THE VISION-BASED METHODOLOGY – A HOLISTIC APPROACH TO THE DESIGN OF PRODUCTS

Abstract

This article presents a vision-based design methodology for the development of products. The background for developing the methodology was the observed limitations with several existing design methods, such as specification coming prior to synthesis and lack of connection to motivation and inspiration. The methodology proposed here is visual oriented with 3 references in the design process, on different abstraction levels: A value mission, product vision and product specification. At the start of a project especially the vision, incorporating the intended user experience, is used as reference for developing ideas. After promising ideas have been developed, the specification become important as framework for optimising and transforming selected ideas. The methodology has been developed and taught over several years in design courses and workshops. It seems promising for projects with a conceptual orientation, where the aesthetic part of the product is viewed as central.

1. Introduction

In the last years there has been an increasingly focus on values, aesthetics, emotions and user experience in design research and education, especially related to interaction design. There is even a new conference devoted to research in design and emotions. Still, overall methods and methodology supporting the design process, that embraces these new directions, seem largely to be missing.

Stoltermann (1994) has described two major schools of thought in the approach to the design process. The first school, called "the aesthetic approach", has an approach based on intuition, personal experience where the designer is 'guided' through the process by his own ideals and values. This description can be related to the school that Jones (1981) describes as viewing the design process as a 'black box', which cannot be understood rationally and viewed from the outside. This school has its background in handcraft design, art and industrial design. The second school is called "the guideline approach" (Stoltermann 1994). According to this school the design process can be described rationally. It is possible to formulate the guidelines as generic design principles and therefore they do not depend upon a specific designer or design situation. The guideline approach is process-oriented, in the sense that it is assumed that by controlling the design process it is possible to control the result. This description can be related to the school Jones (1981) describes as viewing the design process as a 'glass box'. This school has originally its background and basis in engineering design. There are many other interpretations of the design process, such as the processes described by the semiotic school (Butter 1990; Vihma 1995) and by Lawson (1997). The two schools proposed by Stoltermann (1994) are two extremes in design education and practice. Nevertheless, these two schools still seem to be quite dominant within design education and practice. This is the

author's personal experience when encountering several architecture and design schools in the Nordic countries.

The major motivation for developing the vision-based methodology proposed in this article was originally the limitation observed with existing design methods, related to the guideline approach (e.g.; Roozenburg and Eekels 1995; Ulrich and Eppinger 1995). Some of the limitations were the following (Lerdahl 2001): 1) Specification come prior to synthesis. By formulating a specification prior to synthesis the solution space is fixed, inhibiting creativity and unexpected solutions. 2) There is a progression through discrete stages, where for analysis, synthesis and evaluation are in separate boxes, following a sequential order. As Lawson (1997) as shown, analysis, synthesis and evaluation are very closely intertwined, where for instance synthesis helps to make an analysis of the design task. 3) There is a lack of focus and embracement of the aesthetic dimension of the product. 4) There is no clear connection to motivation, inspiration and intuition, even though such aspects are central for creativity. 5) There is lack of focus on the use of the body and physical space as part of the design process. 6) The methods attempt to be context independent. 7) In the methods there is a well-defined problem or need at the start of the project. In practice this is often not the case, the real problem or need is discovered through synthesis and through finding solutions (Lawson 1994). Such methods seem especially limiting when approaching conceptual design projects and projects where the aesthetic part of the product is viewed as central (Lerdahl 2001).

An early source of inspiration for the vision-based methodology was the ViP (Vision in Product) approach, developed by Hekkert (1997) and his colleagues. This approach was viewed as an important contribution in the direction of design approaches that put more emphasis on moods and user experiences. In this approach Hekkert suggests to first break down the old context, create a new context and develop both an interaction vision and product vision as tools for generating new product ideas. Some shortcomings and drawbacks in this approach were observed, when it was tried out (Lerdahl 2001): 1) There was no link to the use of specifications, which is central for developing a sound product. 2) It emphasised a move from abstract visions to concrete ideas. This made the step from vision to ideas often difficult and too large. 3) The approach lacked the focus on the use of exercises and the use of the body as an integrated part of the approach. 4) It lacked a model to describe the level of abstraction one was working on. 5) The expressive means used in the visions were mostly notions (like 'soft, aggressive, distant, sharp') and eventually photos. It lacked expressive means like scenario play, metaphors, mood drawing and sculptures, which in this methodology are viewed as crucial for making the link between visions and concepts.

