

Chapter 7

Design with Intent and the Field of Design for Sustainable Behaviour

Dan Lockton

Abstract Design for sustainable behaviour necessarily involves a multidisciplinary perspective, drawing on insights around human action from multiple fields, and making them relevant to designers. This chapter explores some considerations which build on these multidisciplinary concepts, around questioning assumptions and understanding people's lives better, and introduces the Design with Intent toolkit, a design pattern collection which aims to facilitate reflective exploration of problem-solution spaces in 'behaviour change' contexts, with a brief exploratory example of its application to provoke discussion with householders as part of SusLabNWE.

Keywords Design patterns · Sustainable behaviour · Behaviour change

7.1 Introduction

Both design and sustainability are about the future—bringing into being a world where humanity and other forms of life will “flourish on the planet forever” (Ehrenfeld 2008) or where we can “go about our daily affairs... [knowing] that our activities as civilised beings are expanding our future options and improving our current situation” (Sterling 2005). Design might be one of the mechanisms by which much of our current predicament has come about (Papanek 1971), but perhaps “the future with a future for ‘us’ can only be reached by design” (Fry 2015).

Thus, design and sustainability are deeply enmeshed (Schmidt-Bleek and Tischner 1993)—as we see throughout this book and the variety of examples within the SusLabNWE project. A major component of this is design which relates

D. Lockton (✉)
Royal College of Art, London, England
e-mail: dan@danlockton.co.uk

to people's actions: what has become known as design for behaviour change, behavioural design, or in the case of specific focus on sustainability, *design for sustainable behaviour* (e.g. Lilley 2009; Wever 2012; Daae and Boks 2014; Strömberg et al. 2015). In this section, we will examine some of the issues and dimensions of the topic, and introduce the *Design with Intent* toolkit (Lockton et al. 2010), a design pattern collection for environmental and social behaviour change, which aims to enable exploration of assumptions and problem-solution spaces in 'behaviour change' contexts, which was used in an exploratory way as part of householder interviews around energy use and heating.

7.2 Design and Behaviour

Behaviour change is currently fashionable in design—commercially, politically, and academically—addressing everything from fitness tracking to compliance with tax return procedures to getting passengers to board trains more efficiently. There is an increased policy focus in a number of countries on applying principles from behavioural economics to complex social and sociotechnical issues through initiatives such as the UK's quasi-privatised Behavioural Insights Team, stemming from the popular *Nudge* (Thaler and Sunstein 2008), while advertising agencies—no strangers historically to applying psychology to influence behaviour (Bernays 1928; Packard 1957; Schwartz 1966)—have embraced this burgeoning interest, for example through Ogilvy and Mather's creation of the specialist 'behavioural practice' #ogilvychange [sic]. Others such as Payne (2012) have taken a wider perspective, looking at how to 'inspire' more sustainable behaviour.

Nevertheless, this approach is usually centred on quite small changes in current behaviour, with short time-frames, rather than long-term futures. In this context, different understandings and definitions of 'sustainability', and degrees of ambition for change, complicate the notion of design for sustainable behaviour. What kind of behaviour? Whose behaviour? What kind of sustainability? Is the intended change in behaviour a reduction in some unsustainable behaviour, or a shift to something very different? As Ehrenfeld (2008, p. 20) puts it, "Reducing unsustainability will not create sustainability"; the degree of intervention varies with the boundary of how the 'problem' is considered, whether it is at the level of individual interaction with products, or part of a more systemic societal transition (Irwin et al. 2015). Large-scale changes in human behaviour are central to many visions of more sustainable futures, often going hand-in-hand with scientific and technological advances.

In many cases, technological advances would require people to change the way they act for the potential environmental impact to be achieved, whether through adoption of new ways of doing things at home and at work, decisions about capital investment or purchases, and fundamental changes in assumptions, attitudes and political norms. But design is also often about how broader social influences affect

what people do, and how people's relations, and actions individually and together help construct what society, community and culture are.

