

The Role of Commitment Devices and Self-shaping in Persuasive Technology

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Abstract

We examine the role of self-shaping and commitment devices in persuasive systems. Self-shaping refers to the practice of taking purposeful action in modifying one's environment in order to shape or influence one's own future behavior. We present results from a survey of 23 users that assessed the role self-shaping plays in their use of persuasive technologies. A second survey elicited 65 self-shaping designs from 41 expert users, finding the Fogg Behavior Model describes how the designs were indeed persuasive. We then reviewed 85 tools based on this model to show the two dimensions that can be used to organize persuasive devices: (1) salience of a tool's self-shaping features and (2) their intended flexibility. The resulting four categories of tools are useful for researchers and designers of persuasive systems.

Keywords

Persuasion, behavior, commitment device, self-shaping.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Human Factors.

Three approaches to persuasive technology design

A woman changes her email setting to *pull* rather than *push* email to reduce her anxiety-inducing email-checking behavior on her mobile phone. The feature, ostensibly designed to reduce bandwidth charges, results in a significant behavior change. A middle-aged mother of two buys a scale that emails her weight to her doctor and sister because she wants to feel socially motivated to lose weight. She uses social pressure to her advantage.

While behavior change can be framed as a matter of environmental shaping, Bandura [3] used the economic theory of supply and demand to promote a balanced view. In the domain of health behavior, he acknowledged both media-managed (“supply-side”) approaches and self-managed (“demand-side”) approaches to modifying user behavior with interactive media [3]. Here we describe all three approaches.

External shaping of behavior

Persuasive technologies change a person’s attitudes or behavior with or without their knowledge [6]. “Supply-side” approaches to persuasive technology design are concerned with shaping the user’s behavior rather than training or instructing users to change their own behavior. Characterizing features of supply-side approaches include suggestion [1], perception cues, and peer influence [4].

Self-managed behavior change

Rather than shaping behavior explicitly, another class of persuasive technologies aims to train users to manage their own behavior change. These tools (such as goal-setting software) are based primarily on

theories of and self-management through “informing, enabling, motivating, and guiding people in their efforts to make lifestyle change” [3]. Ostensibly, we can assume that tools in the genre labeled *personal informatics* [8] are included here, which are “applications that help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge”, ostensibly to motivate self-managed behavior change.

Self-shaping: A blended approach

In economic game theory, *commitment devices* refer to any “way of changing incentives so as to make otherwise empty threats or promises credible” [7]. Commitment devices are a method of making a present intention for future action more substantial. From our earlier examples, the second is a commitment device because it modifies the incentive structure.

We use the term *self-shaping* to encompass an approach to persuasive technology that blends both media- and self-managed behavior change. Self-shaping tools are those that enable the user to cause the technology to shape future behavior change in that same user. These user actions could be in the form of creating commitment devices or introducing persuasion strategies. The first example of this paper illustrates self-shaping in that the user disables the functionality that was shaping her to check email frequently.

Self-shaping through persuasive systems

The flexibility of interactive technologies means that the opportunities for creative self-shaping are greater than solely setting commitments or personal rules. The possibilities include leveraging cognitive biases, granular control of peer influence, reputation

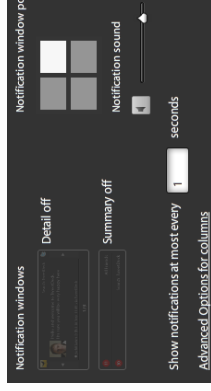


Figure 1: A portion of the Preferences menu on Tweetdeck for OSX, which provides real-time desktop notifications to users based on incoming tweets – a feature that significantly changes the way the user uses the computer. Options way are essentially a means of setting the way in which the application shapes the user's behavior – but they are usually framed functionally (from the software's perspective) instead of being framed in terms of their effect on the user's future behavior.

management, hiding future choices, context-specific and enforceable punishment/reward, and more.

An example is the way which technology designers and economists have long been aware that default choices are extremely important design decisions. In interactive systems, however, defaults can be modified for self-shaping purposes. This practice of 'designing defaults' (e.g. our earlier push/pull email example) is often supported in options menus (see Figure 1). Designers could frame these options as behavioral, not functional, choices. They also may pose the choices at relevant times instead of in an obscure menu, as it often done.

Another illustrative example is the recent emergence of social commitment websites such as stick.com and IMoveYou.com. These self-shaping websites leverage the strategy of public commitment and consistency [4] by basically providing a single feature: explain what you will do and make it known to other people. This type of commitment differs from commitment devices in that the latter is used to off-load one's innate need for consistency onto a device.

The goal of this work-in-progress is to first explore the role of self-shaping in the minds of expert users, identify how they use self-shaping, and then to provide a framework for explaining different kinds of self-shaping. Our hope is to inform technology design and evaluation.

