Nevermind Ubiquity

Jeff Burke
Center for Research in Engineering, Media and Performance (REMAP)
University of California, Los Angeles
102 East Melnitz Hall, Los Angeles, CA 90095-1622
jburke@remap.ucla.edu

ABSTRACT
Systems-level innovation in many fields is reactionary. It responds to the emergence of new components, materials, and processes with new ideas for their use. Despite the benefits of this lure of the new, it can risk undervaluing the role of already deployed technologies in addressing unmet needs. This position paper draws analogies to the tension between new construction and adaptive reuse of buildings to discuss alternative design strategies in ubiquitous computing for citizen science, activism, and resource stewardship.

Categories and Subject Descriptors

General Terms
Design, Economics, Experimentation, Human Factors, Legal Aspects.

Keywords
Ubiquitous computing, pervasive computing, sustainability.

1. INTRODUCTION
Ubiquity is a quality, not a reason. “Everyone will have a car,” automobile boosters told Southern California. Fifty years later, most of our innovation and hope comes from goals of less, or at least better, driving—not more.

Many reasons for information technology to be embedded everywhere are intensely attractive: More communication at less cost; more data available to more people; linkages of the physical and digital yielding deeper understanding of the world; perhaps even increased participation and personal empowerment. Yet the current model of everywhere computing, achieved through billions of mass produced, semi-disposable devices, which many of us turn over yearly for incremental improvements, cannot be applied to sustainability without some irony and, hopefully, some revision.

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UbiComp 2008, Sep 21-24, Seoul, South Korea.
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2. WHAT WE ALREADY HAVE
Market pressures and increased corporate accountability are pushing manufacturers to reduce the impact of what they build, and as users we are more and more aware of the importance of recycling, reusability, and—sometimes—parsimony. Inside this workshop, though, imagine something extreme. Consider what it would be like to never get another mobile phone, a faster internet connection, a better laptop. Take all of our current technological capacity, and freeze it. We have a sort of ubiquity in our workshop room, even embarrassingly so. Now imagine growing old with those devices that we have, the way one might with a grandmother’s watch or a treasured, vintage car.

1 What would we be forced to do? Be lucky to have? Imagine the current, amazing scope of the internet and mobile communications, also frozen.

Pacala and Socolow wrote “humanity already possesses the fundamental scientific, technical, and industrial know-how to solve the carbon and climate problem for the next half-century.” [2] They list fifteen “stabilization wedges” that could be used to meet the world’s energy needs while limiting the trajectory of atmospheric CO₂, essentially orienting fifteen fields around performance goals needed by 2054. More than just know-how, do we already possess the technologies to address significant goals of citizen science and activism around the challenges of environmental stewardship? As designers, would facing a lifetime with our current technologies force us to act more effectively towards these goals? What would we do if we weren’t focusing on the next semi-disposable device or dawning capability? These questions aren’t about design requirements for sustainable ubiquitous technology. They are about how sustainability means understanding and working with what we have, as much as dreaming of something more.

In architecture, there is a similar drive to create new designs with fresh aesthetics and modern materials, and to build spaces that address the unmet needs of groups of people. New buildings are considered cheaper to build, easier to expand and maintain,

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1 In a recent talk, Saul Griffith mentioned another’s quip that people should be assigned a Mont Blanc and a Rolex at birth, pass them on at death, and never buy another disposable watch or pen in their entire life. Current class implications notwithstanding, it’s a provocative point.

2 Though that would be an interesting workshop. For our “frozen” technology, let’s assume that the technology was built to be longer-lasting to begin with, perhaps consistent with the design principles of Danny Hillis’ Clock of the Long Now: longevity, maintainability, transparency, evolvability, scalability. [1]
and more efficient. In fact, many older buildings have the potential to be more energy efficient than all but the most modern construction. [3] Additionally, in old buildings, we can find craftsmanship most could never afford today, and materials that would now be very expensive: stone, wood, and copper, for example. In some cases, that combination of materials and craftsmanship, along with the cultural context, create places that wear well, are appealing, and are part of our identities. To knock down an old building and create a new one with lower “total cost of ownership,” higher “efficiency,” and more “features” seems easier than fixing the old one. But these are buildings that we may never be able to make again, and they may resonate as part of people’s identities, something which is not duplicated or quickly regenerated. In the long view, they may be sturdier and possible to maintain quite well, given some human ingenuity and effort. Ubiquitous electronics are of a different scale, and rarely does any single device contribute to our sense of group identity or resonate with us like a physical place. We can still take inspiration from the (admittedly more difficult) building practices that mix historical and modern structures, from adaptive reuse, from the acknowledgement of the extensive visible and invisible value in what we already possess.

