

Chapter 7 Tweaking interaction through understanding the user

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Abstract: How users will respond to a certain design or interface, and to what extent this may or may not affect their behaviour as intended, depends as much on the choice of the design strategy as on how well the strategy has been applied. This chapter presents a tool called Dimensions of Behaviour Change, which offers a 'crash course' for designers in how the mind of the user works, and translated into aspects that the designer can work with in order to change behaviour. The tool is intended not only for inspiring designers, but also for guiding them towards finding the right opportunities and the right ways to nudge the user in the desired direction.

Key words: Sustainable behaviour, design inspiration, nudging, design methodology

INTRODUCTION

Assuming that designers want to design for sustainable behaviour – what options do they have? What is their toolkit? Which control knobs can they slide when looking for ways to nudge users in the right direction, or away from the wrong direction? What is their room to play with? In the past 10 years research has begun to address these questions, and gradually the field has realised that opportunities are many.

Jelsma's dimensions of 'script' (1997, 2006) was one of the first contributions to understanding how the design of products affects behaviour. He proposed that a script has a direction (how much the behaviour change is in line with the beliefs and values of the user), a force (how difficult the script makes it for the user to act differently to what is intended), a scale (whether the changes are made directly in the interaction between the user and the product, the function of the product or in the entire practice) and a distribution (how much control the user has over the behaviour). These dimensions are essentially an elaboration of the three notions derived from the concept of script proposed by Akrich: in-scription, prescription and de-scription (Akrich, 1992). Description is the purpose (e.g. do not forget to bring the hotel key back to the front desk), in-scription is the translation of the de-scription into the product (e.g. heavy weight on the key reminds guests to return the key) and prescription is what a device allows or forbids the actor to do (e.g. forget to return the key to the front desk or not).

Around 2005, scripts were picked up by various researchers that today make up the Design for Sustainable Behaviour research community (see e.g. Boks and Pettersen (2015)). In 2005, Lilley et al. (2005) expanded on Jelsma's understanding by proposing a distinction between three types of design principles according to how strongly they affected the behaviour. In their structure, the concept of scripts covers the middle part of a spectrum together with what was called Behaviour Steering. On one side they added Ecofeedback, which aims at influencing the behaviour by providing information or feedback, and on the other 'Intelligent' Products and Systems, which take control of the behaviour away from the user and force desired behaviour or block inappropriate behaviour. This created a dimension, where - at one end - the users are in complete control and can choose to read and interpret the Eco-feedback, and further choose to alter their behaviour accordingly or not. At the

other end, the users are forced to behave in the desired way by the 'intelligent' products or systems. Between these two extremes, users are guided towards the desired behaviour by the script, but without being forced. The identification of the categories between the two extremes makes it similar to Zaltmans (1974) classification of social change strategies, which includes re-educative Strategies (communication of fact, feedback), Facilitation (increase the ease), Persuasive (involve bias in the structuring and presentation) and Power Strategies (involve the use and/or threat of force).

Elias et al. (2007) proposed a variation of this categorization of change strategies (although without a strong forceful intervention). He made a distinction between consumer education, feedback and user-centred eco-design. The former two are clearly at the end of the spectrum where the user is in control, whereas the latter is defined as "creating products where the most intuitive and comfortable way of using and interacting with a product or system is also the most environmentally friendly" (Elias et al., 2008), bringing it closer to the understanding of scripts.

Wever et al. (2008) proposed a similar categorisation of change strategies to Lilley et al. (2005), with the inclusion of Behaviour Steering in the script category, and alternate phrasing of 'intelligent' Products and Systems as Forced Functionality, creating a clearer reference to the lack of control this type of principles allows the user to have. Bhamra et al. (2008) elaborated the distribution proposed by Lilley et al. by splitting it up into seven parts; Eco-information, Eco-choice, Eco-feedback, Eco-spur, Eco-steer, Eco-technology and Clever Design. The Eco-feedback strategies are similar to those of Lilley et al. apart from that simple information has been extracted and given the name Eco-information. The intelligent product and systems are similar to the Eco-technology and the strategies Lilley et al. call scripts and behaviour steering resemble Eco-choice and Eco-steering. In addition, Bhamra et al. have added Eco-spur and Clever Design, which are not included in the structure of Lilley et al. Eco-spur is meant to reward the intended behaviour, whereas Clever Design creates the desired end result without changing the user behaviour.

Based on the categorization of change strategies by Bhamra et al. (2008) and Wever et al. (2008), Lidman and Renström (2011) proposed a categorization, dividing the distribution of control into four categories; Enlighten (providing information or educating the user), Spur (encourage or tempt the user), Steer (guide the user) and Force (compel the user). In addition they proposed a category called Match, which does not aim to affect the behaviour of the user and thereby does not naturally have a position within the distribution of control. There are also two other categorizations, which have slightly different perspectives, but apply the same rationale. One is found in the introduction to the Design with Intent toolkit (Lockton, et al., 2010b). Instead of describing how the product is affecting behaviour, Lockton et al. describe three different ways to perceive the user: Pinball (the user does not think at all), Shortcuts (the user takes shortcuts and makes choices based on how the options are presented) and Thoughtful (the user takes every opportunity to learn more about the world around them and their impact on it). These three categories describe the user perspective of the two extremes and the centre part of the distribution of control as described above. The other category was proposed by Tromp et al. (2011), and attempts to describe how products affect behaviour from how the user experiences it. They suggest a two dimensional landscape, where the dimension of force is combined with a dimension of salience. The dimension of force is described with Persuasive or Seductive principles on one end and Decisive or Coercive principles on the other, creating a distribution similar to the one described above.

As the logic in these distributions is similar, the difference seems mainly to be a question of language in naming the scale from 'user in control' to 'product in control'. For example: the Distribution of Control or Force (Jelsma, 1997; Tromp et al., 2011); Axis of Influence (Lilley, 2007); or "Spectrum of

Control” (Lockton, 2013) can all be considered as scales where the user has complete control on one end, and the product has complete control on the other end. Table 1 summarizes the above distribution of change strategies in a single overview where at one end the user is in control. Design strategies at this end focus on providing the user with information or feedback. This information will in most cases have to be registered, interpreted, understood and reasoned upon before a behaviour change is possible. At the other end of the scale are design strategies that either force the user to behave in a certain way, or eliminate the users behaviour by acting automatic. As the user does not have any influence, these strategies may require limited or no attention from the user to change the behaviour. Between these two extremities are strategies with a varying degree of division of control. Solutions may range from simply enabling a certain type of behaviour, to guiding or steering the behaviour in the intended direction by making the desired behaviour easier, or the undesired behaviour more difficult.

