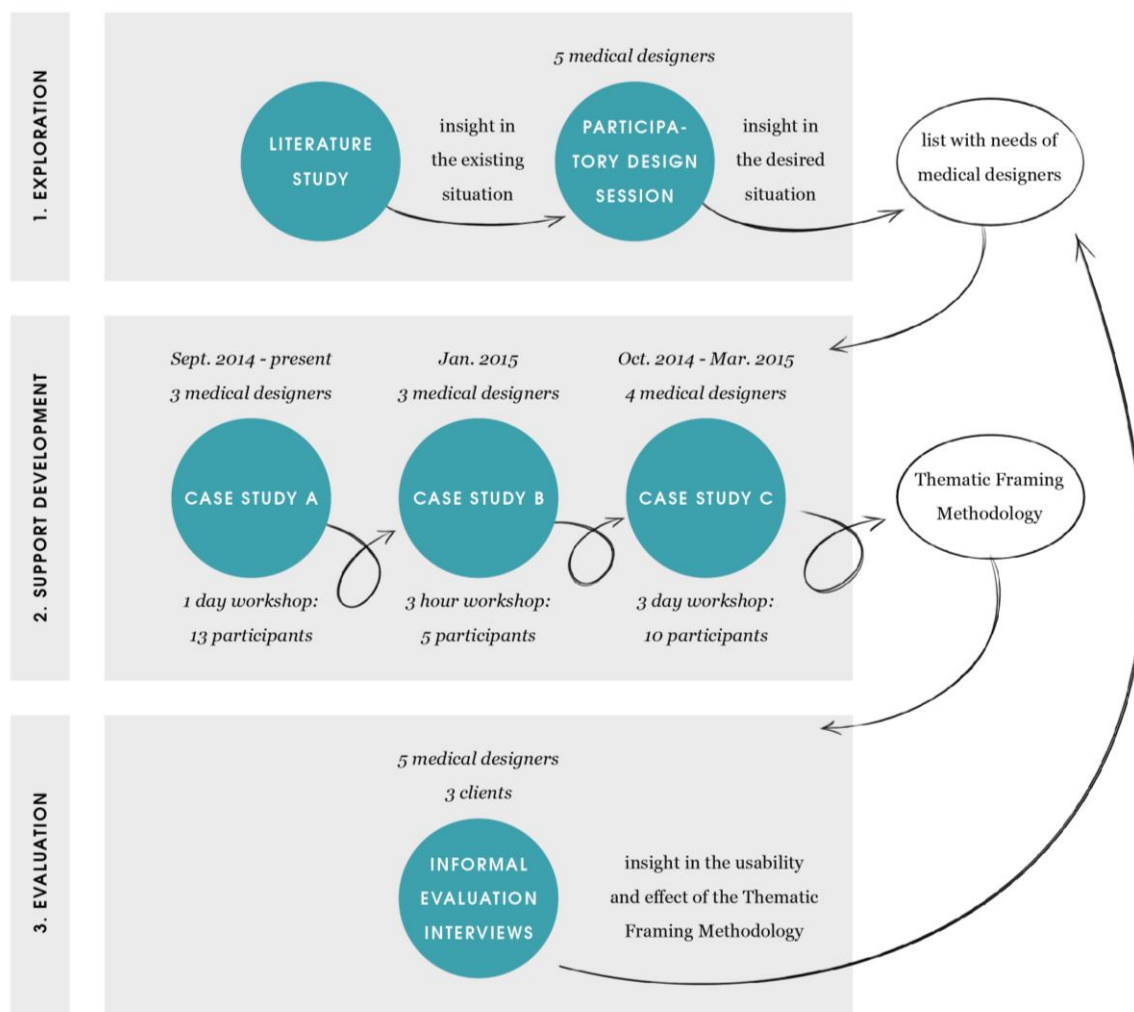
Figure 2: Visualisation of the design research approach

The Thematic Framing Methodology was developed and evaluated together with medical designers, as recommended by Blessing and Chakrabarti (2009). An explorative and iterative case study approach in the context of design practice was found appropriate (Wixon, 2003). Hence, a collaborative research project was set up with Sydney-based medical design agency ide. ide – consisting of approximately 30 employees – has 10 years of experience in developing medical devices for a range of companies in the international medical design industry. The agency provided three real-world design projects for the second stage of this research project. These case studies varied in topic, type of design problem, and available resources. After each case study, the methodology was evaluated and improved together with the involved medical designers. Figure 2 displays the number of medical designers that were involved.