The objective for developing the vision-based methodology was to have a methodology that was not prescriptive and linear, but was a direct guideline and support at the different stages of the design process, from early conceptual thinking to refinement of solutions. The methodology has been taught, developed and improved over many years through design courses with master students and workshops with companies. The author has used action research with observations and written and oral feedback from participants, both during and shortly after courses (Lerdahl 2001). The comments from students in this paper are gathered from a recent course for master students in 2004 where the whole methodology was tried out carefully. The vision-based methodology consists of the following main components:
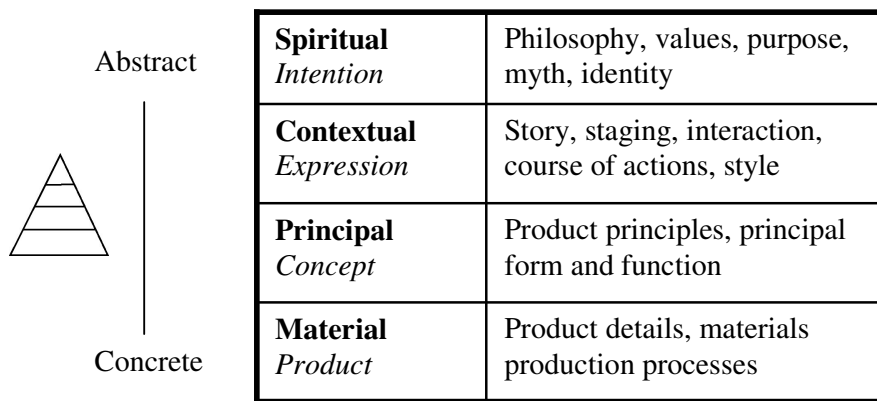
1) Vision - based model
2) 3 major types of references / frameworks

3) Process approach / stages
4) Exercises, arrangement of space and workshops

All these components are closely intertwined and interconnected in an overall methodology. In the following sections each component will be presented and discussed.

2. The vision-based model

The methodology is largely based on a vision-based model (Lerdahl 2001), which views products from 4 levels of abstraction: a spiritual, contextual, principal and material level, see figure 1. The most abstract level in the model is the spiritual level, which is connected to the underlying values, intention, philosophy and purpose behind the product. On this level the product can be viewed as value carrier. The next level is the contextual level, which is connected to the story, expression, style of the product, and the interaction with the user and among the users. On this level the product can be viewed as a social actor with a specific character, influencing the surroundings. The third level is the principal level, which is connected to the principal form and function of the product. The last level is the material level, which is connected with the product details, material and production processes. The spiritual and contextual levels are linked to the immaterial aspects of products, while the principal and material level are linked to the material aspects. All levels are equally important, and in practice there will often be an overlap between the levels. A change on one level influences the other levels. The pyramid form indicates an increased complexity. In a design process it is possible to start anywhere in the model.

Abstract	**Spiritual** *Intention*	Philosophy, values, purpose, myth, identity
	Contextual *Expression*	Story, staging, interaction, course of actions, style
	Principal *Concept*	Product principles, principal form and function
Concrete	**Material** *Product*	Product details, materials production processes

Figur 1. The vision-based model

3. References and frameworks

A fundamental aspect of this vision-based methodology is that the references or frameworks used should reflect the needs for support at the different stages of the design process. It is impossible to associate, improvise and be creative from nothing; some kind of referent or structure is necessary (Kamoche and Cunha 2001). This is especially true when the aim is to develop a product based on specific needs and demands. In this methodology there are 3 main types of references to support the design process, on different levels of abstraction:

1) Value mission
2) Product / interaction vision
3) Product specification

In the following each type of reference is presented more thoroughly, with some examples.

