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Provocative design for unprovocative designers: Strategies for triggering personal dilemmas

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Abstract: Traditional design approaches stimulate the creation of products that make daily interactions more efficient, comfortable, and pleasant. In contrast, provocative design approaches, such as critical design, have a different focus: they aim to challenge the status quo through products that expose assumptions and stimulate discussion. In this paper, we argue that intentionally triggering personal dilemmas is a novel design approach that may be a means to enabling self-reflection. In line with this, this paper proposes three design strategies for triggering dilemmas. These strategies are explained through existing designs and supported by design ideas created using them. Our findings indicate that triggering dilemmas is a counter-intuitive design intention, which can be supported by exercises that facilitate perspective taking and stalling moral judgment. We conclude with a discussion on the overlap between triggering dilemmas and other provocative design fields.

Keywords: design with dilemmas; provocative design; design strategy; conflicting concerns

1. Introduction

Traditional industrial design often focuses on solving problems (Roozenburg and Eekels, 1995). Smartphones enable managing online tasks without having to carry around a personal computer, or office chairs support sitting comfortably during long work hours. A distinct group of design approaches, namely provocative design approaches, share a goal that is often at odds with traditional design. Provocative design aims to challenge existing norms and attitudes through hypothetical or utilitarian designs that expose assumptions and provoke discussion (Bardzell, et al 2012). Most well known among these approaches is critical design, which uses hypothetical objects to challenge unquestioned socio-cultural norms (e.g., see Teddy Bear Blood Bag Radio by Dunne and Raby) (Dunne and Raby, 2013). In addition, adversarial design uses provocative design principles to address political issues

(e.g., see Project ZAPPED! by Heidi Kumao) (DiSalvo, 2012), and discursive design uses utilitarian objects embedded in discourse to communicate ideas such as racial intolerance or world hunger (e.g., see Hug salt and pepper shaker by Mint) (Tharp and Tharp, 2013). Finally, reflective design focuses on stimulating reflection on unconscious values through technologies embedded in computing devices (Sengers, et al 2005). In short, we use the term "provocative design" to refer to design approaches that operate in a design space where asking questions is as important as solving problems.

Despite offering fruitful ground for addressing social, political, and technological challenges faced by contemporary society, the work on provocative design offers little information about the process of designing for provocation. Mostly, the focus of provocative design lies with the subject of design rather than the process of designing (Bardzell and Bardzell, 2013; Bardzell, et al 2012). For instance, Dunne and Raby (2013) clarify the main goals of critical design and provide many inspiring design examples, but they rarely provide reference to the theory and decisions that informed these examples. Therefore, engaging with provocative design can be very challenging for those who are inspired by it, but do not have a background or training in realizing their intentions. Bardzell and Bardzell (2013) have stated that developing tools and methods for critical design can support its broader adoption. Following this, preliminary guidelines and tactics have been developed to support designers in analysing critical designs (Ferri, et al 2014; Bardzell, Bardzell and Stolterman, 2014).

The goal of this paper is to propose design strategies that can be used to intentionally trigger dilemmas as a way of provocation. Provocative design often evokes dilemmas. For instance, Dunne and Raby (2013; p. 89) refer to critical design as way of highlighting dilemmas that can challenge existing belief systems (also see Malpass, 2013; p. 341). Consider, for example, Umbrellas for the "Civil but Discontent" Men in Figure 1. This product combines the symbolic form of a gentleman's umbrella with the form of a sword. This combination suggests a choice between meeting social expectations and being a sword-bearing man, which may represent a dilemma between acting in a civil manner and acting aggressively. In reality, the design may hardly encourage aggressive behaviours. However, through surfacing such a dilemma, it may indeed stimulate contemplating society's expectations about civilized people. Many examples of provocative design seem to trigger dilemmas to raise awareness about a topic of interest. Therefore, we propose that identifying strategies for triggering dilemmas can support designing for provocation. Here, we broadly define design strategies as "prompts for mental exercises that can support associative thinking and seeing alternative solutions in idea generation."

Figure 1 Umbrellas for the "Civil but Discontent" Men by Bruce and Stephanie Tharp for Materious. Photo: Courtesy of the designers.

In this paper, we focus on designing to trigger *personal* dilemmas (i.e., dilemmas that involve individual goals or values), and define them as the realization that one cannot simultaneously engage in two behavioural alternatives (Ozkaramanli, Desmet and Ozcan, 2016). For instance, one cannot indulge in sweets, and at the same time, expect to lose weight. Such mutually exclusive choices are guided by contradictory desires, motives, or personal values; what we refer to as conflicting concerns. Being marked by indecision and doubt, dilemmas may feel uncomfortable; however, they also serve an important purpose: Hesitation is a way for the brain to slow down mental processes to collect information in order to make better choices (Fleming, 2014). In line with this, products that trigger dilemmas may disrupt or slow down decision making in favour of making informed decisions. Here, we define triggering dilemmas as the intention to raise awareness about conflict among personal concerns through designed products and services that engage the user in a "stop and think" type of behaviour.