The sociological concept of practices (Reckwitz 2002) as units of analysis (rather than behaviour) can offer a useful way of exploring issues for designers. Practices are "the mundane activities that make up most of what people do in their daily lives, such as bathing, cooking, laundering and cleaning... socially shared entities with a certain persistence over time and space," as Kuijer et al. (2013) describe them. By considering people's actions in larger, 'supraindividual' socially and culturally situated contexts, designers can potentially develop a better understanding of design's role in much larger—potentially systemic—change. This is an approach taken in a number of studies within the SusLabNWE project.

By enabling closer co-creation with people ('users') themselves in contexts approaching the complexity of real life, the Living Lab approach, as discussed throughout this book in relation to SusLabNWE, enables sustainability transitions to be explored in a variety of different ways, but all through "living change" (Scott et al. 2011) rather than designing in the abstract.

7.3 Multidisciplinarity and Complexity

In academia, work on design for sustainable behaviour has grown significantly in recent years, with the aim of reducing the unintended environmental and social impacts of products and services in use—or increasing the intended impacts—through design which concentrates on *understanding* and *influencing* user behaviour. Design 'interventions' largely involve redesign of products and services, changing the affordances and constraints available to users, or the design of interfaces (often digital) which give users information—and feedback—on use or the impacts of behaviour, for example energy use, waste generation or transportation choices (e.g. Lockton et al. 2008; Wever et al. 2008). Negotiating the large field of possible design techniques can be a challenge for designers briefed with 'changing behaviour', and so a number of toolkits and guides have been developed (e.g. Selvefors et al. 2014; Daae and Boks 2014) which aim to provide designers with a more structured process.

Design for sustainable behaviour is inherently multidisciplinary (Niedderer et al. 2014), drawing on knowledge and models from other fields relating to human action. These include social and cognitive psychology, behavioural economics, human-computer interaction, ethnography, science and technology studies, ergonomics, cybernetics, ethics, and architecture, as well as other facets of design for behaviour change, such as *social implication design* (Tromp et al. 2011), *persuasive technology* (Fogg 2009), *practice-oriented design* (Kuijer et al. 2013; Scott et al. 2011; Pettersen 2015), *product experience* (Desmet and Hekkert 2007) and *transformational products* (Laschke et al. 2011). Many fields, in both research and practice, both within and without what are termed the 'behavioural sciences', have insights or frameworks to contribute, and each works with

particular *models* seeking to explain human behaviour in different ways—even if those models are sometimes mutually incompatible (Gintis 2007). Being aware of, and attentive to, the models we are using as designers, is an important part of a reflective approach.

7.3.1 *Questioning Assumptions*

One valuable contribution that a multidisciplinary approach can make is to enable multiple perspectives on situations, paying attention to issues which designers might otherwise not consider, or might not be afforded the luxury of considering due to the way that briefs are framed. At the very least, a multidisciplinary approach can trigger us to question our assumptions and reflect on the models we are using. Because—much as many designers might like to discover a ‘formula’ for behaviour change—the complexity and interconnectedness of real-life behaviour and practices is deeply enmeshed with social and cultural contexts, power structures, and other people’s actions, and more nuanced than any singular vision can ever capture, which highlights the naïvety of very determinist stances (Lockton 2012), appealing as they might be to a “planning” mindset (Watson et al. 2015). We should question the assumptions embedded in work that presumes one-to-one mappings between design features and resulting ‘behaviours’ (Broady 1966). People will not always behave how designers intend or expect them to (Kanis 1998; Stanton and Baber 2002); even as designers attempt to ‘script’ behaviour (Akrich 1992; Jelsma and Knot 2002). As Brand (1994) puts it, in reference to the built environment, “All buildings are predictions. All predictions are wrong”. Assumptions about people—how they live, how they make decisions, and what affects their actions—are integral to design, while designers are engaged generally in “act[ing] to change the actuality of the world” (Dilnot 2015).

Although these assumptions and issues around them are not necessarily always explicit stances taken by designers or researchers, they embody tensions that arise when a new approach touches on areas that have previously been the preserve of other disciplines with different traditions, expectations and aims. We cannot avoid having models of people (Dubberly and Pangaro 2007) but the question of how these models and assumptions are applied in design is of practical relevance—how those models can be translated, tested, questioned and improved through use in the real world, rather than in laboratory studies (here the Living Lab approach offers a valuable intermediate step).