3.1 The value mission

The value mission is about the underlying, fundamental values for a project. Why do we work on this project, based on a human perspective? What is our moral, what do we want to contribute? It is the basis and pillar for the vision and the specification. The mission is usually presented through 3-4 keywords. It is usually combined with some abstract pictures and frozen body sculptures, to get a visual and bodily anchoring and awareness of the words, see figure 2 and figure 3. The mission has usually also an abstract statement like 'not live in the house, but with the house'. The mission is not directly an operational tool for developing concepts, like the vision is. It lies behind, as a shared ground. One student wrote: 'It created very early a shared, conscious attitude in the group'. It is especially important for conceptual projects in the direction of entrepreneurship and new business development, where the core values are new and important. Some companies have core values they use as basis for all product development. The Norwegian chair company Håg offers "seating solutions" and has 4 guiding principles: dynamic ergonomics, environment, visual design and quality.

Figure 2. An example of a value mission, with keywords (belonging, stability, variety) and pictures

Figure 3. Two examples of body sculptures as part of the value mission.

3.2 The product / interaction vision

In this methodology a vision is defined as "a superior image, which is open but consistent, that gives a holistic sense of desired direction and intended qualities". The vision should incorporate the intended, abstract product qualities and should be visual and expressive. In project with a strong focus on interaction qualities (like IT-products and system of products) the vision is called an 'interaction vision', while in other projects it is called a 'product vision'. The vision functions as an open and associative guideline in the design project, giving direction. One student said it was "an open framework and guideline that inspired and gave room for new associations." The vision can be described as a guiding star, that creates an

overall, shared understanding in a design team. As one student wrote: "The vision created a shared attitude, understanding and feeling in the group towards the direction of the process." The vision should directly stimulate the senses and needs to be experienced. It helps to make the bridging between the abstract core values and the concrete specifications. It also functions as a 'soft' evaluation tool, for choosing ideas, and gives support for the conceptual thinking process.

The vision is usually presented through a variety of expressive means, depending on the project. These means are usually a mixture of notions, metaphors, mood drawings, abstract and concrete photos, scenario play with sounds and sculptures. Short stories or storyboards can also be part of the vision. In interaction design the sculptures can be interactive, expressing the intended user experience through bodily interaction. It is the totally of such means that create the vision, see figure 4. The variety of means is a central aspect of the methodology. Through for instance drama, the design team gets a bodily relation to the intended experiences. By working with sculptures, qualities of the vision are expressed in 3-dimensional, abstract form. By using verbal, bodily and visual means to express the intended experiences, one increases the designer's vocabulary and makes the vision more precise. The use of different expressive means also helps to give a deeper understanding of the vision, and makes the vision easier accessible to others.
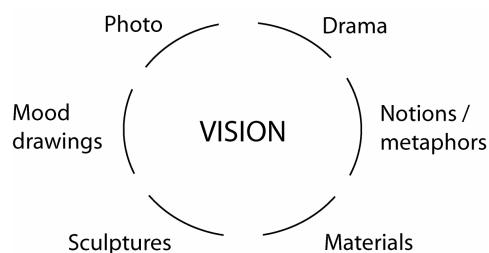
Figur 4. Different expressive means as part of the vision

Observations made by the author indicate that it is positive for inspiration and creativity to have contrasting notions, metaphors and images in the vision, like the metaphors "sushi" and "samba" in figure 5. It is also important to choose words, images and expressions that seem challenging. In some workshops the participants have also developed provocative visions, which take elements of the vision to the extreme. Such provocative visions, which include fantasy scenarios of extreme users, help to get a clearer picture of the desired product vision. Furthermore, such visions help to enlarge the solution space and get a better understanding of the user context (Lerdahl 2001).

In figure 5, examples are given of visions, with photos, notions, metaphors and mood drawing. Scenario play (with sounds) and sculptures, as part visions are shown in figure 6.

