Conferences

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Appliance Design for Pervasive Computing

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The First International Conference on Appliance Design (1AD) took place at HP Labs, Bristol, UK, on 6 to 8 May 2003. The AD conference series intends to bring together a mixed academic and industrial audience with diverse backgrounds in broadcasting, entertainment, consumer electronics, computing, and telecommunications. As the conference subtitle states, it aims to "create a new community of design practice at the dawn of pervasive computing." And indeed, 1AD offered the opportunity for a diverse audience of computer scientists, electronic engineers, designers, architects, and business strategists to discuss and to blend all the perspectives of design—physical, functional, interaction, graphical, and information—of the emerging pervasive computing systems and infrastructures.

Unlike the Pervasive, Ubicomp, and Percom conferences, 1AD focused on interaction design. By the conference's end, the diverse set of participants had indeed found common ground. They had also established an open dialogue, had developed some understanding of each other's priorities, and had come to identify several common strands in the work of interdisciplinary teams.

KEYNOTE SPEECH I: BILL MOGGRIDGE

Bill Moggridge is a cofounder of IDEO, a consulting firm dedicated to user-centered design of products, services, and environments. His work has focused on digital-device design since the mid sixties.

Moggridge addressed issues relating to the coexistence of designers, computer scientists, and engineers in the same team, a mode of interaction that he has been involved in since early in his career. Although such interactions have been occurring for several decades, the need for a better understanding of the mechanisms that make collaboration in interdisciplinary teams effective is becoming more urgent—primarily owing to their complexity and increased importance to product development. Indeed, such collaboration is a delicate balancing act. On the one hand, engineers aim for higher system performance, and they often evaluate their success using quantitative criteria. On the other hand, designers work in the subjective circumstances of personal experience and aesthetics. This tremendous difference in approach frequently causes tension between team members.

Working in mixed teams is a necessity today. However, the combination of interaction design, service design to accommodate business models, and technical infrastructure development, as well as the possibility for significantly improved functionality, raise this task's complexity. This situation also necessitates that teams rather than individuals work together to deliver a solution within the time and resource constraints available.

Even in the design community, traditions and approaches, as well as perceived priorities, differ significantly. For example, interaction design focuses on developing electronically mediated experiences, while architecture focuses on developing spaces for use. This difference in focus implies that, although both share the same priorities, they address the requirements at completely different scales (more on this issue in Bill Buxton's talk later). All these different disciplines and traditions are merging into a new design discipline, which encompasses all aspects of the above elements and works toward shaping everyday life through digital technologies.

The development of this new discipline is creating the current tension and convergence. Indeed, personal digital technologies have followed three evolutionary stages (see Figure 1), from being a leisure activity for computer enthusiasts, to becoming a business tool for professionals, and today emerging as everyday consumer appliances. So, computer and telecommunications technologies have migrated from the technology-intensive environment in which they first appeared to an environment where no technical sophistication is available. Subsequently, the development focus has shifted from "how it works" to "what you do with it." Thus, today, design aims to improve the quality of interaction and system responsiveness by fusing together visual, sonic, and long-lasting elements. At which point, Bill Moggridge declared that we are at the "era of the consumer" and that the way forward is through participatory design at a professional level.

The remainder of Moggridge's talk discussed particular case studies in which he
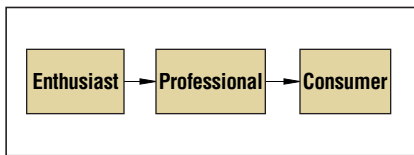
Figure 1. The evolution of electronic technologies and their user profiles.
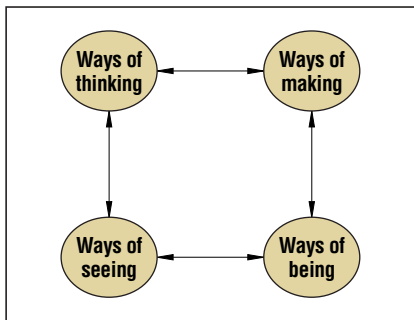

Figure 2. Irene McAra-McWilliam's creative process model.

has been directly involved, with an emphasis on design failure as well as opportunity. He sees the failure's cause in different realms, particularly in a device's or service's value to the consumer, the specific consumer needs it addresses, and consumer perceptions of it. For example, the Softbook, an early electronic book, failed in the market possibly because the resulting experience was too novel for the consumer. H2Eye's Spyfish submarine telepresence vehicle has been redesigned to use sound and graphics to evoke the feeling of being underwater while ensuring that the user maintains movement orientation throughout his or her undersea session.