Case studies

The case studies form the core of our investigation. Below, we briefly describe the goal and setting of each case study project. It should be noted that each project was conducted with a range of medical designers and a client of the involved medical design agency; however, the client details have been anonymised to ensure confidentiality remains intact.

Case study A: Chronic diseases
This first case study aimed at identifying new opportunities in the field of chronic diseases. The client of the design agency conducted an elaborate study into the needs and aspirations of, among others, patients, pharmacists, and relatives, but struggled with the translation of these into tangible solutions. A workshop session with a range of stakeholders was set up to analyse these findings and to find new opportunities.

Case study B: Self-monitoring diseases
A range of diseases can be self-monitored by a patient in his or her home environment. The client for this project wanted to explore new opportunities in this field, especially with regard to the management of information. The project aimed therefore at identifying the needs and aspirations of involved stakeholders – e.g. patients, doctors, insurers, and device distributors – and at creating tangible solutions. We conducted a workshop session with the client and a small selection of medical designers to brainstorm opportunities.

Case study C: Diagnosing diseases
The client for this project wanted to identify opportunities to support doctors with the management of information around disease diagnosing. The client had been brainstorming new opportunities in this field for a long time, but struggled with the selection of an opportunity for further development. The project aimed therefore at gaining a better understanding of the meaning of information management to, among others, radiographers, patients, doctors, and hospital administrators, and at selecting opportunities in line with these. An elaborate workshop session with a range of stakeholder (representatives) was conducted as part of this project.

Results

The results of this study can be categorized into procedural knowledge (knowledge about the developed methodology) and declarative knowledge (knowledge that was gained by applying the methodology in design projects) for this research project as well as for the involved medical designers. Declarative knowledge is based on the notion that a growing set of experiences turns into a repertoire of earlier solutions that designers can directly use in new projects (Lawson & Dorst, 2009, page 100). In line with this, the three case studies showed some first signs of a set of standard themes that reoccur in medical design projects. Such a repertoire of 'medical themes' could be reused in new design projects.

Since the aim of this study is to explore the use of a medical design methodology based on the NADI-model, we focus on the procedural knowledge that was gained. First, the findings

with regard to the needs of medical designers for a HCD methodology are described. Next, we discuss the Thematic Framing Methodology that integrates the four levels of insights into human needs in the early stages of the medical design process and how this was applied in the case studies. It was found that a workshop is a key element within the methodology; this Thematic Framing workshop is described in detail in the last part of the result section.

Needs of medical designers

The literature study and participatory brainstorm session with medical designers in the first stage of this project resulted in a range of needs for the usability and effect of the methodology. The most important ones were:

- The methodology should be flexible, meaning that it is applicable to different types of design problems and projects. One of the brainstorm participants specified this a bit more: *'the methodology should be as in-depth or shallow as the time permits'*.
- All participants mentioned low costs, a fast process, and a high quality of the outcome as needs, whereby the latter two were often ranked as most important.
- In order to adopt the methodology in their design process, the participants stated that the methodology should improve the gathering of stakeholder information as well as the translation of stakeholder needs and aspirations into solutions.

