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Towards a social practice theory perspective on Sustainable HCI research and design

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Abstract (for electronic version): In this chapter, we draw on social practice theory framings of energy use (and other resource consumption that leads to the emission of harmful greenhouse gases) to develop some assertions for what such theoretical underpinnings mean for the business of doing design for sustainability. We conclude that we need effective ways for doing transdisciplinary research and design; we need ways of working at broader temporal scales that account for historical and future trajectories of practice in design; and we propose a framework of social practice theory and design fiction as a promising approach to augment existing practice-oriented design.

This chapter grapples with a conundrum of scales in Sustainable HCI (SHCI): on the one hand, it is now widely agreed that our current ways of living are unsustainable and that if we have any chance at a sustainable future, fundamental changes in these are required. On the other hand, many of the approaches that HCI research and design are taking in addressing sustainability challenges are much too limiting, in various ways, in the context of the scale of change required to avoid catastrophic climate change. In this chapter, we draw on social practice theory framings of energy use (and other resource consumption that leads to the emission of harmful greenhouse gases) to develop some assertions for what such theoretical underpinnings mean for the business of doing design for sustainability. We conclude that we need effective ways for doing transdisciplinary research and design; we need ways of working at broader temporal scales that account for historical and future trajectories of practice in design; and we propose a framework of social practice theory and design fiction as a promising approach to augment existing practice-oriented design.

Recently, a practice-oriented approach to Sustainable HCI has begun to emerge (Pierce et al. 2013), which is part of a broader 'practice turn' in HCI (Kutti and Bannon 2014) whereby researchers are moving to social science theories like Social Practice Theory in order to explicate everyday life and its idiosyncratic complexities, to improve the products of design. This complexity of everyday life and the huge environmental challenges that society is facing are intertwined. It is estimated that to have a reasonable chance of avoiding catastrophic consequences of climate change – including extreme weather events, threats to our food and water supply, and threats to many plant and animal species – we can emit a further 565 gigatonnes of carbon dioxide – that is just 20% of the coal, oil and gas reserves of the world's fossil-fuel companies – mitigating climate change disasters requires ways of living that that involve leaving most of our remaining fossil fuels in the ground (Berners-Lee and Clark 2013).

Designing for new 'ways of living' sits in contrast to the traditional 'Interaction paradigm' in HCI in terms of the scope that it allows for change, by virtue of its framing of the design task and potential solution space: Kutti and Bannon (2014) write that while the Interaction paradigm is about the application of

technologies to change human actions, for the Practice paradigm, *“a whole practice is the unit of intervention; not only technology, but everything related and interwoven in the performance is under scrutiny and potentially changeable, depending on the goals of the intervention.”* The interaction paradigm in SHCI follows from an historical focus on cognitivism and information processing (Harrison et al. 2007). These approaches, themselves, are embedded in economic, political, and cultural systems, and they mirror the dominant paradigms of social change (i.e. economics and psychology) that are embedded in environmental policy (Shove 2010). Their lure comes, in part, from promises of generalisability and large-scale behaviour change that can be achieved by supporting and manipulating individual mental processes. The risk, of course, and this is one of the stickiest tension points for SHCI, is that everyday life is more complex than these models allow for and, hence, we ultimately get results and solutions that are inappropriate and ineffective. The Interaction paradigm isolates itself from any concerns with the cultural or the political, whereas these are integral parts of social practice and hence any paradigm that concerns itself with practices as analytical units (Kutti and Bannon 2014).

Practices might include things like commuting to work, bathing, or making dinner, to give a few examples. Multiple theories of practice exist for formalising these as Pierce et al. (2013) allude to in their introduction to the journal special issue on ‘Practice-Oriented Approaches to Sustainable HCI’. For the purposes of this chapter, we take Shove’s framework that defines practices in terms of three elements: materials *“which “[include] things, technologies, tangible physical entities, and the stuff of which objects are made”*, competences, which *“encompass skill[s], know-how and technique[s]”*, and meanings, which include *“symbolic meanings, ideas and aspirations”* (Shove et al. 2012 in Pierce et al. 2013). Practices are socially constituted phenomena that characterise our everyday activities and routines. Hence, they are not the intention or action of an individual person but a collection of materials, competences, and meanings that come together and are reproduced in socially-meaningful ways through the performance of activities. In terms of framing resource use, the main implication of a practice-oriented approach is that people do not use energy or resources—hence resource consumption cannot be reduced to individual choice—rather, resources are relied upon for the accomplishment of practices. And, agency in practices, and hence energy consumption, is distributed among the elements that make up the practice, which includes the material artefacts that are relied upon for its accomplishment (Hampton 2017). For example, some established forms of bathing rely upon a shower and plumbing infrastructure in the home, water for washing and rinsing, and energy for heating water to an acceptable temperature. Each of these, in turn, has some agency in the reproduction of the practice. It is the social constitution of practices—that they are shared, normal, and routine ways of living—that bring large potential for scalable change for sustainability.

