

Toward a Sustainability Lexicon and Pattern Language?

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ABSTRACT

This paper summarizes the argument put forth in the lead author's PhD dissertation, which has been supervised by the co-authors [9]. The dissertation examines key assumptions underpinning both Sustainable HCI and its related counterpart, Green IT. It is argued that these discourses, along with their specific appropriation of the term 'sustainability', reinforce a set of values that ultimately undermine its solutions and limit its impact. An alternative discourse is proposed that avoids reinforcement of problematic values, and radically different conception of 'sustainability', and the role that computing may play in contributing to a 'sustainable' future, is proposed in a new discourse, namely Cyber-Sustainability. For this summary, the discussion will focus specifically on Sustainable HCI discourse, and the implications for future research by this community.

Author Keywords

Sustainability, discourse, values, frames

ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

INTRODUCTION

Having undertaken an extensive systematic literature review and discourse analysis of sustainable HCI, we propose that the following points comprise the essential argument for the need for a new approach to 'sustainability' in computing:

1. *Sustainable HCI is premised in a set of modernist assumptions which prescribe a limited solution space and a particular strategy for garnering buy-in and enthusiasm.* These assumptions are that people are rational, and determine the most beneficial actions to take with respect to their own self-interests. We note that these assumptions have been recognized and challenged in recent years [2, 5, 16], but it is not entirely clear from these critiques what is meant to replace these assumptions, how one goes about adopting what is effectively a new worldview, and what it means for more appropriate and effective sustainable HCI outputs.
2. *These solutions can at best have an only minor impact towards any measurable sustainability goals, such as carbon emissions reductions; worse, they may reinforce a worldview and a set of values that is incompatible with sustainability and lead to a net negative impact for sustainability.* We apply research into the values motivating unsustainable behavior (insight geared toward NGOs and environmental campaigns) toward sustainable HCI. This values research — which is external to Value Sensitive Design but not incompatible with it — shows that giving people Self-Enhancement reasons for engaging in pro-environmental behavior leads in the long-term to *reduced* concern for the environment, and fewer subsequent pro-environmental behaviors. Content analysis of publications shows that Green IT research is 'worse' for enticing people with self-interested motivations, but Sustainable HCI (and in particular the persuasive technologies under this umbrella) also falls into this trap (see [8]).
3. *Given that these solutions are rooted in a set of assumptions (frames), new frames must be adopted as the foundation for a new 'sustainability' discourse in computing.* Frames are cognitive narratives about how the world works. Discourse analysis of Sustainable HCI publications reveals three key frames that contribute to the activation of (or appeal to) Self-Enhancement values — namely *Rational Actor*, *Self-Interest*, and *Free Market*. Unsurprisingly, yet problematically, these three frames comprise the modernist worldview, which has so powerfully shaped academic institutions and norms. This has important implications about how difficult it may be for Sustainable HCI to break out of this thinking. We may begin, however, by looking to cognitive psychology researchers like Lakoff [12] and Westen [18] who provide evidence to challenge these frames. The alternative frames they propose might be summarized as *Embodied Mind*, *Empathy*, and *Shared Prosperity* (see [3] for more information on these frames).
4. *A discourse that would appear to resolve the problems identified within sustainable HCI discourse (second bullet, above) would be 'imaginative' and 'radical'.* We adopt Dryzek's [6] discourse classifications: prosaic discourses accept the rules of the 'game' of industrialism, i.e. aiming to increase material wellbeing through growth; and imaginative discourses challenge these rules. Reformist discourses fit within familiar modes of rational management; whereas radical discourses argue for a comparatively significant movement away from industrial modes of living and being. We find that Sustainable HCI (like Sustainable Development and the Brundtland Report [19], from which

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it clearly draws influence) is an imaginative but reformist discourse. (Collapse Informatics, however, might be classified as prosaic and radical.¹) There is a gap for computing research to explore which is imaginative and radical (see [10]).

Table 1. Gap for Sustainability Research in Computing

	Reformist	Radical
Prosaic	Green IT (some)	Collapse Informatics
Imaginative	Sustainable HCI, Green IT	?

