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# Design patterns, principles, and strategies for Sustainable HCI

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**Abstract**

This workshop will bring together researchers in the Sustainable HCI (SHCI) field to reflect on sustainability challenges in HCI and collaboratively collate and develop a set of strategies for increasing and accelerating positive impact. We will explore 5 key questions towards this, and produce a collaborative position statement. Our key objective for the workshop will be to begin developing a series of design patterns, which we will ground with 'field trips' to areas of socio-ecological challenge. These design patterns will serve to provide a resource for practitioners and researchers wishing to adopt a sustainable approach to their work, and provide a touchstone for critique and evaluation of this work. The design patterns will contribute to an evolving, wiki-based repository and form the basis for several collaborative papers.

**Author Keywords**

Sustainability; design patterns; systems thinking

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

**Background**

The Sustainable HCI (SHCI) community addresses complex and challenging questions about the impact of

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digital technologies on the sustainability of our world, and how HCI can play valuable roles in bringing about a more sustainable future. This nascent research area has covered a lot of ground in a short space of time, and while we have learned much about the impacts of everyday life and technologies, and about limitations of narrow framings of resource use and everyday life in intervention design, we lack agreement on a cohesive set of foundational principles to apply in practice when designing for sustainability in HCI. Going forward from the many critiques within the community, what should we actually *do* that might make a difference? One example from [3] is that the *"design of new objects or systems with embedded materials of information technologies is incomplete without a corresponding account of what will become of the objects or systems that are displaced or obsoleted by such inventions."* We are concerned with ways to assimilate the knowledge we have gained through our myriad and varied attempts to address sustainability – both in our work and in our own lives – that may enable us to undertake more "effective" [18] SHCI research and practice. A sustainable future requires a significant socio-ecological transformation and it is our belief and hope that SHCI can make a real contribution to this – but it cannot do so while attempts are piecemeal. This workshop aims to rectify that.

For this workshop we are rebooting the idea of developing a pattern language for SHCI, initially attempted at a CHI 2011 workshop [4]. Used in various HCI and non-HCI contexts [1,15], patterns can be useful in drawing out practitioners' accumulated tacit knowledge in creation of concrete and easily distributable wisdom which when utilized can minimize redundancy within a community, short-cut a slow

process of trial and error towards progress in a field, and help researchers avoid others' mistakes. In the context of sustainability, which is often conceived of as ontologically time critical, assimilating sustainable HCI wisdom for rapid progress is urgently needed.

What is clearer now than in 2011 when the first workshop on patterns for SHCI took place is the truly systemic nature of the sustainability challenge [18]. Indeed, we now understand just how difficult it is to conceptualize the problem (or problems) we are seeking to address when we speak of "sustainability". For this reason, pattern language (i.e. a set of interconnecting design patterns) is an especially appropriate tool, as they serve to *"break down very complex challenges into discrete, manageable problems with clear solutions, while remaining true to the greater complexity in which that challenge sits"* [8]. While pattern definitions might imply an emphasis on structure, our interpretation is in the spirit of Alexander's original ideas of patterns as *structure-preserving transformations*—that (built) things are better when they are developed organically over time [1].

In this 2-day workshop, we will bring together researchers and practitioners to propose what such patterns might be in light of the sustainability challenges we are facing. In doing so, we will draw on results from previous workshops (e.g. [4,7,17]) to cover acknowledged directions and strategies for the future of SHCI research. In particular, we will be seeking to develop patterns that respond to the limitations and gaps identified at the CHI 2014 SIGCHI HCI and Sustainability community workshop [17] and the follow-up publication "Next Steps for Sustainable

HCI" [18]. These included the need to consider *longer time scales* in SHCI research; to *specify and operationalize sustainability goals in our work; build and support systems that people use in their everyday practice; address the full diversity of sustainability issues; and move beyond simple models to grapple with the full multi-scalar complexity of "wicked" sustainability problems* [18]. In this workshop, we press the community to further elaborate what they might mean in practice. We aim to produce high-level patterns to serve as strategies for the community in approaching this work, along with lower-level patterns to serve as principles for design that appear to 'work' in various contexts and with different types of interventions being explored in SHCI. Our goal is to produce a repository that consolidates what we have learned up to now, which researchers and practitioners can draw upon, critique and evolve in operationalizing these next steps in SHCI research and design.

