

# **FORMING THE FACE OF GREEN PRODUCTS: MOOD BOARDS AND EARLY CONSUMER INVOLVEMENT IN SHIP INTERIOR DESIGN**

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## **ABSTRACT**

In this paper, we study mood boards and the process by which they can be used to understand consumer inferences about environmental sustainability in the early stages of green product development. As a component of a research project on sustainable ship design, we created mood boards showcasing three ship interior concepts. In simulating the interior design process for a ship, the mood boards displayed three different principles for environmentally sustainable design. Next, we used the mood boards in 14 interviews to elicit information about how consumers infer environmental sustainability from design. The results suggest that mood boards can be used to elicit a range of inferences about environmental sustainability. The inferences raised in our study are well in line with principles for sustainable design suggested in the literature. However, the results also suggest the inferences consumers make about environmental sustainability can differ widely. In addition, the comparative assessment of the mood boards in the interviews often resulted in “spill over” effects. Based on these results, we discuss how the use of mood boards can be adapted to better account for variance in how consumers infer beliefs about sustainability from visual material.

## **INTRODUCTION**

The environmental impact of production and consumption is raised as key consideration in new product development (NPD) (Nidumolu et al., 2009; Vezzoli and Manzini, 2008). A number of guidelines have also been introduced to support companies and designers to develop more environmentally sustainable products (see eg. Brezet and Hemel, 1997; Lewis et al., 2001; Vezzoli and Manzini, 2008; Fiksel, 2009; Shedroff, 2009). In addition to its environmental benefits, a focus on sustainability is posited to open up new value opportunities for companies. Green credentials can result in better cost-efficiency and innovativeness (Porter and Linde, 1995), enhanced consumer experiences (Cagan and Vogel, 2002) and premium pricing (Trudel and Cotte, 2008).

Still, the total market share of green products is low (Dupré, 2005). There are several reasons for this. First, how environmental sustainability is realized in products has an impact on their performance in the market (Williander 2007). In short, for sustainable products to reach success, they must cater for both the individual and collective good. Second, environmental sustainability is not universally favoured by consumers. Luchs et al. (2010) found that products (laundry detergents, car tires and liquid hand sanitizer) marketed as environmentally sustainable induced a negative effect on their perceived performance. Third, consumers do not always understand

what makes products environmentally sustainable (Lin and Huang, 2012). As a result, how to communicate green credentials to consumers represents a challenge for companies.

In this paper, we study how consumers make inference about environmental sustainability and the use of mood boards in the early stages of green new product development. Particularly, we focus on how consumers make inferences about sustainability from the design of products and the role of mood boards can play in understanding such inferences. Design is a promising – yet poorly understood – tool for communicating green credentials to consumers. In new product development, design (i.e. the appearance of products) can be used to influence consumers' expectations of product quality - conveying symbolic and functional meanings to consumers (Bloch, 1995) and influencing product choice (Creusen and Schoormans, 2005). To this end, design has the potential to help companies communicate environmental credentials to consumers (Vezzoli, 2007; Saito, 2008).

Mood boards are a design tool commonly used in the early stages of new product development. Mood boards are used to capture and communicate the underlying ideas and styles for new products (see eg. McDonagh and Denton, 2005; Julier, 2007). In doing so, mood boards are also used to achieve a better understanding about consumers (Cagan and Vogel, 2002) – helping designers and companies to align the design of products with the needs and interests of consumers. This makes mood boards a basic design tool in exploring and defining the design of products in the early stages of development.

The contribution of our study is two-fold. First, we investigate the use of mood boards as an interview stimulus. Specifically, we study what kind of inferences consumers made when asked about the environmental sustainability were displayed in the mood boards. Second, we discuss how such inferences can be used to refine the appearance of products in green product development. In particular, we elaborate on how product development managers and designers can use mood boards to strategically form the design of green products. A number of authors suggest that design can have a significant role in improving the acceptance of green products (Hosey, 2012; Luchs et al., 2012). However, how to communicate green credentials in product design and how consumers infer environmental sustainability from the design of products has received limited attention in the literature. Moreover, as argued by Lofthouse (2004), many green design tools do not sufficiently support the everyday work of industrial designers in product development. Industrial designers often work overall product concept, product pleasure and styling trends, which are rarely addressed in sustainable design literature. In our view, mood boards offer an important starting point for fulfilling this methodological gap because of their commonness in design.