The Thematic Framing Methodology

By experimenting with the use of the four levels of human insights within the three design projects, the NADI-model was gradually transformed into a design methodology for the medical industry. As a result, we identified five stages within the so called Thematic Framing Methodology (figure 3). In each stage, different methods and techniques can be used to gather information on the different levels. Appendix A shows an overview of the methods and techniques that were used in the cases. Moreover, appendix A shows at which level insights were gathered throughout the case studies. Note that the case studies do not visualise an ideal situation; the methodology was still being developed. Figure 3 displays therefore an overview of the five stages as well as advice on which level of the four-layer model should be included in a certain stage (the presence of vertical lines at the top of the figure indicates that the corresponding layer of the model should be included).
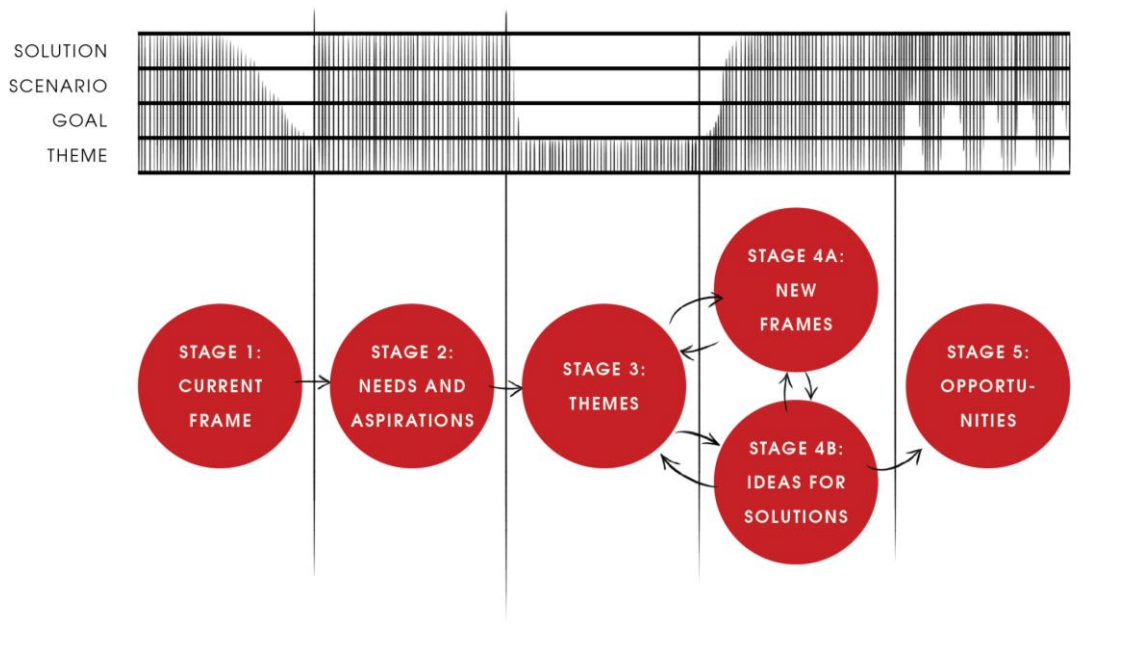
Figure 3: The stages of a Thematic Framing process

In the sections to follow, we will introduce each stage, including a rationale justifying their inclusion in the methodology based on results of the three cases.

1. Current frame
By discussing existing products and services in the design context, one can identify the needs and aspirations that designers implicitly tried to address. It helps to identify opportunities for incremental innovations in the current situation and to identify the involved stakeholders.

We recommend to first look at the upper levels of the NADI-model and use these insights to gradually build knowledge about the underlying themes, as it was found that these are hard to identify retrospectively.

2. Needs and aspirations
In this stage, designers use existing HCD methods to identify the needs and aspirations of involved stakeholders.

In the case studies, we focused on all four levels of the NADI model. Examples of methods that can be used to identify the stakeholders' needs and aspirations are ViP (Hekkert & van Dijk, 2011) and scenario analysis (van der Bijl-Brouwer & van der Voort, 2013).

3. Themes
The gathered insights in the stakeholders' needs and aspirations can be used to identify themes by searching for common patterns. By analysing these themes outside the specified design context using techniques derived from hermeneutic phenomenology in a workshop

format, a better understanding of the values and meanings that drive the stakeholders can be gained.

A workshop format was found essential to analyse themes. In case study B an individual thematic analysis was conducted, which resulted in several frames and opportunities that did not make sense to others.

4a. New frames
New perspectives on the specified design context can be created based on findings about the structure of the theme in other contexts. To make these perspectives more 'usable' for the creation of opportunities, they can be translated into metaphors.

4b. Ideas for solutions
By looking at the goals, scenarios, and solutions within a metaphor, one can directly map these on the specified design context and identify ideas for solutions.