We used a bottom-up approach to understand how design can trigger dilemmas. For this, we formulated two research questions: (1) what are the qualities of products that (intentionally) trigger dilemmas? And (2) what are the strategies designers can use to trigger dilemmas? To address the first question, we analysed designs that seem to trigger dilemmas in collaboration with two design researchers, which resulted in three main categories. For the second question, we examined how an understanding of these categories could contribute to generating ideas through design workshops conducted with fifteen novice designers. Answering these research questions can contribute to the emerging literature on demystifying provocative design, which may be particularly valuable in contexts where this

approach is not intuitively used. We conclude with a general discussion on the overlap between designing to trigger dilemmas and designing for provocation.

2. Exploration of designs that trigger dilemmas

Sixty examples have been collected as input for an analysis session from literature, design blogs, and student projects. Forty of these examples were utilitarian design objects. In addition, we included examples from conceptual art (e.g., Fur Tea Cup by Meret Oppenheim), critical design (e.g., the Hypothetical Lunch Box by Dunne and Raby), and graphic design (e.g., Children Smoking with Adult Arms by Chi and Partners for the Roy Castle Lung Cancer Foundation) to support a richer discussion. We selected examples that seemed to trigger dilemmas (i.e., emphasized a potential conflict between personal concerns) and that were supported by a description as communicated by the designer or the artist. These examples were organized in the form of cards with a picture, a short description, and the triggered dilemma as input for an expert evaluation.

2.1 Expert Evaluation

The first author analysed the collected examples in collaboration with two design researchers, whose expertise were on sources of inspiration in design creativity and the influence of designers' intentions on the aesthetic perception of products. The main goal of this analysis was to eliminate those examples that did not explicitly trigger a dilemma, and to discuss the mechanisms through which the remaining examples triggered dilemmas.

In the first part of the session, the experts (including the first author) individually categorized the examples according to four design criticality tactics proposed by Ferri et al (2014)[1]. These tactics aim to support analysing critical design objects at varying abstraction levels such as reading semantic cues. Because of this, they could provide a solid starting point for discussion. The experts were asked to focus on the following two questions during analysis:

1. Does this example trigger the dilemma specified? If not, does it trigger another dilemma? If not, discard the design.
2. Does this example fit one of the design criticality tactics? If so, which one? If not, put the card aside to be discussed at the end of the session.

The second part of the session involved a discussion about the similarities and differences among the categorizations of experts. This discussion was facilitated by the first author, who asked about the points of agreement and disagreement among experts' categorizations. As a result of this discussion, all experts agreed to exclude the following types of examples from further analysis: (1) Eight examples that were not considered provocative *and* that did not trigger a dilemma; (2) conceptual art and graphic design examples (both experts commented that possible strategies that can underlie the creation of

[1]In contrast to design strategies, which focus on the significant behaviours of designers when ideating, the term "design tactic" refers to a specific organization of significant elements in a designed object. In the case of Ferri et al (2014), design tactic refers to a specific organization of semantic elements in critical design objects (G. Ferri, personal communication, 24 November 2015).

such work would not be relevant for creating design objects with utility); and (3) ten examples that were considered as provocative designs, but they were not thought to trigger a dilemma beyond raising the question "Do I, as a user, agree with the meaning this product is trying to convey?" For the remaining twenty-eight examples, all experts agreed that they could trigger dilemmas in ways that merit further analysis. Table 1 outlines the results of analysing the examples with an anchor example for each group.

Table 1 Analysis of design examples based on their potential for provocation and for triggering a dilemma

Number of cards	Explanation	Example	Image
8	Examples that do not trigger a dilemma	Tank you by Thierry d'Istria for La Tête au Cube: A vase that embodies the opposing concepts of love and war. Photo: Courtesy of La Tête au Cube.	
10	Conceptual art and graphic design examples	Dead Star by Michel de Broin: An installation that is made out of "finished" batteries.	
14	Provocative design examples that raise a question but do not trigger a dilemma	Ta Ta Top: A bikini top that aims to promote questioning society's expectations from women. Photo: Courtesy of Ta Ta Top.	
28	Design examples that trigger a dilemma	Thrive Portionware by Sally NG: A series of kitchenware that subtly encourages people to eat less. Photo: Courtesy of the designer.	

2.2 Three Categories of Products that Trigger Dilemmas

The twenty-eight design examples exemplify the type of products that trigger dilemmas; however, they say little about the design approach taken to create such convincing examples. To understand how design can trigger dilemmas, the experts also analysed the behaviour of these examples based on the way they address conflicting personal concerns. This yielded three distinct categories, which are described as follows and illustrated in Figure 2 with examples:

1. Embodied Symbols: Objects that embody symbols or clues that can represent conflicting concerns.
2. Forced Choice: Objects that force the user to make a choice between two behavioural alternatives that cannot be carried out at the same time.
3. Behaviour Barrier: Objects that form a barrier to one of the behavioural alternatives, which is often the habitual or the automatic choice by the user.