Table 1: Variation of the distribution of control described in the literature

		Zaltman, 1974	Jelsma, 1997	Lilley et al., 2005b	Elias et al., 2007	Bhamra et al., 2008	Wever et al., 2008	Lockton et al., 2010	Lidman & Renström, 2011	Tromp et al., 2011		
Informing	Information				Consumer education	Eco-information						
	Feedback	Reeducation		Eco-Feedback	Feedback	Eco-feedback	Eco-feedback	Thoughtful	Enlighten			
	Enabling	Facilitation				Eco-spur						
	Persuading	Encouraging		Scripts	Scripts and Behaviour Steering	User Centred eco-design	Eco-choice	Scripting	Shortcuts	Spur	Seductive/ Persuasive	
		Guiding	Persuasion							Eco-steer		Steer
		Steering										
Determining	Forcing	Power		'Intelligent' Products and Systems		Eco-technical intervention	Forced-functionality	Pinballs	Force	Decisive/ coercive		
	Automatic											

Lockton has done important research to open up the solution space further. A tool that has received much attention is the Design with Intent (Dwi) toolkit, which consists of 101 patterns or principles for influencing behaviour. The patterns are structured into 8 lenses according to the “worldviews” of how the designer approaches behaviour change (Lockton, et al., 2010b). The eight lenses are: Architectural, Errorproofing, Interaction, Ludic, Perceptual, Cognitive, Machiavellian and Security. Each pattern is presented on a separate card, and consists of a title, a question pointing out the function of the pattern, and an example of an application of the pattern with a short description and a picture (Lockton et al., 2010b). The patterns can be regarded as ways to achieve the desired level of control but also include a variety of cues that can be regarded as suggestions to play with other dimensions that may influence behavior. The toolkit does not suggest which dimensions or pattern to employ – for this, one needs to research who the user is, what goes on in his or her mind, and understand the surroundings that affect the behavior to be changes. To this end, a tool called the Principles of Behaviour Change was developed at NTNU (Zachrisson et al., 2011; Boks and Daae, 2013), but this was still very much building on the distribution of control, combined with obtrusiveness, and did not consider other dimensions.

DIMENSIONS OF BEHAVIOUR CHANGE

To expand the work on the Principles of Behaviour Change tool, subsequently other dimensions that designers could use were explored. The main idea was to explore the missing link between *understanding the user* and knowing *how design may affect behaviour*. The key question was whether it would be possible to know and develop guidelines for which type of design intervention would provide the best opportunity to affect user behavior in the desired way?

Through creative workshops and interviews with both experts on design for sustainable behaviour and professional designers without experience in this field, empirical data was collected on how they thought designers may influence behaviour. As experts, we chose design practitioners, professionally employed at different design agencies and companies located in Oslo and Trondheim. Our empirical data was collected during five workshops at these companies, in workshop session that lasted for about two hours and had between two and six participants. All participants held at least a master's degree in industrial design and work with product and interface design on a daily basis (Daae and Boks, 2014).

After conducting the workshops, it was obvious that the dimensions suggested during the workshops operated on several different levels and were partly overlapping. Thus, the next step was to structure them in a clear and logic way. It was considered useful to try to structure them by finding opposing dimensions, along which designers could try to find the right level of employing the dimension depending on the understanding of the user and how he would react. Some of the dimensions suggested a continuous description along a scale, whereas others were found to be more suitable for a more discrete description, or even representing different logical concepts that are not necessarily opposing. However, the concept of dimensions along a scale between opposing mechanisms was maintained to explore its potential, partly in search of uniformity with 'control' and 'obtrusiveness', two dimensions which at that stage already had received some acceptance. Efforts were made to maintain the essence of all the dimensions and reduce loss of information as far as possible. Table 2 provides an overview of the dimensions that resulted from the workshops.

Table 2: Categorisation of the empirical data: from 55 dimensions to 9 main dimension categories

<i>Dimensions from the workshops</i>	<i>Description of the dimensions</i>	<i>Proposed dimensions</i>
<ul style="list-style-type: none"> • Choice vs no choice • User in control vs product in control • Convince vs demand • Encourage vs impose • Information vs overruling • Force vs guide • Individual freedom vs greater good • Opt in vs opt out • On my way vs far away • Simple vs complicated • Information vs simplify • Forced usage vs punishment 	<p style="text-align: center;"><i>Shall the user or the product determine the behaviour?</i></p> <p style="text-align: center;">Allow the user freedom of choice of action vs. Forcing the user by giving product control</p>	<p>Control (known from literature; e. g. Jelsma, 1997, Lilley et al. 2005, Elias et al. 2007)</p>
<ul style="list-style-type: none"> • Passive user vs active user • Obvious vs hidden • Open and inviting vs secretive and mysterious 	<p style="text-align: center;"><i>How much attention shall the design demand?</i></p> <p style="text-align: center;">Demand attention or action from the user vs. Use a subtle or obvious approach to reach a goal</p>	<p>Obtrusiveness (known from literature; Zachrisson and Boks, 2011, Tromp et al., 2011)</p>
<ul style="list-style-type: none"> • Helpful vs annoying • Invite vs deter • Polite vs impolite • Stigmatising vs elevating • Reduce usage vs increase usage • Reward vs don't reward • Good vs bad conscience • Much info/output vs little info/output 	<p style="text-align: center;"><i>Should the desired behaviour be promoted or the undesired discouraged?</i></p> <p style="text-align: center;">The design leads the user towards the desired behaviour vs. The design leads the user away from the undesired behaviour (Discrete scale)</p>	<p>Encouragement (novel)</p>
<ul style="list-style-type: none"> • Fun vs meaningful 	<p><i>Does the design focus on rational or</i></p>	<p>Meaning</p>

<ul style="list-style-type: none"> • Emotional vs rational • Competition vs no competition 	<p><i>emotional purpose?</i></p> <p>Motivate the user through fun (hedonic)</p> <p>vs.</p> <p>Motivate the user through meaning (rational)</p>	(novel)
<ul style="list-style-type: none"> • User agree vs don't agree • Meaningless vs meaningful • Primary function vs disconnected • Central function vs additional function • Trendy vs not trendy • Environmentally concerned vs not concerned 	<p><i>Is the desired behaviour in line or opposing the wishes of the user?</i></p> <p>The user is motivated to perform the behaviour</p> <p>vs.</p> <p>The user is not motivated to perform the behaviour</p>	Direction (known from literature; Jelsma, 1997)
<ul style="list-style-type: none"> • I know I do something vs the worlds knows it • Social norms vs individual norms • Consequences for me vs for others • Users responsibility vs others responsibility 	<p><i>Is the user focusing on themselves or others and what others think?</i></p> <p>Play on the user's concerns about himself</p> <p>vs.</p> <p>the user's concerns about others</p>	Empathy (known from literature; mentioned by Tromp et al., 2011)
<ul style="list-style-type: none"> • Physical vs intellectual consequence • Fulfilment of dreams vs survival • Large consequence vs small consequence • Neutral sender vs non-neutral sender 	<p><i>How important does the user consider the behaviour to be?</i></p> <p>Make the user feels strong pressure</p> <p>vs</p> <p>Use weak pressure</p>	Importance (novel)
<ul style="list-style-type: none"> • Instructions vs feedback • Long term vs short term consequences • Preventing vs reducing consequences 	<p><i>Should the design target the user before, during or after the interaction?</i></p> <p>The user experiences it now</p> <p>vs.</p> <p>The user experiences it later</p>	Timing (novel)
<ul style="list-style-type: none"> • Always vs particular situations • Rarely vs frequent usage • Dosage vs continuous 	<p><i>How often will the user encounter the design?</i></p> <p>The user is always affected</p> <p>vs.</p> <p>The user is sometimes affected</p>	Exposure (novel)
<ul style="list-style-type: none"> • Easy vs overkill • Perfect vs improved • One culture vs another • Opposing information • Engineering spec. vs usability spec. • New product vs adjust old product • Aesthetics vs usability 	Not usable?	