The "Next steps for sustainable HCI" [18] will form an important starting point for this workshop. But, as well as this, we will draw on valuable existing examples of patterns for sustainable HCI in the literature. For example, Knowles et al. define 'patterns for persuasion' for persuasive technology best practice for sustainability [9]; Blevis' proposes a number of principles for sustainability in interaction design [3]; Odom et al. present a framework of attachment for designing to lessen device and object obsolescence [12]; and, Pan et al. [14] and Pan and Blevis [13] provide mechanisms for positively linking fashion to sustainable HCI and interaction design. A goal of the workshop is to consolidate these and other existing sustainable HCI patterns, and to draw inspiration from them for outlining further patterns. In doing so, we aim

to bridge the gap between domain understandings, theory, and sustainable design practice. In particular, the workshop will address the following questions aimed at allowing us to distill existing literature while providing space for new discussions and propositions:

- (1) *What concrete strategies can we define for operationalizing the acknowledged "next steps for sustainable HCI" [17]?*
- (2) *What can we learn from existing patterns in sustainable HCI, or from work in HCI that may be reframed in terms of patterns?*
- (3) *How do patterns relate to the operationalizing of sustainability goals?*
- (4) *How can we effectively evaluate, critique and evolve sustainable HCI patterns?*
- (5) *What new patterns can we propose from what we have learned so far to operationalize "next steps" and tackle the range of sustainability challenges we are facing?*

### Organizers

All of the organisers are active contributors to HCI & Sustainability research, and play key roles in supporting, maintaining and advancing the community through the organisation of workshops, panels, SIGs, and so on [5,6,7,16,17]. Additionally:

**Bran Knowles** has worked as a research associate at Lancaster University, where she received her PhD in Digital Innovation exploring design patterns in the context of 'Cyber-Sustainability'. She recently co-organised a sustainability workshop at NordiCHI [16].

**Adrian K. Clear** is a Senior Research Associate at Newcastle University. He led last year's sustainability

workshop at CHI [7] and the recent Ubicomp 'Green Food Technology' workshop [1].

**Samuel Mann** is Professor at Otago Polytechnic. He has written two books on sustainability [10, 11].

**Eli Blevis** is Associate Professor of Informatics at Indiana University. His is best known for his pioneering work on sustainable interaction design (e.g. [3]).

**Maria Håkansson** is Assistant Professor in the Interaction Design Division at Chalmers University. She recently co-organised a sustainability workshop at NordiCHI [16].

### Website

The website will be hosted at  
<http://openlab.ncl.ac.uk/sustainabilitypatternsworkshop>

The link will be circulated along with the call for papers. The website content will contain information about the organizers, relevant updates about the workshop, and the call for papers. As well as this, all accepted papers will be made available to participants prior to the workshop, and will be hosted on the website thereafter. The website will also link to workshop output, including a workshop summary and position statement. Any patterns developed in the workshop will be housed on the SHCI community's knowledge base, currently being developed.

### Pre-workshop plans

We will distribute the workshop Call for Papers via relevant mailing lists (e.g. chi-announce, sustainable-chi, departmental lists), social media (e.g. Facebook group, Twitter) and via a website that we are

developing for the workshop. We will use the organizers' professional networks to directly notify colleagues and students who may be interested in taking part. We will invite submissions of 2-4 page position papers including but not limited to the following topics:

- Proposals of proto-patterns to be developed into more concrete patterns at the workshop
- Proposals of known, existing patterns from other domains that may be usefully applied to SHCI
- Strategies for SCHI to operationalize Silberman et al's "Next steps for sustainable HCI."
- Accounts of applying patterns to sustainability design challenges, including reflections on the process, and applications of existing patterns to new challenges
- Outlines of sustainability design challenges that are ripe for pattern and systems-level thinking, e.g. obsolescence
- Critiques, including perceived challenges, in creating a pattern language for SHCI
- Assessments of the utility of a framework like pattern languages to advance HCI discourse on sustainability, and proposals for alternative frames.
- Exemplars/Cases of sustainability related research and/or practice that may not be related to patterns but which do advance sustainability in HCI.

Each submission will receive at least two reviews for their paper by the workshop organizers, and those with well-argued, insightful contributions that represent a broad range of perspectives on the workshop themes will be selected. We expect approximately 15-20 participants to take part in the workshop. Participants will be asked to bring to the workshop a local example

of a real-world sustainability project to prompt consideration of the “situatedness” and diversity of problems/solutions in defining larger patterns. We will arrange an informal social event on the evening before the workshop to introduce participants to each other and encourage lively interaction at the workshop.

### Workshop structure

This is a two-day workshop. The first day of the workshop will proceed as follows: (1) ‘*Lightening talks*,’ with each participant briefly outlining their position in relation to the workshop themes, and their local sustainability project. (2) To provide a real world context for the consideration of sustainable HCI patterns, workshop participants will undertake a *field trip* in the vicinity of the workshop venue. It will cover a range of city and rural contexts (e.g. high street, business, residential) where participants will use a “sustainable lens” to reflect on social, cultural, economic and infrastructural sustainability and relationships to HCI. This field trip will drive home the scale of the challenge, the interconnectedness of the problem, and perhaps seeds of positive action. Participants will form small group and documenting the trip with field notes, photos, etc. To provide for a varied discussion and a productive second day, visits will be prearranged for different sub-groups to engage with different communities and environments in the San Jose area; (3) *Sense making and reporting*, participants will stay in their groups and make sense of their trip content in terms of “next steps for sustainable HCI”, strategies and design patterns; and report back.