## **DESIGN AND ENVIRONMENTAL SUSTAINABILITY**

Several authors argue that the environmental credentials of products should be recognisable their design to steer consumers towards more sustainable consumption (see eg. Walker, 1995; Vezzoli, 2007; Saito, 2008). However, what green products should look like is unclear. The sustainable design literature only provides limited guidance for the appearance of sustainable products.

Guidelines for environmental sustainability are typically based on design engineering methods for decreasing the environmental impact of products, i.e. lifecycle design (see Brezet and Hemel, 1997; Lewis et al., 2001; Vezzoli and Manzini, 2008; Fiksel, 2009). These guidelines provide detailed instructions for the

technical development of products, e.g. how to use material or energy more efficiently in all stages of the product lifecycle. At the same time, there is limited similarity between different guidelines on what should be the focal area of interest or how different guidelines relate to each other. As seen in Figure 1, guidelines for sustainable design cover everything from four to eight principles depending on the author. The principles also branch out in more detailed instructions. For example, Vezzoli and Manzini (2008) list six sub-principles for minimising materials consumption with each encompassing two to seven specific recommendations. However, the importance placed on different principles differs across authors. For example, Lewis et al. (2001) list the use of low-impact materials as the starting point for green design whereas other models suggest starting from avoiding excessive material use. Also, material toxicity is a topic in its own right in Lewis et al. (2001) but falls into the sub-category of low-impact materials in Vezzoli and Manzini (2008).

Author	Lifecycle design strategies
Brezet and van Hemel (1997)	<ul style="list-style-type: none"> <li>New concept development</li> <li>Selection of low-impact materials</li> <li>Reduction of materials usage</li> <li>Optimization of production techniques</li> <li>Optimization of distribution system</li> <li>Reduction of impact during use</li> <li>Optimization of initial lifetime</li> <li>Optimization of end-of-life system</li> </ul>
Lewis et al. (2001)	<ul style="list-style-type: none"> <li>Select low-impact materials</li> <li>Avoid toxic or hazardous materials</li> <li>Choose cleaner production processes</li> <li>Maximise energy and water efficiencies</li> <li>Design for waste minimization</li> </ul>
Vezzoli and Manzini (2008)	<ul style="list-style-type: none"> <li>Minimise resource use</li> <li>Use low impact resources</li> <li>Optimise product lifespan</li> <li>Extend material lifespan</li> <li>Design for dissassembly</li> </ul>
Fiksel (2009)	<ul style="list-style-type: none"> <li>Design for Dematerialisation</li> <li>Design for Detoxification</li> <li>Design for Revalorization</li> <li>Design for Capital Protection &amp; Renewal</li> </ul>

Figure 1. Examples of lifecycle design strategies.

Regardless, from a design perspective, the guidelines above provide limited direct guidance for the appearance of products. As a consequence, they do not fully address the work practices and role of industrial designers in new product development projects. For example, Walker (1995, p. 21) argues that “maintenance, repair and upgrade requirements also suggest a reduction and simplification within product design”. Similarly, Whiteley (1993) suggests that the use of natural colour dyes often imply a more muted colour range for products. However, technology can present itself in numerous ways. As such, by treating the appearance of a product solely as a consequence of technical guidelines for environmental sustainability, designers may fail to utilise the broader potential of design in green product development.

The situation is further complicated by the fact that consumers do not always favour an overly green design. As Steffen (2010) notes, the distinct look of green

products in the 1970's was rejected in the 1980's due to its overly strong manifestation of green values. Furthermore, clearly showcasing the environmental credentials of a product in its design may induce a negative effect on its attractiveness (Hosey, 2012) and may negatively affect its perceived quality (Luchs et al. 2012). Therefore, according to Saito (2008), green product development should avoid "ecological determinism" in which ecological constraints and ambitions totally dictate the design of a product. Thus, it is often stressed that the design of green products should resonate with interests of consumers rather than necessarily being the outcome of technical constraints or ecological ideals. As a result, how to creatively present environmental credentials in the design of products represents a key question in strengthening the market position of green products.

