PROVOCATIVE AWARENESS

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ABSTRACT

Recently a number of systems have been designed that connect remote lovers, or strangers in an urban setting. The forms these systems take and the functions they serve may be unfamiliar, but they can be seen as extensions of awareness technologies to new domains. Awareness technologies have often been specialised to give information for particular work activities or relationships. Given that relationships in the home or in local communities tend to be different from those of the workplace, it is appropriate that both the form and content of information conveyed to increase awareness should be different as well. The systems described here, for instance, explore new sensory and interaction possibilities, use ambiguity to increase engagement, and address a wider range of emotional relationships than do most workplace awareness systems. They point to ways of extending notions of peripheral awareness to new domains on the one hand, and possibilities for new forms of workplace awareness on the other.

INTRODUCTION

The Bench Object, designed by Fiona Raby (Dunne and Raby, 1995) is intended to be found in a public space. Equipped with sensors and heaters, the seat warms when somebody sits on a partner bench (Figure 1). The effect is a visceral feeling of intimacy with the other person, potentially as uncomfortable as sitting on a recently vacated seat. The Bench Object provides peripheral awareness of other people, but in a form that is unfamiliar and disturbing. Its effects rely on two features: First, in using warmth to indicate the presence of another person, the bench conveys a direct sense of their corporeality. Second, its situation in a public space implies intimacy with strangers, challenging assumptions of public inaccessibility to which urban dwellers are accustomed.

Designs like the Bench open up notions of the perceptual senses that might be used in conveying peripheral awareness, and illustrate possibilities for technology-mediated awareness to be quite direct. Such designs also point to new possibilities for the functions and experiences awareness systems might serve, suggesting forms of telecommunications that might fit domestic or public spaces rather than the workplace. Despite being unusual, designs like the Bench Object have continuity with and can be seen as extensions of more traditional systems for supporting awareness.

Figure 1. Raby's Bench objects warm when people sit on partner benches, providing an uncomfortable sense of their presence and corporeality.

Focusing Peripheral Awareness

Notions of peripheral awareness as a resource for shared work grew to a great degree from experiences with video mediated communication. Mediaspaces—computer controlled networks of audio and video linking offices and public space—were intended to short-circuit physical distances, allowing some of the benefits of co-location or proximity in terms of the ease of coordinating activities or entering into serendipitous communication (Bly et al., 1993; Root, 1988; Stults, 1986). These benefits include not only the ability to engage in focused, task-oriented conversations, but also and crucially on a more general orientation to the presence and activities of colleagues.

Peripheral awareness, as embodied by mediaspaces, seemed to depend on rich, unfiltered information conveyed through images or sounds. After all, awareness is 'peripheral' insofar as it concerns activities that are not foreground tasks, so it would seem that information meant to support it should be relatively open-ended in order to maximise the chances that it will be good for some as-yet undetermined collaborative activity. In addition, it makes sense to avoid text and concentrate on visual or auditory presentation to avoid task interference, particularly in office environments where much work involves speaking, reading, or writing. From this point of view, video appeared to provide a good basis for general awareness, allowing people to appropriate what they need as resources for their current activities.

Assumptions that information for peripheral awareness should be unselective and avoid speech or text, however, may have been misleading. To begin with, it is not the case that video itself is unselective. Ethnographic studies of collaboration in established working environments (e.g., Heath and Luff, 1991) argued that the framing of video, and in particular the emphasis on head and shoulders views, cuts out gestures and artefacts that may be crucial for coordinating work. This led to attempts to modify video views (e.g. Gaver et al. 1993), but overcoming video's essential limitations—including those related to privacy—is difficult. Thus other awareness systems turned towards greater mediation of information, using electronic systems ranging from door icons, to multiple cursors in shared drawing spaces, to animated avatars in virtual environments. Such techniques remain in the family of peripheral awareness systems in that the information they convey concerns the context of activity, but they involve a significant narrowing and design of information offered for awareness.

The increasing development of systems providing focused information for awareness does not negate the hypothesis that peripheral awareness may best be served by rich, unselective information. Rather, such systems reflect the fact that all technologies are constrained in terms of the information they can convey. Using more sophisticated understandings of how people actually coordinate everyday work allows systems to be developed that make a virtue of technological constraints, by

working within them to provide the information necessary for certain forms of shared activities. Such systems make hypotheses, implicitly or explicitly, about the information that is and is not useful for people to coordinate work, and thus emphasise some experiences over others. In focusing on the support of relatively well understood aspects of shared work, however, we may question whether such systems have abandoned the potential to provide more subtle and open forms of shared experience that early mediaspaces allowed.

