Meaning Frames: The Structure of Problem Frames and Solution Frames

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Introduction

The growing interest in "design thinking" from other disciplines has challenged the design community to be more explicit about its theories, methods, and models, including the concept of "framing." Framing has found a new and revitalized position in design theory; the discussion of it has moved in two differing directions in the current literature, each suggesting different points of focus.

On the one hand, framing is discussed as a way to approach wicked problems. Frames are highlighted as the designer's approach to creating a new or redefined perspective on a problem that offers a new and radical direction for resolving it. Framing in this context is used to handle ill-defined, open-ended, and ambiguous problems that other problem-solving methodologies fail to handle. In these discussions, the framing is commonly labeled a "problem frame," signifying that the problem is the center of the framing activity.[1]

On the other hand, framing as originally developed had the aim of providing a better understanding of design reasoning and meaning making. Several studies have followed this initial thinking on frames and further explored reasoning and meaning making in the context of design teams and their creation of solutions. Here, frames have been defined from an operational perspective as the implicit assumptions that influence which issues are seen as relevant, which values and goals are deemed important, and which criteria can be used to evaluate the meaningfulness of a given solution.[2] The creation of these frames is more closely related to understanding the significance of a given solution, rather than to understanding the problem; therefore, we propose labeling them "meaning frames."

The main argument of this paper is that although the development of the problem framing concept has been vital to the design community, understanding how designers create "meaning frames" and how the frames' structure integrates important perspectives on the product and sets the relevant boundaries for the envisioned solution space offers greater value and insight. Based on a literature review, we conceptualize meaning frames as a basis

1 Kees Dorst, *Framing Innovation* (Cambridge, MA: The MIT Press, 2015): 44–50.

2 Jonathan H. G. Hey, Caneel K. Joyce, and Sara L. Beckman, "Framing Innovation: Negotiating Shared Frames During Early Design Phases," *Journal of Design Research* 6, no. 1–2 (2007): 79, doi:10.1504/JDR.2007.015564.

Design*Issues:* Volume 35, Number 3 Summer 2019 https://doi.org/10.1162/desi_a_00547

for understanding the way designers and design teams create a vision for the project and define the solution space in the early phases of innovation. We use this conceptual model to conduct comparative, in-depth case studies of the framing process at five different companies: Butchers & Bicycles, Libratone, Coloplast, Vipp, and B&O. The case studies allow us to identify and understand relevant elements and patterns that characterize the meaning framing process. As such, the case studies provide further insight into how expert framers, based on an initial problem frame, develop a set of solution frames to integrate different perspectives and how these frames together constitute the meaning frame.

Framing Theory: Two Emerging Directions

As frames have been explored in various fields of research, they have come to be defined as cognitive shortcuts that help to make sense of complex situations.[3] Donald Schön has made one of the most important contributions to the concept of frames in the context of design as part of his work on reflective practice.[4] Schön was the first to explain the design process as a matter of naming, framing, moving, and reflecting. Framing was initially defined as representing "the underlying structure of belief, perception and appreciation."[5] Numerous studies have built on Schön's work on framing and provided the design community with new insights into this implicit and informal process, which is based on abductive reasoning and tacit knowledge.[6] Schön has been widely acknowledged by design practitioners for his ability to describe the design process in practice. However, in the research community, Schön also has been criticized for his lack of both empirical evidence and precision in terminology.[7] More recent research on frames and framing has sought to present a more nuanced understanding of the framing process, resulting in two different theoretical directions for framing.

Problem Frame

Kees Dorst's introduction in 2011 of a model that combined different modes of reasoning and problem solving in the notion of frames was an important milestone in the definition of problem frames.[8] Dorst showed that when designers work with wicked and ambiguous problems, they do not define upfront *what* they are designing or *how* the solution is going to work; instead, designers create a frame. The frame is a proposal for how the solution will work to achieve an aspired value. Thus, the designer creates both a new way of understanding the problem and a new direction for the solution, which then can be tested and explored further (see Figure 1).[9]

Dorst defined a problem frame as a proposal of how to handle a wicked problem. His definition provides an important clarification of how designers approach problems, as well as an understanding of why frames play such an important role in the

3 Erving Goffman, "Frame Analysis: An Essay on the Organization of Experience," *Contemporary Sociology* 10, no. 1 (1981): 60, doi:10.2307/2067804; Marvin Minsky, "A Framework for Representing Knowledge," in *Readings in Cognitive Science: A Perspective from Psychology and Artificial Intelligence* (2013), 156–289, doi:10.1016/B978-1-4832-1446-7.50018-2.