Figure 5. Examples of visions with photos, notions, metaphors and mood drawing

Figure 6. Examples of scenario play and sculpture, as part of visions

3.3 The product specification

The product specification is a more concrete and precise framework than the vision. It is linked to the lower levels of the vision-based model. It is a framework that should help to modify and transform product concepts, and help to detect strengths and potential improvements. It should also help to take into account all necessary requirements for the product, related to production, function, marked etc. The specification narrows the solution space and helps to fix the mind in a more precise direction.

In traditional methods specifications tend to become very 'dry', rational and complex. It seems to kill motivation and inhibit creative thinking. In the vision-based methodology the specification should be combined with images, metaphors and drawings. These images should be more precise than in the vision, and illustrate functions and desired qualities in a concrete way, see figure 7. It is also quite useful to present the specification with concrete objects, which also show product functions and qualities. By using images and examples the specification is easier to grasp and functions more easily as a tool for dialogue in a team. As a student remarked: 'I experience that the specification functions well when it is linked to inspiring pictures and images. Such images seem to facilitate the communication and dialogue.'

Figure 7. An example of refined product specification with images

In complex design projects it will be fruitful to divide the specification into two levels of abstraction, similar to the two lower levels in the model; a *principal specification* and a *detail specification*. The principal specification is then more open and general, with the use of many images and metaphors. Such images help to give an overview and for stimulating the synthesis process. The detail specification is on the other hand more precise and specific, and is important for ensuring that all necessary requirements (function, usability, production, environment etc.) are taken into account. It is important not to use a detail and complex specification too early, since it may narrow the solution space and inhibit creative moves and explorations.

3.4 Differences between vision and specification

One student remarked the differences between vision and specification in the following way: "The vision gives inspiration, helps to unite the group, leads to creativity, gives energy and helps to motivate. It is an open guideline or undefined framework. The specification is instructive with a clear framework, it limits and narrows the solution space, helps to make decisions. It gives arguments for choices and is easier to grasp for outsiders." Another student wrote: "If the vision is about images, experiences and moods the specification is about how we can obtain these". The vision functions as a shared emotional basis in a design team. The differences can be illustrated graphically, see figure 8. The vision is an open guideline, while the specification is a more closed framework.
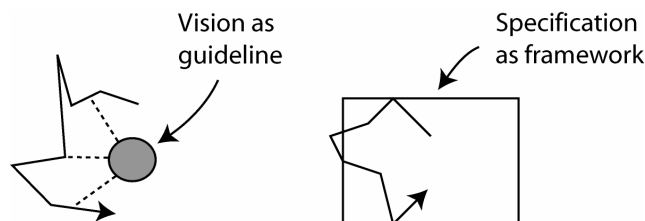

Figure 8. Illustration of differences between vision and specification

The vision is an open structure that invites and gives room for flexibility, exploration and improvisation in the design process. It can be seen as a minimal structure that is necessary for creativity, relating to the metaphor of jazz improvization (Kamoche and Cunha, 2001). In

organizational studies Brown and Eisenhardt (1997) found that successful product innovation combined limited structure with freedom to improvise. The specification should also invite for improvisation, but within more specific constraints and limitations. The use of images in the specification should stimulate associative and visual thinking.

Visions, that are visual and holistic, are the framework often used by designers in the design process, even though they often are not formulated consciously and verbally. On the other hand, traditional specifications without images and concrete examples are the framework often used by engineers in the design process. It seems that a visual specification, with the use of images, metaphors and product examples, might be the 'missing link' between these two 'cultures' and ways of approaching the design task. Such a specification, as a tool for dialogue between designers and engineers, deserves further research.

4. Process approach / stages

There are many ways of approaching the design process, based on the model and references just described. In the following section the way in which the design process is approached, when developing completely new concepts, will be described. It consists of a vision-based and specification-based stage, and some preliminary research. The vision-based stage is especially important in open, conceptual projects, where there is a need for conceptual and unexpected solutions, for instance when aiming for entrepreneurship or new business development.