Looking at the differences between how designers themselves model ‘their’ intended users in relation to sustainability or other issues (Lockton et al. 2012), and how users themselves understand and think about the situation can be instructive here in understanding how design for sustainable behaviour techniques are applied in practice, and how they could be improved. This suggests the need for a structured way of exploring the assumptions and implications inherent in design which seeks to influence behaviour, both to negotiate the large field of possible

design techniques from different disciplinary backgrounds and traditions—and their appropriateness for different situations—and to enable a more reflective design approach. The ability to question and reframe the assumptions inherent in a brief, as part of a *problem-framing* (Dorst 2015) or even *problem-worrying* (Anderson 1966) approach potentially requires the designer to have a much greater awareness of the problem-solution space (Maher et al. 1996), including both deeper contextual enquiry, through researching the situation in the field, a knowledge of the repertoire of design approaches which might be applicable (Lawson 2004), and deeper knowledge of sustainability in context (Liedtke et al. 2013).

7.3.2 *Understanding People's Lives*

Taking a subject central to SusLabNWE—domestic energy use behaviour change—Strengers (2011) considers it “alarming” that the model of individual householders as “micro-resource managers”, and the language of ‘demand management’, continue to dominate the design of feedback systems. Brynjarsdóttir et al. (2012) describe persuasive design for sustainability as “a modernist enterprise”, focusing both on individuals at the expense of broader social considerations, and on narrowing the broad scope of sustainability into “the more manageable problem of ‘resource minimisation’,” drawing on Scott’s (1999) conception of how states have attempted to make populations ‘legible’ through reducing their variety (of behaviour as of other characteristics). In other areas of design for behaviour change, Fantini van Ditmar and Lockton (2016) explore the ways in which simplistic models of motivation underlie much of the quantified self technology arising from Silicon Valley, while Whitson (2014) draws parallels between the increasing use of quantified ‘gamification’ in design for behaviour change (employing game elements, such as earning points, in non-game contexts) and forms of governance and normalisation drawing on Foucault (1977).

The criticism links well with approaches highlighting the potential value of considering social practices (Wilhite 2013; Shove et al. 2012) in this area, rather than ‘behaviour’—specifically because social practice theory’s emphasis on shared activities and ways of meeting daily needs can “lift understandings of resource consumption to [a] supraindividual level” (Kuijer et al. 2013). Scott et al. (2011) call for “a more comprehensive understanding of ‘users’ as social creatures, and the role of consumption in everyday life, than has ever been undertaken through design”.

What a lot of these issues perhaps come down to, is something around *inclusion*: to what extent are real people, in real contexts, included in design processes around sustainability (Wiek et al. 2014)? Many design for sustainable behaviour interventions—often arising from work in human-computer interaction (HCI)—are not necessarily designed inclusively, in the sense of considering all users’ needs and abilities, including older people, people with disabilities, and even people on lower incomes (Eikhaug and Gheerawo 2010). As Langdon and Thimbleby

(2010) argue, HCI can (and must) learn from inclusive design research, and embrace opportunities to involve a much wider range of users in the development of new interfaces, and the same applies in behaviour change. One prescription might thus be for more participatory processes, including co-design, hackathons and participatory prototyping.

7.4 The Design with Intent Toolkit

The *Design with Intent toolkit* (Lockton et al. 2010) aims to help designers and other stakeholders explore the space of behaviourally relevant design concepts, through presenting examples and insights from different disciplines using a *design pattern* format (Fig. 7.1). This could lead to idea generation, through use as a ‘suggestion tool’ to help a form of directed brainstorming, or serve as an exploratory, reflective or teaching tool. The toolkit was developed via an iterative, participatory process, running workshops with students and designers throughout its development (Fig. 7.2) to understand how it is being used and how to improve its structure and content. The patterns were extracted—and abstracted—from a literature review of treatments of human behaviour in a range of disciplines. While the toolkit has been applied in sustainability contexts (Lockton et al. 2013a), it has also been developed as a tool for interaction designers more widely (Lockton 2017).