4 Donald Schön, *The Reflective Practitioner* (New York: Basic Books, 1983).

5 Donald Schön and Martin Rein, *Frame Reflections* (New York: Basic Books, 1994): 23.

6 Norbert F. M. Roozenburg and Johannes Eekels, *Product Design: Fundamentals and Methods* (West Sussex: Wiley, 1995); Kees Dorst and Nigel Cross, "Creativity in the Design Process: Co-Evolution of Problem-Solution," *Design Studies* 22, no. 5 (2001): 425–37, doi:10.1016/S0142-694X(01)00009-6; Rianne Valkenburg and Kees Dorst, "The Reflective Practice of Design Teams," *Design Studies* 19, no. 3 (1998): 249–71, doi:10.1016/S0142-694X(98)00011-8.

7 Jennifer A. Moon, *Reflection in Learning and Professional Development* (London: Kogan Page Limited, 1999).

8 Kees Dorst, "The Core of 'Design Thinking' and Its Application," *Design Studies* 32, no. 6 (2011): 521–32, doi:10.1016/j.destud.2011.07.006.

9 Ibid., 523–24.

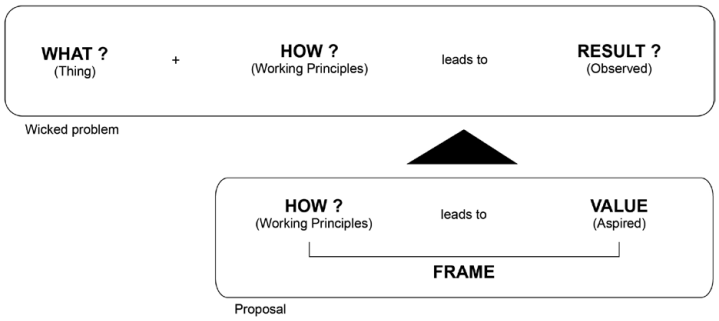


Figure 1
Dorst's definition of a frame—a proposal for handling a wicked problem.

design reasoning process. Following Dorst's theory on framing, subsequent studies highlighted framing as an approach that could better handle wicked problems than other problem-solving methodologies. Framing thus was seen as a way to approach ill-defined, open-ended, and ambiguous problems in design, as well as in innovation, business, or society in general.[10]

The purpose of the problem frame is to create a new perspective on a problem—"a novel standpoint from which a problem can be solved."[11] The problem frame can be identified in the design process as metaphors or coherent statements that are useful to "think with" but the moment they have been accepted by the design team, they begin to fade away. Pee et al. even use the term, "problem framing," and suggest that further work be done with metaphors to illuminate the "mysterious" problem-framing process.[12]

Meaning Frames

Originally, the concept of framing was developed and defined with the aim of providing a better understanding of the design reasoning and meaning-making behind a given solution. Framing was a process of sense-making that allows designers to "see things as" or to create specific object worlds.[13] In many of the studies we identify as focusing on meaning framing, the act of framing is most often explored in the context of design teams.[14] Hence, it is highlighted as an approach to creating a "shared" understanding of relevant issues, important values and goals in the project, and criteria for evaluation.[15] The purpose of the meaning frame is to create a plausible image that rationalizes what will be created and thus gives context to the decision making and the steering of the design process.[16] In these studies, the observable dialog reveals how teams create, test, and negotiate the frames differently than individuals undertaking a framing process, where framing is mainly done through personal reflection.[17] The research on framing in teams has further underlined how important the framing process is for the success of conceptual development and the importance of the team's engaging in a shared framing process to achieve shared goals.[18] Meaning frames typically are identified by an operationalized definition. For example, Hey et al. defined the frame by its constitution in the design process; similarly, Dong et al. (2013)

10 Bec Paton and Kees Dorst, "Briefing and Reframing: A Situated Practice," *Design Studies* 32, no. 6 (2011): 573–87, doi:10.1016/j.destud.2011.07.002; Suat Hoon Pee, Kees Dorst, and Mieke Van der Bijl-Brouwer, "Understanding Problem Framing Through Research into Metaphors," in *Interplay* (Brisbane: The 6th Conference of International Association of Societies of Design Research, 2015); Dorst, "The Core of 'design Thinking' and Its Application"; and Dorst, *Framing Innovation.*

11 Dorst, *Framing Innovation*, 55.

12 Pee, Dorst, and Van der Bijl-Brouwer, "Understanding Problem Framing Through Research into Metaphors."

13 Rianne Valkenburg, "The Reflective Practice in Product Design Teams" (PhD thesis, TU Delft, 2000); Karl E. Weick, *Making Sense of the Organization* (Malden, MA: Blackwell Publishing, 2001); Schön, The Reflective Practitioner; Louis L. Bucciarelli, "An Ethnographic Perspective on Engineering Design," *Design Studies* 9, no. 3 (1988): 159–68, doi:10.1016/0142-694X(88)90045-2.

