The Human Experience

Gregory D. Abowd
Georgia Institute of Technology

As our readers know, *IEEE Pervasive Computing* serves as a meeting ground for various intellectual disciplines that attack the challenges Mark Weiser and others have put forth. We encourage submissions that explore the human perspective of pervasive and ubiquitous technologies and applications, and here we present four such articles. Although research focusing on the human experience often requires a deep understanding of the technology, the goal is not simply to develop new technologies. Rather, the objective is to shed light on how to design for and better understand human interactions in a world of increased technological accompaniment.

Exploring the human experience

Many questions motivate this line of research. For example, who are the stakeholders that pervasive technologies affect? Decades of research into human-computer interaction and human factors have expanded our definition of *user* from a single individual to groups. It is no longer sufficient to explore just the individual's psychology and cognitive structure. The sociology of communities and the market impact of various sectors or demographics also influence design direction.

What pervasive computing technologies will drive adoption well into the future? Some research directly targets this question, while other research seeks to explain how human issues often counteract an otherwise compelling application. Pervasive computing has energized many researchers because it is targeted at everyday lives and practices, presenting new challenges beyond an office's more structured activities. In this special issue, articles address popular pervasive computing domains, including education, retail shopping, and assisted living. The challenges in these domains concern both the work activity's structure (or the lack thereof) and correct measures of success.

How do we measure and document progress in our understanding of the human experience? Measuring success is just as important in human-centered research disciplines as it is in technology-driven disciplines, but it often takes on a very different form. Classical empirical studies of people and technology often present hypotheses on human performance in the presence of highly controlled technological settings. Human performance is directly linked to objective measures of efficiency, such as time-to-completion or error rate. Although these quantitative measures remain important, they are not the only effective gauges for understanding technology's impact.

In less structured activities, efficiency might matter less in gaining a deep understanding of how people cope and coevolve with technology. Beyond summative (that is, post deployment) empirical studies, it is important to conduct formative studies of people and technologies (that is, studies prior to and during design), especially in situations such as pervasive computing in which technologies' potential purposes are not clear.

In this issue

"Using the Experience Sampling Method to Evaluate Ubicomp Applications" describes a quantitative and qualitative evaluation technique gaining popularity for investigating formative design challenges for ubiquitous computing. An examination of experience sampling to motivate the need for technology such as the Intel Personal Server demonstrates how this field observation technique can inform design.

"Consumers and Pervasive Retail" describes the evaluation of pervasive technologies in a European retail environment. It is often too expensive to deploy a new technology widely enough to predict its impact on user practices. This article demonstrates how we can carefully evaluate design studies and limited deployed prototypes to gauge consumer reaction.

An effective summative assessment of technology requires adoption into everyday practice. "Designing for Ubiquity: The Perception of Privacy" presents conclusions from a series of careful interviews with stakeholders from a sensor-rich assisted-living community, uncovering the trade-off between invisible sensing technologies and issues of notice and consent that are cornerstones of fair use of information technology. This work is most meaningful because it relates to individual perception of technology's value after adoption.

"The Smart Classroom: Merging Technologies for Seamless Tele-Education" is the most technology-centric of the four articles. Many researchers have explored the application of pervasive technologies in education. This work describes the development of a remote, synchronous teaching experience with an emphasis on how to coordinate existing and novel technologies.

The articles in this special issue reflect a good variety of research efforts from the human perspective in pervasive computing. *IEEE Pervasive Computing*'s editors want to stress to potential authors the importance of research reflecting human as well as technological concerns in this increasingly important field of mobile, ubiquitous, and pervasive computing. ℙ

the **AUTHOR**

Gregory D. Abowd is an associate professor in the College of Computing and the GVU Center at the Georgia Institute of Technology. He is also the director of the Aware Home Research Initiative at Georgia Tech. His research interests involve applications research in ubiquitous computing, concerning both human-computer interaction and software engineering issues. He received a Dphil in computation from the University of Oxford. He is a member of the IEEE Computer Society and ACM. Contact him at abowd@cc.gatech.edu; www.cc.gatech.edu/fac/Gregory.Abowd.