### **Mood boards as a tool for understanding consumer inferences about green credentials**

Mood boards are often used in the early stages of NPD to help designers creatively shape the appearance of products. Mood boards are collections of images, drawings and other visual material that are brought together to display certain features and/or moods of a product concept (McDonagh and Denton, 2005; Julier, 2007). Given their quick-and-dirty nature, mood boards provide a cost-effective design tool for interacting with consumers. In many ways, they fill a similar communicative role in NPD as product concepts (see Keinonen, 2006). Mood boards may even be viewed as rudimentary product concepts. As a visual interview stimuli (Harper, 2002; Crilly et al., 2006), mood boards are also likely to elicit responses that normally do not emerge through verbal exchanges alone.

Despite their commonness, there is limited guidance in the NPD literature about how to use mood boards, and what information can be retrieved from using them. Yet, as a common design tool for early consumer involvement, mood boards are likely to be among the first tools designers will use in trying to understand how consumers make inferences about sustainability. To this end, targeted research on the use of mood boards in green NPD has the potential to help in filling the methodological gap recognized by Lofthouse (2004). Thus, focusing on green design in NPD, the following research question directs our inquiry:

*How do consumers infer beliefs about environmental sustainability from the design of products, and what role can mood boards fulfil in understanding such inferences in the early stages of green NPD?*

### **METHOD AND DATA**

To answer our research questions, we simulated the use of mood boards in NPD. Our interest was on the role mood boards could fulfil as an interview stimulus when trying to understand how consumers infer beliefs about environmental sustainability from products. As a pioneering study on mood boards usage in green NPD, we were not only interested in what inferences consumers make about environmental sustainability from visual material but also how such inferences come to be.

The study was conducted as a part of a larger research project on ship design in which passenger experience and sustainable design were focal areas of study. The development context for our simulation was the design of a ship interior for a new passenger ship. Over the last decades, environmental sustainability has become an important consideration in the shipping and cruising industry (Takarada, 1996; Johnson, 2002; Brida and Zapata, 2010). However, as often is the case for green NPD (see e.g. Luchs et. al., 2012), there are a few examples available for how to go about in

achieving a superior design for ship interiors while successfully communicating environmental credentials. Hence, simulating the design process of a ship interior provided us the opportunity to explore a situation when designers need to think anew on how to communicate environmental credentials to consumers through the design of products, and where mood boards would represent a logical, simple and cost-effective way to explore different design alternatives.

### **Stimuli development**

The mood boards used for our study were developed by the first two authors (both trained as industrial designers). In developing the mood boards, we began by studying different green product development and design guidelines (as shown on Figure 1). Each mood board was designed to showcase a certain sustainable design principle without resorting to ecological or technical determinism. This meant that each mood board was designed to express a (technical) principle but without letting the principle dictate the final design.

As noted earlier, there are several different guidelines for sustainable design in the literature. We purposefully focused our study on the five design lifecycle design principles by Vezzoli and Manzini (2008) because of their breadth and detail. The principles opened up several design opportunities in terms of how to visually express environmental sustainability. For example, to visually express minimised material consumption, we had more than twenty possible sub-principles to build on (instead of only one broad category).

In creating the mood boards, we began with collecting a broad spectrum of pictures from internet sources that could represent the different lifecycle design principles. After the initial collection, the images were clustered according to their respective lifecycle design principle. Finally, a subset of images was selected for each mood board. In showcasing one of the five design principles, the mood board included six images. Two of the pictures were selected to depict the two most important interior spaces of a ship: the cabin and the restaurant (Xie et al., 2012). The other four images – showcasing materials and objects – were selected to amplify the intended atmosphere of the interior spaces in accordance with a given design principle.

After studying the initial set of mood boards, we decided to limit ourselves to three mood boards. There were two reasons behind this decision. First, we discovered that representing design for disassembly required significantly different images from the rest of the mood boards in terms of what was represented in pictures. In the case of design for disassembly, there were many pictures showing deconstructed products and details whereas the other mood boards were focused on more generic themes. As our interest was on mood boards as a design tool rather than product construction (technical determinism), we excluded the design for disassembly mood boards from our study. Second, despite several attempts to differentiate them from each other, the mood boards for low impact materials and material lifespan extension became very alike. This was likely caused by the interrelatedness of the two principles (i.e. use of natural materials often makes composting well achievable). We dropped the mood board representing material lifespan extension for the reason that the strategy is employed only after the product has been used.