14 Hey, Joyce, and Beckman, "Framing Innovation"; and Vedran Zerjav, Timo Hartmann, and Christoph Achammer, "Managing the Process of Interdisciplinary Design: Identifying, Enforcing, and Anticipating Decision-Making Frames," *Architectural Engineering and Design Management* 9, no. 2 (2013): 121–33, doi:10.1080/17452007.2013.775106.

15 Hey, Joyce, and Beckman, "Framing Innovation": 81.

16 Zerjav, Hartmann, and Achammer, "Managing the Process of Interdisciplinary Design": 124.

17 See, e.g., Rianne C. Valkenburg, "Shared Understanding as a Condition for Team Design," *Automation in Construction* 7 (1998): 111–21, doi:10.1016/S0926-5805(97)00058-7; and Hey, Joyce, and Beckman, "Framing Innovation."

18 For the former, see Valkenburg and Dorst, "The Reflective Practice of Design Teams," 269; for the latter, see Hey, Joyce, and Beckman, "Framing Innovation,": 94; and Louise Møller and

	PROBLEM FRAME	MEANING FRAME
WHAT IS THE PURPOSE OF THE FRAME?	To create a novel standpoint from which a problem can be solved (Dorst 2015, 55).	To create a plausible image that rationalizes, what is being created. (Stompff 2016; Smulders and Brehmer 2011)
WHAT CONSTITUTES THE FRAME IN THE PROCESS?	A new and innovative perspective on the problem situation in the form of e.g metaphors or coherent statements twhich are useful to 'think with' (Pee, Dorst, and Van der Bijl-Brouwer 2015; Dorst 2015)	1) A desired end state or goal 2) Relative importance & relevance of features (prioritisation of designers' attention) 3) Boundaries to the design situation (problem scope, solution scope, resource constraints) 4) Criteria for evaluation (of new information, features and possible solution concepts) (Hey, Joyce, and Beckman 2007, p. 81)
WHAT IS THE ROLE OF THE FRAME WITH RESPECT TO THE TEAM?	A 'shared way of seeing' at a specific moment in the design process that directs the team's actions. (Dong, Kleinsmann, and Deken 2013)	A basis for creating a shared mental model ascribed to the entirety of the knowledge and belief structures associated with the design. (Dong, Kleinsmann, and Deken 2013)
WHAT IS THE TEMPORALITY OF THE FRAME?	Once accepted the frame immediately begins to fade (Dorst 2015)	It gives context to decision making and helps to steer the design process (Zerjav, Hartmann, and Achammer 2013)

Figure 2
The division between problem frames and meaning frames.

defined solution frames with respect to their function in the team. The prior literature on frames and framing contains two different matters of concern: framing of the problem and framing of the meaning of the solution. Valkenburg touched on this difference in 2000, when she looked at the reflective practices in teams and noted that "we can make a distinction between frames concerning the design task (the problem) and frames concerning the solution(s)."[19] However, she did not further clarify or examine the subject. Similarly, in introducing the concept of shared mental models, Dong, Kleinsmann, and Deken indicate a difference between frames that focus on the problem (a "shared way of seeing" at a specific moment in the design process that directs the team's actions) and frames that focus on the solution (a shared mental model ascribed to the entirety of the knowledge and belief structures associated with the design).[20] Further, when Stompff, Smulders, and Henze studied the reframing process in interdisciplinary design teams, they found two steps in the reframing process: first, sense making (that deals with the problem situation) and second, future framing (that focuses on the solution).[21]

Despite the fact that these studies indicate a difference in frames relating to the problem and frames evolving around meaning making, the distinction between problem frames and meaning frames is not explicitly articulated, nor is it well understood in design research. Based on our literature review of recent research on frames, we identify four dimensions to which problem frames and meaning frames relate differently: 1) the frame's purpose; 2) its constitution in the design process; 3) its role with respect to the teams; and 4) the frame's temporality. (See Figure 2 for an overview.)

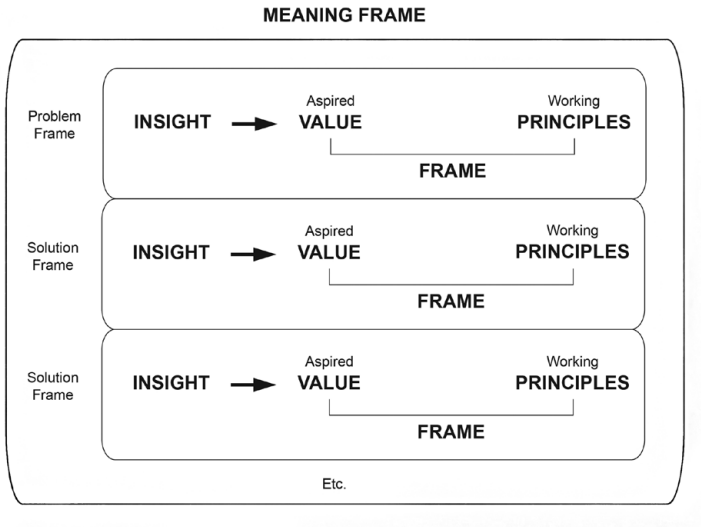
Christian Tollestrup, *Creating Shared Understanding in Product Development Teams* (London: Springer Verlag, 2013), 106.