Category 1: Embodied Symbols
Sugar Gun Lollipop by Marije Vogelzang
Photo by Patricia Schimmel.
Courtesy of the designer.

Category 2: Forced Choice
Dilemma by Dean Brown for Fabrica
Photograph by Shek Po Kwan.
Courtesy of the designer.

Category 3: Behavior Barrier
KitchenSafe by TheKitchenSafe
Courtesy of the designer.

Figure 2 Three categories of products that can trigger dilemmas

Sugar Gun lollipop (see Figure 2) carries a metaphor, “eating sugar kills”. Here, the gun may symbolize a short life (a consequence of being unhealthy) whereas sucking on a lollipop may symbolize enjoyment. By combining these two symbols, this product can trigger thinking about conflicting personal concerns, such as the conflict between health and enjoyment. In addition, Dilemma (see Figure 2) is a table piece that can be used as a fruit bowl or a cake plate, which presents two alternative ways to enjoy food: eating healthily or indulging. Here, the design requires the user to make a choice between two behavioural alternatives (i.e., assembling the product as a fruit bowl or as a cake display) without suggesting the “better” alternative. Finally, KitchenSafe (see Figure 2) is a lockable jar that aims to prevent people from accessing tempting objects (e.g., candies, smartphone) for a desired amount of time, programmed by the user. By forming a barrier to a habitual or automatic action, such products can raise awareness about unquestioned choices (e.g., temptations) that rule our everyday life.

3. Generating design ideas to trigger dilemmas

The expert evaluation revealed that design could trigger dilemmas in, at least, three distinct ways (i.e., embodied symbols, forced choice, behaviour barrier), which supports better

understanding this particular design intention. We suggest that an understanding of these categories can be helpful in generating ideas to trigger dilemmas, in a context in which it is, in fact, counterintuitive to do so. Therefore, we implemented the categories in a series of ideation sessions with fifteen "unprovocative" designers, i.e., designers who have been trained mainly as creative problem solvers with a structured and methodological approach to designing.

As input for the ideation sessions, we (the authors) envisioned the steps that would be necessary to deliberately create design ideas for each category of products. Using backward thinking, we formulated active descriptions that can stimulate new ideas. For this, we emphasized the nuances between the ways each category tackled dilemmas. For instance, we observed that products that embody symbols, such as Sugar Gun Lollipop, stimulate reflection about conflicting personal concerns (i.e., health vs. enjoyment), but do not necessarily require the user to act upon these thoughts. In contrast, the second and the third categories (forced choice and behaviour barrier, respectively) require making a choice among behavioural alternatives, which may link action to reflection. In line with these observations, we formulated the following preliminary strategies:

1. Embodied Symbols: Brainstorm about **symbols** for each concern in a dilemma, and embody them in an object by modifying one or more of the following: form, function, materiality, interaction, or use context.
2. Forced Choice: Brainstorm about **possible choices** in a dilemma, and create a product that **alternates** between mutually exclusive behaviours.
3. Behaviour Barrier: Brainstorm about **possible choices** in a dilemma, and choose a "habitual" or "automatic" choice. Create a design that acts like a barrier to this choice, while, to some extent, preserving the possibility of achieving it."

The preliminary strategies suggest that choosing appropriate symbols can facilitate creating products for the first category, while the second and third categories necessitate a set of behavioural choices as input. Therefore, we envision these categories to be used in combination with a mind-mapping exercise, during which the participants can brainstorm about appropriate symbols and behavioural choices.

3.1 Aim and Procedure

To refine and to further develop the preliminary design strategies, we conducted ideation sessions with fifteen participants who had similar levels of design experience. All participants were either alumni or master level graduate students at the faculty of Industrial Design Engineering at Delft University of Technology. The participants were familiar with the approach of designing with dilemmas; however, the topic of triggering dilemmas was new to them. Four sessions were conducted in groups of three to five participants to enable in-depth discussions. Each session lasted approximately three hours.

One day before the workshop, participants received an email about the agenda of the session and two design briefs to choose from. The first brief was about promoting condom use to prevent transmission of sexually transmitted infections (see Baele, Dusseldorp and Maes, 2001). The second brief was about promoting balanced smartphone usage (see Harmon and Mazmanian, 2013). Each design brief included an explanation of the dilemma relevant for the brief and illustrated on the model of dilemmas for designers (Ozkaramanli, Desmet, and Ozcan, 2016) (see Figure 3a and 3b). Both design briefs were phrased in an open-ended way to allow autonomy in specifying situations where triggering dilemmas might be appropriate.