The procedure above resulted in three mood boards that were comparable in their overall design yet differed in terms of the specific design principle that was showcased (see Figure 2). The first mood board (MB1) was designed to display optimised product lifespan. The second mood board (MB2) was designed to display

the use of low-impact materials. The third mood board (MB3) was designed to display minimised resource use.



Figure 2. The mood boards used in the study.

### Data collection

We used the three mood boards in interviews to explore what kind of inferences could be derived by using them, and how references to environmental sustainability came to be. We interviewed seven women (F1-F7) and seven men (M1-M7). The age of the participants ranged from 25 to 62 with a median age of 30 years. All of the participants had been on a passenger ship or ferry. The basis for recruitment was availability.

In the interviews, the different mood boards were presented to the participants, who were then asked to comment on the environmental sustainability of the different concepts. They were also asked to describe who would be the main customer in each concept and tell which of the concepts they personally favoured and why. The participants were not given any information about underlying design principles for the mood boards, i.e. they were not told about what principle that we had tried to convey through the selection of pictures. The interviews were recorded and transcribed for analysis.

### Data analysis

In analyzing the transcripts, we began by doing an initial coding of both direct references to environmental sustainability (i.e. “MB2 is sustainable because it uses natural materials”) as well as generic sustainability related comments that emerged during the interviews (i.e. “using natural materials does not guarantee that it’s sustainable”). In understanding the role the mood boards played in the interviews, our focus was on two things. First, we analyzed *what* was inferred as sustainable in the mood boards (as well as what was perceived as sustainable in general). Second, we analyzed *how* these inferences and claims were built up. This meant that we tried to identify how the inferences related to what was shown in the mood boards. Next, we categorized the codes according to the five lifecycle design principles of Vezzoli and Manzini (2008).

## RESULTS

All participants made inferences about sustainability that matched at least the three targeted lifecycle design principles of Vezzoli and Manzini (2008). The most salient inferences were made to the *use of low-impact resources* and *minimized resource use*. These inferences were closely followed by inferences to *extended material lifespan* and *optimized product lifespan*. As could be expected, inferences to *design for disassembly* were few. In addition to the five main principles of Vezzoli and Manzini

(2008), we also identified a number of *other* inferences to environmental sustainability that did not directly follow one of the main principles.

Figure 3 provides an overview of how many of the participants referred to each of the sustainability principles as well as the share of instances across the six categories (principles) during the interviews. Overall, we located 214 instances in which the participants (1) made inferences about environmental sustainability or (2) introduced criteria for making these inferences. We discuss the inferences to each category in more detail below.