19 Valkenburg, "The Reflective Practice in Product Design Teams," 132.

20 Andy Dong, Maaike S. Kleinsmann, and Fleur Deken, "Investigating Design Cognition in the Construction and Enactment of Team Mental Models," *Design Studies* 34, no. 1 (2013): 1–33, doi:10.1016/j.destud.2012.05.003.

21 Guido Stompff, Frido Smulders, and Lilian Henze, "Surprises Are the Benefits: Reframing in Multidisciplinary Design Teams," *Design Studies* 47 (2016): 187–214, doi:10.1016/j.destud.2016.09.004.

Figure 3
The analytical framework for identifying meaning frames.



Dividing frames into problem frames and meaning frames provides a new perspective on the framing process—both in terms of understanding the contributions of previous studies and as a new starting point for approaching future research into frames. However, it also reveals a gap in consistent terminology, particularly with respect to meaning frames. Although recent research has scrutinized and explained the structure of problem frames, an examination of the structure of meaning frames is still lacking in current design research on framing, and the understanding of the meaning frame as a concept has less consensus compared to the concept of problem frames. Dorst's work on problem frames has created an important definition and foundation for further work with problem frames, and a similar definition and foundation still are needed for meaning frames.

To provide clarification and a deeper understanding of the definition and structure of meaning frames, we build on Dorst's definition of a problem frame. We expect this definition for meaning frames to be more complex because it must hold the entirety of knowledge and belief structures associated with the design. Our argument is that meaning frames are constituted by several different frames. First, the problem frame provides an important direction by establishing the problem; second, multiple solution frames are integrated to identify potential directions for the solution. We expect these solution frames to have a similar structure to Dorst's definition of problem frames and thus to connect an aspired value with a working principle. Moreover, as Dorst also highlights, we expect these solution frames to be communicated through metaphors and storytelling because such methods more easily allow the designers to change perceptions as well as make the key elements of the new solutions visible (see Figure 3).[22]

22 Jerome S. Bruner, *Acts of Meaning* Cambridge, MA: Harvard University Press, 1990); A. Simmons, The Story Factor: Secrets of Influence From the Art of Storytelling *(Basic Books, 2006); George Lakoff and Mark Johnson, Metaphors We Live By* (Chicago: University of Chicago Press, 1980).

The following analysis examines the meaning frames, understood as the connection between: 1) a key insight, 2) an aspired value, 3) a metaphor (or one-liner), and 4) a working principle.

Methodology

To explore what characterizes a meaning frame, we conducted case studies of the design of meaningful products. The research focused on already existing products to ensure that the meaning frames would be apparent. The case studies included a series of semi-structured interviews with five designers or design teams in four different industries. The designers all worked as in-house teams in one of the following companies: Butchers & Bicycles, Libratone, Coloplast, Vipp, or B&O (Bang & Olufsen). The interviews focused on examining the framing of the products, based on the parameters delineated. In practice, the semi-structured interview guide centered on questions about the needs, dilemmas, or paradoxes for which the products were created, their unique selling points, and their positioning in the marketplace. Furthermore, the interviews were intended to produce insight into the reasoning for and principles behind the products, including their aspired values, solution principles, descriptive metaphors, and one-liners. We gathered data by reviewing the history of the development process, its challenges and strategic decisions, and by asking questions about the reasons for specific details of the products. We made audio recordings of the interviews, transcribed the central parts, and analyzed them according to the analytical framework outlined; the analyses were shown to the designers to verify the findings.

Cases and Analyses

In this section, we provide a short introduction to each of the products and then present an overview of the different frames with which the design teams worked, including the insight that initiated the frame, the aspired value that arose, the descriptive metaphor or one-liner that guided them, and the solution principles that resulted. Finally, we identify the characteristics of the product's meaning frame.