4.1 Preliminary research
Prior to the development of visions and product ideas the designer or design team should investigate the given or chosen topic area. If the design team is supposed to develop new product ideas in relation to food and drinking for everyday life, they should study the existing context and future trends. What are the normal user activities nowadays in relation to food and drinking? What are the future trends in terms of user behaviour and needs? The designer or design team can analyse existing products in relation to the vision-based model, with a focus on the spiritual and contextual level. What are the underlying values, what is the story and how do the users interact with the products? How do they interact with each other and what are their needs and desires? User observation and interviews, combined with user involvement using for instance games (Pedersen and Buur, 2000) and cultural probes (Gaver et al, 1999), will help to identify user values, needs and desires. It is important to emphasise that research and user involvement should be ongoing and integrated in the vision-based and specification-based stages, as ideas and concepts are developed.

4.2 Vision-based stage
A crucial aspect of the methodology is the continuous shifting between abstract and concrete work, related to the levels in the model, see figure 9. In the vision-based stage, one develops a wide range of product ideas, based on the design task and preliminary research, using different types of creative techniques (brainstorming, brainwriting, forced relationship, storyboard, extreme thinking, mind-mapping, scenario writing, etc). This can be described as a horizontal movement within the same level in the vision-based model (Tollestrup 2004). The product ideas developed at the start of the project are not evaluated, just quickly sorted out. At the same time one formulates core values (mission) and starts to develop a vision, based on the preliminary research. The initial visions and visual metaphors are developed

through the use of creative methods (post-it sessions, mind-mapping), different expressive means and through discussion and negotiation in the teams.
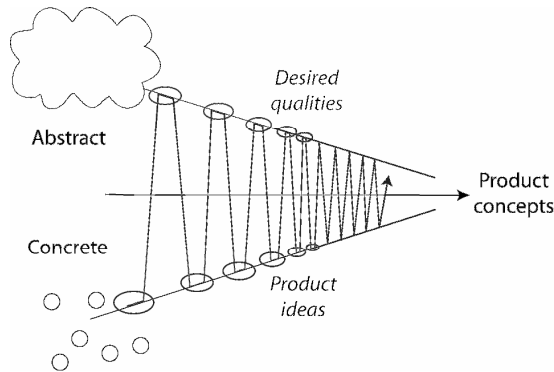

Figure 9. Shifting between abstract and concrete work

Quite early in the process, as the designer or design team starts to have a vague vision and some potentially, interesting ideas, they should start to make a conscious link between the vision and ideas. This is achieved by developing ideas based on the vision, and abstracting qualities from the potential ideas, see figure 10. This can be described as a vertical movement between levels, in relation to the model (Tollestrup 2004). Through this shift back and forth, the jump (or gap) between abstract and concrete work becomes smaller and smaller and easier to do, see figure 9. The designer or design team becomes more and more precise in both vision and ideas, which then serves as basis for dialogue, interaction and development with clients and users.
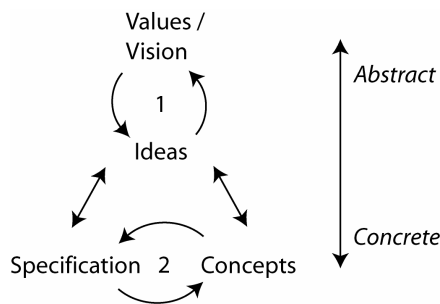

Figure 10. The synthesis process

4.3 Specification-based stage
As one develops further the ideas, through combination, association and experimenting, the product ideas slowly become product concepts. At this stage, called the specification-based stage, it is important to select a few premature concepts and start to formulate a specification for each concept, see figure 10. The specification is more concrete, specific and precise than the vision. At this stage the designer or design team should have a triangular movement between the vision, specification and concepts. The specifications will then influence the concepts and vision, and vice versa. Especially the specification and concepts are continuously developed and improved at this stage. The tension between the intended expression and product qualities (vision), the overall requirements (specification), the temporary solutions (concepts) and user and client feedback (real context) awakes creativity, deeper understanding and better solutions.

