

Design-Led Futures: Emotional and Behavioral Response to Radical Future Concepts

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Introduction

The Design Led Futures program develops product concepts for industry for ten years into the future. DLF creates connections between industry, government, and academia. Companies have used some of the concepts as promotional tools for expressing an image of innovation and research. This paper reports on a study about the connection between emotional and behavioral responses of people towards some concepts developed in the program. It was hypothesized that stepping stones were necessary for people to create positive emotional and behavioral connections towards the concepts. Familiarity of some aspects of the concepts could create such stepping stones. However, the study shows that this is not always necessary. We suggest that the concerns products attempt to fulfill are as important as the level of public familiarity with the concepts. The connection between the extent to which people share the concerns that concepts attempt to elicit, and how much people believe the concept actually fulfils the concern, are essential elements to consider when studying the connection between the emotional reaction of people and their behavioral willingness to adopt the concepts. Finally, the relevance of this type of study for industry and the DLF program is discussed.

Connection DLF: Industry, Government

The Design Led Futures (DLF) program was established at Victoria University of Wellington's School of Design in 2004. The School of Design received considerable funding from the New Zealand Government in order to create the program. The Government believes that design can become a leader for New Zealand's industry development. The DLF program offers companies visions of the future. It explores possible scenarios for ten years into the future. It attempts to expand the range of possibilities that a company can see by challenging what the company currently does. It entices companies to take risks by offering believable future scenarios. Partner companies have included Fisher & Paykel and Methven from New Zealand, and currently DLF is working with Nike.

Companies have seen DLF as an opportunity to develop visions of the future with two main purposes in mind. The partners do not expect to develop intellectual property out of the projects. Rather, they use them to challenge their own teams into thinking beyond their comfort zone. Secondly, the concepts proposed by DLF are used by companies as promotional tools. The concepts serve the same function as 'concept cars'. They are not intended to go into production, but they help companies create an image of themselves for the public. This is useful in the sense that the company can express a sense of innovation without necessarily producing the concepts.

Connecting Conceptual Designs for the Future: Emotion, Behavior

Using conceptual products can improve the image that the public has of the company. It has been widely discussed that products can elicit emotion (Desmet, 2002; Norman, 2004), and that a continuous elicitation of emotion by a product can create a positive sentiment towards the brand (Rodríguez Ramírez, 2006). Conceptual products can work as any other stimulus and also elicit emotion. On the other hand, conceptual products also have the potential to elicit unpleasant emotion thereby creating negative sentiments towards a company. It is, therefore, important for the company and for DLF to develop a better understating of the emotional reactions that conceptual products may elicit in the public. Furthermore, there is a strong connection between the emotion products elicit and the behavior that people perform as a result. DLF expects that people would be willing to adopt the technology and concepts suggested in the program, or that they develop a sense of joy and satisfaction from the potential experience the concepts offer.

The process in which emotion works has been widely explained through the Appraisal Theory (Frank, 2004; Frijda, 1986; Mesquita, Frijda, & Scherer, 1997). The Appraisal Theory has also been applied in product design, in particular for the appearance of products (Desmet, 2002, 2003). The Appraisal Theory suggests that a person would appraise a stimulus according to the way in which it satisfies the person's concerns and expectations. If the stimulus, in this case an object, is deemed beneficial to the person's concerns, the appraisal would be positive and elicit a pleasant emotion. On the other hand, if the object is deemed to be harmful, the appraisal would be negative and elicit an unpleasant emotion.

The Appraisal Theory has connected emotion to behavior. If the appraisal is negative and the emotion unpleasant, the person would engage in a withdrawal type of behavior. If the emotion is positive, the person would approach the stimulus. This has been explained for instance with a person who is afraid and withdraws from the stimulus. On the other hand, a person who enjoys an experience would be expected to approach such experience. This can be expressed not only as an actual behavior, but also as the willingness of people to perform behavior, whether it actually occurs or not. In this case, the emotion would elicit willingness to perform an action. Under this perspective, the study of behavior can include the behavioral willingness of people to perform an action.