It was found that four of the dimensions – Control, Obtrusiveness, Direction and Empathy – were already known from literature. Whereas Meaning, Encouragement, Importance, Timing and Exposure were considered new dimensions in the context of the current design literature that contribute to the extension of the toolkit that designers can draw on when designing interactions.

Aiming towards such a toolkit, the dimensions needed to be translated into a format that would be usable for designers. After some consideration, it was decided to create a physical tool, in the form of a series of relatively large A5 sized cards, as they would be relatively easy to understand, and with an inspiring and visual content that would facilitate discussion in a cooperative setting. Each card depicts a number of photos or illustrations that explain the dimension and how it may affect a user's behaviour. To help the designers understand the potential consequences of the different parts of the

dimension, a number of likely advantages and disadvantages are briefly stated for each extreme, and in some cases also for the central part of the dimension. The reverse of each card contains some further elaborations on the dimension, providing additional support for designers.

DESIGN FOR BEHAVIOUR CHANGE TOOL

This section provides an overview of the dimensions and the related cards. Only the front side of each card is shown, with the exception of the Control card, for which both sides are shown. For the other cards, the explanations below the picture of the front side reflect what is written on the flip sides.

Control



Figure 7.1 Dimensions of behaviour change card 'Control'



Figure 7.2 Dimensions of behaviour change card 'Control' (back)

How much control the user has over the behaviour can vary from complete control to no control. If the user has much control, designers can only expect the user to behave the desired way if this is in line with their intentions. Having more control is often easier to accept for users, but will generally require more attention, and willingness to pay that amount of attention.

- By providing people with information of what to do, it is up to them if they choose to read it and follow up on it. Example: washing instructions on clothes.
- By making the desired behaviour the easiest or most intuitive, people are gently pushed while still being in control. Example: an ecobutton that easily puts the PC in minimum energy mode
- By forcing people to behave in a particular way, the behaviour is guaranteed, but people might not accept it. Example: speed bumps forces drivers to proceed slowly.
- Providing people with feedback about their behaviour gives them the option to interpret it and change their behaviour accordingly if they desire to do so. Example: a water counter on the faucet.
- Making the desired behaviour obvious or enabling it may increase the likelihood that it occurs. Example: a dual flush button on a toilet.
- By making the desired behaviour happen automatically, it is guaranteed to happen. Example: opening a microwave door makes the microwave turn off automatically.

Obtrusiveness

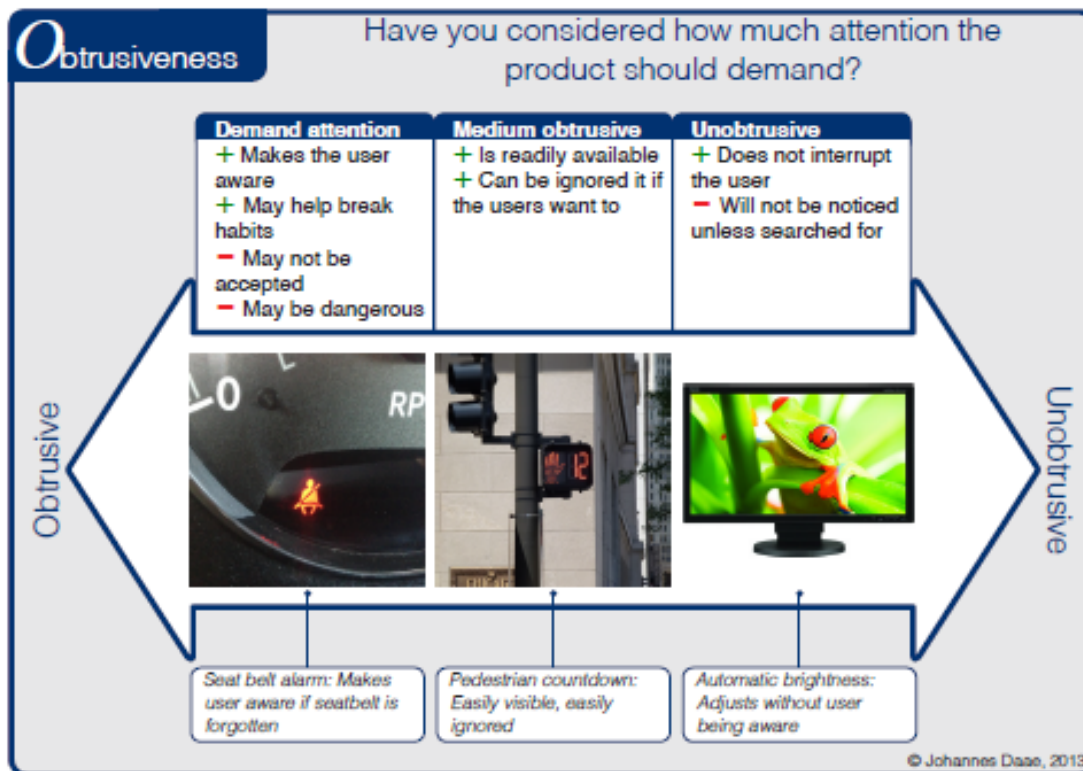


Figure 7.3 Dimensions of behaviour change card 'Obtrusiveness'

How obtrusive a design is will affect how likely it is that the user will become aware of it, but it will also affect how likely it is that the user accepts it. Sometimes the immediate attention of the user is required, whereas in other contexts the user must not be disturbed.

- By requiring extra actions, the attention of the user may be required and their attention is directed. Example: train carriages where the door only has a handle on the outside.
- If something is sufficiently easy, people may be aware of it without it requiring much attention. Example: using one dishwasher detergent tablets per washing.
- User instructions are often hidden and will only be seen if searched for. Example: instructions of how much dishwasher detergent people should use.
- If the information is presented there where the attention of the user is, it becomes more likely to be noticed. Example: presenting a message on the screen of the cell phone.
- Information may be presented in a way that is easy to see but does not require attention after it has been seen. Example: traffic signs.
- Sometimes it is important to avoid demanding the attention of people. Example: dash board information suggesting that it would be beneficial to change gear, should not distract people from driving safely.

