Infrastructure and Sustainable UbiComp

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Received: June 20, 2007 / Accepted: July 2, 2007

Abstract As technology designers we may be inclined to focus on designing sustainable consumer products and influencing individual decisions. Infrastructure and the often powerful organizations that make it happen, however, are crucial to effective sustainability efforts and should be engaged.

Keywords Infrastructure · Sustainability · Ubicomp

Eli Blevis, in his CHI 2007 manifesto of sustainable human-computer interaction, describes design as the practice of “choosing among or informing choices of future ways of being”. This description raises questions of who is choosing our future ways of being. Is it designers? Users? Designers’ managers and employers? Politicians and policy-makers? Design as Blevis describes it is an activity that occurs well beyond the professions of interaction design and system building, or indeed any professionalized design practice.

As designers it is easy to focus on designing sustainable consumer products and influencing individual decisions regarding sustainable practice. While these are certainly worthy goals, I would suggest that some of the greatest gains towards sustainable practices are not to be found by influencing individuals, or even breaking industrial cycles of hardware and software obsolescence and waste, but rather in engaging construction, maintenance, and interaction with infrastructures and the organizations – often corporate or governmental – that control them. Putting solar panels on your home is great, connecting them to a grid in order to supply electricity to others is even better [8].

If we are concerned with ubicomp and sustainability, I would argue, we must be concerned with infrastructure as a negotiated, relational entity [4]. In support of this argument, consider some of the ways in which urban, as opposed to suburban infrastructures support sustainable practice. To start with, stand-alone homes are among the least energy-efficient structures to heat, whereas more typically urban apartments or houses that share walls with their neighbors are far more efficient. An environment built to a walking scale should certainly be preferable, from a sustainability standpoint, to an environment scaled for automobiles and rendering foot travel impractical. Public transit is preferable to universal car use; and in the latter case, at least carpooling might be encouraged.

Indeed, many individual decisions on whether to own a car and/or whether to carpool are constrained or heavily influenced by the urban infrastructures – public transit, good roads, car-sharing, or carpool lanes – available to the decision-maker.

We should not take as given (or not) infrastructures such as urban public transit or housing stock. Infrastructure takes coordinated, centralized work to build, just as it takes coordinated work to change or dismantle. The patchiness of public transit and dominance of the automobile in Los Angeles took work on the part of General Motors; the economic and social dominance of St. Louis County over St. Louis City as well was fostered by infrastructures of risk analysis and federal housing loans [3]. While many individual decisions on whether to buy a car or where to buy a house certainly played a role in shaping these urban forms and practices, the root causes lay in the construction and destruction of infrastructure by governments and large corporations.

While some reliable urban infrastructures, such as public transit, may contribute to sustainable practices; other infrastructures, such as freeways, may encourage more unsustainable practices; and haphazard or nonexistent infrastructures may also hinder efforts to live sustainably. Urban slums, especially prevalent in the developing world and often lacking state-run water, sewage, trash collection and transit infrastructures, are some of the most politically and environmentally unsustainable practices in existence [2], generating tons of waste daily that is never disposed of.

The problem here is that, while a focus on design practice and individual decision-making can provide technology designers with a clear plan of action, or at least make us feel empowered to act, an engagement with infrastructure – fraught with issues of compatibility, accountability and power, and slow to change – is a less tractable problem. Not only should we engage in interdisciplinary collaborations with urban planners, architects, and anthropologists, we also need to interact with governments, standards bodies and non-governmental organizations, some of whom may not regard environmental sustainability as a priority, or who may be actively hostile to the idea.
The conflict of priorities here is not unlike the problem of breaking the cycle of obsolescence in commercial product design.) Possible directions for research and action addressing sustainable ubicomp and infrastructure include:

- Exposing infrastructures and the decision-making and maintenance behind them. This may inform individual decision-making, but may also inform community activism and feedback towards organizations that play a role in infrastructural decisions. Bruce Sterling [5] provides an example of such an infrastructure exposure in proposing a system of tagging foods with information about their source, and methods of raising and transporting that food. (Though other sustainability issues may be raised in tagging everything in sight with RFID.)

- Designing relatively infrastructure-independent technologies. In cases where infrastructures are hostile towards sustainable practices, we may simply wish to subvert those infrastructures, but we cannot then rely on them. The use of wireless sensor nets [7] and feral aibos [1] to detect and expose urban pollution levels are good examples of such subversive computing projects. Incorporating affordable solar cells instead of batteries into wireless sensor networks would render them less infrastructure dependent, more environmentally friendly, and perhaps easier to maintain.

- Dealing with developing countries and indigenous populations must be part of a sustainability agenda. Environmental sustainability is a global problem, and all too often positive steps in one part of the world (such as stricter laws around industrial pollution) are undone in a global economy by more pollution and exploitation in other parts. Designing to support activism, anti-colonialism and populist anger at local environmental destruction might be an effective tactic in cases where governments are oppressive or ineffective [6].

References


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