The Appraisal Theory has recently been challenged. Firstly, neurobiological findings have found that our brain processes information in the form of images (Damasio, 1994, 2003). It has also been suggested that we can create images of ourselves behaving in particular ways. Such images can be about our specific interactions with objects and systems (Rodríguez Ramírez, 2007). Behavioral images are strongly connected to emotion. Behavioral images are accompanied by an emotional response or image, and may be elicited by an emotion as well.

Conceptual products hold the potential to elicit behavioral images in people. The concepts can make people dream about the way in which they would interact with the product, and the kind of experience that products would offer. Such images are accompanied by emotional responses that would hopefully be pleasant. For instance, consider a person watching a concept car. One of that person's main concerns may be sustainability. The car uses clean energy and can seamlessly interact with a public transport system. The person pictures herself interacting in such a system, traveling to work without the guilt of polluting, and without having to suffer traffic jams, because other people are also using this system. She may experience joy and satisfaction, even if the experience is not real or has never actually happened. Damasio suggests that mental images of this kind about potential events of the future have the same neurobiological characteristics as mental images about events of the past (Damasio, 2003). In a way, a concept that offers a behavioral image about a potential future experience may hold the same strength as a past experience.

It has been suggested that radical change has a better chance to be accepted if it occurs through stepping stones (Hoed, 2004). If the concepts suggested by DLF involve a radical change, then including stepping stones would facilitate a higher degree of public acceptance. The sense of familiarity that a concept evokes may be considered as a stepping stone that encourages the public to approach the concept. This sense of familiarity is also connected to the behavioral image that the person experiences. It will be assessed whether the sense of familiarity of the public towards some DLF concepts relates to their emotional response and behavioral willingness to adopt the concepts.

A different theory has also challenged the Appraisal Theory. It has been suggested that emotion is better explained as a feedback mechanism than as a causal process (Baumeister, Vohs, DeWall, & Zhang, 2007). Under this perspective, emotion would affect behavior which in turn would affect emotion. Behavior would be considered as the actions that a person would take in the search for a pleasant emotion, or in the attempt to stop an unpleasant one. At the same time, behavior would attempt to elicit a desired emotion.

This discussion asks the following questions. How can design connect the study of emotion and behavior with conceptual designs for the future? What are the connections between industry and academia in this process? There are many elements to connect. Firstly, the Appraisal Theory is still a valid way to study emotion. This needs to consider the stimulus, in this case the conceptual designs, the concerns that the

stimulus satisfies, whether people share such concerns, and whether people experience an expected emotion. On the other hand, it would be valuable to relate these factors to the behavioral image people have of the future, and whether the behavioral willingness to adopt such conceptual designs is related to the emotional response.

There are a number of potential hypotheses. The first one is that the emotion the concepts elicit would affect the behavioral willingness to adopt the concepts, in a causal manner. The second one is that in order to connect emotion and behavior, it is necessary to understand whether people share the concerns that the concepts attempt to address, and whether they believe that the concept would actually fulfill such concerns. The third hypothesis would be that while behavior is connected to emotion, this happens in a feedback process. This would imply that the concept elicits an emotion and a behavioral image, which in turn would elicit another emotion. Finally, the more positive the behavioral image and emotional response is, the more willing people would be to accept more radical changes. This would be useful for the company, which could see this conceptual work as stepping-stones for future developments. In order to start a discussion about these issues, the researchers assessed public reactions to some of the DLF conceptual designs.

Methodology

A questionnaire was provided to visitors to the Domestic Futurists exhibition, in which projects from the DLF program were showcased. The location was The New Dowse Gallery in Wellington, New Zealand. The questionnaire attempted to correlate the behavioral image people have of certain activities in the future; their emotional reaction to products involved in such activities; to what extent people share the concerns objects attempt to fulfill; and the behavioral willingness of people to use such products. It was hypothesized that the emotional response of people to the concepts would be correlated to their willingness to adopt such concepts. Also, the more the participants related to the concerns addressed by the product, the stronger their emotional reaction would be. This would theoretically be indicated by a stronger willingness to adopt the concept. Because the concepts are supposed to exist ten years into the future, the questionnaire assessed the behavioral willingness of participants to adopt products in the long term future.