Encouragement

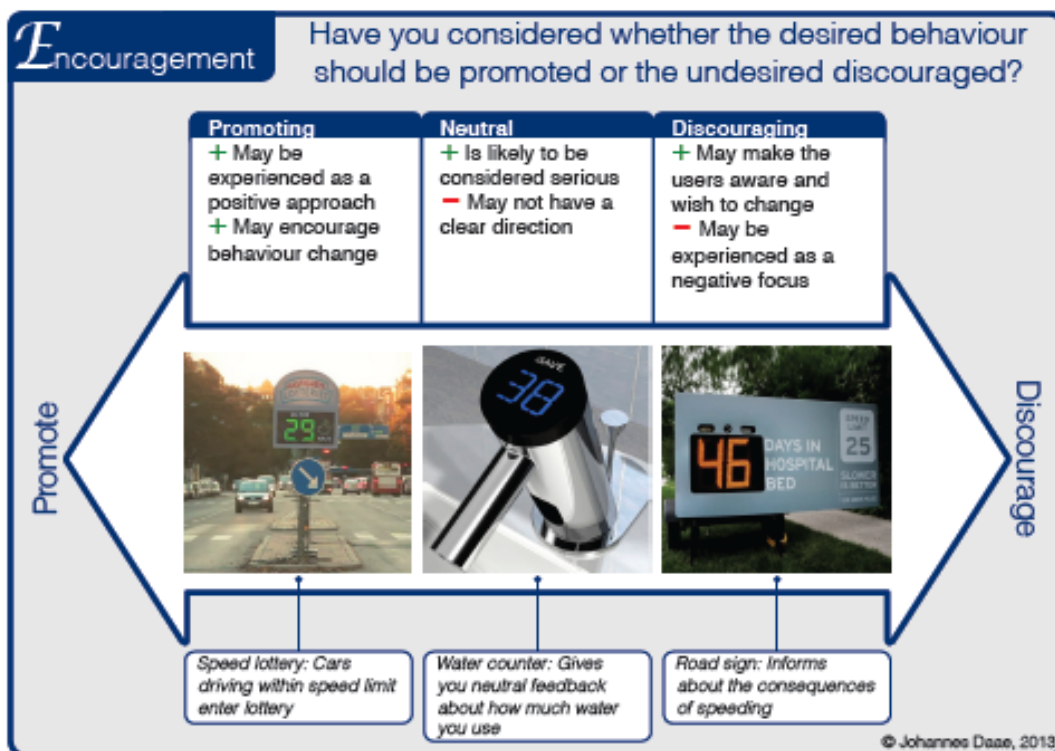


Figure 7.4 Dimensions of behaviour change card 'Encouragement'

When attempting to make people change their behaviour, designers can focus on which behaviour to avoid, on which way to behave, or present alternative ways of behaving – all with various degrees of encouragement.

- Being presented with the positive consequences of their behaviour, people may be encouraged to behave that way. Example: how much money they may save by driving a hybrid car.
- It is possible to present the consequences of behaviour without promoting or discouraging it. For instance by presenting energy consumption and its cost.
- Being presented with how much worse certain behaviour is compared to that of others, users may feel bad and change their behaviour consequently. Example: presenting them with how much more energy they use compared to their neighbours.
- Being exposed to information about what other users do, users may want to behave in the same way. Example: stating how many other hotel guests reuse their towels.
- Instructions on how to behave can be presented without promoting or discouraging it in particular. Example: suggested traffic speeds.
- By making undesirable behaviour more difficult, it becomes less tempting to behave that way. Example: the Eco-kettle requires that people push a button for every cup they shall boil.

Meaning

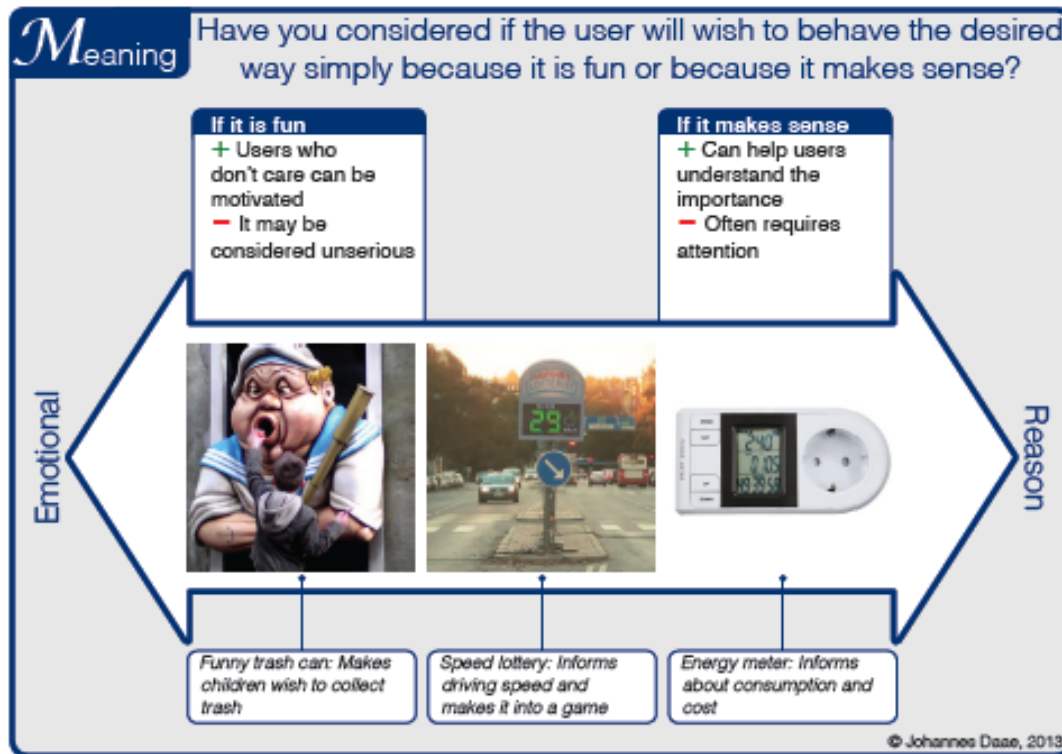


Figure 7.5 Dimensions of behaviour change card 'Meaning'

Sometimes people behave a certain way because they think it is the right way to behave, or because they are afraid of the consequences of behaving differently. Sometimes people might do something just because it is enjoyable or fun, or emotional in some other way.

- Everyday activities may become fun if they become competitions or games. Example: a bottle-bank-arcade makes recycling of bottles into a game.
- Sometimes it can be enjoyable to behave in a rational way. Example: driving in a way that saves fuel and compete against yourself to see how low consumption you can manage.
- Explaining the consequences of an action may make people want to change it. Example: how much money people save on fuel by changing to a hybrid or electric car.
- Designers can use emotional triggers to influence people to behave in certain ways. Example: if the water level in a goldfish bowl reflects the water usage, people might use less water.