The case studies showed that the creation of frames and ideas for solutions are interrelated: new frames result in new solutions, but new solutions result also in new frames. Moreover, stage 4 results in a better understanding of the theme which again results in new or improved frames and solutions. Dorst and Cross (2001) defined such a process as 'co-evolution'.

5. Opportunities
This last stage aims at improving the usability of a solutions and at exploring its economic viability and technical feasibility in order to transform the ideas in opportunities that can become a market success.

Case study A showed that it is essential to reflect regularly back to the thematic level in this stage. When exploring the viability and feasibility (Brown, 2009) of the selected idea, designers focused on the solution and scenario level. The idea was adapted on these levels, but designers lost sight of the underlying theme. Eventually, the idea was not desirable anymore and the concept was rejected.

The Thematic Framing Workshop

Overall, it was found that a workshop is a key element of the methodology as it allows a collective better understanding of all stakeholder needs and aspirations. This understanding is essential when creating new frames and ideas for solutions together. Based on the workshops that were conducted in the case studies (red dots in appendix A), we recommend to perform stage 2 – 4 in a workshop format with 6 – 12 stakeholders. For such a workshop, one should take at least 5 hours.

Next, we describe the different techniques that we recommend to use in this so called 'Thematic Framing Workshop' using an example of case study B.

2. Needs and aspirations
The workshop should start with asking a selection of key stakeholder the question: what is

important to you? With regard to disease self-monitoring, we found for example that both doctors and patients want to be sure that the right monitoring procedure is conducted.

3. Themes

Next, the workshop should proceed with the identification of themes by clustering the identified needs and aspirations and searching for common patterns. For example, the need of doctors and patients as described above had the underlying theme 'security'. This theme can then be analysed by sharing personal experiences related to the theme. For example, the workshop participants can be asked: have you ever experienced the feeling of security? What triggered it? What changed it? Did others play a role? By having different participants share experiences, a pattern can emerge that shows the structure of the theme (Rijken, 2013). For example, security is related in a structured way to confidence, certainty, prediction, etc.

4a. New frames

The thematic analysis results not only in insights in the structure of the theme, but also in a selection of metaphors. For example, the facilitator asked the participants to give concrete examples of situations in which they felt secure. One of the participants mentioned that the weather forecast made him feel secure: it allowed him to make a prediction about the future. This weather forecast could be a new frame for disease monitoring: what if disease monitoring was like weather prediction and people could see a bad disease value (bad weather) coming?

4b. Ideas for solutions

At last, the identified frames should be translated into goals, scenarios, and solutions. This is a creative step. The metaphor 'weather prediction' resulted in the goal 'patient does not get (unpleasantly) surprised by the disease value'. A scenario that enables this is 'the patient can predict the value of the disease'. As a solution, we then described a smartphone application that keeps track of the different aspects that influence the disease and uses this information to calculate an expected value.

Evaluation

According to Blessing and Chakrabarti (2009), the evaluation of a design methodology should focus on its application process as well as its outcome. Therefore, both the usability of the methodology and the effect were discussed during informal interview sessions with the medical device developers and the clients that participated in the case studies.

Usability of the methodology

First, we reflect back on the needs of medical designers that were defined in the participatory brainstorm that concern usability. The flexibility of the methodology was proven by the fact that it was applied to different types of design projects that had access to different resources. Other needs of the medical designers included low costs, a fast process, and a high quality of the outcome. As the case studies showed that a design team has to explore different themes

and cannot beforehand determine the fruitfulness of a theme, it is hard to promise constant valuable results when applying the methodology. A clear communication of the explorative nature of the process is therefore essential.

Next, we discuss some additional findings with regard to the usability of the methodology:

- *The thematic analysis is a challenge.*
  A thematic analysis does not solely consist of asking the questions as described before. The way one understands the question is essential as well as the way the facilitator interprets the answer. This process can only be learned by actively doing it according to Van Manen (1990).
- The use of metaphors within the workshop was found inspiring and essential in order to stimulate creative thinking of the workshop participants.
  The metaphors did not only help to create new frames step by step, but they also made it easier for workshop participants to participate actively. During the thematic analysis, personal metaphors were used to 'unpack the theme'. Sharing personal experiences in a group is often easier and more fun than sharing your ideas: an experience cannot be wrong.
- The participating medical device developers indicated that a structured step by step approach was found more usable.