The participants were people visiting the exhibition, which is open to the public and entry is free. At the entrance of the exhibition, visitors were asked to fill out a paper questionnaire. The total number of questionnaires collected was 79; 60 questionnaires were answered in full. No distinctions were made amongst participants; all participants willing to fill out a questionnaire were considered. The questionnaire assessed the extent to which the participants share the concerns listed. This is used as the parameter to define participant segments. Market segments are ignored and replaced for 'concern segments' which this research considers more relevant when addressing the study of emotion.

The concepts that were exhibited at The New Dowse Gallery, and assessed in this study are briefly described as follows (Figure 1).

Pipette, by Kylie Baker. Model 1:10 and 1:1. A 6-meter-long shower shaped like a giant pipette uses rainwater and water pumped from a filtering garden to slowly fill the bulb reservoir throughout the day. As the bulb fills, the balance changes visually, expressing the stored potential and opportunity for a shower. While the person showers, she can see the bulb emptying, resulting in visual feedback about the use of resources. The shower can rotate over a showering area that ranges from indoor to outdoor, through private enclosures and public spaces. (http://www.designledfutures.com/portfolio/energising_water/tidal)

Puff'r by Oliver Moon. Model 1:10. Puff'r gives the appearance of a decorative tile set into the wall, but is a clothes washing machine. The tiled machine inflates and deflates the textured silicon walls with compressed air to create the motion required to agitate the water and clothes contained within. The wall tiles come in three sizes, the choice of which is determined by how much and how often the clothes are washed. This facilitates the conservation of water, space, and energy.

Flutter, by Andrew Gillespie. Models 1:10. Every year, hundreds of children in New Zealand are admitted to hospital with scalds and burns resulting from kitchen accidents. Flutter is a cooking system that uses

an embedded induction lattice to adjust the size and shape of the workspace. It offers the advantage of heating only the cooking utensil that is required, thus reducing the likelihood of accidents. Flutter's special feature is its set of rotating 'fingers' that can lock in position to become a convenient and practical work surface, and a safe zone between children and the cooking area.

Air Wheel, by Tom Neilssen. Model 1:10. Inspired by the form of a water wheel, Air-Wheel uses recycled water from the products in the floors above to provide the rotational motion required for drying clothes. This water then flows downward to power the products on the level below, and so on. The small outer cavities/paddles that catch the water are sealed off from the dry internal segments where the laundry is inserted. The wet laundry is placed into adjustable segments, each of which contains a heating element and a sensor. The sensor calculates the amount of heat required to dry the clothes. The translucency allows sunlight to help dry the clothes. The opening into the dryer can be adjusted to a comfortable height for any user as it spins around a central axis.

Ice³ by Adzrina Mona Ibrahim. Models 1:10 and 1:1. Ice³ is a 6-meter-long, modular refrigeration system that is embedded in the wall. It can be slid inside or outside. The containers come in two sizes and are made of corundum transparent ceramic (external layer), maize plastic (internal layer), and LCD tint glass. These components provide for the individual temperature control of each unit, which makes an efficient use of energy by cooling only the necessary space. It allows for the removal of individual containers.



Figure 1. DLF projects exhibited and assessed in this study.

The questionnaire

The questionnaire was divided in three steps. In the first step, participants were asked to describe and/or draw how they picture themselves performing five different activities in the year 2017. Each activity was related to each of the concepts. This first part attempted to gather information about the behavioral image people have of themselves performing the activities in the year 2017. The activities were as follows: Washing oneself, keeping food fresh, drying clothes, washing clothes, and cooking. The second step assessed to which extent participants shared the main concerns that the products attempted to fulfill. One main concern was identified for each concept. The concerns were assessed on a scale of 1 to 7, 1 being 'I share this concern' and 7 being 'I do not share this concern'. The concerns included the amount of energy and water used by each appliance, as well as safety of gas stove-tops.