Direction

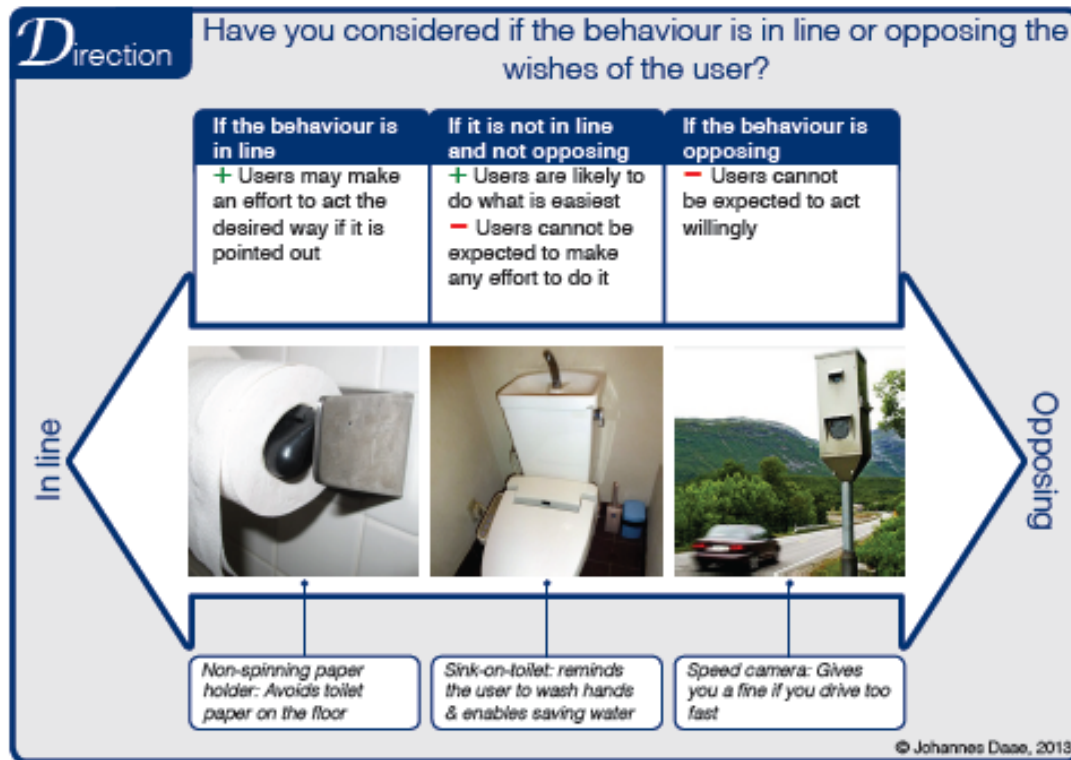


Figure 7.6 Dimensions of behaviour change card 'Direction'

The more the user will agree with the way the designer tries to make him or her behave, the more likely it is that they are willing to make an effort or even sacrifice to behave that way.

- If people want to achieve something, they are likely to be willing to make an effort to do so. Example: reading the washing instructions on new clothes before washing them.
- Even if people don't care if they do it or not, they might behave the desired way if it is sufficiently easy. Example: by making the opening of recycle bins indicative of their purpose.
- Sometimes people wish to do something that is undesirable. Products or interfaces can be designed to prevent this. Example: handles in the middle of benches to avoid loitering.
- People may accidentally do things they do not wish to do, and products can be designed to prevent it. Example: opening a microwave door makes the microwave turn off automatically.
- If people don't care about something, it might be possible to make them realize they care about other aspects. Example: Making people aware about the costs connected to energy use, instead of the energy use itself.
- Sometimes people can be convinced to do something they would prefer not to do. Example: they may be convinced to ride a bike instead of driving a car, in order to get fit or save money.

Empathy

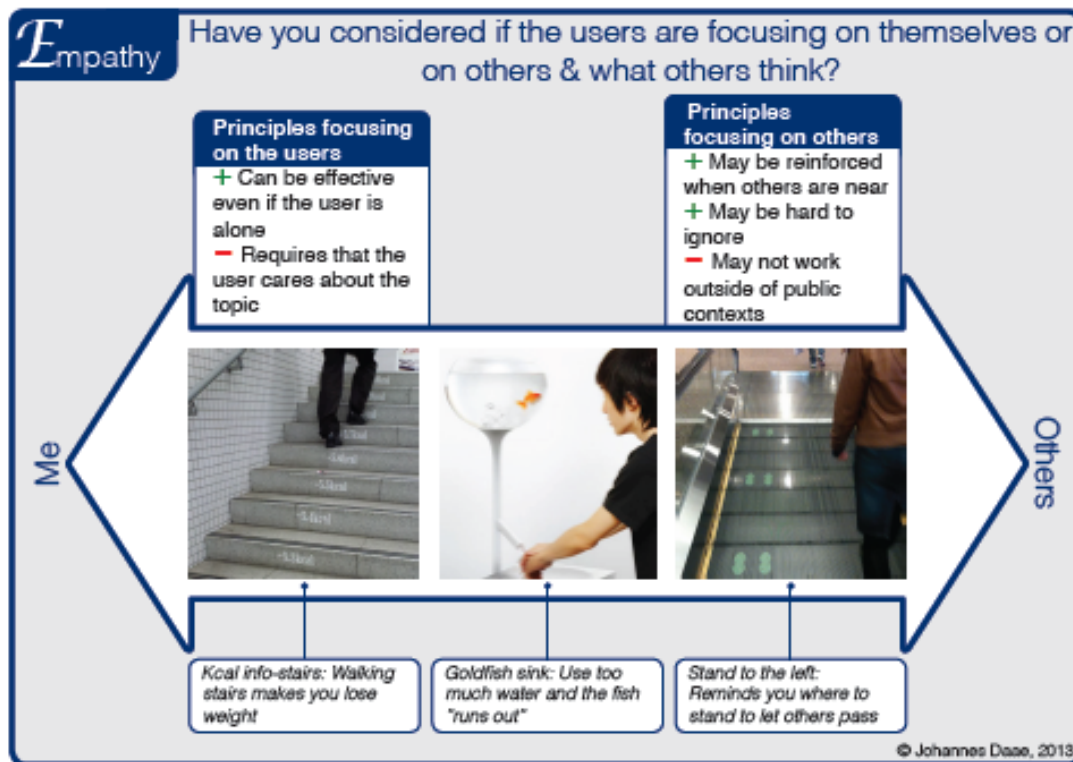


Figure 7.7 Dimensions of behaviour change card 'Empathy'

Whether people focus on themselves or on others and what others might think of them depends both on who they are, what they think is important, and on the situation they are in.

- By making people set goals for their consumption and then help them monitor it, they can compete against themselves and be motivated to change their behaviour.
- Reminding people in private to do something that is desirable for the common good. Example: a sink basin on top of a toilet cistern reuses hand-washing water to flush the toilet, also adding a conservation message.
- By comparing people's behaviour with that of others, they can both understand how well they do and be motivated to change. This can also be used to create competitions.
- Informing people of the personal consequences of their consumption can motivate them to change their behaviour. Example: how much money the use of an appliance costs.
- Sometimes people can do something for personal gain, but if they succeed it is announced to others. Example: winning the bottle-refund lottery makes the machine play a melody.
- By making it obvious to others that people do something might motivate them to do it as they may experience recognition by others that way.