  In case study A, the creation of new frames and opportunities passed off dynamically. Starting with a theme, we brainstormed to possible goals, scenarios, and solutions simultaneously. Some of the participants struggled with this: they preferred to first identify the goal, then accompanying scenarios, and at last solutions.

Effect of the methodology

The outcome of the support was discussed with the involved clients. They were asked their opinion about the quality of the generated opportunities as well as to which extent they expected to use the gained insights in future projects.

Overall, all the clients were content with the outcomes and surprised by the wide range of ideas in which the workshops resulted. A quote of the client from case study C illustrates this:

'We have done a lot of post-it sessions over the years, but this one is different and led to fresh and new ideas.'

Moreover, the client of project C stated that new opportunities were created that did not only change their perspective on the specified design context, but on the whole field for which they are developing solutions:

'Some of the innovative ideas generated are applicable to not only this specific product but to all of our products in this field. This is going to be very useful as we continue to transform to the next generation of products.'

In all projects, a first selection of solutions was made based on gut feeling and their affinity with the client's values. However, case study A showed that this does not necessarily transform into a successful opportunity. A practical approach should be developed to select and transform ideas into opportunities that are successful on the market. A large body of literature can already be found on this topic. For example, an existing tool that can be integrated in the methodology is the innovation matrix of Gardien (2006) that displays different options to move imaginative ideas effectively to the market.

To conclude, a note about the effect of case study B should be made. Even though this case study did not result in ideas with which the client wanted to continue at this moment, a valuable outcome was that the client mentioned that they could see how the methodology could lead to successful outcomes and that they wanted to apply it in other design projects. An understanding of the added value of the methodology is an almost equally important outcome as the quality of generated ideas, since analysing themes is an explorative process: one can not be sure beforehand that a theme will lead to valuable ideas. The client's understanding of the methodology and its explorative character is especially key when the analysed themes did not appear to be fruitful.

Discussion

Comparison with other design methodologies

In this section, we compare the developed methodology with other design innovation methodologies and explore the question: what is the added value of the Thematic Framing Methodology? Another design innovation methodology is the ViP (vision in design) approach described by Hekkert and Van Dijk (2011) which supports innovators to 'design' a vision – the reason for existence – underlying their design. This vision is similarly created through investigating a what, how, and why level. The latter is called the 'context level' at which they describe human insights such as human 'principles' and 'trends'. Similarly many design-led innovation methods start from gathering 'deep customer insights' and investigating the customer's 'why'(Martin, 2009; Bucolo, Wrigley, & Matthews, 2012). The step from insights to solutions often involves intuition, sometimes described as the 'magic of the creative process' (for example in health care innovation by Paramewaran and Raijmakers 2010). The added value of the methodology described in this paper, compared to these methods, is that the 'why' level is divided in why's on the goal level – within the design context – and the theme level that will be analysed outside the specified design context. As we have shown in this research project, moving outside the context allows mapping the pattern of the theme to solutions in other contexts (the metaphors), which subsequently stimulates reframing. This gives concrete guidance as to how deep customer insights support innovation and leaves it less to the mysterious creativity of the designer to translate these insights into desirable solutions.

Radicalness of innovations

At the start of this research project, we identified a need for radical innovations in the healthcare industry. Based on the definition of Dahlin and Behrens (2005) – that states that an innovation is radical as it is novel, unique, and adopted – we can only distinguish ideas that might have the potential to become a radical innovation. Whilst reflecting on the ideas, it was found that a mix of possible radical as well as incremental innovations was gained. Both types are essential: incremental innovations optimise radical innovations and without radical innovations incremental innovations would reach a limit. However, because only little support is available for the development of radical innovations, the question comes to mind whether it is possible to steer a Thematic Framing project more into the direction of radical than incremental innovations. Future research should focus on investigating which aspects of the Thematic Framing process lead to radical innovations: when are new frames created that can lead to a change of meaning? And how can we make sure that these aspects are addressed consequently in each project?