A practice-oriented approach, then, necessarily takes these entire practices as units of analysis, intervention and design. We see that it requires a broadening of our understanding of people and everyday life, from ‘users’ and consumers, to account for the contexts in which resources are spent. Indeed, the importance of context in shaping our behaviours and interactions is not a new idea in HCI

(Suchman 1986). However, the context for sustainability is arguably unprecedented in the field of HCI. It is one of large-scale social change involving radically new forms of living (Shove 2009; Kuijer et al. 2013) to address a 'wicked' problem. Established methods for doing interaction design and achieving scalable results in traditional HCI contexts (e.g. laboratory studies for evaluating interface design for task completion, exercises inspired by specific domain understandings, or participatory and co-design with specific participant groups) are severely limited for challenges involving social change. In the rest of this chapter we ask, what does it actually mean to *take* a practice-oriented approach to HCI research and design for sustainability, and what can we hope to get out of it? We develop some assertions about this from literature on social practices.

A broader scope for design

Rather than being solely concerned with interactions between humans and computers, the concern of the HCI researcher and designer taking a practice approach becomes these wider configurations of practice elements, which include computers and peoples' interactions with them, but also a range of equally important elements including other forms or materiality, know-how, norms and expectations. As Pierce et al. (2013) put it, "*they expand beyond human-computer "interactions" to grapple with the complexities of sustainability in terms of how people go about their everyday lives.*"

This represents a step-change in SHCI: In an effort to overcome the complexity of energy and climate change, a dominant approach in the field, following on from approaches in policy-oriented research (Shove 2009), has been to narrow our conceptualisations of social change to one of individual behaviour change. DiSalvo et al. (2010) found that in approximately 70% of SHCI literature, interventions were targeted at individual consumers. In this framing, the massive scale change required to mitigate harmful effects of climate change can be achieved through the aggregated effects of individual consumers making (technologically-mediated) informed, rational decisions out of self-interest (Dourish 2010). Interaction design in this vein might be categorized as 'persuasive technologies' or 'eco-feedback' (DiSalvo et al. 2010; Brynjarsdottir et al. 2012). The aim is to 'nudge' or bring about changes in individual consumer behaviour through the provision of information about levels of resource consumption, using psychological and economic models of change. For example, an in-home display might provide householders with quantitative measures of current and historical electricity, gas, or water consumption.

The practice lens has been used to provide an account of everyday life and energy consumption that draws attention to the limitations of these particular intervention approaches, or framings of energy use, by highlighting the breadth of constraining forces that hold unsustainable practices together when the designer intends change (e.g., Clear et al. 2013; Strengers 2010). Ultimately, what this approach reveals then, are understandings of the established, unwavering units of everyday life, dissected into the elements and their linkages that constitute practices. Our first assertion, then, is:

1. *Social practices provide us with a framework for evaluating design interventions, by examining the ways that configurations of elements resist intended behaviour change*

In this way, practices provide important domain understandings for *informing* research and design initiatives, and we must not undervalue this exercise, but our concern in this chapter is with what a practice-orientation tells us about *operationalising* these in designing for sustainability. Matt Watson (2013) describes a practice as “*a concept which enables analytical attention to work on from specific moments and sites of action, to comprehend how moments and patterns of doing are orchestrated and reproduced over time and across different spaces.*” This description provides a coherent link between empirical inquiry and change at scale, and importantly, points to the magnitude and mechanics of the design task in question. The mechanism by which social practice opens up scalable change is in drawing out from the experienced reality or situated performance to extrapolate and intervene in the social fabric that holds ways of doing together, i.e., going from practice as performance (the physical act of doing) to redefine practices as entity (a shared notion of what constitutes a practice). For instance, observing cooking practices might reveal the use of particular ingredients, and characterise this use with the issues of its materiality (e.g. origin, availability, cost), competences (e.g. food literacy, cooking skill), and meanings (e.g. satiety, healthfulness, cultural appropriateness). These connections necessarily extend beyond the individual performance, for instance to infrastructures of food production and transport, economic and market configurations of access, and cultural values such as gendered roles which have implications for who and how we learn to cook. We see that:

2. *Social practice theory provides designers with a framework to move from reasoning about design at the micro-level of experience and situated performance of practice, to the macro-level material and social fabric that holds ‘ways of doing’ together, and to understand interactions between these.*

Important sites for engagement beyond individual consumers are obscured by narrow framings of consumption as individual choice. Brynjarsdottir et al. (2012) link underlying assumptions about rational choice, and dominant foci on calculability, efficiency, and top-down control, to modernism. Paul Dourish (2010) highlights how dominant cultures of market capitalism lead to intervention approaches that reduce social change for sustainability to the moral choice of individual consumers. By framing issues of climate change in terms of personal responsibility, such models ignore questions about the roles and responsibilities of other important social actors such as governments, institutions, and corporations, and, for example, their policies, regulations, and ideas of corporate responsibility in which our unsustainable ways of life are embedded and sustained. In fact, such framings serve in turn to sustain these forms of governance (Shove 2009). And, included in this feedback loop are our notions about what valid approaches for modeling social change and designing interventions are. Before we can effectively engage with climate change issues, we need to be explicit about the extent to which our existing systems and social

entities such as governments and corporations shape our everyday lives and patterns of consumption (Shove 2009; Dourish 2010).

Ultimately then, the task we are charged with is to redefine social life as we know it. Hence, as well as highlighting constraining factors outside of the control of the “users”, a practice-orientation also alludes to the extent to which elements of everyday life and the ways that they are configured are beyond the control of the HCI researcher or designer. This represents a challenge for the SHCI community to find effective ways to do transdisciplinary design research.

3. *Everyday life is shaped by our social systems and actors meaning that much of the sustainable design task is out of the scope of any individual design practitioner or discipline.*

In summary, practices are mostly comprised of elements that normally fit outside the scope of human-computer interaction, such as cultural reproduction of practice, infrastructures and policy, and the prevalence of neo-liberal economics. We might question whether an exercise in sustainable change falls within the remit of HCI at all. This temptation highlights the transdisciplinarity of the challenge but also the need to acknowledge and be satisfied that while computers do not play a central role in the construction of our everyday lives, they, importantly, are relied upon, shape, and are shaped by the things that we do in direct and indirect ways. By corollary, their “design” shapes and is shaped by our (un)sustainable practices and ways of living. But “design” more broadly includes other material and non-material elements and many other stakeholder groups (including the practitioners) are employed in doing the designing, and so we might consider practices to be the outcome or emergent behaviour of the interactions between these processes. Our capacity and challenge as HCI researchers and designers is in understanding and manipulating interaction design within this broader context of designing sustainable living, and we might more effectively do so by coordinating stakeholders. The concerns, needs, values, and language of these may be diverse and conflicting, but we might leverage practices as an analytic entry- and endpoint of this broader system.

Considering temporality and change

If we take a social practice orientation to understanding the sustainability of resource consumption, we find that the elements of practices and their configurations have become established through historical trajectories and that any practice in time is linked in meaningful ways to its historical configurations. Take, for example, showering – Hand et al. (2005) provide an illuminating account of how current UK bathing practices, which involve one or two showers-a-day, have changed in less than a generation from a weekly bath. The prevalent material elements of this practice – en suite bathrooms and stand-alone power showers (we could perhaps now also include combi-boilers) – have emerged from bathtubs in shared bathrooms. During this emergence, bathtubs augmented with electric showers were popular. Conventions of short, convenient daily or twice-daily showers have emerged from lengthier, weekly baths. And, conventions of the body and hygiene have become more related to ideas of health and fitness.