Importance

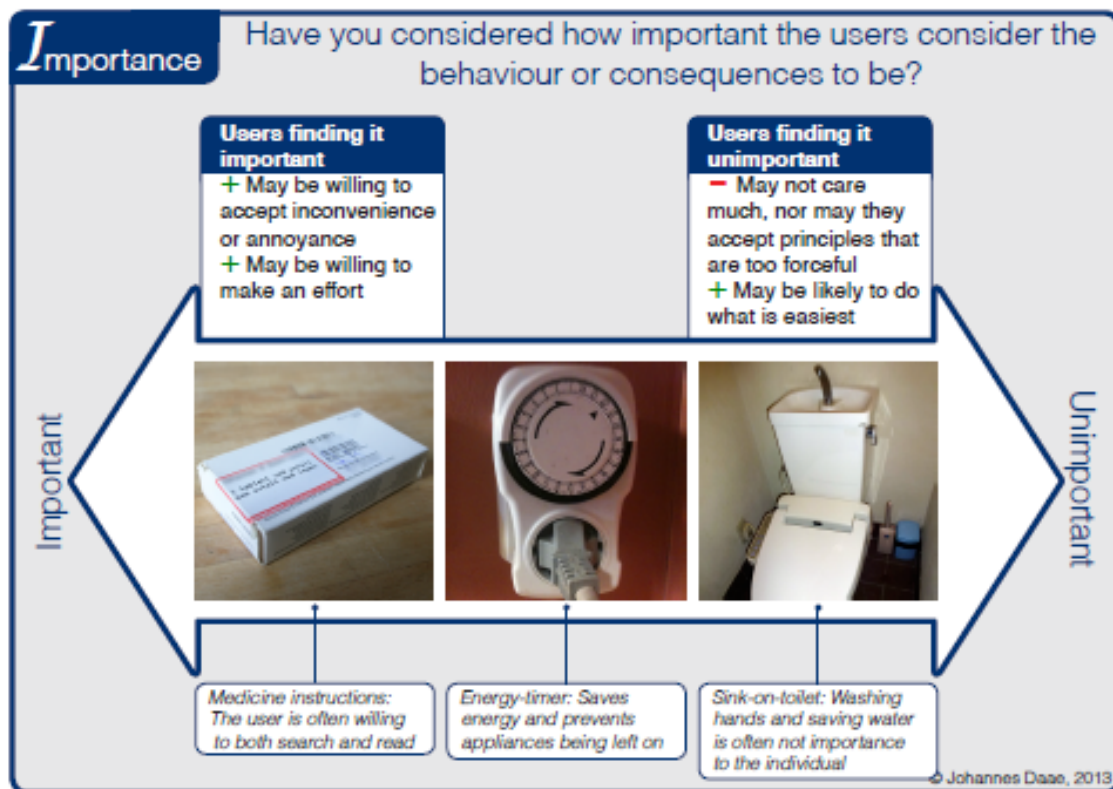


Figure 7.8 Dimensions of behaviour change card 'Importance'

How important someone considers certain behaviour, or the consequences thereof, to be, will affect how much effort the user is willing to put into it. It will also affect to what extent they will accept design solutions that take away the possibility to control their own behaviour.

- Many people will gladly accept the interruption from the seat belt or front lights alarm in the car, because the consequences of forgetting putting the seat belt on or driving without front lights can be severe.
- By describing the consequences of a certain behaviour, more people might consider it to be more important. Example: how much water a hotel saves by not changing the sheets.
- If people do not think something is important enough to affect their behaviour, it may be an idea to make the desired behaviour easier. Example: by shaping the opening of a recycle bin according to its purpose.
- If something is important, people may accept being forced into certain behaviour or functions being disabled. Example: opening a microwave door makes the microwave turn off automatically.
- To increase the likelihood of people doing something that they do not think is very important, make it easy or obvious for them to behave that way. Example: by informing people how long it will take until the next green traffic light.
- Sometimes it is necessary to punish those who are unwilling to behave the desired way. Example: speed bumps are really uncomfortable to cross with high speeds.

Timing

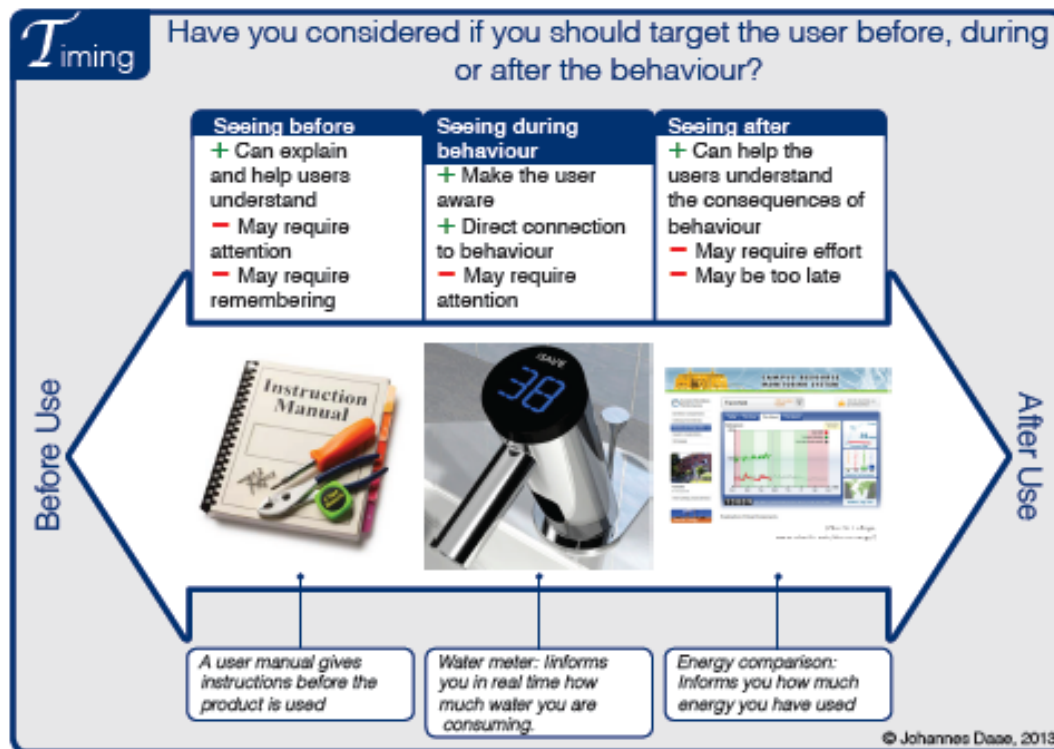


Figure 7.9 Dimensions of behaviour change card 'Timing'

Whether users encounter behaviour principles before, during or after the behaviour will affect how they are affected by them. Sometimes the context or the users disqualify some options because the users are unwilling to pay attention, or because the context does not allow them to be interrupted.