Awareness at Home or on the Street

Current systems designed to support peripheral awareness have grown with business environments in mind. Because of this, they tend to embody assumptions about the underlying goals of providing awareness, the information that might be useful, and the media by which they might be conveyed. As collaborative technologies move out of the office and into the home or local community, new goals emerge, and thus new requirements for information and media. At home technologies could support emotional connections, providing access to other peoples' moods or attitudes, not simply their presence or availability. Within the community, technologies might help bridge different social groups, values and attitudes, to potentially mediate the communication of varied subcultures. These new functions for awareness technologies imply new forms and new means of conveying information.

In the following sections, I describe a number of systems that have been designed to support communication in the home or in the community. The systems described here fall into two complementary groups. First are systems intended to provide emotional connections among people who are distant from one another but would like to feel closer. The second are systems for community settings, intended to create contact among people who are physically close to one another, but emotionally and culturally distant.

This work comes from a design tradition, rather than the science and engineering approaches underlying most research on human computer interaction and computer supported collaborative work. There are several distinctive features of work from this tradition. First, most of these projects take the form of design proposals rather than implemented systems. This springs from a focus on the systems' aesthetics and cultural implications rather than the technologies used to implement them. Second, they are ‘tested’ informally in studio or gallery settings or via descriptions and scenarios (c.f. Martin and Gaver, 2000). This reflects a stress on the evocative potential of design concepts, their ability to provoke understanding and imagination, and implies a form of evaluation centred on the richness of insights and inspiration they may offer (see also Dunne and Gaver, 1997).

From this point of view, the design concepts I discuss here should not be taken as implemented systems so much as instantiated arguments about the forms that awareness technologies might take. My purpose is to bring these arguments to a new audience, to suggest ways that notions of peripheral awareness traditionally discussed in the computer supported collaborative work community might be expanded in form and in function. Several themes run through this work. First, in exploring a wide range of forms and media, the designs presented here suggest that awareness technologies might explore a wider range of sensory and aesthetic possibilities. Second, in conveying information imprecisely, they suggest that hints or clues about other people’s activities may be as effective, and more emotionally satisfying, than more complete information in evoking experiences of connection. Finally, in addressing a variety of relationships, they suggest that awareness

technologies might reflect and support a wider range of activities and situations supported by peripheral awareness than they do now.

INTIMATE CONNECTIONS

Separated lovers may employ letters, the telephone, and even email to maintain their relationships, but it often seems difficult to use symbolic media in creating a shared emotional experience. A variety of proposals have emerged recently for systems that use less precise, non-linguistic displays to evoke or communicate emotions. Most are concerned with creating emotional connections between lovers when they are apart, though some focus on less intimate friendships.

Feather, Scent, and Shaker

In an early exploration of emotional communication, Rob Strong developed a number of experimental systems for supporting emotional relations while a student at the Royal College of Art (Strong & Gaver, 1996). The Feather, for example, describes a scenario in which a travelling partner would carry a small picture frame showing perhaps a romantic photograph of the couple. Picking up the frame closes an electrical circuit as a low current flows through the user's body itself, causing the device to make a connection to a linked device placed in the home. This is a small wooden cabinet mounted on long legs, with a clear plexiglas cone extending above it. When the connection is made from the picture device, a small fan mounted in the cabinet activates, wafting a small white feather to float around within the cone (Figure 2). The drifting feather becomes a poetic metaphor for the thought of the absent lover.

The Scent device is similar to the Feather, but the receiving device consists of a large bowl with a heating element that warms a smaller container of essential oil, causing scent to permeate the local environment (Figure 3). The use of smell is evocative and intimate by its nature, and in addition allows the signal to be customised, perhaps by the use of the couple's favourite perfume. Even after the connection is broken, the scent lingers, like the memory of a recent encounter.

Figure 2. Feather: when an electronic picture frame is handled, a small feather drifts within a clear plexiglas cone.

Figure 3. Scent: the smell of oil heated in a small bowl indicates that a connection has been made.

Figure 4. Shakers: moving one device causes the other to move analogously.