Butchers & Bicycles: MK1-E (cargo bike)

The MK1-E is an electric cargo bike designed for urban bikers who have become parents and therefore need transportation that carries their children. The problem framing of the MK1-E was to create the *Tesla of electric bikes* and thereby an approach for addressing the new urban parents' paradox of having to choose between the car (which would change their lifestyle) and the slow and heavy cargo bikes (which would ruin their feeling of flow and easy movement in the city). When the design team moved from the overall problem frame of *Tesla of electric bikes* toward the solution, they needed to integrate different perspectives for the solution. First, regarding the

MEANING FRAME

	Insight	Aspired values	Frame metaphor/ oneliner	Working principle
Problem Frame	Urban bikers, who have children, have to choose between the car that changes their lifestyle and the inconvenience of a carrier bike, which is heavy and slow, and limits the biking experience. Furthermore, most carrier bikes give the biker an upright position (similar to 'old lady bikes') and a more family oriented expression.	The aspired value is to create the urban replacement of the car. With safety for the children and comfort for the driver. Furthermore, the aspired value is to create a bike that will make the urban male biker look cool.	"The Tesla of electric bikes".	An electric motor to help push the weight of the children or goods – in order to maintain flow and comfort. Added conveniences like isofix, clove compartment, cup-holder. Forward leaning position – as on a mountain bike. Adjustable and comfortable for tall people.
Solution Frame	When driving a regular cargo bike you lose the biking experience, because the bike is very heavy and the driver has to slow down at every corner in order not to tilt.	The aspired value is to create a bike, where the experience of flow and speed of the regular urban bike is combined with the option to transport children and goods.	"The three-wheeler that drives like a two wheeler".	Front-wheels that can be angled and make it possible to lean into the curve.
Solution Frame	People buy means of transportation and they want to be assured that it will work every day.	The aspired value is to create a bike that is easy to buy, use, manage and maintain.	"The everyday tool that works"	Meaningful choices: black or white, lights or not. Low maintenance: service deals, puncture free tyres, PU-leather, drain wholes and up-grade like belt drive. Thought-through interaction: easy to park, stable when it is parked, easy to load (door for children).
Solution Frame	It is estimated that a family with two kids will have a need for this bike for 5 years.	Therefore the aspired value is to create a bike with a product lifetime of five years minimum, to fulfil the urban families need for transporting children (which is much longer than avarage bikes).	"Quality that lasts".	Quality components i.e. the carrier box is made of solid coloured ABS, that can be refurbished and acid free stainless steel to avoid rust film. Classic styling. No seasonal trends and only two colours. Characteristic lines and simple tube constructions to downplay the complexity of the front wheels.

Figure 4
The Meaning Frame of Butchers & Bicycles: MK1-E.

experience of riding the cargo bike, the design team learned that the cargo bikes currently on the market were very heavy and slow. In their design, they wanted to create a cargo bike that had the agility of a regular bike—in other words, *a three-wheeler that drives like a two-wheeler*—and the working principle would allow the driver to lean into the corner, as on a regular bike. Another solution frame added to the MK1-E was expressed as *an everyday tool that*

MEANING FRAME

	Insight	Aspired values	Frame metaphor/ oneliner	Working principle
Problem Frame	The market for docking stations is growing because people use mp3 players, iPods and phones for music, however the sound quality in most docking stations is very poor.	The aspired value is to create docking station with hi-fi quality.	"As an acoustic guitar"	A one speaker-unit, which sends sound in all directions of the room and use the room's reflection to create a 360-degree sound experience
Solution Frame	The market for consumer electronics is highly competitive. As a newcomer, the best way to penetrate the market is through differentiation.	The aspired value is to 'get away from the piano black' and 'out of the PC reference' and like 'Apple' compete on other aspects than the typical technological features.	"As a piece of furniture".	Styling inspired by contemporary Scandinavian furniture.
Solution Frame	Traditionally, high end hi-fi systems are bought by males. However, they often end up in the basement, because they are not 'allowed' into the living room by the female occupant.	The aspired value is to create a 'unisex sound system'.	"Balancing bold and discrete".	Bold triangular shape and discrete soft cover.
Solution Frame	Music consumption is changing. Music is not just something you sit down and listen to; it has become a soundtrack to other activities.	The aspired value is to create a sound system that can play music everywhere in the house.	"Portable plug and play"	A handle to make it easy to bring the unit around the house. Wireless connection to the music and only one plug for power.

Figure 5
The Meaning Frame of Libratone Live.

works. This frame focused on the interaction with the bike and added the intention to create a cargo bike that was easy to buy, use, manage, and maintain. Finally, the team added the solution frame, *quality that lasts,* which influenced the choice of styling and materials. (Figure 4 shows the full meaning frame for the MK1-E.)

