

Promoting sustainability through behavior change: A review



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Over the last decade, the design research community has become increasingly interested in promoting more sustainable behaviors through the design of new products and services. We conducted a literature review to help advance this growing research area. The review characterizes the current state by identifying conceptual studies that proposed strategies, frameworks, toolkits, and guidelines for behavior change. It also documents empirical studies that investigate opportunities for behavior change by proposing novel artifacts that promote sustainable behaviors and evaluations of these artifacts through field studies. Our review identifies gaps including a lack of detail on how designers select target behaviors, users, and opportunities; research on topics other than electricity consumption and the domestic context; research that integrates behavior change strategies other than feedback; and longitudinal evaluations that demonstrate a lasting behavior change. Based on these gaps, we offer some priorities for future research.

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The design of new products meant to change people's behavior has become an important topic in design research and practice. Industry increasingly asks design teams to create new things that motivate various behaviors such as increasing exercise, adopting a healthier diet, reducing resource consumption, choosing environmentally friendly transportation, and even acting more fiscally responsible.

Today, few designers really know how to do this. While almost every industrial design program teaches students to design for manufacture, few programs instill an equal level of competence when it comes to designing for behavior change. Design researchers have increasingly investigated this new challenge. Within the last decade, they began to develop methods, tools, and techniques

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to provide more guidance. Today a critical mass of research exists, such that a review and synthesis can benefit researchers and practitioners.

This paper presents findings from a review on 70 peer-reviewed design research articles on behavior change and sustainability. We chose to focus exclusively on sustainability, as it is an important and growing area of concern for design research, and substantial work now exists to make a review possible and beneficial. Our review advances the work on sustainability and behavior change by characterizing the current state of design research and exposing critical gaps that future research should address.

1 Method

We wanted to advance design research on behavior change and sustainability by analyzing how it has unfolded so far. We took several search approaches to assure good coverage of design research on this topic. To be included in our study, an article needed to be published in a design journal or conference. Additionally, we accepted articles published in other venues when they were written by design researchers; researchers who regularly publish in design research venues. We started with peer reviewed design journals and design conferences, looking at work published between January 1, 2000 and June 30, 2014. All journals and conferences had a focus on design and some had a focus on sustainable design and persuasive technology. During this process, we used *design for behavior change*, *design for sustainable behavior*, *environmentally responsible behavior*, *persuasive design*, *intentional design* and *persuasive technology* as search terms, and found 59 design research papers. We then expanded our search by using articles derived from the reference sections of the found papers, looking at other design research papers from journals and conferences outside design. We found 70 papers published between 2002 and 2014 (Table 1).

For the analysis, we first sorted articles according to methodological approach: conceptual studies or empirical studies. We then categorized conceptual studies based on their outcome: frameworks, guidelines, toolkits, and research gaps. We categorized empirical studies based on their outcome and the method: formative field studies exploring opportunities for behavior change, formative field studies exploring opportunities for behavior change and proposing a designed artifact, formative field studies proposing a design artifact based on identified opportunities and evaluating this artifact in the field, summative field studies evaluating commercial behavior changing products, and finally experiments evaluating the effectiveness of behavior change techniques in lab settings. The purpose of this categorization was to characterize the current state of the work, and to make a higher-level observation of the current state.

To better identify how current research informs the design of products promoting sustainable behaviors and to facilitate the field's transition towards

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