Given a charge for “adaptive reuse” of the technologies and know-how that, hypothetically, our workshop now must live with forever, we would need to translate our aspirations for activism, citizen science, and sustainability into innovations that fit within the capabilities of the communications technologies we already have. And they are not lacking! Like working with classic buildings, it may require thinking that’s not off-the-shelf conventional tech wisdom. In our workshop room, we at least have access to wireless devices, local and remote computation and storage; displays and perhaps a projector; connectivity of various kinds; local sensing of images, audio and location—and maybe more, depending on what people bring to demonstrate. We have stylus, keyboard and touch interfaces for data entry and probably many other capabilities. We even have access to existing online systems that facilitate self-report, mapping, data publishing and analysis, and media sharing. Surprisingly, we may need to spend some time on a real asset inventory of what we already have. Not only will we need to assess what our now-lifelong technological capacities are, but what assumptions about them we may have made “before the freeze” that needn’t apply if we really have to make what we have work. We will need to create the pieces that fit between the old and the new, rather than waiting for everything to be “new.” (Written down, the latter doesn’t seem very logical—but I find myself doing it all the time.)

But work to do what? Next comes the question of where to apply our tools first, on what topics and towards what combination of discovering new knowledge, promoting awareness, or directly affecting change. As I understand it, sustainability takes the long view. Activism focuses on the urgent awareness, or directly affecting change. As I understand it, a combination of discovering new knowledge, promoting awareness, or directly affecting change. As I understand it, a combination of discovering new knowledge, promoting awareness, or directly affecting change.

3. THE CONTEXT FOR DESIGN

To some extent, these applications and questions are being explored in the ubicomp and sensing systems communities using both current and near-future technologies. There is related work by UCLA, MIT, Dartmouth, Columbia, Carnegie Mellon, Intel, Nokia, and many others in the “urban sensing”, “people-centric sensing”, “participatory urbanism”, and similar areas. [6-12] These approaches could be applied within the proposed technological time capsule of our workshop. The significant challenge facing us is how to move from early research to more significant and active contributions, both locally and internationally.

For this workshop, perhaps this thought experiment can help uncover assumptions underneath our current design practices and the status quo of academic research. To continue the earlier analogy, many supporters of the “green building movement” promote the idea that we can make our building approaches more “sustainable” or energy-efficient while benefiting the bottom-line of the organizations and people that build them. While this is a reasonable goal and often helps such projects find traction enough to get built, it can encourage assumptions and qualifications to our analyses that do not take into account other social goals, cultural values, or attempt full consideration of the economics or consumption practices involved.

For example, Emily Wadhams of the National Trust for Historic Preservation makes the argument that to recover the energy put into the creation of an older building, after it is demolished and replaced with a new energy efficient one, can take decades. [3] Similar assumptions to this one—that new buildings with expensive eco-materials necessarily reduce overall energy use, that a zero-sum economic result is a minimum criteria for success, or that the commercial market offers the only opportunity for significant contributions of technology—represent only one set of possible contexts for our decision-making or for answering the questions above. We should consider possible public policy mechanisms to bring new capacity to communities or to support sustainable approaches to meeting people’s needs. These might include not just regulatory enforcement, as in California’s Title 24 Building Energy Efficiency Standards, [4] but stimulation of expression and innovation in the communication channels created by new technologies, such as the U.S. Public Broadcasting Act of 1967 [5]. (Perhaps it is time to consider publically programmed services in the rest of the wireless spectrum, and not just television and radio.)

As designers, we could start by creating better explanations of what we think is possible now to others whose expertise could help us relate to it to both local and global challenges. We might embark on our own investigations with the tools that we have. If our technology was frozen, we would have unfamiliar advantage:
innovating within existing capacity will not be passé or underfunded. We needn’t worry about our technology being superseded, or having to move to a new platform, or feeling the familiar stasis of waiting for the right technology to arrive. The active use of current internet and mobile technologies in ad-hoc crisis response and more generally in developing regions illustrate that this is possible and productive.

4. CONCLUSION
The concepts of sustainability and stewardship challenge us to value the existing as well as the new, and not to mistake the availability of a means for the motivation to use it. Perhaps the position is obvious. It also feels like unfamiliar territory for both technology and pop culture. To leverage the scale of ubiquitous computing towards sustainability—to make ubiquity matter—we have to be willing forget it as a motivation. Sustainability demands by definition that we focus on what already exists out in the world, and only then on what we will expend energy to build anew. Hybrids of the two may be some of the most interesting, humane, and challenging solutions we will find. The larger the scale we look at, the bigger variety of devices we will see in use, the older many of them might be, and the more we will have to work with. In this workshop, like Pacala and Socolow, let’s look at what we already have, and make a similar analysis of ubiquitous computing around what we feel is significant, urgent, and not-for-us.

5. ACKNOWLEDGMENTS
The architecture example is heavily influenced by conversations with Kaitlin Drisko, Peyton Hall, Chris Gray and others of the historic preservation community in Los Angeles. Thanks also to the anonymous reviewers for their insightful comments.

6. REFERENCES