5. *One notion of sustainability that is ‘imaginative’ and ‘radical’ and reinforces values consistent with its ambitions is the Quadruple Bottom Line of sustainability.* Sustainable HCI currently hangs off a Triple Bottom Line notion of sustainability, which includes consideration of environmental, social and economic concerns simultaneously. If Sustainable HCI is looking for inspiration from alternative notions of sustainability that may form the foundation for higher impact research, one candidate might be the Quadruple Bottom Line of sustainability (see again [10]). In addition to demoting economic concerns to ‘a means to an end’ and introducing ‘personal meaning’ as a key consideration for designing for sustainability, the Quadruple Bottom Line (as articulated by [17]) is based in the frames above that are consistent with values associated with long-term and significant pro-environmental behavior: *Embodied Mind, Empathy, and Shared Prosperity.*

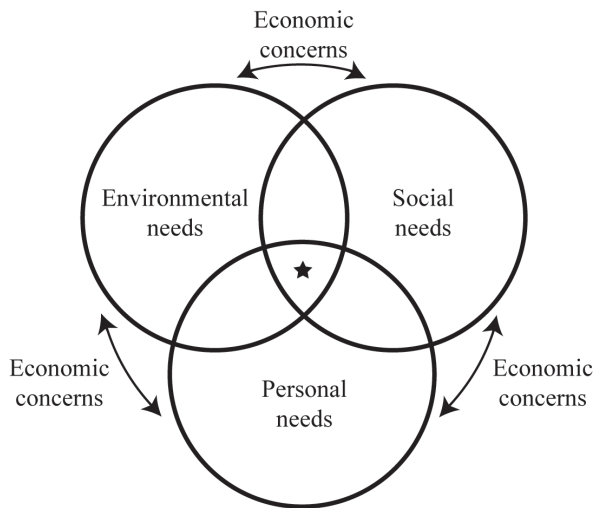


Figure 1. Quadruple Bottom Line framework (adapted from [18], see [10]).

6. *Adopting these alternative frames and the Quadruple Bottom Line as a foundation for a new sustainability discourse*

¹Note that these classifications are not discrete types but exist on continuum. To say that Collapse Informatics is ‘prosaic’ and ‘radical’ is to say that it is more prosaic and radical than the rest of Sustainable HCI.

in computing, it may be possible to develop ideas for radically different sustainability solutions that have yet to be explored. In addition to environmental concerns and social justice concerns, Sustainable HCI might consider how technology can attend to more profound notions of human flourishing [11] to combat ‘meaninglessness, anomie, and despair [which] will corrode the desire to be sustained and the belief that humanity is worth sustaining’ [13]. This aligns with Davison’s [4] argument for reconceptualizing sustainability and ‘sustaining-ability’, which is more closely related to notions of human sustenance.

DISCUSSION

There is a danger of the term ‘sustainable’ being so variously defined as to approach meaninglessness. But rather than seek conformity for definitions of sustainability, the solution seems to be to insist on *clarity of terms*. While it is certainly far easier to converse about ‘sustainability’ in HCI as if a shared meaning exists between all parties and all researchers, there are clearly foundational premises that differ between conceptions of the term. A lexicon for teasing out these differences seems to be required in order to debate these premises and make headway during discussions about what Sustainable HCI is or ought to be. As a starting point, we may make use of cognitive frames for the purposes of differentiating these understandings.

It is important to note that the discourse analysis we present in [9] describes the apparent understanding of sustainability (both the perceived sustainability problems and potential solutions to these problems) currently being communicated through Sustainable HCI research *as a whole*, which is undoubtedly not representative of every individual researcher’s stance on sustainability. Where researchers differ in approach or in worldview, the ‘essence’ of these differences in framing ought to be named and enter into a growing lexicon for the community that can enable better communication and debate.

Similarly, Collapse Informatics has entered into the Sustainable HCI community without appreciation (by some) of the fundamental differences between the discourses. As a prosaic/radical discourse, Collapse Informatics research cannot simply be assimilated into Sustainable HCI, which is imaginative/reformist. If Sustainable HCI (as a whole or in part) is sympathetic to a Collapse Informatics discourse, this suggests a need to reflect on whether this represents a shift in Sustainable HCI’s approach and/or worldview, and what might have caused this shift, or whether this indicates existing schisms in the community that Sustainable HCI had not previously been able to identify.

As new sub-communities continue to emerge — a natural result of a growing lexicon with which to differentiate researchers — the problem of effective collaboration between these groups will become increasingly pressing. There are synergies to be found between Sustainable HCI and the more ‘engineering’ focused community of Green IT, and where these synergies exist, it makes sense to capitalize on them (see [10]). At the same time, there are important differences between communities, and in order for computing to maximize its sustainability impact, these differences will have to

be negotiated effectively. For example, where might certain communities have to make concessions to other communities' understanding of sustainability in order to make mutual progress? What, for that matter, is the mutual goal that unites these factions? Once this larger narrative is developed, it may be easier to carve out and prioritize specific research activities for each sub-community.