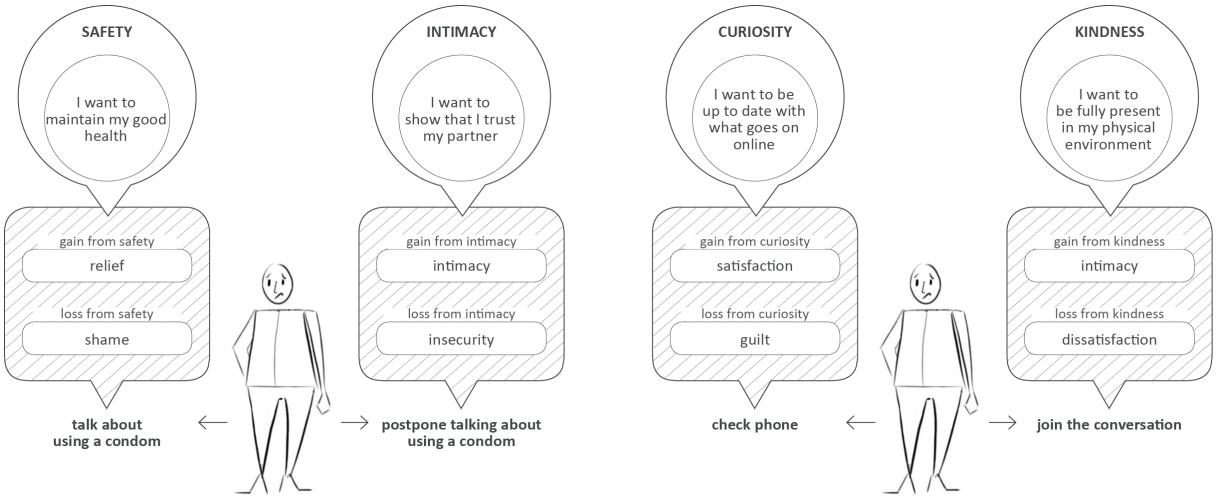


Figure 3 Two models that illustrate the dilemmas relevant for the two design briefs: (a) On the left: conflict between safety and intimacy related to condom usage; and (b) on the right: the conflict between curiosity and kindness related to smartphone usage.

In the sessions, the participants were first introduced to the phenomenon of dilemmas and the three categories of products that can trigger dilemmas. As the categories could be unfamiliar (and rather complex), the participants were asked to group a variety of design examples under the given categories to clarify the nuances among them. Next, the participants were asked to explore the dilemma in the design brief of their choice by creating guided mind-maps.[2] For this, they were asked to create two types of mind-maps: one for symbols representing conflicting concerns (e.g., having safe sex vs. trusting my partner) and one for mutually exclusive choices that correspond to the conflicting concerns (e.g., talking about using a condom vs. ignoring the topic).

Finally, participants were asked to create ideas by using ingredients of the mind-maps and by incorporating their understanding of the categories. To facilitate analysis of ideas, an ideation template was used on which the participants could describe their ideas and the approach they used to create them. The participants were asked to create as many ideas as

[2]Here, we would like to differentiate between open mind-maps, i.e. those where the designers decide what the central concepts to brainstorm about are; and guided mind-maps, i.e. those where the central concept and possibly some of the branches are pre-defined by the researchers.

possible, prioritizing variety and originality more than feasibility. Following idea generation, the participants presented some of their ideas and discussed how they experienced the process of designing to trigger dilemmas.

3.2 Analysis

The participants generated fifty-seven ideas in total. Nine ideas were discarded from analysis since they were unclear or unfinished. Remaining forty-eight ideas were categorized according to the three preliminary design strategies the participants intended to use. In addition, all discussions were voice-recorded and transcribed as input for analysis. The information on the transcripts and the idea sketches, supported by the comments on the ideation templates, were analysed with a focus on the opportunities and challenges of using the preliminary design strategies in ideation.

3.3 Findings

We structured our findings using two main information sources: reflections of the participants on their own ideation process and evaluation of the final design ideas.

REFLECTIONS ON THE IDEATION PROCESS

All participants mentioned that triggering dilemmas was an interesting design intention, yet they also found it very challenging to implement. One participant phrased this challenge as follows: "*Although I thought I am not really a problem solver, I went into problem solving immediately. Now I realize that this approach is about taking different perspectives rather than choosing one perspective to follow."* In addition, fifteen ideas, despite being interesting, intended to resolve dilemmas instead of triggering them. For instance, seven participants thought about the same idea of underwear with a secret pocket for condoms to make them easily accessible when needed. During discussions, the participants acknowledged that such underwear might indeed promote using condoms, but might not provoke questioning the topic through triggering dilemmas.