Change in practices is always incremental (Watson 2013). In thinking about HCI design for sustainability, this means that any future practices, and any digital artefacts and user experiences embedded in them, will have meaningful trajectories from current practices. Hence,

4. *Design for future practices should be suitably contextualised and informed by understandings of current practices.*

To elaborate on this point, the context of design that we refer to here might usefully be framed in terms of the inertia of the elements that constitute current practices. Hand et al. (2005) illustrate how practices have a momentum of their own in that they are continually reproduced through their performance in everyday life, giving them stability, or a 'closing' effect. They are also constituted by these performances, which can vary in more and less significant ways in any given instance. Repeated performances involving new elements can lead to fundamental changes in the practice, meaning that the future of any practice is 'open'. However, "'obdurate' elements have a 'closing' effect on the variety of plausible futures, so structuring otherwise 'open' possibilities" (Hand et al. 2005).

That changes in practice are incremental is not to say that design exercises should limit their scope to increments on the present, and the realms of plausibility for this. In fact, we argue for the contrary, as framings that treat too much of the present, such as current energy demands, as foregone conclusions only serve to reproduce it (Hand et al. 2005). We might argue that persuasive technologies are overly rooted in the present: while they can certainly be effective in particular situations where the targeted behaviour is isolated and defined, in the context of sustainable living they limit the scope for reductions in resource-use to easy and convenient shavings from the status quo. Any conservation changes will be made within individuals' own conceptions of need and what are normal ways of doing things—these are socially and culturally constructed, for example, in the case of thermal comfort (Shove 2003), and it is these configurations of need and normality that are unsustainable. This approach treats the reduction of energy demand as an information deficit problem for 'energy consumers' – that people will act as micro resource managers (or 'Resource Man' (Strengers 2014)) if the right information and tools are available to them. In reality, this atomisation of behaviours, resources and actors takes a simplistic view of everyday life in which people can and will make easy decisions to optimise the energy consumption of their and their household's practices. Everyday life is more complex and socio-culturally varied (Brynjarsdottir et al. 2012) and so the causal relationship between information/feedback and what people do (behaviour change) is often extremely weak – what people do is shaped by a complexity of factors including household dynamics, social and cultural conventions and values, routines and pressures on time. As such, interventions appeal to "*a limited number of people who are interested in their energy data and bills, who want to talk about their consumption with others, or who want to use new technologies to manage their energy demand*" (Strengers 2014).

More fundamental changes in our ways of living than these approaches allow for are required. As Elizabeth Shove writes, for any effective response to climate change challenges, “*new forms of living, working, and playing will have to take hold across all sectors of society*” (2009). Silberman et al. (2015) argue that for HCI, this means “*considering, as rigorously as possible, the long-term social, economic, political, and ecological processes that might influence the adoption, use, and effects of particular technologies and practices.*” This suggests that for sustainability, we shouldn’t limit ourselves by the present in design; we should consider long-term projections into the future, but social practice theory reminds us of the importance of considering *the process* of incremental change in practice to get there. In summary,

5. *Sustainability requires radically new ways of living so design should not be limited (and limiting) by present configurations of practice and resource use, but it must consider the process of incremental change that stems from these to more sustainable ways of living.*

According to Hand et al. (2005), the practice is not a consequence of any of its elements and their trajectories in isolation, but the coming together, the linkages, between these elements in time. Continuing with their bathing case study, prior to its current place in bathing practices, the shower already existed and featured centrally in bathing in Roman times, when bathing was public and collective, but then fell out of use. And the plumbing infrastructure required for showers existed long before their widespread adoption. Their reintroduction into common use occurred alongside wider changes in the temporal organisation of daily life: “As such the shower belongs to a set of domestic devices whose popularity has grown precisely because they promise to help people cope with the temporal challenges of (late) modern life” (Warde 1999 in Hand et al. 2005).

This implies that it is not sufficient to understand current practices for what they are now, as this tells us little about designing for change. For this, we need better understandings of how current practices have come to be, which includes how they are established through changes in historical practices. This requires not only a focus on the constituent elements and their respective historical trajectories. More importantly, it requires a focus on the linkages between the elements and how these are made and broken over time.

6. *To design for a process of change towards more sustainable ways of living requires designing for the making and breaking of linkages between elements of practice.*

Silberman et al. (2015) argue that “the processes that give rise to the issues indexed by the term “sustainability” are larger in time, space, organizational scale, ontological diversity, and complexity than the scales and scopes addressed by traditional HCI design, evaluation, and fieldwork methods.” Their conceptualisation of time is, quite rightly, future-oriented calling for research that considers longer timescales of change. However, if we consider how practices are established, this argument might also usefully extend to the past.