CONCLUSION

As part of an emerging lexicon, it seems we ought to be naming and cataloguing solutions that seem to 'work', along with those that we have tried and seem not to work, so that we are not wasting time and effort reinventing the wheel. This suggests collaboration toward the development of a pattern language for Sustainable HCI. Patterns describe a repeating problem, along with a suggestion for a solution that is proposed to solve the problem better than other attempted solutions. Pattern languages are collections of patterns pertaining to the same problem space (cf. [14]). (This technique was used in [9] to develop patterns for a proposed new discourse called Cyber-Sustainability.)

A pattern language for Sustainable HCI might include patterns of varying granularity, such as those pertaining to specific design characteristics as well as those pertaining to broad 'approaches' that may orient designs. For the latter, these patterns may encapsulate lessons learned about the framings that differentiate groups of researchers, and what their outputs contribute to sustainability.

In order to propose and evaluate potential solutions, a problem domain needs to be defined alongside a desired end — e.g. architecture that is conducive to wellbeing [1]; communication that promotes conviviality [15]; programming that is flexible, elegant and reusable [7]. As difficult as it is to construct a pattern language, the most difficult aspect of this endeavor will likely be the identification of the goal to which these patterns cohere. Given the difficulties in agreeing on a meaning for 'sustainability' (and 'Sustainable HCI'), it would hardly suffice to develop a pattern language of 'designs for Sustainable HCI that succeed in fostering sustainability'.

It remains to be seen whether a mutual goal can be articulated, and even whether this can be done without diluting the strongly held views on what sustainability is or ought to be. It seems likely that a more effective pattern language for Sustainable HCI would carve out separate patterns for each of the conflicting views of sustainability, which we might then use as a means of identifying design solutions that are shared between sub-communities, so that we might make mutual progress in our goals.

REFERENCES

1. Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., and Angel, S. *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press, New York, 1977.
2. Brynjarsdóttir, H., Hákansson, M., Pierce, J., Baumer, E. P., DiSalvo, C., and Sengers, P. Sustainably

unpersuaded: how persuasion narrows our vision of sustainability. In *Proc. CHI'12*, ACM (2012), 947–956.

3. Darnton, A., and Kirk, M. *Finding Frames: New ways to engage the UK public in global poverty*. Bond, London, January 2011.
4. Davison, A. *Technology and the contested meanings of sustainability*. SUNY Press, 2001.
5. Dourish, P. HCI and environmental sustainability: the politics of design and the design of politics. In *Proc. DIS'10*, ACM (2010), 1–10.
6. Dryzek, J. S. *The Politics of the Earth*. Oxford University Press, New York, 2005.
7. Gamma, E., Helm, R., Johnson, R., and Vlissides, J. *Design patterns: elements of reusable object-oriented software*. Addison-Wesley Longman Publishing Co., Inc., Boston, 1995.
8. Knowles, B. Re-imagining persuasion: designing for self-transcendence. In *Proc. CHI EA '13*, ACM (2013c), 2713–2718.
9. Knowles, B. *Cyber-Sustainability: Towards a Sustainable Digital Future*, Lancaster University, UK, 2014.
10. Knowles, B., Blair, L., Hazas, M., and Walker, S. Exploring Sustainability Research in Computing: Where we are and where we go next. In *Proc. UbiComp '13*, ACM (2013b), (in press).
11. Knowles, B., Walker, S., and Blair, L. Design for cyber-sustainability. In *The Handbook of Design for Sustainability*, S. Walker and J. Giard, Eds. Berg Publishers, Oxford, 2013a, ch. 30, 488–512.
12. Lakoff, G. *The Political Mind: Why You Can't Understand 21st-Century American Politics With An 18th-Century Brain*. Viking, New York, 2008.
13. Orr, D. R. *Four Challenges of Sustainability*. School of Natural Resources, University of Vermont, 2003.
14. Pan, Y., and Stolterman, E. Pattern language and hci: expectations and experiences. In *Proc. CHI EA '13* (2013), 1989–1998.
15. Schuler, D. *Liberating Voices A Pattern Language for Communication Revolution*. MIT Press, Cambridge, 2008.
16. Strengers, Y. A. Designing eco-feedback systems for everyday life. In *Proc. CHI'11*, ACM (2011), 2135–2144.
17. Walker, S. *The Spirit of Design*. Routledge, London, 2011.
18. Westen, D. *Political Brain: The Role of Emotion in Deciding the Fate of the Nation*. PublicAffairs, 2008.
19. World Commission on Environment and Development. *Our Common Future*. Oxford University Press, 1987.