Finally, Moggridge presented Prada's first Epicenter store, which opened in New York City and features the interactive dressing room. All merchandise contains radio frequency identification (RFID) transceivers with immediate access to back-end data through sales staff appliances. The customers themselves are also identifiable through their RFID-enabled loyalty cards. Each dressing room is a simple eight-foot-square booth with Privalite glass walls that switch from transparent to translucent when a room is occupied. Once inside, customers can switch the doors back to

transparent at will, exposing or protecting themselves from onlookers. Lighting controls let customers view their selection in either a "warm evening glow" or "cool blue daylight." While inside the dressing room, customers can directly access information relating to their particular garment selection. When garments are hung in the closet, embedded RF readers scan their RFID tags. Finally, the dressing rooms feature a video-based "Magic Mirror" that lets customers see an image of their back. As customers turn in front of the mirror, the image becomes delayed, letting them view themselves in slow motion from all angles.

KEYNOTE SPEECH II: IRENE MCARA-MCWILLIAM

Irene McAra-McWilliam is the director of the Department of Interaction Design at the Royal College of Arts and former director of Design Research & Development for Philips Design. She discussed "the creative process"—that is, a novel methodology for creating "new things." This process is fundamentally different from information systems design and development methodologies, and it provides a useful insight into how disciplines other than computing develop their solutions. A main reason for this approach's development has been the realization by McAra-McWilliam and her colleagues that a main problem in interaction design today is that electronic and computer based artifacts are developed to replace rather than elevate human traits. In effect, such designs redefine humans in terms of computer qualities rather than the other way around. This approach creates significant friction in using pervasive services and appliances because it directly conflicts with humans' need to sustain themselves and their perceptions of themselves as individuals.

The creative process model (see Figure 2) works best for planning or reevaluating a strategic design process because it exposes the raisons d'être behind observable characteristics or designs and interactions. The model

develops around four motifs:

- The psychology of possibility (design koans)
- Creativity with uses (seeing the world)
- The design process (insight and imagination)
- Making worlds (embodying and shaping)

Its main objective is to prepare individuals from distinct backgrounds for collaboration. In fact, the speaker identified collaboration and connectedness as the main ingredient in creativity.

McAra-McWilliam used the model to draw some corollaries about collaboration in interaction design. First, the interaction between ways of making and ways of being is a core factor in the high stress levels related to technology use ("if it requires effort to use, it causes stress"). Familiarity and intuitiveness come from reflection on actions and are embedded through experience. That is, they close the cycle from ways of being to ways of making. However, there are significant pressures and lack of time to reinforce this feedback loop.

Second, prototypes play different roles in computing and in design. For computer engineers, prototypes are constructive, in that they're the first step to implementation. For designers, prototypes are destructive, in that they're created to be destroyed, with their deconstruction furthering the creative process.

Finally, McAra-McWilliam observed that the path she presented as a forward process (from ways of being to ways of making) has been followed backward throughout design history. Originally, design was considered a means for making artifacts. Over the past decades, it has been transformed several times, and today is seen as a means to reflect identity.

KEYNOTE SPEECH III: BILL BUXTON

Bill Buxton is a principal of Buxton Design, a design and consulting firm, and an associate professor in the Uni-

versity of Toronto's Department of Computer Science. His talk revolved around two themes: technology as prosthesis and location as an interaction paradigm.