Three formative studies

Study 1: Self-tracking to behavior change

Our goal was to identify how expert users see the role of self-shaping in the tools they use. We anonymously surveyed participants of the local chapter of the

Quantified Self (QS) interest group, personal informatics hobbyists. Through a web-based survey, we asked 18 QS participants and 5 laypeople (average age 30.5, 13 females total) about their behavioral goals in relation to the self-tracking tools they used. We asked them about whether this change required self-discipline or they used tools to shape their behavior, thereby reducing the self-discipline required.

Anecdotally, QS users were more thoughtful than laypeople about what contributes to behavior change. However, even QS participants rarely attributed their behavioral difficulties to anything other than self-initiated change, as predicted by the fundamental attribution error [10], the tendency to attribute behaviors to the person's in-born tendency or character rather than the influence of the environment.

On a Likert type scale of 1-7 (1 being no self-discipline), the mean reported self-discipline required to implement a desired behavior was 4.4 ($SD=0.8$). With the right tool, participants estimated 3.4 ($SD=0.9$). The statistically equivalent values indicate the general opinion that self-discipline is required regardless of tool use (e.g. food diaries, pedometers). This result presents a caution to designers of persuasive systems that their users are likely not convinced that technology can indeed change their behavior.

These results indicate that reasons for behavior change, even when using persuasive technologies, are often influenced by the fundamental attribution error. For designers of such technologies, they may need to not only influence change but measure it and ensure their users understand the role of the technology in that change. In doing so, users may more frequently

Path/Trigger/Motivation

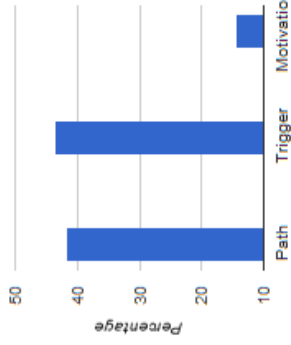


Figure 2: Types of self-shaping designs observed shows the vast majority are path and trigger designs. The vast majority of systems have not attempted to support self-shaping of motivation.

Self-shaping domains

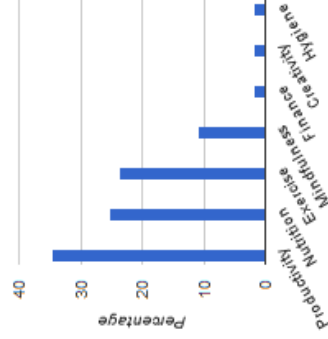


Figure 3: Domains represented by user-generated self-shaping examples.

exploit the benefits of interactive technology for their behavior goals.

Study 2: User-generated self-shaping designs

The objective of this study was to elicit specific self-shaping designs and then to identify patterns designers can support with technology. We created a website, DesignBehavior.com, on which we included a survey that elicited instances of self-shaping. The study ran for nine days eliciting 65 self-shaping designs from 41 experts. Instead of categorizing the tools based on the persuasion strategies employed (as is typically done), we interpreted them based on the means in which they aim to shape behavior. Thus, we used the Fogg Behavior Model [6], which describes persuasive interventions by identifying three components: path/ability, trigger, and motivation. Figure 2 summarizes the results and Figure 3 illustrates the distribution of designs across domains.

SELF-SHAPING ABILITY/PATHS

The user manipulates the means or ease in which the desired behavior is achieved, either by reducing hurdles to adopting it or by installing hurdles to opposing behaviors. *Keywords:* force myself to, make it easier to, make it harder to, so I can't, so I won't.

E.g.: "I don't buy sodas and other sugary drinks so I can't drink them when I'm at home", "I removed Safari from my dock so I am forced to use Chrome."

SELF-SHAPING TRIGGERS

The user designs a change in their environment that modifies future attention via reminders or adjusting salience. *Keywords:* remind, attention, tells me to.

E.g.: "TIM GETS WEEKLY REMINDERS IN HIS EMAIL THAT REMIND HIM TO STRUCTURE HIS WEEK," "I PUT MY MOST IMPORTANT WORK FILES ON TOP OF MY CLOSED COMPUTER AT NIGHT TO ENSURE THEIR ATTENTION IN THE MORNING."

SELF-SHAPING MOTIVATION

The user makes changes to elicit future emotional response that makes the desired behavior easier or undesired behaviors more difficult. Peer influence and the fear of losing money are often invoked. *Keywords:* force myself to, guilt me, motivate me, look forward.

E.g.: "I park in "no parking after 8am" spaces to force myself to wake up and go surfing," "I only have a 450 minute/mo. phone plan to reduce chatter."

Of the 65 responses received, 10 were behaviors that were not actually self-shaping or commitment devices and, instead, relied on self-discipline. *E.g.*, "I always lock the doors, fasten the belt and switch on the lights when I get my car." This confirms the results from Study 1 which challenges designers of persuasive technologies: users frequently attribute behavior and behavior change to their own discipline or decisions.