The third step in the questionnaire asked participants to answer five questions about each project, on scales of 1–7. The first question asked how radically different the project is to the participant's current lifestyle (1: not so different; 7: radically different). This question assessed the level of change that people perceive in comparing their current lifestyle to the concept presented. The second question assessed the emotion that the concept elicits in the person. For ease of assessment and to avoid overburdening visitors to the exhibition, the emotions were confined to 'pleasant' (1) and 'unpleasant' (7). The third question assessed to which extent participants believed that the concept would indeed satisfy the concern (1: it satisfies the concern; 7: it does not satisfy the concern). This turned out to be essential. It will be discussed in the results section that the extent to which participants shared the concern and the extent to which they believed the product actually satisfied such concern were crucial factors to connect their emotional response to their behavioral willingness. The fourth question assessed participants' reports of behavioral willingness to adopt the product (1: I would be willing to use this product; 7: I would not be willing to use this product). Finally, the fifth question asked participants whether they were familiar with specific aspects of the concept, such as the technology, appearance, interaction, and functionality (1: I am familiar; 7: I am not familiar). This was related to the behavioral image, and was compared and complemented by the image participants had of the activities in the future as reported in step 1 of the questionnaire.

The projects were amongst a total of 20 exhibited over a period of three months. The concepts were presented in 1:10 scale models. There were 1:1 models of two of the projects. The projects were also explained through an interactive animation on a computer. The animation mentioned the way in which the products work, how people would interact with them, how they would save resources or be safer than existing products, and showed an animated interaction.

The second part of the research assessed the increase in familiarity reported by participants towards the exhibited concepts. It was hypothesized that if the familiarity increased, the willingness to adopt the concepts in the future would also increase. It was also theorized that this would be connected to an increase in the pleasantness of the emotion reported.

This second part included two follow up questionnaires among people who gave their details at the exhibition. Two groups of seven people each participated. Group A was sent an online questionnaire one week after the exhibition finished. Group A and B were sent a questionnaire one month after the exhibition had finished. The questionnaires were similar to the original questionnaire applied during the exhibition and included links to the DLF website in which details and animations about each product could be found. It was expected that group A would have a more positive report of familiarity, emotion and behavioral willingness, given that they would have been exposed to the concepts more than group B had been.

Results

The final results show that the report of emotion was on the pleasant side (mean: 2.86; std. dev: 1.47), and the behavioral willingness to adopt the products was even more positive (mean: 2.48; std. dev: 1.42). The results of all the concepts together show a close correlation between the degree to which the concern is satisfied, the pleasantness of the emotion elicited, and the behavioral willingness to adopt the product (Figure 2). There are slightly more marked differences between concepts. The showerhead, dryer, washing machine and stovetop received the closest correlation between concern, emotion and behavior. Whereas for the fridge, participant's perception of it satisfying the concern was lower. Nevertheless, the report of emotion and behavior were close for this object.

Radical change, familiarity, and pleasant emotion. As expected, the report of radical change was oppositely correlated to the report of familiarity. The dryer, washing machine, and stove-top received higher scores for familiarity. The latter two also received the highest scores for pleasant emotion. This suggests a connection between the familiarity people perceive towards the concept, and the emotion it elicits. The second part of the study resulted in an increase in familiarity for the subsequent questionnaires. The emotion was also more pleasant, but the increase was not as marked as the familiarity.