Fig. 7.1 Selection of Design with Intent toolkit cards

Fig. 7.2 A workshop using the cards at Philips Research, Eindhoven



In the toolkit, 101 design patterns for influencing behaviour are described and illustrated (Fig. 7.2), grouped into eight ‘lenses’—categories which provide different disciplinary ‘worldviews’ on behaviour change, challenging designers to think outside the immediate frame of reference suggested by the brief (or the client), and helping with transposing ideas between domains. The lenses (described in Table 7.1) are not intended to be ontologically rigorous, but primarily a way of triggering multiple viewpoints within an ideation session. The patterns are essentially recurring problem-solution instances, described in a way which can be easily referenced, to enable practitioners to recognise the situation. The pattern form can help a designer recognise that a ‘new’ problem situation is similar or analogous to one encountered previously elsewhere, even in a different context. This makes them a useful format for cross-disciplinary transfer. However, the classification is not perfect: there are many ways to view certain concepts, depending on disciplinary perspective. The intention is that all apply to multiple fields; examples from (for instance) software, can often be translated into the physical world, and vice versa.

7.4.1 Example: Applying the Toolkit to Explore Householders’ Perspectives

Within the SusLabNWE project, a preliminary exploration was made of how a subset of the Design with Intent patterns could be used for research with householders, about how they saw possible sustainable behaviour-related interventions fitting into their daily lives. We worked with four households in Dartford, Kent, in south-east England.

For each of the eight lenses, one pattern was applied to an energy-related issue within the home, to generate a plausible concept (or adapt an existing one) and a simple ‘provocation’ card created (Fig. 7.3). The energy issues centred on heating

Table 7.1 The Design with Intent toolkit lenses and patterns

Lenses	Patterns
Architectural The Architectural lens draws on techniques used to influence user behaviour in architecture, urban planning and related disciplines such as traffic management and crime prevention through environmental design	Angles; converging and diverging; conveyor belts; feature deletion; hiding things; material properties; mazes; pave the cowpaths; positioning; roadblock; segmentation and spacing; simplicity
Errorproofing The Errorproofing lens represents a worldview treating deviations from the target behaviour as ‘errors’ which design can help avoid, either by making it easier for users to work without making errors, or by making errors impossible in the first place	Are you sure?; Choice editing; conditional warnings; defaults; did you mean?; Interlock; matched affordances; opt-outs; portions; task lock-in/out
Interaction All the patterns are really about interaction design in one form or another, but the interaction lens brings together some of the most common design elements of interfaces where users’ interactions with the system affect how their behaviour is influenced, including from the field of persuasive technology (Fogg 2009)	Feedback through form; <i>kairos</i> ; partial completion; peer feedback; progress bar; real-time feedback; simulation and feedforward; summary feedback; tailoring; tunnelling and wizards
Ludic Games are great at engaging people for long periods of time, influencing people’s behaviour through their very design. The Ludic lens includes a number of ‘gamification’ techniques for influencing user behaviour that can be derived from games and other ‘playful’ interactions, ranging from basic social psychology mechanisms such as goal-setting, to common game elements such as scores and levels	Challenges and targets; collections; leave gaps to fill; levels; make it a meme; playfulness; rewards; role-playing; scores; storytelling; unpredictable reinforcement
Perceptual The Perceptual lens combines ideas from product semantics, ecological psychology and Gestalt psychology about how users perceive patterns and meanings as they interact with the systems around them	(A)symmetry; colour associations; contrast; fake affordances; implied sequences; metaphors; mimicry and mirroring; mood; nakedness; perceived affordances; possibility trees; prominence; proximity and grouping; seductive atmospherics; similarity; transparency; watermarking
Cognitive The Cognitive lens draws on research in behavioural economics and cognitive psychology looking at how people make decisions, and how this is affected by ‘heuristics’ and ‘biases’. If designers understand how users make interaction decisions, that knowledge can be used to influence interaction behaviour. Equally, where users often make poor decisions, design can help counter this	Assuaging guilt; commitment and consistency; decoys; desire for order; do as you’re told; emotional engagement; expert choice; framing; habits; personality; provoke empathy; reciprocation; rephrasing and renaming; scarcity; social proof

(continued)

Table 7.1 (continued)