Libratone: Live (music system)

Libratone Live is an airplay speaker with a 360-degree sound experience. When the speaker first was introduced, the market of docking stations was growing, but the sound quality of most of the products was very poor. Hence, the problem framing was to create the speaker *as an acoustic guitar* and to create a full room sound experience from just one unit. Based on the initial problem framing, the team added a further solution frame: The traditional, bulky hi-fi speakers, often bought by males, generally ended up "in the basement" when they moved in with a girlfriend. The design team created a frame for the solution that would allow the product to be displayed more prominently, called *as a piece of furniture*. The intention was to differentiate the product from the existing market by deemphasizing the *electronic/technology* reference and adding a

MEANING FRAME

	Insight	Aspired values	Frame metaphor/ oneliner	Working principle
Problem Frame	For many patients getting an ostomy is often combined with feeling a loss of dignity. And even if patients after some time end up living almost normal lives, the medical expression of the ostomy bag keeps them in the paradigm of being sick or handicapped.	The aspired value is to create a product that changes the paradigm of ostomies from the prosthesis expression that stigmatizes the user as sick or handicappet to a product that radiates 'just an everyday product' and help the user to retain a feeling of dignity.	As a piece of clothing.	Fabric cover rather than the typical plastic cover that resemples products typically used in the hospital. Geometric shapes, rather than organic shapes
Solution Frame	Presently ostomy bags are made from cheap plastic material (typically used for disposable one-time-use products) and therefore they are very uncomfortable to wear.	The aspired value is to create a product that feels comfortable and natural to wear close to the body.	Material dignity.	Woven lining fabric that feels soft to the skin. No division marks or edges.
Solution Frame	Presently, ostomy bags imitate white 'skin colour' which make them look strange or 'wrong' on bodies of darker skin colour. Furthermore, if the ostomy bag differentiates too much from the skin colour, its shadow on the skin becomes visible under white or light coloured clothing.	The aspired value is to create a product that looks beautuful on every skin colour and is perfectly discrete under light coloured clothing.	Become one with the shadow.	A warm grey colour that is based on the similarities between different skin tones and aligned with the 'colour' of the bag's shadow on skin.
Solution Frame	Safety with respect to leakage and bad smells is very important to the patients. Coloplast is leader of the ostomy bags' market, because they were the first to offer this safety. But competitors are catching up and hence it is considered duty functions and no longe a differentiating capabilities.	The aspired value is to build upon the core values and working principles that can be found in Coloplast's previous ostomy products and the on-going research with respect to this.	Security first.	Very flexible 'glue disk' that fits all body shapes and sizes to avoid leakages. Furthermore the 'glue disk' can be placed on and removed from the body without causing damage to the skin. Different layers of material in the bag to prevent leakage of fluid and smell, while allowing the possibility to look into the bag if needed. New filter-system for air-transmission that lower the probability of ballooning.

Figure 6
The Meaning Frame of Coloplast: SenSura Mio.

home reference. Finally, the team also created the solution frames, *bold and discrete* and *portable plug and play* to define a direction for the interaction with the product, as well as to nuance the product's expression. (See Libratone's meaning frame in Figure 5.)

Coloplast: SenSura Mio

Sensura Mio is an ostomy bag developed by Coloplast. It is a product that approaches the emotional challenges of ostomy procedures, which often are difficult for the patients because they feel like they have lost their dignity. The ostomy bags that are currently on the market have a prosthesis expression that stigmatizes the patient as handicapped or sick. Therefore, the problem framing was to create an ostomy bag that would look just like *a piece of clothing* and thereby minimize the focus on being sick. When the design team moved from the overall problem frame toward the solution, they added a few more solution frames. The first, *material dignity,* focused on making the ostomy bag more comfortable to wear. A second solution frame was called *become one with the shadow.* With this solution frame, the team aspired to make a product that would look natural on every skin color and be discrete under light-colored clothing.

Finally, the team adopted one of the solution frames that can be found in all Coloplast's ostomy bags, *security first,* which focuses on the importance of creating a product that is safe in terms of leaks, both of contents and odors. (See Figure 6 for the meaning frame of the SenSura Mio.)

Vipp: Vipp Kitchen

The Vipp kitchen is a high-end, stainless steel kitchen that builds on the design DNA of the Vipp pedal bin. The pedal bin, designed in 1939, is known for its durability and classic expression. Previously, it was sold as an accessory to new kitchens in various kitchen retail stores; however, executives at Vipp were dissatisfied with this arrangement, mainly because kitchens are fashion products with a limited lifetime, and Vipp bins are produced to last for decades. Hence, Vipp's design team decided to create *a kitchen to go with the bin*. When the design team moved from the overall problem frame toward the solution, it added a few more solution frames to transfer some of the DNA from the bin to the kitchen, including *it is a tool* and *demonstrating craftmanship.* The aim of the first frame was to set a direction for the interaction, whereas the second solution frame set a direction for the quality of the product. In the process, the designers also added the solution frames, *Ford T-type choices* and *free-flowing boxes*. The *Ford T-type choices* referred to Henry Ford's famous quote: *"Any colour—so long as it's black"* and set the direction for few choices and few customization possibilities. This was added to accommodate online sales and to set a direction for the purchase experience. The *free-flowing boxes* frame was added to enable easy installation all over the world. (See the full meaning frame in Figure 7.)