The mind-maps helped generating the necessary ingredients for implementing the preliminary design strategies. Specifically, the participants talked about four main benefits: (1) Structuring thoughts: "*The mind-maps helped me to structure what my opinion about this design brief is."* (2) Increasing efficiency: *"Creating the mind-maps seems time consuming, but when it speeded things up when creating ideas."* (3) Finding inspiration: *"Especially the symbols mind-map was really helpful. I was already drawing on the mind-map, and it was easy to get ideas out of there.*" (4) Broadening the mind-set: *"I was not really brainstorming about phone usage. Instead, I was brainstorming about stimulation vs. mindfulness and that helped me to be more open minded."* Four participants noted that the fourth benefit could also be a disadvantage, since freely brainstorming about symbols or situations could disengage their thoughts from the focus of the design brief: *"The jump from the mind-maps to creating ideas was a big one for me; I felt that I missed something, like contextual information, that could connect the ingredients on the mind-map in a meaningful way."*

Figure 4 and Figure 5 illustrate example mind-maps created by the participants. Figure 4 shows a mind-map that explores the conflict between curiosity (e.g., check smartphone) and kindness (e.g., ignore smartphone) through brainstorming about *the symbols* representing each concern. Figure 5 shows a mind-map that explores the conflict between stimulation (e.g., check smartphone) and mindfulness (e.g., ignore smartphone) through brainstorming about possible *choices* that can fulfil each concern.

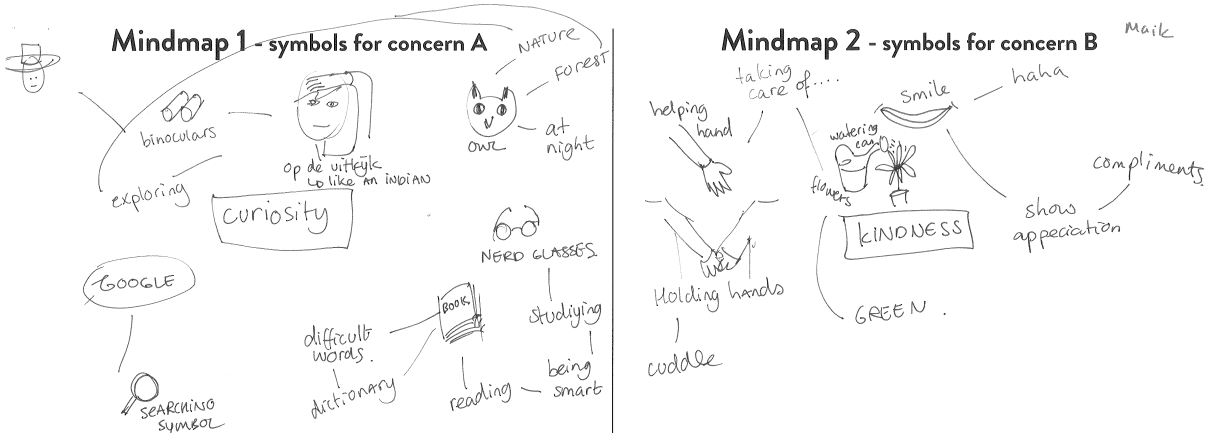


Figure 4 Mind-map that explores symbols for the conflict between curiosity (e.g., check smartphone) and kindness (e.g., ignore smartphone)

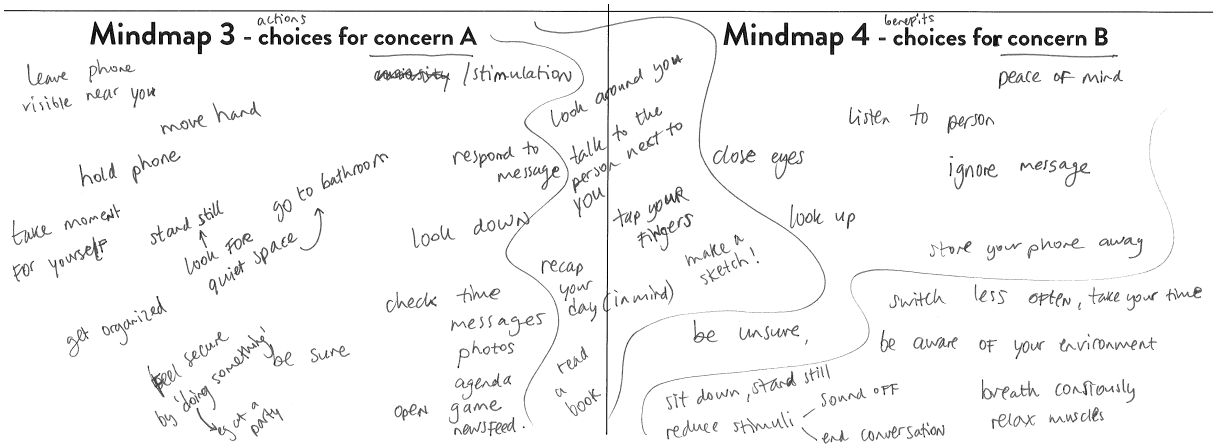


Figure 5 Mind-map that explores possible choices for the conflict between stimulation (e.g., check smartphone) and mindfulness (e.g., ignore smartphone)