Lenses	Patterns
Machiavellian The Machiavellian lens comprises design patterns which, while diverse, all embody an ‘end justifies the means’ approach. This may be unethical, but is nevertheless commonly used to control and influence consumers through advertising, pricing structures, planned obsolescence and lock-ins	Anchoring; antifeatures and crippleware; bundling; degrading performance; first one free; forced dichotomy; format lock-in/out, functional obsolescence; i cut, you choose; poison pill; serving suggestion; slow/no response; style obsolescence; worry resolution
Security The Security lens represents a ‘security’ worldview, i.e. that undesired user behaviour is something to deter and/or prevent though ‘countermeasures’ designed into products, systems and environments, both physically and online, with examples such as digital rights management	Coercive atmospherics; peerveillance; sousveillance; surveillance; threat of injury; threat to property; what you can do; what you have; what you know; what you’ve done; where you are; who or what you are

system control and feedback on overall energy use, two areas which had emerged from earlier work with households in London (Lockton et al. 2013b) as part of the initial UK phase of SusLabNWE.

After a discussion about energy-related issues in their homes, their daily routines and decision-making, and their priorities for change, householders (five in total—three on their own, and one couple) were asked to ‘think aloud’ with the eight cards, talking through whether they believed they would find each idea desirable (and why) and whether they believed it would ‘work’ in their context (and why), and grouping them accordingly (Figs. 7.4 and 7.5).

While this was a small, exploratory use of these cards, it revealed some interesting details about the differences between householders’ views towards interventions around energy use. For example, one householder did not *like* the idea of the self-turning thermostat, but said she thought it would nevertheless work in her house in terms of reducing energy use, because of other household members who often turned the thermostat up and forgot about it. Another said that she thought an energy-saving game would work for her for a while, but would lose its appeal as she lost motivation, whereas a heating system, which took control itself, would potentially have a greater effect in the long term.

The cards and the discussion they provoked provided interest for the subsequent interviews around other aspects of energy use in the home, and integrating qualitative self-reporting and quantitative sensor data (see Chap. 12 ‘In situ and mixed design interventions’), and by including some more ‘controversial’ cards, it was possible to elicit opinions around wider issues of control and agency, topical issues around renewable energy, and householders’ perceptions of and worldviews around sustainability. The method will be developed further in future projects, but from a practical design for sustainable behaviour perspective, the diversity of responses suggests that designing tailored interventions, to match the realities

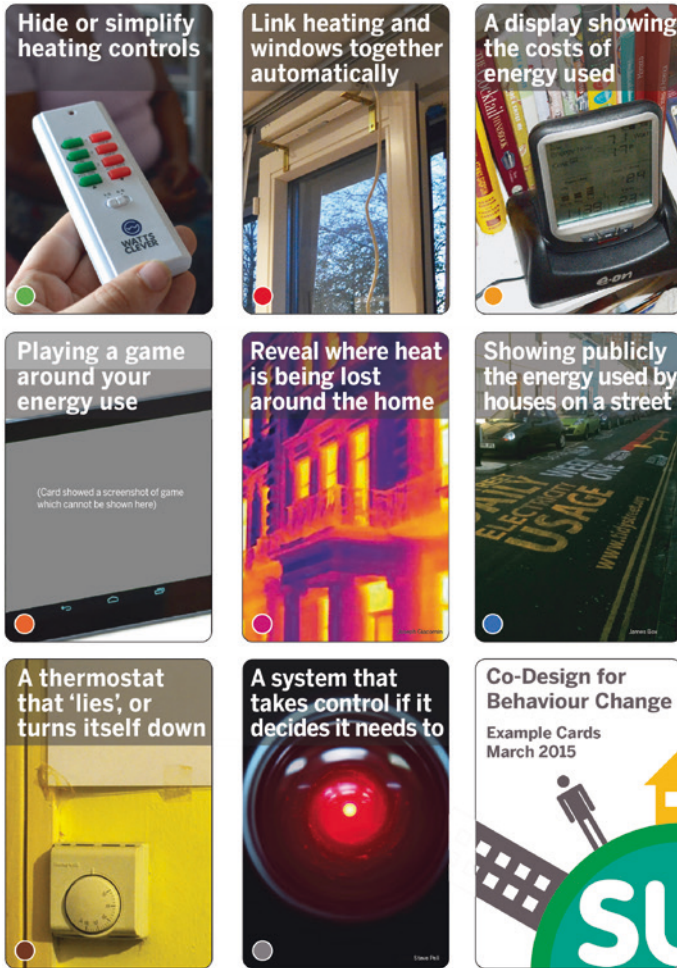


Fig. 7.3 Cards developed from Design with Intent patterns, applied to household energy questions, used to prompt discussion with householders. *Top row* applies patterns from Architectural, Errorproofing and Interaction lenses; *middle row* Ludic, Perceptual and Cognitive lenses; *bottom row* Machiavellian and Security lenses. The examples include the Equarium (Keyson et al. 2013), Giacomini and Bertola's (2012) thermal energy visualisation work, and Brighton's Tidy Street (Bird and Rogers 2010)