Shakers, finally, are aimed at less intimate, more playful relations among friends. Pairs of devices are linked, with each containing a solenoid and transmitter/receiver device (Figure 4). Shaking one simply causes the other to shake in an analogous fashion, allowing people to communicate in a direct language of gentle or forceful movements. Similar devices have since been proposed both by Hiroshi Ishii's group at the MIT media lab (Brave & Dahley, 1997) and by students at Stanford University (Fogg et al., 1998). The notion behind all of these designs is that in allowing a variation of tactile communications, more or less explicit languages and games might evolve.

Strong's designs demonstrated the possibility that emotional relationships might be mediated using perceptible indications of connections. Although never tested with real lovers, both the proposals and the objects themselves are greeted with

delight by many people. There seem to be several factors in their success. First, they rely on evocative materials and mappings, without resorting to obvious metaphors— in fact, it can be argued that they are not symbolic at all, or perhaps that metaphor is employed in literary rather than didactic ways. A second factor is their physicality and use of senses not typically addressed by technology. The effect of the Feather, for instance, would seem less powerful or poetic if it were merely simulated onscreen. Finally, they open new functional domains for awareness technology, suggesting that peripheral awareness is important in supporting emotional as well as working relationships.

Kiss, Heartbeats, and Other Possibilities

A number of other designs intended to convey emotional messages have been explored. For example, members of a student initiated workshop held at the Delft University of Technology (Society of Industrial Design Engineering Students, 1997) suggested a simple system that transmits heartbeat information from one lover to another. Taking the form of a brooch or pendant, perhaps, such a system would monitor the heartbeat of one lover to control a display worn by another. Although it was only simulated using video, the results were surprisingly powerful. Even with simple displays, the direct reflection of another's heartbeat seems capable of creating a powerful sense of connection.

Rachel Murphy, an interaction designer and jeweller, explored a variety of other possibilities for emotional communications. These including devices to be worn in the ear which warm up when a partner object is heated with the breath (Figure 5), or a pendant with small streamers which blow around in response to a distant partner's voice. Her focus differed from that taken by the Delft students in emphasising how the sensual experience evoked by various materials and interactions might be appropriated for use in conveying emotion.

Finally, the Kiss Communicator, designed by Heather Martin and Duncan Kerr of IDEO (Barley, 1999) is a more sophisticated tool for supporting intimate communication. Inspired by the idea of blowing a kiss to an absent lover, the Communicator is a rounded, handheld device with embedded sensors, processing, and communications facilities, and a display created by coloured LED's (Figure 6). Blowing on the device creates ripples of light that move just under the surface of the translucent object. Once a desirable pattern of has been achieved it can be sent to the partner device using the communications software, so the partner will see the same pattern. Expression is achieved by varying the force of the blow, for instance modulating from a gentle sigh to a harsher puff of breath.

Figure 5. Murphy's earwarmer heats when a partner object is warmed.

Figure 6. Patterns of light on the Kiss Communicator reflect the breath of a distant lover.

By conveying the breath, the Kiss Communicator carries an intimate signal to the partner. It clearly relates to Feather, Scent and Shaker in providing a medium for intimate communication. Moreover, the large range of patterns that can be formed, combined with the ability to choose which patterns to send, potentially allows a more complex language to emerge from its use, one which can be more deliberately con trolled than that suggested by the Shaker and similar objects. Most importantly, however, in reflecting the breath of a partner, it combines the directness of a heartbeat monitor with a rich and sensuous material aesthetics, suggesting that it might well allow a directly expressive form of communication.

Reflecting on Emotional Communications Systems

Despite a growing number of design experiments dealing with conveying emotions, there has been little explicit consideration of the hypotheses about emotional communication that these concept prototypes imply. Here I raise several issues that are important in thinking about this work. First, it seems important to distinguish systems that actually communicate emotions from those that simply evoke them. Devices that provide direct indications of physical or sensuous activities such as the heartbeat, the breath, or physical movement might serve as a true medium for expressing emotions to one another. Alternatively, devices might be closer to triggering emotional reactions or mimicking the effects of emotional communication insofar as their effects depend on sensuous forms, materials, or interactions.

The poetry of designs such as the Feather, for instance—from the picture frame to the feather itself—rely on the particular materials employed, and their abilities to evoke emotional responses. In terms of the information transmitted, the picture frame might as well be replaced with a pushbutton, and the feather with a light. If this reduces the system's emotional resonance, it is because of a change of materials, not the potential for interaction. As it is, when the feather drifts in its plexiglas enclosure there is no way to tell whether it is in response to a distant lover staring adoringly into the picture frame, a perfunctory shake given the picture frame before going out, or the frame being dusted by a cleaner. Given these limitations, the devices may be too constrained or sentimental to be emotionally satisfying in the long run—for instance, there is no way to argue or express displeasure using the devices, except implicitly by refusing to send a message. Finally, because the display is created by a designer, it may become relatively impersonal for the people using it, as clichéd and inauthentic as a greeting card.