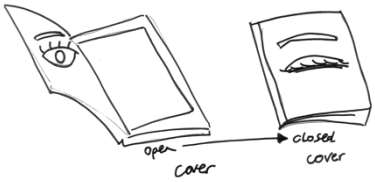
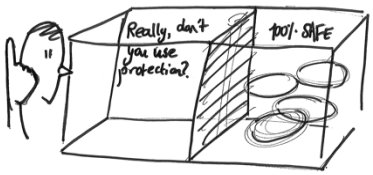
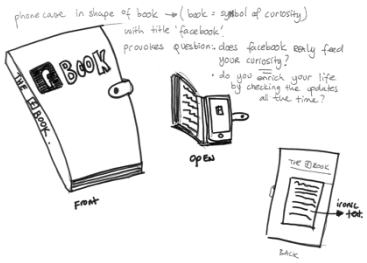
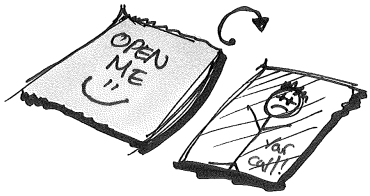
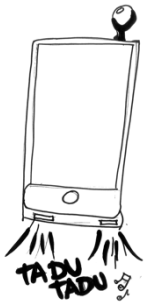
Twelve out of fifteen participants mentioned that using the categories as a starting point for ideation blocked their creativity and commented that the "real" inspiration came from the exercise they did with the categories (i.e., embodied symbols, forced choice, behaviour barrier): "*When I tried to pick a strategy to go on with, it was not working. It was too rational. The description of the categories helped me to understand how it works or to check whether my ideas are good or bad. But what worked best was the mind-maps in combination with the exercise we did with categorizing different products."* Another designer, who was aware of her personal preferences in generating ideas, said: "*Well, I*

decided that I will not look at the strategies when I start. I will first create ideas and when I get stuck, or when I have some ideas, I will go back to the strategies to analyse where they fit, and to come up with more ideas or to improve the ones I have." Moreover, the designers who did start ideating using the strategies mentioned that it was frustrating to start thinking about one category and to end up with ideas for another: "*I wanted to do something for the first category, but when I had an idea, I immediately started thinking 'is this the right category?'*

EVALUATION OF THE FINAL DESIGN IDEAS

To better explain insights gained from the evaluation of participants' ideas, we will refer to six design ideas generated in the sessions and presented on Table 2.

Table 2 Six design ideas generated in the ideation sessions

Category 1 (Embodied Symbols)	Category 2 (Forced Choice)	Category 3 (Behaviour Barrier)
		
Sleeping Phone Smartphone cover that displays a sleeping eye when closed; and an awake eye when open.	Love Counter A transparent storage box in which one can keep packaged condoms in one compartment and part of the packaging from used condoms in another.	Breathing Phone A smartphone phone gadget that requires you to breathe slowly and consciously into a tube in order to unlock your phone.
		
Facebook Book A phone case in the shape of a real book, with title, Facebook.	Open Me Condom packaging that only opens on one side, while the other side has pictures of people with a sexually transmitted infection.	Ta-Du Phone A smartphone application that, when programmed, makes annoying noises when one takes his smartphone out of his pocket in a social setting.

Nine out of fifteen participants considered the first strategy to be very interesting, but challenging to implement in the way it was presented. For instance, *Sleeping Phone* (Table 2) is a suitable example for this category because it symbolizes alertness (i.e., checking phone) and relaxation (i.e., ignoring the phone) in one product. However, we observed that it is important to think flexibly about combining symbols that represent conflicting concerns. The *Facebook Book* (Table 2), for instance, combines a real book that symbolizes "constructive" curiosity, with the Facebook logo that symbolizes "destructive" curiosity to provoke the question "does Facebook genuinely feed people's curiosity?" On the ideation sheet, the participant noted, *"I used two symbols, but both are related to the concern for curiosity, and none to the concern for kindness. I am really confused now."* Although the participant was satisfied with his idea, he could not rationalize using the first strategy. This remark indicates that designers can refer to the strategies if and when they are needed, instead of following them as a sequence of steps.

The second strategy received little attention from the participants compared to the others. This could be due to the challenge of suspending one's moral judgment when designing, which may particularly be challenging when the "right" choice seems clear (i.e., using a condom). For example, *Love Counter* (Table 2) does not imply that using a condom is the "right" (or "wrong") action. Instead, it enables the user to track the consequences of both actions. In contrast, *Open Me*, implies what the "right" choice is, which was apparent in many ideas based on the second strategy.

Using the third strategy enabled the participants to communicate what they thought the "right" choice was. However, when using this strategy, they found it challenging to identify subtle barriers that would not be perceived as an annoying punishment by the users. For instance, the participant who created the *Ta-Du Phone* (Table 2) commented that he would never want a phone like that himself. However, the participants who discussed the *Breathing Phone* (Table 2) thought that breathing slowly and consciously before using a smartphone could be a subtle yet provocative barrier. This might explain why the third strategy was used most frequently, while at the same time, many participants mentioned that it was their least favourite strategy.