of people's everyday experience and decision-making—and which perhaps can evolve over time—may be a sensible strategy.

Fig. 7.4 Householders in Dartford, UK, sorting and discussing the cards



Fig. 7.5 Householders in Dartford, UK, sorting and discussing the cards



7.5 Discussion

The huge scope of sustainability is such that large infrastructural changes are needed, with large changes in not just interaction behaviour with products, but as noted earlier, adoption of new everyday practices at home and at work, decisions about purchases, and fundamental shifts in assumptions, attitudes and political norms. This is where small interventions such as redesigning a heating system interface can seem insignificant, and the value of concepts inspired by something like *Design with Intent* can seem irrelevant in the larger scheme of things. However, it is important to remember that everything around us that has been designed, from the layout of our cities to the structure of our governments, in some way influences how we live, how we make decisions, what resources are

used, what is easy and what is difficult. It also, over time, affects how we think, and how we understand the world that we are part of, both individually and together as a society, historically, at present, and looking forward to the future.

So, design which focuses on behaviour is perhaps most usefully understood as design which *reflectively considers* its effects on human action, although there is an inherent presumption towards change. If this reflection can be incorporated into the design process, through questioning assumptions and working with people to understand their lives, and the contexts in which everyday decisions are made, we can be more effective in reaching sustainability goals and in improving quality of living.

It is clear that sustainability needs to be about actions more than just awareness: as Tonkinwise (2004) puts it, “sustainability is a strangely hypocritical politics: even when issues are well understood, actions fail to result; strong and comprehensive awareness of sustainability fails to translate into sustainable behaviour”. Design which focuses on people’s actions, whether at the level of products, services, environments or larger systems will, inevitably, play an important role in the way we construct our future on this planet.

References

- Akrich, M. (1992). The description of technical objects. In W. Bijker & J. Law (Eds.), *Shaping technology, building society: studies in sociotechnical change* (pp. 205–224). Cambridge, MA: MIT Press.
- Anderson, S. (1966). Problem-solving and problem-worrying. talk delivered at architectural association. London.
- Bernays, E. L. (1928). *Propaganda*. London: Routledge.
- Bird, J., & Rogers, Y. (2010). The pulse of tidy street: Measuring and publicly displaying domestic electricity consumption. In *Workshop on Energy Awareness and Conservation through Pervasive Applications, Pervasive 2010*.
- Brand, S. (1994). *How buildings learn: What happens after they're built*. London: Viking.
- Broadly, M. (1966). Social theory in architectural design. In R. Gutman (Ed.), *People and buildings*. New York: Basic Books.
- Brynjarsdóttir, H., Håkansson, M., Pierce, J., Baumer, E. P. S., DiSalvo, C., & Sengers, P. (2012). Sustainably unpersuaded: How persuasion narrows our vision of sustainability. In *Proceedings of CHI 2012, Austin, Texas*.
- Daae, J. Z., & Boks, C. (2014). Dimensions of behaviour change. *Journal of Design Research*, 12(3).
- Desmet, P. M. A., & Hekkert, P. (2007). Framework of product experience. *International Journal of Design*, 1(1), 57–66.
- Dilnot, C. (2015). History, design, futures: Contending with what we have made. In: T. Fry, C. Dilnot, & S.C. Stewart (Eds.), *Design and the question of history*. London: Bloomsbury.
- Dorst, K. (2015). *Frame innovation*. Cambridge, MA: MIT Press.
- Dubberly, H., & Pangaro, P. (2007). Cybernetics and service-craft: Language for behavior-focused design. *Kybernetes*, 36(9/10), 1301–1317.
- Ehrenfeld, J. R. (2008). *Sustainability by design*. New Haven, CT: Yale University Press.
- Eikhaug, O., & Gheerawo, R. (Eds.). (2010). *Innovating with people: The business of inclusive design*. Oslo: Norwegian Design Council.