Building a repertoire of medical themes

As mentioned in the results section, this research project did not solely result in procedural knowledge about the design methodology. The case studies showed some first signs of reoccurring themes in the medical industry. For example, the themes 'support', 'control', and 'safety' were identified as important themes to the stakeholders in all three case studies. More research is needed to identify these reoccurring 'medical themes'.

The declarative knowledge about such 'medical themes' is not related to one specific design project due to the universal character of themes (van Manen, 1990). This means that if a designer already analysed a theme once, the next time the theme occurs amongst stakeholders the thematic analysis does not have to be executed from scratch. Storing and sharing of this knowledge about themes can therefore be extremely helpful to medical designers. Such a repertoire of 'medical themes' should include knowledge about the structure of themes – from which it is highly likely that new insights are gained in each design project – as well as knowledge about fruitful metaphors that were used to reframe the design context. Future research should therefore focus on how medical designers can share, store, and use this type of knowledge.

Conclusion

In this paper we explored the research question:

How can insights into human needs and aspirations support the generation of ideas for radical innovations in the medical design industry?

A preliminary answer to this question was given by proposing a design approach that uses the deepest level of human needs and aspirations – phenomenological themes – to reframe the perspective of designers and involved stakeholders. This process of thematic framing

supports the creation of new goals, scenarios, and solutions. Within the approach a so called thematic framing workshop was defined as a key element for a successful outcome, as the discussion of stakeholder's needs and aspirations with a selection of key stakeholders leads to better understanding of these needs and aspirations which is essential when creating new frames.

Besides the involvement of the many different stakeholders that are present in the healthcare industry, the approach is not specific to medical design; it can be used for other design projects in other fields as well. In order to develop its application further for medical design, future research should be broadened and involve a range of different medical design agencies. In addition, the application in real world design projects showed opportunities for the development of a repertoire of 'medical themes'. By storing and sharing this declarative knowledge, the support can be transformed into one that is specialised for medical design.

On the other hand, the fact that the methodology is in its current state not that specifically focused on medical design allows opportunities to research the possibilities of the approach within other fields than healthcare. For this, we should look at fields that are characterised by a wide range of stakeholders and a demand for the identification of opportunities.

Overall, the evaluation showed some first proof of the usability and effectiveness of the methodology. Future research should include quantitative analyses of, for example, the generated ideas and responses of designers to validate the methodology with more strength.

Acknowledgements

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Appendix A

Figure A1 – A3 show an overview of the methods and techniques that were used in the cases per stage. Each step of the case studies is visualised with a coloured dot that contains a number and a textual explanation. The numbers in the dots represent the stages of the Thematic Framing Methodology: (0) current frame, (1) needs and aspirations, (2) themes, (3.a) new frames, (3.b) opportunities, and (4) viability and feasibility. The red coloured dots show which steps were executed in a workshop format. The graph at the left side of the figures shows at which level insights were gathered: the presence of horizontal lines indicates that the corresponding layer of the model was included.

SOLUTION SCENARIO GOAL THEME

OVERVIEW CASE STUDY A 'CHRONIC DISEASES'

TIMELINE September 2014 - March 2015

WORKSHOP DETAILS One whole day, 13 participants, 1 facilitator

STUDY PRELIMINARY RESEARCH OF CLIENT TO NEEDS & ASPIRATIONS
(2)
Output: selection of key stakeholders + quotes of key stakeholders

STAKEHOLDERS DISCUSS QUOTES: WHAT IS IMPORTANT?
(2)
Output: list with needs and aspirations of key stakeholders

CLUSTERING OF NEEDS & ASPIRATIONS
(3)
Output: themes

SELECTION OF 3 THEMES
(3)
Output: 'control', 'belonging', and 'denial' (based on gut feeling)

THEMATIC ANALYSIS: SHARING PERSONAL EXPERIENCES
(3)
Output: understanding of the structure of the 3 themes + list of metaphors

BRAINSTORM TO NEW FRAMES & SOLUTIONS
(4)
Output: range of frames and solutions related to the 3 themes

IDEA SELECTION WITH CLIENT
(4)
Output: 1 selected idea direction (based on client affinity + gut feeling)

IDENTIFICATION OF DESIGN REQUIREMENTS
(5)
Output: list of requirements for the selected idea direction