The results indicate that, first, the practice of self-shaping is a function of the individual, not the tool or technology. *E.g.*, a user can use a general-purpose, relatively neutral tool such as a pencil to creatively shape their future behavior.

Second, the user-generated designs illustrated various levels of clarity of the intended future behavior. The clearer the intention of a future concrete behavior is, the more personalized the self-shaping design was.

E.g., the self-shaping design to support “eating healthy” may not be as clear and personalized as one whose aim is to shape the behavior of “eating an apple each morning.”

Third, the salience of self-shaping features differs greatly between tools. *E.g.*, a computer printer does not explicitly describe how it can be used to shape future behavior but a bedside alarm clock does. The former requires greater creativity to self-shape.

Fourth, tools vary widely in how flexible their self-shaping use is. *E.g.*, an online calendar reminder can remind one of many things while a pedometer is most often used to motivate the user to walk more.

Study 3: Features that support self-shaping

We reviewed 67 tools to identify reasons why different tools are used for self-shaping in different ways. In this review, two axes emerged: the self-shaping features of tools have various degrees of salience (x-dimension, ‘Salience of Self-Shaping Features’) and intended specificity/flexibility of use ‘Flexibility of Use’ (y-dimension).

Figure 4 depicts the two dimensions with 16 of the 67 tools depicted. These tools illustrated the properties of the different quadrants we call, clockwise from top-left:

FLEXIBLE APPLIANCES

These are tools that are relatively broad in their use but are flexible enough to be used for self-shaping. However, they require creativity on the part of their users to do so. The investment in this creativity, though, could make the self-shaping designs personally meaningful and memorable.

FLEXIBLE SELF-SHAPERS

These are powerful self-shaping tools whose behavior-shaping functionality is clear and are also flexible enough to shape different behaviors or in different environments. This flexibility may come at a cost.

FIXED-USE SELF-SHAPERS

These are tools meant to self-shape a specific behavior and hence, their designs can focus solely on that behavior. They can communicate this purpose clearly and tailor their feature set to the behavior in question.

FIXED-USE APPLIANCES

These tools require a greater deal of creativity to be used for self-shaping because they are meant for very specific uses and don’t have clear self-shaping features.

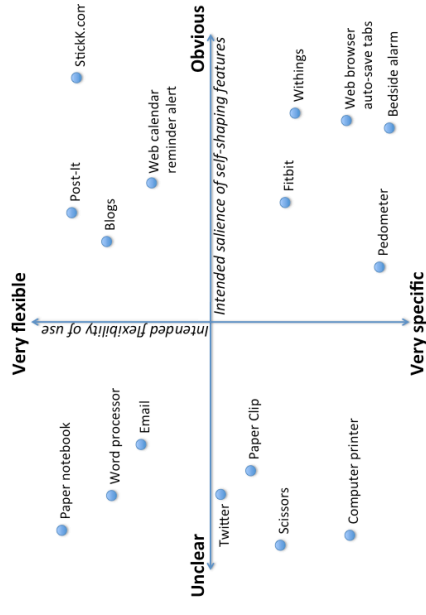


Figure 4: Design features that lead to self-shaping in different ways. Tools can make their self-shaping capacity salient to different degrees (x-axis) and for flexible/specific use (y-axis).

Discussion and Conclusion

We presented self-shaping as a naturally occurring technique framed as a blended path in the duality between media- and self-managed behavior-change. The results of two formative user surveys showed that self-shaping and commitment devices are not clearly conceptualized of in the minds of even expert users. Instead, as predicted by the fundamental attribution error, users attribute behavior change to self-discipline.

Because the impact of self-shaping on the user is not clearly known, this presents an opportunity for persuasive technology to provide feedback on the efficacy of the user's self-shaping designs. For example, options menus could provide data showing the demonstrated impact of these different menu options, possibly taken from an anonymized community of users instead of the individual only.

Users often do generate self-shaping techniques of various sorts and in varied domains and these can be described using the Fogg Behavior Model. These descriptions can help designers identify exactly how they want to invoke behavior change in the lives of their users. We found that few (6%) of the user-generated designs were made to self-shape motivation. We attribute this to difficulty in assessing or manipulating future motivation. This presents a challenge and opportunity for researchers.

Lastly, a review of existing tools led to the emergence of four types of self-shaping tools. These groups require various degrees of creativity to be used for self-shaping and they differ in how tailored they are. Designers of persuasive systems can use these categories to better define their own tools.

Future work

Future work in this area will first empirically validate some of the claims made from these formative studies. This will be followed by a rigorous analysis of the different properties of different self-shaping devices. For example, different tools require different levels of investment and frequency of use. They also provide feedback immediately or delayed by a great deal of time, impacting the iterative self-shaping process.

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