- Fantini van Ditmar, D., & Lockton, D. (2016). Taking the code for a walk. *Interactions*, 23(1), 68–71.
- Fogg, B. J. (2009). A behavior model for persuasive design. In *Persuasive 2009: Proceedings of the 4th International Conference on Persuasive Technology*. New York: ACM.
- Foucault, M. (1977). *Discipline and punish: The birth of the prison*. New York: Pantheon Books.
- Fry, T. (2015). Whither design/whether history. In: T. Fry, C. Dilnot, & S.C. Stewart (Eds), *Design and the question of history*. London: Bloomsbury.
- Giacomin, J., & Bertola, D. (2012). Human emotional response to energy visualisations. *International Journal of Industrial Ergonomics*, 42(6), 542–552.
- Gintis, H. (2007). A framework for the unification of the behavioral sciences. *Behavioral and Brain Sciences*, 30, 1–61.
- Irwin, T., Kossoff, G., Tonkinwise, C., & Scupelli, P. (2015). *Transition design 2015: A new area of design research, practice and study that proposes design-led societal transition toward more sustainable futures*. Pittsburgh, PA: Carnegie Mellon University.
- Jelsma, J., & Knot, M. (2002). Designing environmentally efficient services; a ‘script’ approach. *The Journal of Sustainable Product Design*, 2(3), 119–130.
- Kanis, H. (1998). Usage centred research for everyday product design. *Applied Ergonomics*, 29(1), 75–82.
- Keyson, D. V., Al Mahmud, A., & Herrera, R. N. (2013). Living lab and research on sustainability: Practical approaches on sustainable interaction design. In Augusto J.C. et al. (Eds.), *Proceedings of Aml 2013* (Vol. 8309, pp. 229–234). Springer LNCS.
- Kuijter, L., de Jong, A., & van Eijk, D. (2013). Practices as a unit of design: An exploration of theoretical guidelines in a study on bathing. *ACM Transactions on Computer-Human Interaction*, 20(4), article 21.
- Langdon, P., & Thimbleby, H. (2010). Editorial: Inclusion and interaction: Designing interaction for inclusive populations. *Interacting with Computers*, 22(6), 439–448.
- Laschke, M., Hassenzahl, M., & Diefenbach, S. (2011). Things with attitude: Transformational products. In *Proceedings of Create 11*.
- Lawson, B. R. (2004). Schemata, gambits and precedent: Some factors in design expertise. *Design Studies*, 25(5), 443–457.
- Liedtke, C., Ameli, N., Buhl, J., Oettershagen, P., Pears, T., & Abbis, P. (2013). Wuppertal institute designguide. *Wuppertal Spezial*, 46.
- Lilley, D. (2009). Design for sustainable behaviour: Strategies and perceptions. *Design Studies*, 30(6), 704–720.
- Lockton, D. (2012). POSIWID and determinism in design for behaviour change. Working paper, Social Science Research Network.
- Lockton, D. (2017). *Design with intent: Insights, methods and patterns for designing with people, behaviour and understanding*. Sebastopol, CA: O’Reilly.
- Lockton, D., Harrison, D., & Stanton, N. A. (2008). Making the user more efficient: Design for sustainable behaviour. *International Journal of Sustainable Engineering*, 1(1), 3–8.
- Lockton, D., Harrison, D., & Stanton, N. A. (2010). The design with intent method: A design tool for influencing user behaviour. *Applied Ergonomics*, 41(3), 382–392.
- Lockton, D., Harrison, D., & Stanton, N. A. (2012). Models of the user: Designers’ perspectives on influencing sustainable behaviour. *Journal of Design Research*, 10(1/2), 7–27.
- Lockton, D., Harrison, D., & Stanton, N. A. (2013a). Exploring design patterns for sustainable behaviour. *The Design Journal*, 16(4), 431–459.
- Lockton, D., Bowden, F., Greene, C., Brass, C., & Gheerawo, R. (2013b). People and energy: A design-led approach to understanding everyday energy use behaviour. In *Proceedings of EPIC 2013: Ethnographic Praxis in Industry Conference*.
- Maher, L., Poon, J., & Boulanger, S. (1996). Formalizing design exploration as co-evolution: A combined gene approach. In J. Gero & F. Sudweeks (Eds.), *Advances in formal design methods for CAD*. London: Chapman and Hall.