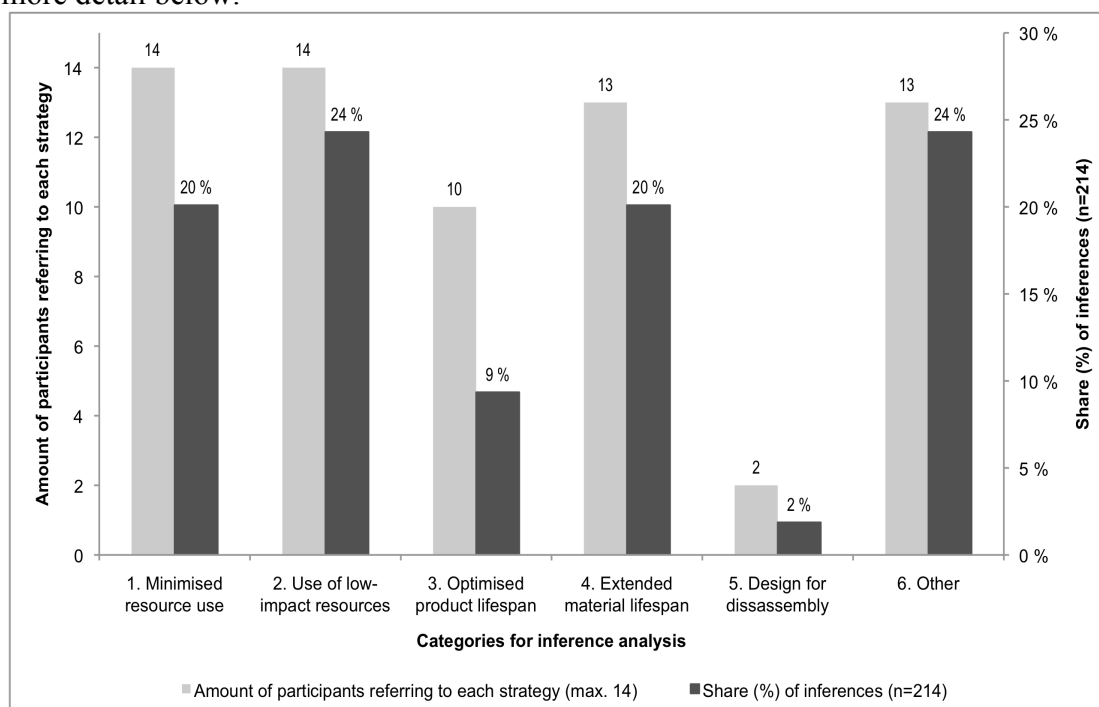


Figure 3. Categorisation of results showing the number of participants referring to each category and share of inferences based on category.

The *use of low-impact resources* principle refers the use of bio-compatible, abundant, non-toxic and recycled resources in products (Vezzoli and Manzini, 2008). This principle was by far the most commonly occurring among the inferences of the participants, who often inferred this type of sustainability from the displayed images (24% of the instances overall). Especially, in evaluating MB2, references to natural materials often emerged, as exemplified by one of the participants (M1): “[MB2] seems to be the most sustainable design [...] as it uses natural materials, you know, they are renewable materials”. Similarly, another participant (M2) asserted that “I guess just looking at it number two communicates well whether it’s natural material”. However, some participants were far more sceptical in regards to the vivid display of natural materials and provided conditions in which case which environmental sustainability would be true. As one participant (F5) remarked, “this [MB2] could be environmentally friendly in the sense that wood is a natural material, but then again it’s completely different if the wood is endangered”. In other words, the inferences to this principle were different when the participants extended their assessment beyond direct references to the material usage displayed in the mood board.

The *minimized resource use* principle implies using less of materials and energy during development and use (Vezzoli and Manzini, 2008). All the participants made references to this principle (20% of the instances overall). For example, fuel and energy efficiency was inferred from what kind of lightning was shown in the mood

board and the amount of energy needed to realize the concepts. Many of these inferences were also based on the overall feel of the mood boards as the following comment highlights (F7): “[MB3] does not give you an ecological feeling at all. More on the contrary, it feels that it consumes a lot”. Another participant (F3) took a different stance towards the same mood board by stating that “the new technology and this hi-tech, that is more efficient” creates a feeling of good ecological performance.

The *extended material lifespan* principle refers to the reuse and recycling of materials (Vezzoli and Manzini, 2008). References to this principle were made by all but one of the participants (20% of the instances overall). Most of the inferences classified to this principle related to comments about the waste management of the ship and how the interior concepts facilitated this. For example, in assessing the overall look of MB3, a participant (M5) made the following remark: “I don’t know how it would be organized, how to take care of garbage, any waste. Or what about recycling? Because this looks so advanced, I could expect that there are some really good ways of recycling on board”. References to the recyclability of individual materials were also common: MB2 was seen as very positive in terms of recyclability because of it had clearly displayed natural materials and it was speculated by many that MB3 would use materials specifically designed for recyclability because of its novel appearance. There were also many general remarks made in relation to recycling and its contribution to environmental sustainability. One possible reason for this is that recycling is a rather well accepted means to participate in pro-environmental behaviour, at least according to studies made in Finland and the United Kingdom (Tonglet et al., 2004; Kuittinen et al., 2008).