First, for understanding how change happens, as we noted above. But also, many of our ways of living in even the recent past were more sustainable. There may be elements, or configurations of elements that were once part of acceptable ways of doing which we might aim to design back into future practices. Or we might gain valuable insight from tracing alternative trajectories of material artefacts that fit with the evolution of the other elements of a practice, much in the same vein as Steampunk culture preserves Victorian-era aesthetics in fictional futures (Tanenbaum et al. 2012).

7. *Understandings of past practices can provide us with deeper roots for design exercises that aim to map possible future trajectories for sustainable practice.*

We can sum up these assertions as tension points along two dimensions that arise from our pursuit for scalable change: abstraction (from concrete situated performances of practices to shared ideas about what the practice is), and temporality (from the very present situated performance to trajectories of change that project from the past into the future). First, the practice-as-entity represents practice-at-scale, as it is the social, shared understanding of a practice that enables us to recognise a practice performance for what it is, and continue to reproduce it – it is the situated performances of a practice that shape the practice entity. This implies that we must be analytically concerned with the situated performance, but that any innovation in performance will be limited by the forces that hold the elements of the practice together. And that while innovation/experimentation in any isolated performance might tell us something about plausible changes in a practice from the practitioner perspective, it excludes from design the more indirect social and cultural forces – and stakeholders in these – that shape the performance and the shared practice entity.

The second tension point concerns temporality. The need to be concerned with situated performance places a strong emphasis on the present. And, while we have established that situated performance and the present are of critical concern, such a focus can neglect longer-term change in designing for sustainability. In the next section, we address this challenge of maintaining a concern with the present while also integrating the longer-term future in the design exercise. And, of designing for future practices that are radically different, while maintaining sensible trajectories from current ones.

Innovation in practices

Thus far, we have motivated a concern with practices in HCI design for sustainability, and we have made some assertions about what the scope and dynamics involved in configuring practices mean for the design task. We have seen how notions of scale are problematised with the practice turn in illustrating how previous work that fits with the interaction paradigm has focused too narrowly. But, we also see how a broadening of this scope introduces new complexities of scale – elements, processes, and temporalities that are typically outside of the remit of HCI. In this section, we begin to address some of these in asking *how* to design in this context: what design approaches are appropriate for

the innovation work involved in constructing and transitioning to new ways of doing.

The first tension point that we concluded the previous section with is recognised by Kuijer et al. (Kuijer and de Jong 2009; 2011; Kuijer et al. 2013) who suggest a move from an analytic concern with practices to considering what it means to treat practices as units of design, “*generating and evaluating what could (or should) be in the future.*” Their method for this relies on the bringing together of “*crises of routine*” and “*improvised performance*” of practice. A crisis of routine is required to “*overcome resistance to radical change*” and entails the orchestration of situations where practitioners can break out of “*existing material and social structures*”. In their case study, Kuijer et al. (2013) used a laboratory environment to isolate the practitioner for this purpose. This setting consequently provides scope for improvised performance where the practitioner adapts and experiments with mutations of the practice, constrained by the lab environment and the structuring of the design task, to find the most valid and acceptable configurations for them. In their work, Kuijer et al. (2013) recruited improvisation actors to consider “*splashing*” as an alternative (to showering) bathing practice. We might draw parallels to a recent HCI study by Hasselqvist et al. (2016) where participants relinquished their cars and replaced these material elements of their transport practices with small electric vehicles for one year. In endeavoring for actual changes in practice, Kuijer et al. (2013) draw attention to the importance of ‘doing’ that is characteristic of these approaches. First, in that the designing becomes the concern of the practitioner and, secondly, the act of performance gets beyond peoples’ imaginaries to what they actually do. In fact, what participants don’t do might be as revealing about designing for sustainable practices as what they do.

This innovative approach to practice-oriented design embodies two important characteristics that relate to the assertions we derived previously. First, a concern with the ‘doing’, or the situated performance; and, second, a means (crisis of routine) to reduce the constraining impact of established practices on the innovation. Kuijer et al. (2013) remind us, however, of the gap that remains between innovation of this nature and the innovation of social change: “*Only if this variety on the practice is repeatedly performed by several practitioners (if it works and spreads), it can change from exceptional and improvisational to acceptable and normal, thereby reconfiguring the practice-as-entity.*” We can draw on the assertions we made previously to outline how this approach might be augmented to overcome some limiting factors in this.