- Niedderer, K., Cain, R., Clune, S., Lockton, D., Ludden, G., Mackrill, J., Morris, A., Evans, M., Gardiner, E., Gutteridge, R., & Hekkert, P. (2014.) *Creating sustainable innovation through design for behaviour change: Full report*. University of Wolverhampton.
- Packard, V. (1957). *The hidden persuaders*. New York: D. McKay.
- Papanek, V. (1971). *Design for the real world: Human ecology and social change*. New York: Pantheon Books.
- Payne, O. (2012). *Inspiring sustainable behaviour: 19 ways to ask for change*. Earthscan.
- Petersen, I. N. (2015). Towards practice-oriented design for sustainability: The compatibility with selected design fields. *International Journal of Sustainable Engineering*, 8(3), 206–218.
- Reckwitz, A. (2002). Toward a theory of social practices. *European Journal of Sociology*, 5(2), 243–263.
- Schmidt-Bleek, F., & Tischner, U. (1993). Designing goods with MIPS. *Fresenius Environmental Bulletin*, 2, 479–484.
- Schwartz, E. (1966). *Breakthrough advertising*. Englewood Cliffs, NJ: Prentice-Hall.
- Scott, J. C. (1999). *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven, CT: Yale University Press.
- Scott, K., Bakker, C., & Quist, J. (2011). Designing change by living change. *Design Studies*, 30, 279–297.
- Selvefors, A., Renström, S., & Strömberg, H. (2014). Design for sustainable behaviour: A tool-box for targeting the use phase. In *Ecodesign Tool Conference, Gothenburg*.
- Shove, E., Pantzar, M., & Watson, M. (2012). *The dynamics of social practice*. London: Sage.
- Stanton, N. A., & Baber, C. (2002). Error by design: Methods for predicting device usability. *Design Studies*, 23(4), 363–384.
- Sterling, B. (2005). *Shaping things*. Cambridge, MA: MIT Press.
- Strengers, Y. (2011). Designing eco-feedback systems for everyday life. In *Proceedings of CHI 2011*.
- Strömberg, H., Selvefors, A., & Renström, S. (2015). *International Journal of Sustainable Engineering*, 8(3), 163–172.
- Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. New Haven, CT: Yale University Press.
- Tonkinwise, C. (2004). Ethics by design, or the ethos of things. *Design Philosophy Papers* 2.
- Tromp, N., Hekkert, P., & Verbeek, P.-P. (2011). Design for socially responsible behavior: A classification of influence based on intended user experience. *Design Issues*, 27(3), 3–19.
- Watson, J., Clegg, C., Cowell, C., Davies, F., Hughes, C., McCarthy, N., & Westbury, P. (Eds.) (2015). *Built for living: Understanding behaviour and the built environment through engineering and design*. London: Royal Academy of Engineering London.
- Wever, R. (2012). Editorial: Design research for sustainable behaviour. *Journal of Design Research*, 10(1/2), 1–6.
- Wever, R., van Kuijk, J., & Boks, C. (2008). User-centred design for sustainable behaviour. *International Journal of Sustainable Engineering*, 1(1), 9–20.
- Whitson, J. (2014). Foucault's fitbit: Governance and gamification. In S. P. Walz & S. Deterding (Eds.), *The gameful world: Approaches, issues, applications*. Cambridge, MA: MIT Press.
- Wiek, A., Talwar, S., O'Shea, M., & Robinson, J. (2014). Toward a methodological scheme for capturing societal effects of participatory sustainability research. *Research Evaluation*, 23(2), 117–132.
- Wilhite, H. (2013). Energy consumption as cultural practice: implications for the theory and policy of sustainable energy use. In S. Strauss, S. Rupp, & T. Love (Eds.), *Cultures of energy: Power, practices, technologies*. CA: Left Coast Press, Walnut Creek.