The *product lifetime optimisation* principle advocates designing products that can be used for prolonged periods of time as well as can be used intensively (Vezzoli and Manzini, 2008). References to this principle were made by ten of the participants (9% of the instances overall). In referencing this principle, both the physical lifetime of the materials and the styles were discussed. The main focus was on material durability as exemplified by the following remark about MB2 (F6): “It’s not sustainable development that everything is just non-toxic [...] You should rather pick materials that don’t need attention for a hundred years”. Additionally, a few participants picked the style of MB1 as a sign of long durability, as exemplified in this response (M3): “I mean #1 is just kinda old-fashioned and you could think of re-using and sustainability in that sense...”. Another participant (F4) focused on the furniture in MB1 and MB3, stating that “they seem to be of better quality and more expensive, and that they would have been acquired for a longer period. They look like... maybe when you recognize some of those products you know they are good quality and more expensive”. Interestingly, many participants also stated MB1 to be the least exclusive in terms of clientele but did not think that widely appealing style would be a sustainability contribution.

The *design for disassembly* principle implies designing product and material configurations that are possible to separate at the end of their lifecycle (Vezzoli and Manzini, 2008). With no mood boards specifically targeting this principle, it was the least recognized during the interviews with only two participants making references pertaining to this type of strategy (2% of the instances overall). Yet, the references that were made concerned mainly the possibility to separate and reuse materials, i.e. as a pre-stage for material lifespan extension. For example, one participant (M1) inferred about MB2 that “this wooden structure allows you to tear it down, use the wood for something else”.



Roughly a quarter (24%) of the inferences made during the interviews did not correspond to any of the five lifecycle design principles of Vezzoli and Manzini (2008). These inferences were categorized as *other* inferences about environmental sustainability. All but one of the participants made inferences about sustainability that extended beyond the five lifecycle principles. Altogether, these inferences were typically more holistic in nature and originated in the overall atmospheres conveyed in the mood boards. Among these inferences, discussions about the perceived novelty and oldness of the three concepts were particularly salient. For example, based on the style of MB1, it was inferred that the concept had been designed during a time when sustainability had not been on the agenda: *“Number one is like the most traditional, so you associate this to a point in time when these issues were not considered that much”*(F6). In contrast, the traditional style of MB1 was also recognized as a sign of durability (F1): *“this [MB1] looks like a hotel from 15 years ago which means that it has lasted for 15 years, so in that sense it’s quite sustainable”*. Similarly, MB3 was by one participant (M1) seen as too novel and unsustainable: *“ [MB3] is the least sustainable design as it is [...] very much following trends and trends change quite rapidly so this type of design might be outdated in a few years”*. Whereas another participant (M6) saw the novelty a sign of superior technology and therefore inferred the concept as more sustainable: *“[MB3] could be [environmentally friendly] in my opinion. It looks like everything down to the last detail has been thought of with new materials and solutions”*.

## **MOOD BOARDS AND INTERPRETING INFERENCES TO ENVIRONMENTAL SUSTAINABILITY**

The first important thing to note in interpreting the results above is that the inferences to environmental sustainability (and their connotations) seldom were universal. The participants could pick up on the same visual cues from the mood boards, but the inferences they made were often very different. To this end, the novelty of a style lead to inferences of problems in terms of durability but also evoked a sense of superior, new technology and a departure from old ways of doing things. Similarly, oldness made some participants to consider durability of style and materials whereas for others it made reminisce to an era when less sustainable technologies were used. Thus, depending on what angles the participants took in evaluating certain design features in the mood boards, they could come to very different conclusions about the sustainability of a concept.

In addition to the different angles that were taken, inferences also varied in terms of how thoroughly (how deep) the participant evaluated different facets of a certain issue. As the discussion on natural materials shows, some participants went beyond the direct connotations of natural materials to more critical discussions on the source of the wood and whether what was presented was wood at all. In many ways, these deeper elaborations involved the participants taking more than a single perspective on a certain feature in the mood board. This reveals the trade-offs when products are subjected to comprehensive environmental analysis: the other side of biodegradability often is shorter product lifespan.

It is also important to consider how the inferences were built up in understanding the role of the mood boards played in the interviews. In most cases, the participants did not focus solely on one mood board at a time. Instead, they based their judgment on comparisons across multiple mood boards. In other words, what was displayed in one mood board was used as a reference for inferences on other mood boards. For example, one of the participants (F1) came to the following conclusion: *“[an] interior*

*like this [MB3], and it has furniture like this [...] they have used lots of carbon-based materials, like plastics.[...]This concept [MB2][...] it at least used the material from nature as it is".* This meant that the inferences she made were not based only on what is presented in MB2 but also on what was presented in MB3 and vice versa.