3.4 Discussion

Our findings indicate that triggering dilemmas as a means to design for provocation is a different challenge than finding a creative way to deal with users' personal dilemmas. Designers who are trained to take deliberate design decisions (defining a target group, a design context, or a clear design goal) may find it uncomfortable to delay these decisions or leave them to the interpretation of the users. In contrast, much of provocative design seems, often by the virtue of their ambiguity, to take comfort in allowing for multiple interpretations by users (Gaver, Beaver and Benford, 2003). It might have been helpful to further emphasize the essence of this design intention by, for example, engaging the participants in a debate or a role-playing exercise about the design brief prior to the ideation

session. Such exercises might have facilitated the sensitive mind-set of taking different perspectives and stalling moral judgment.

The ideation sessions broadened our knowledge on the nature of the design strategies that can be helpful in ideation when designing to trigger dilemmas. Bardzell et al (2012) identified several challenges that can influence the critical design process, one of which is about operationalizing critical theory: "Making the leap from descriptive [critical theory] to generative [designing], the designer must make judgments about how to proceed." (Bardzell, et al 2012; p. 293; brackets added). This has proved to be a challenge in our work as well: our experience shows that designers need a "bridge" between "understanding a dilemma" and "the act of triggering dilemmas". However, as the word "strategy" may suggest, these strategies need not be concrete, step-by-step instructions similar to those in a recipe book. Neither do we suggest that abstract goals such as "design for provocation" or "trigger a dilemma" can provide a bridge between understanding and generating. Similar to strong concepts proposed by Höök and Löwgren (2012), we envision design strategies to reside on an abstraction level that transcends particular instances while maintaining a generative value. In the context of designing to trigger dilemmas, we define design strategies as a set of creative exercises that can facilitate reflection in action and being sensitive to different perspectives on the subject of design, while suspending moral judgment.

We argue that this extended definition of design strategies can work well due to the involvement of three main mental activities during ideation: understanding, recognizing, and generating (see Chi, 2009). For instance, the descriptions of the product categories helped *understanding* principles that define these categories, classifying various product examples under different categories helped *recognizing* them, and redesigning those examples to fit under different categories helped *generating* new design ideas. More importantly, our findings have shown that designers engage in these mental activities in an iterative fashion (vs. a linear, consecutive fashion). In fact, starting the ideation with a specific category in mind did not necessarily led to generating new ideas, whereas techniques such as redesigning a rough idea using the principles from different categories, or using the categories as a lens to analyse first ideas worked better. This active participation of designers in building the strategies they use to generate ideas resembles the central element of constructivist learning theories (Fosnot and Perry, 1996), which, in future research, may form the basis for developing new techniques that can support ideation in the context of designing for provocation

An important limitation of the ideation sessions should be mentioned. Both the design briefs and the design approach being proposed were new to the participants, and thus, allowing more time to understand and implement the input; for instance, in ideation sessions with multiple-stages, could have been a more fruitful research format.

4. General discussion

The promise of provocative design approaches has often been neglected in traditional product design mainly due to the resulting objects being considered as art and lacking a utilitarian function expected of traditionally designed objects (Malpass, 2015). Therefore, designing to provoke reflection and debate has become an established practice only at few universities such as Royal College of Art, Central Saint Martins, and Design Academy Eindhoven, where it gradually acquired its privileged nature as a practice reserved for the distinct few (Bardzell, et al 2013). Reasonably, if we had conducted the ideation sessions with students or alumni of these institutions, our findings would have been drastically different. However, we believe that designers who are trained in a problem-solving tradition can also benefit from strategies that can support them in designing for provocation. Such strategies can broaden the repertoire of their design thinking and stimulate creativity and willingness to consider the ethical implications of their design intentions. In addition, the increasingly interdisciplinary nature of design and its ambition to deal with complex societal issues have broadened the definition of function in design. This development seems to make provocative design approaches more relevant to traditional design than they may have ever been.

In this paper, we argued that triggering dilemmas might be a means to designing for provocation. The two approaches have both similarities and differences. First, a common aim for provocative design is to challenge *socio-cultural* norms, values, and assumptions, in order to cultivate *social awareness*, whereas, triggering dilemmas focuses on *personal* desires, norms, values and aspirations, in service of *self awareness*. Second, even though provocative design, particularly critical design, takes inspiration from everyday objects, it does not usually result in designs that are bought and used by a general audience. In contrast, we intend products that trigger dilemmas to be utilitarian and embedded in everyday life. We argue that their repeated usage, which may invite interpretation, discussion, and reflection, can be a strength for such products. Third, triggering dilemmas is only one way of designing for provocation, where other means are possible such as creating curiosity and engagement through ambiguity. Because of this, experts who participated in the research categorized some of the products as “provocative designs that do not trigger a dilemma”. These products do embody arguments and ideas, but these ideas do not necessarily represent personal dilemmas.