We suggest that one promising approach to explore for this is to employ design fictions, written within a framework of social practice, as they have a number of characteristics that fit our purposes, here. First, they can serve as ‘boundary negotiating objects’ – “*objects which both inhabit several intersecting social worlds and satisfy the informational requirements of each of them*” (Star & Griesemer 1989) – that can be co-created and negotiated by the various relevant stakeholders. In Kuijer et al. (2013), the innovation is restricted to the perspective of the practitioner. Design fictions enable the creation of crises of routine that are inclusive of the range of stakeholders that are invested in the

configuration of the various elements that make up everyday practices. For example, for food practices, some of these might include domestic practitioners, vendors, marketers, farmers and nutritionists. Working successfully with a range of stakeholders to achieve purposeful improvisation requires common agendas that unite them, and 'climate change' and 'sustainability', while being relevant backdrops for crises of routine, are often too distant from stakeholder's everyday concerns. Hence, one important role for design fictions is in constructing sustainability agendas and goals that are relevant for the range of stakeholder groups.

Design fictions also provide scope for imagining much larger scale crises of routine, along the dimensions of abstraction and temporality that we mentioned previously. Related to the latter, they can extend well into the future while providing a narrative from the present, thus enabling us to treat sustainable design as a process. And, they could facilitate a means to interact with situated performance and vice versa, by providing a much richer framing of the kind of improvisational work in Kuijer et al.'s (2013) approach, while feeding the experience of this back into the shape of the narrative.

Design fictions can also help us design for the negotiation work involved in 'real world' improvisations of practice. Although crises of routine provide opportunities for reconsidering the status quo, in 'real world' innovation, it is impossible to separate the negotiation of acceptable and valid practice reconfigurations from existing social and material infrastructures. What we might strive to do instead is to draw attention to the a wide variety of possible performances, and what factors are at play—not just the practicalities, but the politics involved—in prioritising one over another. Design fictions can be diverse, considering a multiplicity of alternatives. They are diegetic prototypes in that they "explore alternate models of values and meanings" and these in turn cause us to reflect on and critique our own norms and values (Tanenbaum et al. 2012). Tanenbaum et al. (2012) show how the Steampunk community, through doing design fiction, come to establish their own cultural values through debate and negotiation about the cultural values and political meaning expressed, consciously or unconsciously in the designs that they create. In a similar vein, we might imagine how a community of stakeholders might establish their own sustainability values. For example, design fictions might allude to power dynamics, or inconsistencies between objectives and agendas within organisations. In this way, a key role for HCI might be a recursive one in inspiring crises for routine by bringing elements of the status quo into the spotlight.

In fact, we might look to our own communities of practice first. Sustainability is, at best, a fringe topic in HCI. What might a sustainability agenda look like for the ways in which we 'do' our work? Coming back to the quote that this chapter started with, might sustainability design fictions help us reconsider and establish new 'patterns that perpetuate' themselves in our community that treat sustainability as a fundament? Of course, this would include fundamental questions about technology design, but it might also include questions about, for example, our publishing venues and cycles (Silberman et al. 2015).

Closing remarks

In 1950, Norbert Wiener characterised social life with the following quote: 'We are but whirlpools in a river of ever-flowing water... We are not stuff that abides, but patterns that perpetuate themselves' (Capra 1996). Ultimately, this chapter has highlighted the full complexity and huge challenge of what it means to consider HCI for breaking out of the seeming inertia of such patterns to bring about and perpetuate more sustainable ways of living. We have addressed the limitations of focuses on the individual and consumer, and offered an account of social practice as a pathway to considering change at a broader scale. Although the development of a practice-oriented approach for SHCI is a major progress in this direction, we are quite a way off realising the potential for sustainable design that the theory promises. In recognising the transdisciplinarity of the challenge, it is clear that any route forward for research and design will entail meanderings of understandings and intervention around the complexity and depth of everyday practice elements and their interconnections. The widening lens of social practice means that we cannot always expect simple, easy or quick solutions and research contributions will often not clearly fall into one discipline or another, or be expressible as quantifiable reductions in energy use or greenhouse gas emissions. However, social practice theory provides a framework that we can use to position and orient our approaches and contributions towards design for sustainable living, and as a means to link our new insights and understandings to the design of the digital materials that most concern us in HCI.

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