- Giving instructions of how to use a product, for instance how much dish washer detergent to use, increases the ability to apply the right amount of detergent (if the instructions are read)
- Presenting people with alternatives at the moment they are about to act may make them reconsider. Example: entering a red-cross lottery with the money from their bottle-refund.
- Car computers can inform people about how much fuel their cars have used on average. This can also be compared with their current driving.
- Explaining the consequences of particular behaviours can motivate people to change their behaviour in the future.
- People may act out of habit or be unaware of something. Reminding them at the moment of interaction can make them aware. Example: ATMs returning a bank card before giving out cash.
- Telling them what to do next may help people doing it. Example: sending a message saying that the phone is fully charged and that chargers should be unplugged to save energy.

Exposure

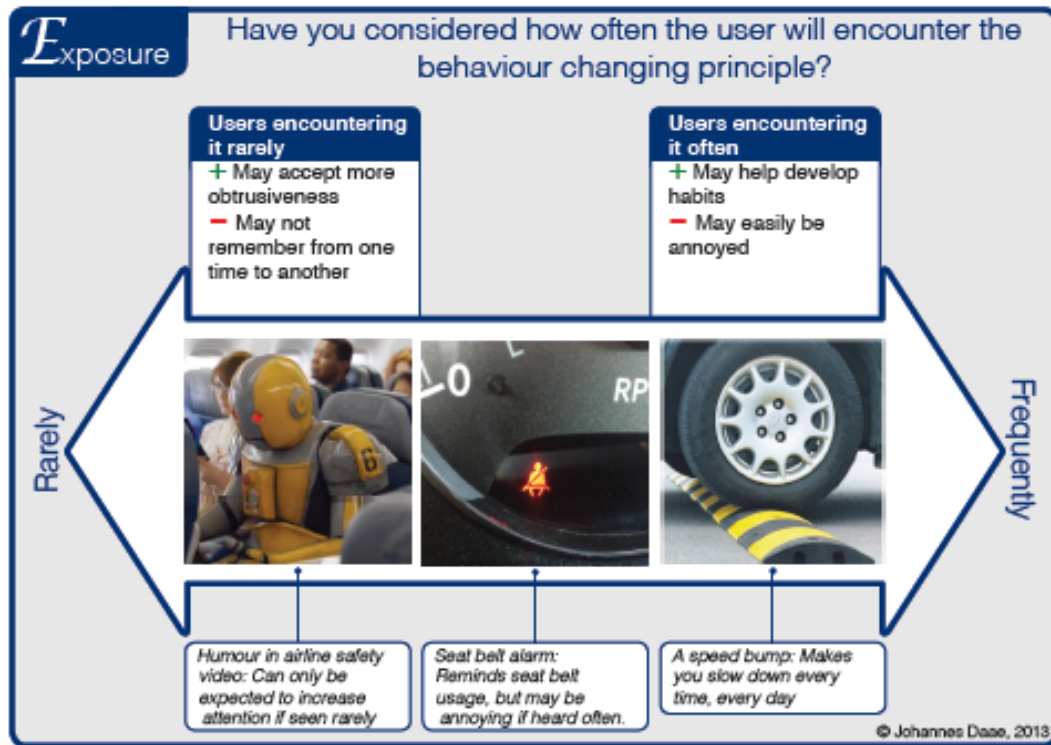
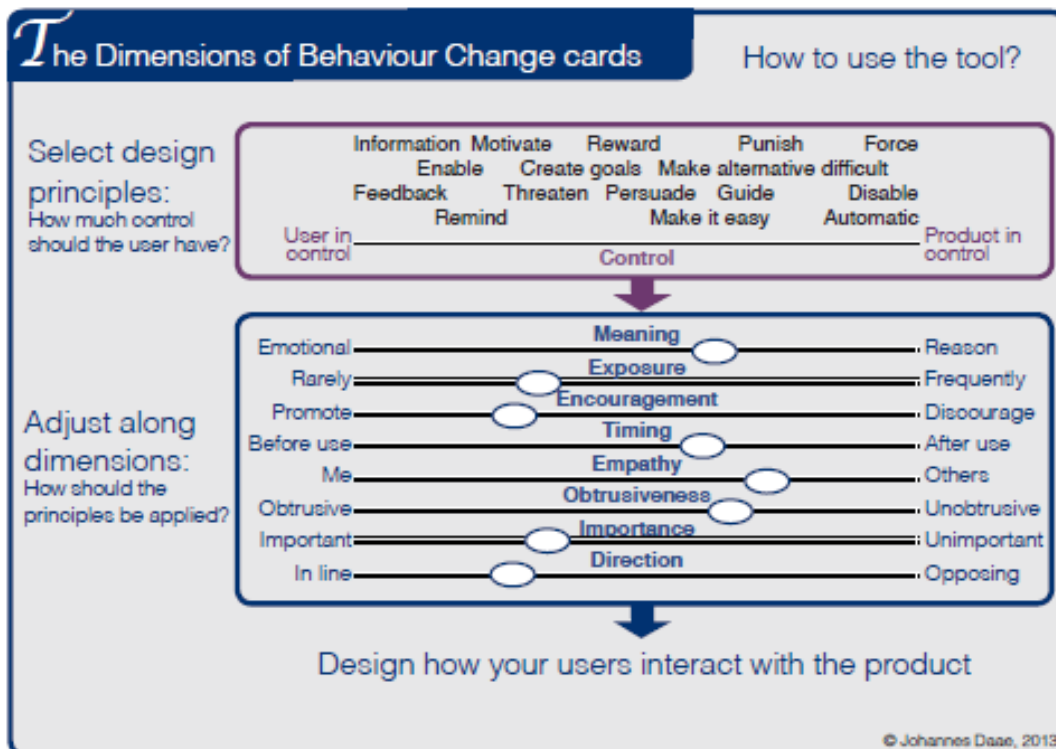


Figure 7.10 Dimensions of behaviour change card 'Exposure'