The vision is in this stage very important for maintaining a holistic perspective of the design project. Once in a while, when the designer or design teams feel mentally locked in details related to specifications and solutions, it will be very useful to return to the mission / vision and to the deeper intention for the project. This will usually help to loosen up, and regain motivation. As one student remarked: "I experienced it as helpful and positive to return and look at the vision when we was stuck with the ideas and concepts. It helps to loosen up and get in touch again with the outer framework." When a group disagrees on the specification, they can return to the vision, which is a shared, common ground. An idea that is represented on an abstract level can lead to many different solutions on a concrete level. So at all stages of the process, one should work with all levels of the vision-based model, but where the main focus is changing towards the concrete and specific.

Late in projects, the specifications are formulated into more detail specifications, and the chosen concept moves in the direction of a product, through the development of prototypes etc. This would be the movement from the principal level to the material level in the model. Through the whole process both the mission, vision and specification change so that they finally should reflect the final product. In such a way they are not only support along certain stages of the way, but through all stages of the process.

5. Exercises, arrangement of space and workshops

A central factor in the methodology is the conscious use of exercises, as a tool for creating a good and playful atmosphere in the class. These exercises are also tools for learning aspects of the methodology and a way of training abstract and associative thinking. Exercises are often used at the start of the day, when having workshops. The best exercises have both process and problem related effects (Lerdahl 2001). They help to get closer to the problem or task and at the same time influence the atmosphere, process and learning. An example of an exercise would be to write scenarios in groups, directly related to the design task, and later play them out in drama.

In the methodology the arrangement of space is also viewed as central. The walls are used for exposing visions and ideas, see figure 11. Relevant products and pictures are within sight as a source of inspiration. The designers or design students shift between standing and sitting, and move frequently around the workshop space, to get inspiration and new perspective, see figure 11. Areas of the space are used for scenario play, both for presentation of the vision and for presentation of the ideas and concepts, during the whole project. Scenario play is a powerful tool to understand the user context and develop ideas (Lerdahl 2001). The whole space is used actively during exercises, as part of the workshop.

Figure 11. Using walls during workshop

In the methodology, parts of the project work are usually done in workshops. It appears clearly fruitful for idea development to get into an intensive working modus, over a couple of days, with frequent presentations. Idea development needs full concentration and participation, and in intensive workshops the students get more easily into a creative thinking modus. Furthermore, learning the methodology in practice requires active participation and presence, since it is quite extensive and different from traditional ways of approaching the design task. The methodology embraces the use of frequent presentations in workshops and the use of events around milestones, with for instance the active use of scenario play. Frequent presentations and events help to give a rhythm and natural progress in the development process (Lerdahl 2001).

The vision–based stage of the methodology has been applied a few times in industrial cases through the use of intensive workshops. Ideas developed in some these workshops have later lead to several industrial products (Capjon 2004). An overall model for the application of the whole methodology is proposed in figure 12. A project group, consisting of a few persons, is initially responsible for preparation, preliminary research and quick screenings of ideas in the organisation. Then the *vision and idea workshop* is held, lasting normally for two days. This workshop concentrates on the vision-based stage. Employees from different departments in the company are participating, together with designers and other consultants. With good planning most employees are able to allocate two days from their daily work. One or two persons are facilitating the workshop, which consists of 10 to 20 participants, working in groups. In such a way a large part of the company takes part in the idea development and therefore gets ownership to the process. After this workshop the model proposes that the project group should be responsible for elaborating and visualising the visions and many ideas from the workshop, to a higher level of refinement. The project group may also have sessions with user groups where some of the ideas are tested out.
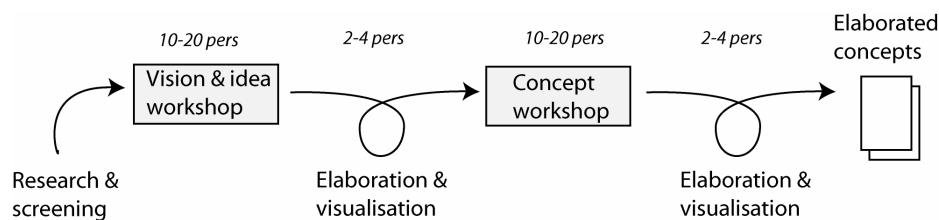

Figure 12. Model for the application of the methodology in a company context

In the following *concept workshop* the model indicates between 10 to 20 participants. The participants should be employees in the company and external consultants. The workshop should concentrate on the specification-based stage, where the participants elaborate on the visions, concepts and specifications. After this workshop the model suggests that the project group is responsible for further elaboration and visualisation of the concepts, visions and specifications. The concepts should then finally be presented internally in the company. This is an overall model that will soon be tried out in a large Norwegian company, consisting of several divisions.