IDEA DEVELOPMENT
(5)
Output: a range of concepts

STUDY TO USERS' NEEDS FOR SELECTED IDEA DIRECTION
(5)
Output: selected idea does not match users' needs

SELECTION OF OTHER THEMES (NOT FINISHED YET)
(3)
Output: -

Figure A1: Overview of the design process of case study A

SOLUTION
SCENARIO
GOAL
THEME

OVERVIEW CASE STUDY B 'SELF-MONITORING DISEASES'

TIMELINE October 2014 - March 2015

WORKSHOP DETAILS 3 hours, 5 participants, 1 facilitator

1 ANALYSIS OF CURRENT CONTEXT AND COMPETITORS

Output: insight in stakeholders and opportunities within the current frame

2 TREND RESEARCH

Output: insight in possible future stakeholder goals

2 STAKEHOLDER INTERVIEWS + OBSERVATIONS

Output: needs of key stakeholders summarised in personas

2 ANALYSIS OF PERSONAS: WHAT IS IMPORTANT?

Output: list with needs of key stakeholders

3 CLUSTERING OF NEEDS & ASPIRATIONS

Output: themes

3 SELECTION OF 2 THEMES

Output: 'security' and 'freedom' (based on gut feeling)

3 THEMATIC ANALYSIS: SHARING PERSONAL EXPERIENCES

Output: understanding of the structure of the 2 themes + list of metaphors

4 BRAINSTORM TO NEW FRAMES & SOLUTIONS

Output: range of frames and solutions related to the 2 themes

3 SELECTION OF 2 THEMES

Output: 'care' and 'privacy' (based on respectively gut feeling and trends)

3 INIDIVIDUAL THEMATIC ANALYSIS: LITERATURE + ART STUDY

Output: understanding the structure of the 2 themes + list of metaphors

4 INDIVIDUAL BRAINSTORM TO NEW FRAMES & SOLUTIONS

Output: range of frames and solutions related to the 2 themes

4 DEFINING AN UMBRELLA METAPHOR

Output: what is disease self-monitoring is like driving a car?

Figure A2: Overview of the design process of case study B

SOLUTION SCENARIO GOAL THEME

OVERVIEW CASE STUDY C 'DIAGNOSING DISEASES'

TIMELINE January 2015

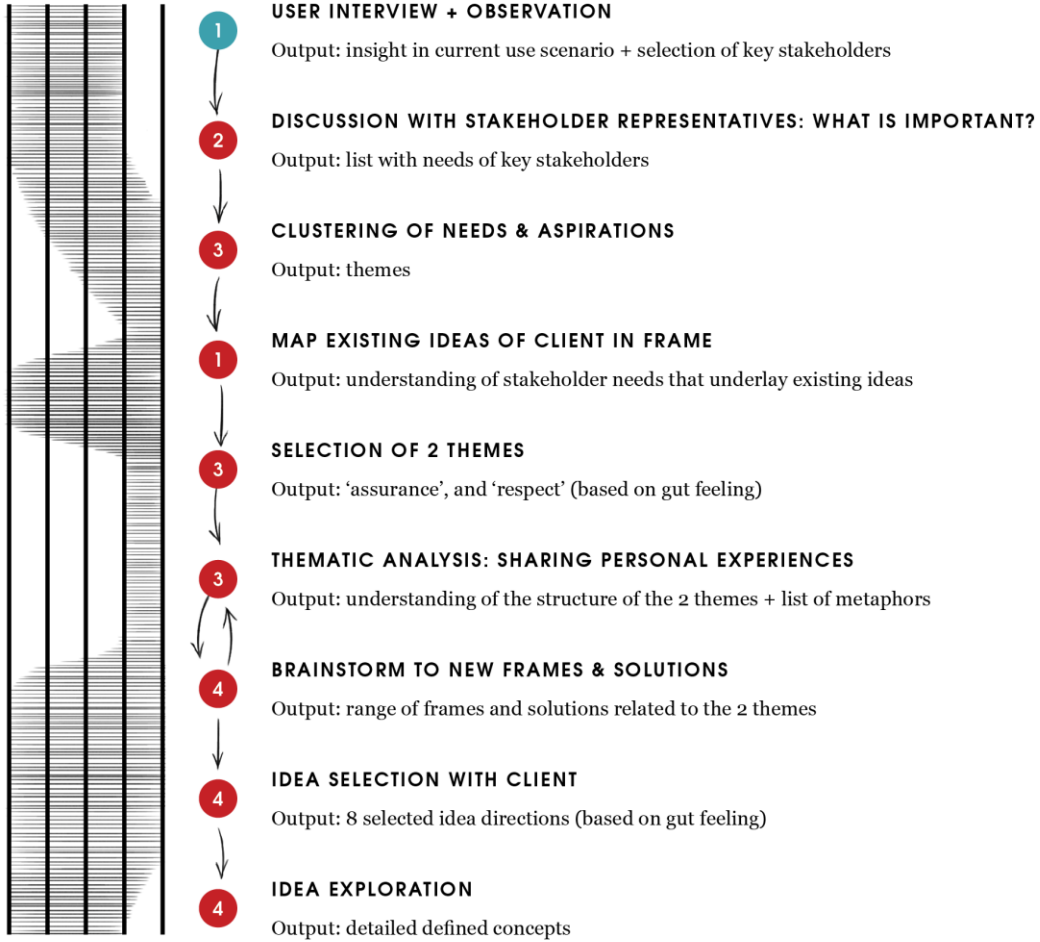**WORKSHOP DETAILS** 3 days, 10 participants, 1 facilitator