MEANING FRAME

	Insight	Aspired values	Frame metaphor/ oneliner	Working principle
Problem Frame	Previously Vipp's kitchen bins were sold as a piece of accessory to new kitchens in various kitchen retail stores. However, kitchens are 'fashion products' with a 7 year average lifetime, whereas Vipp bins are made to last decades.	The aspired value is to create a kitchen to go with the bin. A kitchen that does not go out of fashion.	The black trench coat of kitchens. .	Long lasting furniture that fit into many different places (you can take it with you, if you move). Stainless steel top and details with reference to a classic (industrial) kitchen workspace. Black or white only.
Solution Frame	The market for online shopping of kitchens is starting to mature. VIPP wants to be globally present and tap into this new sales channel that fits a small company like VIPP.	The aspired value is to create a kitchen that is optimized for online sales.	Ford T-type choices.	Minimising choices and variables so the kitchen can be planned very fast based on a floorplan only All appliances are pre-chosen, choice of gas range or induction only.
Solution Frame	The original VIPP pedal bin was conceived as a tool to make it easier to access the bin with something in your hands and therefore the DNA of VIPP is to create everyday tools with improved interac-tions.	The aspired value is to create a kitchen that is not only for show, but a tool that will be used by people, who love to use it.	It is a tool.	In all the 'places' where the user interacts with the product more attention is added to the details e.g the handle bar and gas-regulator-buttons have been milled in a way that creates a machine like feeling when turned.
Solution Frame	Most costumers will be international due to the expected price of the kitchen, therefore installation needs to be simple enough to be handled by local installers.	The aspired value is to create very little interface with existing structures in the room, where the kitchen will be installed in order to minimize the challenges of the installation.	Free flowing boxes	Free standing modules with adjustable legs. 3 types of modules. Variable in length only.
Solution Frame	Some of the first VIPP pedal bins are still in use 40 years after they were produced. The only thing that wears over time is the pedal arm, which can be replaced.	The aspired value is to create a kitchen with the same duability and lifespan, as well as expression of craftmanchip	Demonstrating Craftsmanship.	Organic feel of things being connected e.g. accentuated meeting between handle and face of the drawer. Connections that ensure that the kitchen can be repaired (no glue or pop-nettings).

Figure 7
The Meaning Frame of the Vipp Kitchen.

B&O Play: Beoplay A9 (music system)

Beoplay A9 is one of the first products launched from B&O's sub-brand, B&O Play. A9 is a music system designed and crafted as a piece of furniture, with legs of wood and a cover made of fabric. The overall aim was to introduce young people to the B&O brand, quality, and experience and to turn them into future B&O customers. The expression of the product was a main consideration in the

MEANING FRAME

	Insight	Aspired values	Frame metaphor/ oneliner	Working principle
Problem Frame	Previously, young people would get introduced to the B&O brand through their parents, and get to know the quality and experience at a young age to become loyal future customers. Today that is not the case	The aspired value is to create B&O products that can introduce young people to the B&O brand, quality and experience and to make them future B&O costumers.	"it is a designer chair and not a pretentious sculpture".	New design direction mirroring other products used by young people - visual inspiration from the Eames chair
Solution frame	Young people less static. They move from apartment to apartment; and hence the intricate installation and integration into the house that most B&O products demand are less attractive.	The aspired value is to create B&O products for parties that can fill the room with music, but easily be moved and repositioned. It must be able to follow the party.	"Placeability" or "Go where the party people are"	Plug and play. Handle for lifting. Air-play and use of wi-fi. Legs and wall mounting opportunity.
Solution frame	Many objects in music have round references. The compact disk, the volume bottom, the tuba and trumpet.	The aspired value is to express this timeless shape of music.	"BEO round" or "the large tuba".	The main shape is round.
Solution frame	The umlimited access to music sometimes makes it hard to select music and turning on the music can be slow.	The aspired value is to create a product that will start playing easily and instantly.	"The hand on the product".	You can turn on the product just by touching it. You can turn the speaker up and down, just by caressing it on top
Solution frame	B&O is known for its craftmanship.	The aspired value is to transfer this craftmanship to the new product.	"B&O craftmanship".	Detailed design of openings on the back in order to make sound come out from here. Quality in every connection line or assembly.