Finally, we provided insights on the nature of design strategies that can be used to generate ideas to trigger dilemmas. Specifically, we aimed to contribute to the dynamics of ideation and utilized the ingredients of dilemmas (e.g., conflicting concerns and mutually exclusive behavioural alternatives) to formulate preliminary design strategies. The way we defined design strategies, i.e., creative exercises that facilitate perspective taking and stalling moral judgment, can be extended. For instance, Gaver et al (2003) identified three types of ambiguity (information, context, and relationships) and proposed several strategies for each (e.g., point out things without explaining why). In addition, Ferri et al (2014) proposed the

design criticality tactics, namely thematic blending, semantic shifts, social transgression, and body modification, which can be used to analyse critical designs. Such tactics may also be of great value in ideation as they extend the understanding of the behaviour of provocative design examples. Therefore, studying the generative value of these tactics is an interesting direction for future research.

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5. References

Baele, J., Dusseldorp, E., and Maes, S. (2001) Condom use self-efficacy: Effect on intended and actual condom use in adolescents. *Journal of Adolescent Health, 28*(5), 421—431. doi: 10.1016/S1054-139X(00)00215-9

Bardzell, J., and Bardzell, S. (2013, April) What is critical about critical design? In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: Changing Perspectives,* Paris (pp. 3297—3306). New York: ACM Press. doi: 10.1145/2470654.2466451

Bardzell, S., Bardzell, J., Forlizzi, J., Zimmerman, J., and Antanitis, J. (2012, June) Critical design and critical theory: The challenge of designing for provocation. In *Proceedings of the Designing Interactive Systems Conference: In The Wild,* New Castle (pp. 288—297). New York: ACM Press. doi: 10.1145/2317956.2318001

Bardzell, J., Bardzell, S., and Stolterman, E. (2014, April) Reading critical designs: Supporting reasoned interpretations of critical design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: One of a CHInd,* Toronto (pp. 1951—1960). New York: ACM Press. doi: 10.1145/2556288.2557137

Chi, M. T. (2009) Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science*, *1*(1), 73—105. doi: 10.1111/j.1756-8765.2008.01005.x

DiSalvo, C. (2012) *Adversarial Design*. MIT Press.

Dunne, A., and Raby, F. (2013) *Speculative Everything: Design, Fiction, and Social Dreaming*. MIT Press.

Ferri, G., Bardzell, J., Bardzell, S., and Louraine, S. (2014, June) Analyzing critical designs: Categories, distinctions, and canons of exemplars. In *Proceedings of the 2014 conference on Designing interactive systems: Crafting Design,* Vancouver (pp. 355—364). ACM Press. doi: 10.1145/2598510.2598588

Fleming, S. (2014) Hesitate! Indecision is sometimes the best way to decide, http://tinyurl.com/lmnu47f, (Accessed 7 November, 2015).

Fosnot, C. T., and Perry, R. S. (1996) Constructivism: A psychological theory of learning. *Constructivism: Theory, perspectives, and practice*, 8—33.

Gaver, W. W., Beaver, J., and Benford, S. (2003, April) Ambiguity as a resource for design. In *Proceedings of the SIGCHI conference on Human factors in computing systems: New Horizons,* Florida (pp. 233—240). New York: ACM Press. doi: 10.1145/642611.642653

Harmon, E., and Mazmanian, M. (2013, April) Stories of the smartphone in everyday discourse: Conflict, tension and instability. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: Changing Perspectives,* Paris (pp. 1051—1060) New York: ACM Press. doi: 10.1145/2470654.2466134

Höök, K., and Löwgren, J. (2012) Strong concepts: Intermediate-level knowledge in interaction design research. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *19*(3), 23—41. doi: 10.1145/2362364.2362371

Malpass, M. (2013) Between Wit and reason: Defining associative, speculative, and critical design in practice. *Design and Culture*, *5*(3), 333-356. doi: 10.2752/175470813X13705953612200

Malpass, M. (2015) Criticism and function in critical design practice. *Design Issues*, *31*(2), 59—71. doi: 10.1162/DESI_a_00322

Ozkaramanli, D., Desmet, P. M. A., and Ozcan, E. (2016) Beyond Resolving Dilemmas: Three Design Directions for Addressing Intrapersonal Concern Conflicts. *Design Issues, 32*(3) (in press).

Roozenburg, N. F., and Eekels, J. (1995) *Product design: Fundamentals and methods* (Vol. 2). Chichester: Wiley.

Sengers, P., Boehner, K., David, S., and Kaye, J. J. (2005, August) Reflective design. In *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility,* Aarhus, Denmark (pp. 49—58). New York: ACM Press.

Tharp, B. M., and Tharp, S. M. (2013, June) Discursive design basics: Mode and audience. In *Proceedings of Nordic Design Research Conference: Experiments in Design Research,* Copenhagen (pp. 406—409).

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