① USER INTERVIEW + OBSERVATION

Output: insight in current use scenario + selection of key stakeholders

② DISCUSSION WITH STAKEHOLDER REPRESENTATIVES: WHAT IS IMPORTANT?

Output: list with needs of key stakeholders

③ CLUSTERING OF NEEDS & ASPIRATIONS

Output: themes

① MAP EXISTING IDEAS OF CLIENT IN FRAME

Output: understanding of stakeholder needs that underlay existing ideas

③ SELECTION OF 2 THEMES

Output: 'assurance', and 'respect' (based on gut feeling)

③ THEMATIC ANALYSIS: SHARING PERSONAL EXPERIENCES

Output: understanding of the structure of the 2 themes + list of metaphors

④ BRAINSTORM TO NEW FRAMES & SOLUTIONS

Output: range of frames and solutions related to the 2 themes

④ IDEA SELECTION WITH CLIENT

Output: 8 selected idea directions (based on gut feeling)

④ IDEA EXPLORATION

Output: detailed defined concepts

Figure A3: Overview of the design process of case study C

Author Biographies

Minke Dijkstra

Minke Dijkstra just finished her master in Industrial Design Engineering at the University of Twente. Her graduation project focused on human-centred design for medical design innovations. For this, she worked together with the Design Innovation Research Centre at the University of Technology Sydney and product development group ide. She is now working at ide as a product designer, amongst others to further research and develop human-centred medical design in practice.

Mieke van der Bijl-Brouwer

Mieke van der Bijl-Brouwer is Senior Research Fellow within the Design Innovation Research Centre at the University of Technology Sydney. She has a background in industrial design and has wide experience in studying and developing user-centred design methods. Her current research spans the fields of human-centred design methodology and social innovation, by investigating how human-centred design methods contribute to tackling complex societal problems. For that purpose she works with practitioners in the public sector across domains such as education, mental health, housing, crime and community.

Geke Ludden

Geke Ludden (MSc, PhD) is an assistant professor at the University of Twente, Faculty of Engineering Technology, Department of Design. Her research focusses on 'design for healthy behavior'; research into the design of products, services and persuasive systems that help people change their lifestyle in order to improve their (physical as well as mental) health. Geke is a member of the board of the Design & Emotion Society and has published in international journals such as International Journal of Design, Journal of Engineering Design and Journal of Medical Internet Research.

Willem Mees van der Bijl

Willem Mees van der Bijl is Product Development Manager at ide, a product development group in Sydney. He has over 15 years of experience in developing and implementing new product innovations and has headed up Design & Engineering teams in The Netherlands and Australia. Among the products he helped realise have been a range of Child Safety products and Medical Devices. Over the past 10 years he has been collaborating with universities to research and develop innovative ways of initiating, developing and implementing new solutions that help us realise better futures for people.