In this context, "prosthesis" means to extend human capabilities through additions to these three dimensions: our motor or sensory abilities, cognitive abilities, and social skills. To this end, Buxton proposed an appropriate measure of success for prosthetic technologies: whether the new service or device reduces or increases complexity of a situated task and whether it increases or reduces the user's control of this complexity. This measure reflects the need for higher fidelity in the three dimensions of prosthesis. Finally, he reflected that the design process for systems augmented by computational and communications capabilities should aim to increase those systems' intelligence. Following Piaget, he defines intelligence as a system's or organism's ability to adapt and assimilate to a changing environment.

Regarding location, Buxton addressed the relationship between design and architecture and the fact that the former evolves to be more like the latter. That is, although objects as devices or service portals are important, the need is increasing to design behavior instead. Indeed, Buxton believes that a key challenge in industrial design is making informed decisions in terms of the behavioral aspects of what's being designed. He offered a possible solution inspired by a quote from Louis I. Kahn: "Thoughts exchanged by one and another are not the same in one room as in another." He considers this concept to be true not only for thoughts exchanged between people but also between people and devices, and even devices and devices. So, the physical and social proximity and the social and physical (rather than solely information) ecology in which ideas are being exchanged have a crucial, but as yet unexplored and underexploited, impact on the exchanges themselves. Therein lies the potential usefulness of exploiting location, which can signifi-

cantly reduce the complexity of use for systems and concepts such as ubiquitous computing, augmented reality, wearable computing, and pervasive computing.

EXHIBITION

One of the most interesting aspects of 1AD was the research exhibition, held during the afternoon of the first day after the paper presentations. Several interesting installations attracted visitors' interest; I discuss three here.

Notably, a competition of Schminky ran throughout the conference, with the winners receiving an award from HP Labs. In Schminky, players try to identify the missing sound from a musical pattern, an adaptation of an idea from Simon, the old gamer favorite. However, Schminky is played in groups. Players can search for and invite others over a wireless network, the idea behind the game being to foster interactions in public spaces. According to the game developers at HP Labs, Bristol, a Schminky installation ran for a week-long trial at the Watershed Café in downtown Bristol, with great success (http://cooltown.hp.com/mpulse/0603-Schminky.asp).

Web Signs are "display-based Internet appliances" developed by Appliance Studio under its Smart Signs initiative (www.appliancestudio.com/sectors/smartsigns.htm). They form the basis for a range of applications that require low-cost, low-footprint, software-configurable displays. They're situated displays furnishing a flat-panel touch screen, wireless networking, and an embedded Web server. They're often used together with Web-based collaboration servers to provide office and workplace signage, retail point-of-sale terminals, or adaptive, interactive displays for museum galleries and exhibitions. They run on the company's own embedded Linux operating system.

Finally, "A Walk in the Wireless Woods" is one of the "experience projects" that form Equator, the premier pervasive computing academic-research collaborative in the UK (www.cogs.susx.ac.uk/projects/equator). The proj-

ect showcased the Periscope, cooperatively developed by researchers from the universities of Sussex, Nottingham, Bristol, and Southampton, and the Royal College of Art. The Periscope is an interactive device designed to be situated in woodland and to augment children's field trips by providing relevant information to their outdoors activities. It consists of a display and a collection of RFID sensors. Users control it by rotating it and twisting the handles. A collection of Petri dishes fitted with RFID tags let children carry out experiments, with the results appearing on the display.

1AD successfully provided a forum for discussing the emerging pervasive information appliances that will require multidisciplinary teams to reach across traditional and subject matter boundaries, encompassing the various types of design, technology innovation, and human-centered studies. It also highlighted issues crucial to facilitating collaboration and the practicalities of such collaborations, including mechanisms to help build common understanding.

2AD will take place 11 to 13 May 2004 at HP Labs Bristol and will be structured around six themes:

- The knowledge workspace
- Home and entertainment appliances
- Wearable appliances
- Games and social experiences
- Urban contexts
- Experience design

2AD will introduce an "appliance bazaar" and a robot soccer tournament to increase audience participation. ℙ

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