When considering the overall interview situation it may be speculated whether preference was influential in directing sustainability inferences. As Ehrich and Irwin (2005) have found out, consumers may exercise "wilful ignorance" towards ethical product information in case it collides with preference. Overall, MB2 was the most preferred concept and it was also evaluated as the most sustainable of the three concepts. As the participants took many different stances in their inferences, it may be that the most preferred mood board was also evaluated using the most favourable criteria.

## **DISCUSSION**

The results of our study suggest that mood boards as an interview stimuli can provide rich information from consumers in the early stages of green NPD. The interviews revealed a number of ways in which consumers inferred environmental sustainability from visual cues in the mood boards (e.g. the use of natural materials, lightning type or stylistic novelty). Furthermore, the interviews showed the richness in which such inferences can be made. The inferences spanned multiple design principles for green NPD, of which some were more recognisable than others. The interviews also indicated that while some inferences were more common than others few inferences were universal in nature. Instead, different features and their contribution to environmental sustainability differed significantly among the participants.

Our study suggests a number of issues to consider when using mood boards as an interview tool in green NPD. First, many of the references to environmental sustainability that emerged during the interviews focused on what was *not* present in the mood boards. Second, while many of the inferences were based on recognisable features or details in the mood boards (such as the use of natural material), more holistic inferences were also made based on the overall style, ambience and atmosphere that the mood boards conveyed. This is well exemplified in the inferences about novelty and oldness, which provided the participants cues about the overall context of the design work, and what kind of technology was likely used in the concept. Hence, making references to more traditional (old) designs in one of the concepts produced negative responses from some participants as it suggested that older and less sustainable technology was involved in the development of the interior. Third, many of the inferences the participants made were comparative in nature. That is, the design features that were displayed in the mood boards were compared with each other, creating "spill over" effects when the participants evaluated the concepts. For example, the prominent use of natural material in the second concept (MB2) made a number of the participants to focus on the fact that the two other concepts *did not use* natural materials. Companies may therefore want to carefully consider how they use mood boards in green NPD.

## **Limitations and suggestions for future research**

There are some limitations to consider in interpreting the results of our study and which opens up venues for new future research. First, the mood boards used in our study were intentionally made distinctly different from each other. Also, our focus was solely on expressing environmental credentials in the design of the mood boards.

In real world NPD projects, more subtle differences might be more relevant. Additionally, other significant design factors, such as company design guidelines, should be taken into account when developing the stimuli. An important avenue for further research is therefore to replicate our study in a real life setting.

Second, there is much room to streamline the process of using mood boards for consumer research in NPD projects. While creating mood boards is quick and unobtrusive within the NPD process, instructions for how to go about in creating mood boards are few. Our study constitutes a first step towards a more systematic exploration of mood boards in NPD. Designers may therefore want to carefully consider the work practices they follow in preparing visual material. They should also carefully consider alternative ways to interviews as a means for gathering data about consumers.

### **Implications for green new product development practice**

For managers of NPD, our results suggest that there are three factors to be aware of when forming the face of green products through the use of mood boards. First, managers must be aware that consumers may take different angles in evaluating concepts in terms of their performance and environmental credentials. Second, the depth of their evaluation varies from superficial issues to hidden features such as ideals about materials usage. Third, the evaluations draw insights from the surrounding environment, such as other comparable products. It is fair to say that product design and appearance on its own is not sufficient in communicating all the aspects of sustainability in a uniform way. However, design can amplify positive and minimize negative connotations relating to sustainability and can be used as a complimentary tool for communicating product sustainability aspects. For example, in the case of the natural materials in MB2, providing information about wood certification might alleviate the scepticism that the vivid display of the natural materials may induce.

Overall, the inferences that the participants made were closely in line with green design guidelines presented in the literature. This suggests that there are opportunities for companies to communicate their efforts in sustainability through the design of products as they embark on implementing such guidelines. However, as our study shows, some sustainability principles are more difficult to display in the design of products than others. Also, our results show that how consumers infer sustainability from the design of products is multifaceted. Different consumers may focus on the same feature in the design but infer different things depending on the context and their own experiences. Thus, the consumer and the broader context of the product in question must be carefully considered if managers want to pursue design strategically. As illustrated in this study, the use of mood boards may help product developers to acquire such an understanding.

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