7. Evaluation of the methodology

One of the major challenges with the methodology is that it requires some training to learn to switch between different levels of abstraction. Visions and abstract thinking can furthermore

be hard to grasp at the start. One student wrote: "At the start it seemed strange to describe the core values, since they are not very tangible. But later in the process we could sense how the values lived on and became more tangible and concrete, through the visions, product and specifications." In practice, students also need training to get a clear understanding of the differences and overlap between the mission, vision and specification. The role of the teacher or facilitator is in this process quite crucial, both in motivating students and participants in the workshops, and in facilitating the process through the use of different exercises and methods. The facilitator needs experience with the methodology and needs to be able to clarify the differences between the levels.

The visions help to give an overview and function as a shared guideline and source of inspiration for the design team. A weakness with the use of visions is that it can be hard for external people to understand the depth of a vision. Many images, thoughts and values associated with the vision are shared and calibrated in a team. Outsiders have not been part of this process. When presenting the vision for outsiders, it is important to be aware of this fact. It seems helpful to give a written explanation and show more images and examples when presenting the vision for outsiders. Furthermore, the specification that goes along with the vision is more concrete and easier to grasp for outsiders.

The methodology has now been taught and used as a whole or in parts at several design schools, in Denmark and Norway, both by the author, other teachers and students. The vision-based stage has also been tried out in a few industrial cases. A recent doctoral thesis has looked at the value transformation and systematic unfolding of the methodology, and developed tools for navigating more systematically between the different levels in the model (Tollestrup 2004). The written and oral feedback from professional designers and master design students concerning the methodology is positive, it helps them learn more about the design process, it gives support through the whole design process, both in analysis, synthesis and evaluation. Furthermore, it leads to good conceptual solutions. The methodology seems especially promising for projects with a creative and conceptual orientation, where the aesthetic part of the product is viewed as central. Typical areas would be packaging design, interaction driven design (like games), fashion design, interior design and product design. The vision-based stage helps in the search for conceptual and unexpected solutions, while the specification-based stage ensures the quality and refinement of the solutions. The methodology "leads to concepts that would never occur through tradition ways of approaching the design task", as one student said. The comparison made to traditional methodology is subjective, where both professional designers and design students compare this methodology with other approaches they have previously used and experienced.

In relation to design practice in companies, the link between a traditional design brief and the references used in this methodology (mission, vision and specification) is interesting. Design briefs are often just formulated through words, and the awareness concerning abstraction level seems often to be missing. Finding the right level of abstraction and openness is central for the design process. Making the brief more visual and holistic, with for instance images, stories and metaphor, could make the brief more stimulating and inspiring for idea development and communication. This deserves further research. The whole methodology, including the specification stage, also needs to be tried out in more industrial cases. Since the methodology is quite different from traditional ways of approaching the design task, there is a challenge in convincing companies to try it out. Introducing this methodology should be part of an overall design strategy and clearly involves change of practice and organisational change. The expressive means used in the methodology should be adapted according to the company

context and design project. For some companies the use of scenario play might for instance be too radical, at least as a start point. The exploration of all expressive means might furthermore be too time consuming in industrial practice, a selection needs to be made.

When relating to the two schools by Stoltermann (1994), the methodology presented in this article is viewed as part of a new school of design philosophy and thinking, where the design process is neither viewed as a "black box" nor a "glass box", but somewhere in between. It does tell directly and rigidly how to proceed, step by step, in the design process, but still has some guidelines and means to support the design process. This school strongly embraces values, personal experience, intuition and aesthetics. It gives some means and open guidelines for working, expressing and communicating such aspects and integrating them with more 'tangible', functional and concrete requirements.

Acknowledgement

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