09:00—09:30 *Welcome; goals and agenda*  
 09:30—10:30 *Round-table ‘lightening talks’*  
 10:30—11:00 *Coffee break*

11:00—13:00 *Field trip*  
 13:00—14:00 *Lunch*  
 14:00—15:30 *Field trip continued*  
 15:30—17:00 *Sense making and reporting*  
 EVENING *Informal meal for networking*

The second day of the workshop will proceed as follows: (1) Short position paper presentations. (2) Participants will form affinity groups aimed at articulating strategies for operationalizing the “next steps for sustainable HCI” and considering patterns and strategies towards this. Participants will be encouraged to underpin these with real-world scenarios and experiences from field trip on Day 1. Groups will map and connect concepts to existing bodies of empirical research and produce a collective statement on the topic. (3) Working papers proposal: participants will draw on the themes from the workshop to propose and discuss a number of working papers. The organizers will facilitate an exercise to allow these to ‘bubble up’ and reached consensus on topics. (4) Working papers outline: participants will form groups to outline their working papers and produce an abstract for the workshop website.

09:00—10:30 *Short position paper presentations*  
 10:30—11:00 *Coffee break*  
 11:00—13:00 *Affinity group discussions and collective statements*  
 13:00—14:00 *Lunch*  
 14:00—16:45 *Working papers proposal and outline*  
 16:45—17:00 *Commit to post-workshop activities*  
 EVENING *Informal meal for networking*

Throughout the workshop, spaces (walls, whiteboards, tabletops) will be made available for participants to physically map concepts and discussions using pens and stick-e notes. This can be a useful exercise for

documenting collective opinions and understanding abstract topics. During feedback/discussion parts of the workshop, one of the organizers will summarize and document ideas and concepts (e.g. in mind map diagrams) using a projector or flipchart.

### **Post-workshop plans**

We will arrange a meal after the workshop to continue discussion. The workshop will produce initial contributions and recommendations for deposit in the SHCI Knowledge Base, an innovative, open access, digital repository being designed specifically to support those engaged in HCI & Sustainability inquiry. Post-workshop dialogue will continue online to refine the patterns, strategies, and position statement. As happened at the 2014 workshop [17], this will be circulated within the HCI & Sustainability ACM community group to allow input and comment from those not present. The statement will form basis for a collective research agenda and be published in *Interactions*, and affinity groups will be encouraged to conduct joint research on topics identified for publication in journals and conferences.

### **Call for participation**

This workshop will bring together researchers in the Sustainable HCI field to reflect on sustainability challenges in HCI and collaboratively collate and develop a set of strategies and patterns for SHCI research and design that will serve as an evolving platform for practice, critique, and evaluation. SHCI has covered a lot of ground in a short space of time, and, while we have learned much about the impacts of everyday life and technologies, and about limitations of narrow framings of resource use and everyday life in intervention design, we lack a cohesive set of principles

or patterns for thinking about and designing for sustainability in HCI. In this 2-day workshop, we will bring together researchers and practitioners to propose what such patterns might be in light of the sustainability challenges we are facing.

The workshop will focus on the following questions:

- (1) *What concrete strategies can we define for operationalizing the acknowledged "next steps for sustainable HCI" [17]?*
- (2) *What can we learn from existing patterns in sustainable HCI, or from work in HCI that may be reframed in terms of patterns?*
- (3) *How do patterns relate to the operationalizing of sustainability goals?*
- (4) *How can we effectively evaluate, critique and evolve sustainable HCI patterns?*
- (5) *What new patterns can we propose from what we have learned so far to operationalize "next steps" and tackle the range of sustainability challenges we are facing?*

We aim to produce a collective position statement that addresses these questions, and to develop a number of collaborative working papers in the workshop based on the themes and interests that emerge.

We invite 2-4 page submissions in CHI ACM Extended Abstract Format. Submissions will be selected that offer original, well-argued and insightful contributions with potential to generate interesting discussion at the workshop. Relevant topics include but are not limited to the following:

- Proposals of proto-patterns to be developed into more concrete patterns at the workshop
- Proposals of known, existing patterns from other domains that may be usefully applied to SHCI
- Strategies for SCHI to operationalize Silberman et al's "Next steps for sustainable HCI."
- Accounts of applying patterns to sustainability design challenges, including reflections on the process, and applications of existing patterns to new challenges
- Outlines of sustainability design challenges that are ripe for pattern and systems-level thinking, e.g. obsolescence
- Critiques, including perceived challenges, in creating a pattern language for SHCI
- Assessments of the utility of a framework like pattern languages to advance HCI discourse on sustainability, and proposals for alternative frames.
- Exemplars/Cases of sustainability related research and/or practice that may not be related to patterns but which do advance sustainability in HCI.

Please direct queries and submissions to Adrian Clear (adrian.clear@newcastle.ac.uk). Further information is available on our website:  
<http://openlab.ncl.ac.uk/sustainabilitypatternsworkshop>

At least one author of each accepted position paper must attend the workshop, and all participants must register for the workshop and at least one day of the ACM CHI 2016 conference.

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