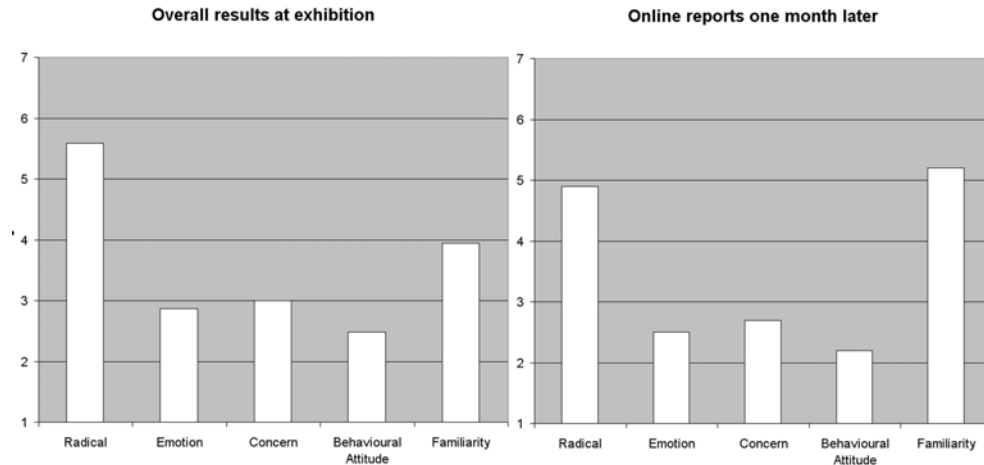


Figure 2. Overall results at exhibition and one month later.

Pleasant and unpleasant emotion. If we consider the reports of pleasant (n : 42) and unpleasant emotion (n : 18) separately, there was a closer correlation between concern (mean 3; std. dev: 0.34), emotion (mean: 2.9; std. dev: 0.34), and behavior (mean: 2.5; std. dev: 0.15). The exception was the fridge, for which the report of fulfilling the concern was relatively negative (mean 3.7; std. dev: 1.53) compared to the report of emotion (2.6; std. dev: 1.1) and behavior (2.5; std. dev: 0.94), which were very close. The more unpleasant the emotion was, the more the concern, emotion and behavior diverged (Figure 3).

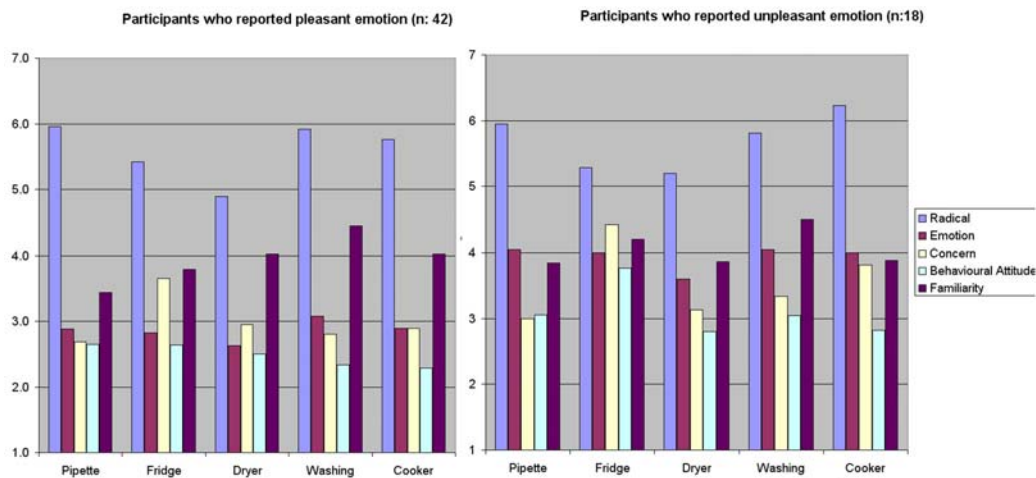


Figure 3. Comparison of participants that reported pleasant and unpleasant emotion.

Strongest connection: Sharing concern and believing that concept satisfies concern. If we consider only the reports that share the concern (mean: 1.36; std. dev: 0.1), AND that believe that the product satisfies such concern (mean: 1.7; std. dev: 0.14) (n : 29), then the attitude towards using the product increases dramatically (mean 1.68; std. dev: 0.38). In this case, the emotion reported is also highly pleasant (mean: 2.09; std. dev: 0.38). The report of familiarity (mean: 3.86; std. dev: 0.4) does not seem to correlate in this case (Figure 4). This may suggest that as long as the concern is believed to be satisfied, the person would be willing to adopt it, regardless of the concept being familiar to the person or not. This would contradict the idea that there have to be stepping stones for the acceptability of a long term concept. Unless the fact that the concept is believed to satisfy a concern that the person shares is

considered as a stepping stone. The connection between familiarity and pleasant emotion above also points to the importance that familiarity can have in behavioral willingness to adopt a product. Nevertheless, it may not be absolutely necessary, which means concepts can make use of a combination of both, using familiarity and/or the satisfaction of concerns.