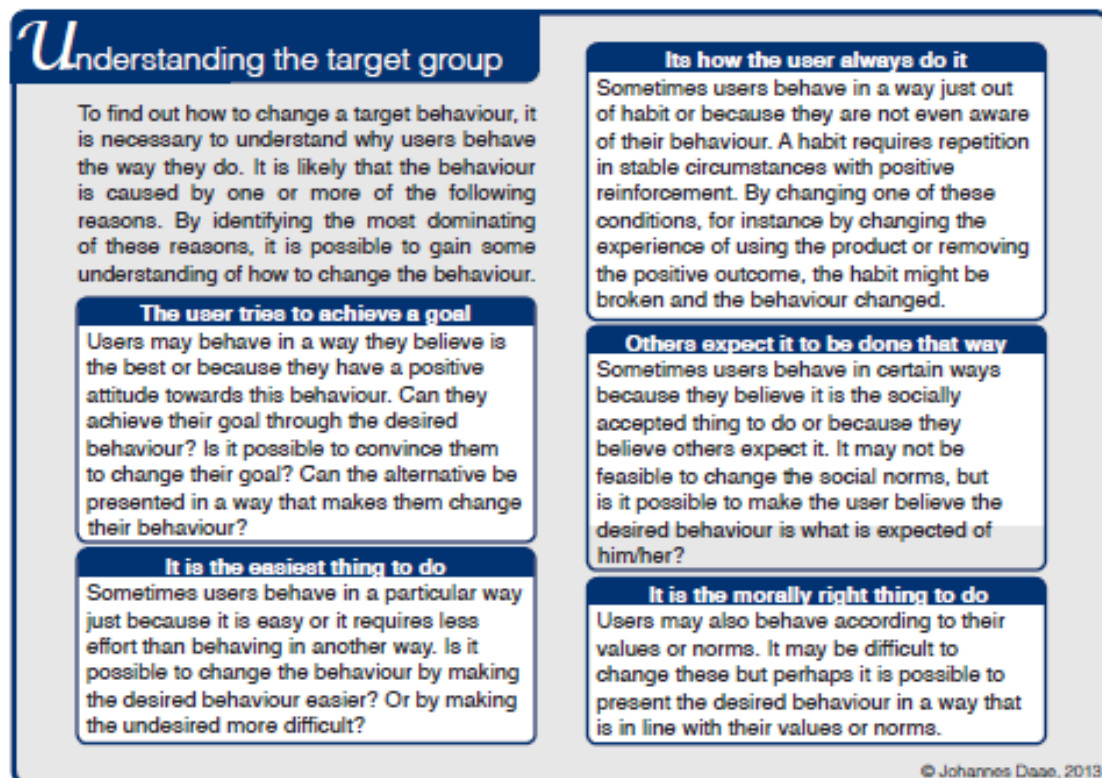
Users have different needs, and exhibit different levels of acceptance, depending on how often they interact with a product. Something might work if the user encounters it rarely, but lose its effect or become annoying if the user encounters it every day.

- When people are about to do something they rarely do, they might need detailed instructions. They are more likely to read and follow it if the behaviour is important or less intuitive.
- Street light countdown displays provide people with information about expected waiting time every day. As they can easily be ignored, it is likely they will not annoy people.
- Very obtrusive designs, such as a light-bulb heating-element can raise awareness about energy consumption, but are not likely to be accepted if encountered daily.
- Having the main energy switch connected to a key card holder works well in a hotel room but might not be accepted in private homes where people would encounter it every day.
- Dishwasher detergent tablets are likely to make people use the right amount of detergent every time, as the desired behaviour also is the easiest.

The cards describing the dimensions were complemented by two cards explaining the tool. The first card explains how to use the dimensions of behavioural change cards, while the second introduces key principles in understanding the target group.



Dimensions of Behaviour Change card 1.



Dimensions of Behaviour Change card 2.

Figure 7.11 Dimensions of behaviour change card and how to use them

REFLECTION

The Dimensions of Behaviour Change (DBC) cards target similar design challenges in comparison with the Design with Intent (Dwl) cards, and both decks aim to inform a design for sustainable behaviour process. However, the decks use a different approach to achieve this goal. Dwl aims to help designers generate as many ideas as possible for changing behaviour through their design, whereas DBC aims to help designers make informed decisions about which strategies may be most suitable in relation to a certain design for sustainable behavior challenge. This makes the two tools supplementary rather than competing. It is therefore suggested that a project may benefit from applying both tools for the appropriate purposes.

In 2015, a survey about the future of Design for Sustainable Behaviour research was undertaken, targeting expert researchers that had at least five years of experience with this field. The main results were published in Boks et al. (2015). One issue included in the survey (but not included in this publication) was a question about the relative importance of the various dimensions discussed in this chapter to provide direction for further research. The respondents were quite clear: Control and Obtrusiveness scored best. This may have to do with the fact that researchers are most familiar with these dimensions; they are in a sense the most obvious ones, but it is interesting to note that the respondents still think there is much further research potential related to these. Encouragement, Meaning, Timing and Frequency made up a middle group of dimensions that were considered as relatively interesting to research further. Direction, Importance and Empathy were considered dimensions that were least interesting for further research. One reason for this could be that these dimensions are less obvious, and it is somewhat more difficult to grasp what they entail.

Referring to the title 'Tweaking interaction through understanding the user', one question remains to be considered, which is 'what ethical implications are involved in making decisions on how users should behave without them even knowing?' Some of the dimensions discussed in this chapter, and many of the examples in the Dwl cards for that matter, may give rise to discussion, may be cause for concern, or could be frowned upon: For example, is it okay for a designer to design a thermostat which intentionally indicates a room temperature that is two degrees higher than the actual room temperature, if that would lead to reduction of energy consumption? Berdichevsky and Neuenschwander (1999, p.58) stated their golden rule of persuasion: "The creators of a persuasive technology should never seek to persuade a person or persons of something they themselves would not consent to be persuaded to do". They also were of the opinion that "...the creators of a persuasive technology should disclose their motivations, methods, and intended outcomes, except when such disclosure would significantly undermine an otherwise ethical goal" (ibid., p. 57). Within Design for Sustainable Behaviour, this last statement could be interpreted as a carte blanche for designers to manipulate users as they see fit, as long as the ethical goal of global sustainability is in sight. Discussion on this topic is ongoing, and has not resulted yet in a widely acknowledged code of ethics. As it was the intention of this chapter to explore ways that designers can influence behavior, rather than discuss the ethical consequences of doing so, this issue is not explored further here. For a meaningful discussion on the ethical aspects of designers and industry influencing user behaviour the reader is referred to Pettersen and Boks (2008) and Lilley and Wilson (2013).

CONCLUSION:

The aim of this chapter has been to give an overview of the different 'dimensions', related to aspects of how the human mind works, that designers can draw on to design ways that users interact with products, interfaces and technology in general around them. Some of these are more obvious, such as how much control a designer can give a user, or how obvious or obtrusive a certain design feature is, and were therefore described early on in literature on this topic. Designers can also utilise a number of additional dimensions, such as considering importance and timing, or finding ways to appeal to meaning, or how much empathy a user might have for others, or for himself. The chapter also introduces a design tool, Dimensions of Behaviour Change, that designers may use to get inspired, to get directed to finding the appropriate 'control knobs' and the degree to which these should be slid for creating an optimal design.

'What dimensions work best?' is a good question, but difficult to answer, other than with 'it depends'. Design for Sustainable Behaviour methodologies suggest that it is very important to understand both, what goes on in the mind of the user, and what goes on around him or her. It is also important that the proper user research methods (such as ethnography, contextual enquiry and cultural probes) should be applied for achieving this, as interviews and surveys will generally not give sufficient insights into important aspects of behaviour such as habits and objective constraints of behaviour (Daae and Boks, 2015). What dimension works best, will then depend first and foremost on the user. A woodstove study (Daae et al., 2016), where extensive applied ethnographic investigation was used to find out how a woodstove could be designed in a way that users would be more likely to exhibit recommended (and sustainable) ways to ignite and maintain a wood fire, revealed that simplicity (by for example using the dimensions Direction and Control) was attractive for many users. However, the ethnographic observations also suggested that some users would strongly resist such solutions, as they were convinced that burning wood is both an art and a science. Literature does not provide us with studies that have extensively tested different dimensions in a comparative and detailed way.

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