Figure 8
The Meaning Frame of B&O Play A9.

design process, focusing on how a music system could fit the home environment and not be just another docking station. The expression of a chair became the main reference. Accordingly, and to view the product differently, the problem framing was *it's a design chair and not a pretentious sculpture*. When the design team moved from the overall problem frame toward the solution, it added a few solution frames, including *on the go.* The team realized that young people are more mobile: They move from apartment to apartment, and hence, the installation and integration into the house that most B&O products require are less attractive to the younger target group. The main focus, then, was to make the product easy to move and to reposition—without any stationary installations. Three further frames were added. The first one, *the large tuba,* was a reference to the musical instrument and set a direction for the

main shape of the product. A second one, *B&O craftsmanship,* was a reference to the B&O identity and set a direction for the detailing. Finally, *the hand on the product* set a direction for the interaction and music experience. Here, the team found that access to unlimited music often means that turning on music is a slow process. The aspired value was to produce music quickly and easily, making the product easy to master, even for guests, without complex instructions. The product should invite interaction by making it playful, so in place of a remote, the user controls the music by stroking it. (The full meaning frame is shown in Figure 8.)

Findings

The interviews with the designers and design teams about the reasoning behind the products revealed that they developed their products based on an initial problem frame, as well as on a number of solution frames that were added when the design team moved from the overall problem framing toward the solution.

The different solution frames each added further perspectives or detailed directions for certain aspects of the product, which were not captured in the initial problem frame. They referred to the experience, interaction, quality, expression, or installation of the product. For example, the MK1-E cargo bike was initially signified by the problem frame, *the Tesla of electric bikes.* The experience of driving the bike was further defined and clarified by the solution frame, *a three-wheeler that drives like a two-wheeler.* The design of the interaction also was framed by how children get into and out of the bike, how the bike is parked, and how its battery is charged—all of which were designed with input from the solution frame, *an everyday tool that works.* Finally, to guide the construction—the choice of materials and components—the team added the solution frame, *quality that lasts.*

As the cases show, the problem frame and the solution frames together provide the designer or design team with a plausible image—a meaning frame—that rationalizes what is being created. Furthermore, the meaning frame constitutes a direction for the desired goal and creates an understanding of the relevance and relative importance of features. The problem frames and the solution frames together integrate different perspectives, set the boundary for the design situation, and prioritize the designers' attention, both for the overall vision and for the details. They also provide the context for the decision-making and direction with respect to the overall experience and to more concrete elements, such as materials and components.

Based on the thorough literature review and the in-depth analysis of the case studies, we suggest the following characterization of a meaning frame:

- A meaning frame is created from a problem frame and a varying number of solution frames, depending on the specific product. The problem frame creates a novel standpoint from which the problem can be solved, whereas the different solution frames add further perspectives or detailed direction to certain aspects of the product
- A meaning frame consists of a number of insights and aspired values that are connected to a set of working principles, often expressed as metaphors or one-liners
- A meaning frame creates a plausible image that rationalizes what is being created
- In the design process, four aspects of the meaning frame can be identified: 1) a desired end state or goal; 2) the relative importance or relevance of features (i.e., prioritization of the designers' attention); 3) boundaries of the design situation (e.g., problem scope, solution scope, and resource constraints); and 4) criteria for evaluation (of new information, features, and possible solution concepts)
- A meaning frame is a basis for creating a shared mental model among design team members and is ascribed to the entirety of the knowledge and belief structures associated with the design
- A meaning frame gives context to decision making and helps steer the design process.

Conclusion and Discussion

In this paper, we have contributed to the discussion and revitalization of the concept of framing. As many design researchers have suggested before us, we see great potential in framing as a key to approaching the wicked and ambiguous problems that emerge in early phases of innovation.

In this paper, we have tried to clarify framing theory and terminology to understand and support the rather complex framing process in which design teams engage during the early phases of innovation. Based on a thorough literature review and an in-depth analysis of five product cases, we have examined how design teams move from an overall framing of the wicked problem—in the literature, the problem frame—to creating a

meaningful solution. This study contributes to the previous literature by establishing a clear division between problem frames and meaning frames, as well as by defining the characteristics of meaning frames. This definition provides insight into how designers, based on the overall problem frame, construct a set of solution frames, thus moving toward a solution that integrates different perspectives. Together, the problem frame and the solution frames constitute the framing of the meaningful solution; hence, we call the assemblage the meaning frame. When the design team creates a meaning frame, it sets and clarifies the boundaries, the values and goals, and the criteria for evaluating a proposed solution. As such, the study sheds light on the otherwise hidden reasoning process of framing toward a meaningful solution, rather than simply framing the problem, as a majority of the current literature does.

Identifying and studying meaning frames has illuminated the designers' inherent framing process. Moreover, this characterization of meaning frames and development of a methodology for analyzing them provides design teams, who work in the front-end of innovation, with a framework or structure for communicating their reasoning in the concept development process and supports their on-going reflection and evaluation of the concepts. Finally, being able to understand and dissect different integrated perspectives into multiple solution frames provides an opportunity to transfer or mobilize the solution frames to inspire and drive new and innovative product concepts.