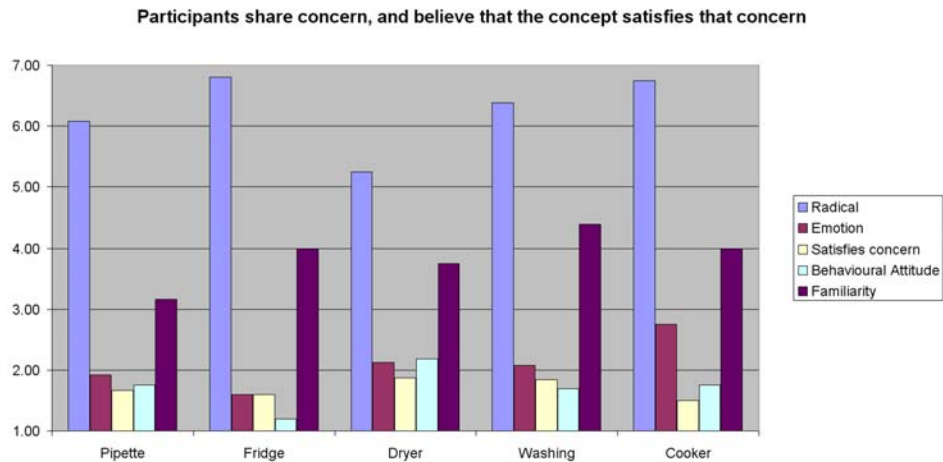


Figure 4. Participants share concern and believe that the concept would satisfy such concern.

On the other hand, there is less of a clear correlation between emotion and behavior when the person shares the concern, but does not necessarily believe that the product can satisfy such a concern. In this case, the standard deviation between the reports was also higher, which indicates that responses were more diverse.

Conclusion

The study of emotion can also be applied to the development of concepts for long term future scenarios. Nevertheless, this needs to be connected with a study of concerns. It has been discussed how a clear connection between emotion and behavior was found in two instances. Firstly, emotion was strongly connected to behavioral willingness when the participants shared the concern and believed the product would satisfy it. Secondly, such connection also occurred when there was a higher report of familiarity towards the concept, and the emotion was pleasant. This suggests that both, the perceived satisfaction of shared concerns and a sense of familiarity towards the product can have a positive effect on the elicitation of pleasant emotion, and on the behavioral willingness to adopt the concept in the future.

From the clients' perspective, it can be said that the concepts elicited emotions on the pleasant side and that there was a behavioral willingness to adopt the products. According to Damasio (2003), the creation of a mental image about the future can have similar effects to those invoked by a mental image about the past. In this case, it may be argued that the behavioral images that the concepts created in the public had a positive effect that would hopefully be connected to the company and the DLF program.

One of the difficulties found in this study is that the emotional response would change depending on what concern people find most important. This study focused on only one main concern that the product attempted to fulfill. More detailed studies could pinpoint and separate the different concerns that single products attempt to satisfy. In this way, the understanding of the emotional reaction of people to products can be better explained.

There is also the question as to whether emotion can be seen as a feedback mechanism. This study addressed behavioral willingness to adopt a future concept. The responses from participants one month after the exhibition show a positive change in familiarity, emotion, and behavioral willingness. Nevertheless, more studies are necessary for assessing emotion as a feedback mechanism in the actual interaction with products.

Finally, further research should address in more detail the potential that conceptual designs have to elicit sentiments of belonging in the public. These concepts successfully elicited pleasant emotions, and the consequent exposure to the public improved such responses. Can that response increase in the long term? How can designers attempt to elicit sentiments of belonging through the design of conceptual products for the future?

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