The appeal of the Feather is in its materials; its limitations come from the constrained interactions it allows. Systems such as the Shaker, the heartbeat monitor, or the Kiss Communicator, on the other hand, imply richer possibilities. The emotion is not in the form of their output, but in the dynamics of their use; it is in their interactivity that the emotional nature of the messages lies. It should not be inferred from this that evoking emotions is necessarily less desirable because it might be less sincere than more direct communication: a dozen roses delivered to the door is usually considered a welcome signal of affection even if a clearly symbolic, asynchronous, and mediated one. Instead, the point is that issues about what it means to evoke emotions versus communicate them—or whether what is being conveyed is emotion versus some visceral sense of presence—have not been explored deeply in the design of these new forms of communication. In the long run, balancing the directness and richness of designs like the heartbeat monitor to the aesthetic richness of designs like the Feather is the challenge in creating devices that engender fulfilling emotional experiences.

Related to this, we have only begun to understand the tradeoffs involved in creating a deep sense of intimacy while retaining autonomy. Direct access to one another's heartbeat, for instance, may create a powerful sense of physical intimacy, even at a distance, but it may also lead to problems in negotiating privacy. What is one to think if one's lover's heartbeat starts pounding strongly in one's absence? While creating a sense of union at a distance may be desirable, it raises a conflict between the desire for intimacy and that for personal autonomy that must be addressed with delicacy.

Workplace awareness systems have tended to address privacy either by assuring symmetry or allowing senders to set how much information is revealed. Neither of these is entirely satisfactory for emotional communication, however. Symmetry may redress one-sided monitoring or intrusion, but by enforcing equal losses of autonomy. Privacy settings allow more fluid transitions between intimacy and autonomy, but the explicit act of changing settings to reduce intimacy, however, itself may convey an undesirable emotional messages. Design proposals for emotional communication devices have thus relied on two other strategies little explored in workplace system (though see Hudson and Smith, 1996): either sending information is made an explicit act, or systems use minimal, impressionistic messages. These strategies reduce the peripheral nature of sharing information in complementary ways. Explicitly sending information is a foreground activity for the sender, while potentially remaining in the periphery of the receivers' attention. Sending impressionistic images, in contrast, may be peripheral for the sender, while requiring more attention from the recipient to interpret.

If issues of directness and autonomy are not well understood, it is in part because emotional communication itself is mysterious. Devices meant to support it are relatively new, their designs based on relatively unarticulated intuitions, and tests of their ability to produce emotional connections limited to demonstrations of prototypes. They are valuable in spurring the imaginations of viewers, who can at least give an intuitive prediction of whether the experiences might be fulfilling. Longer-term tests in real situations, however, seem clearly necessary to understand better the issues involved in using technology to mediate intimate communications.

SOCIOCULTURAL AWARENESS

Just as awareness can be extended from workplace systems to the support of more intimate personal relations, so they might be applied to systems found in public places. Raby's Bench Object, for example, was designed to be deployed in a public building, raising issues of the relations between technology and the ways we negotiate privacy and involvement in public spaces. Confronting people with such visceral contact might be uncomfortable, but is meant to emphasise and criticise the degree to which people in urban environments—crowded together on subways, for example, or jostling along busy streets—can simultaneously be physically close, and yet mentally, emotionally, and culturally quite far apart. The Bench Object is a starting point finding ways to reconnect people in urban spaces.

The Bench Object also points to possibilities for expanding upon awareness technologies in CSCW. It is possible that strategies used to allow working colleagues to be peripherally aware of one another's activities might also be valuable in increasing mutual awareness of separated urban inhabitants. Where the need for workplace awareness is often satisfied by information about the presence and activities of remote colleagues, however, community awareness might benefit more from information about attitudes, values, and cultures.

The Schedule

A project which I pursued in collaboration with Apple Computer illustrates the range from instrumental to cultural awareness. The goal of the Schedule was to develop a visualisation of the Computer Related Design course's timetable to be projected in a public space. Initially, the research was intended to test whether the affordances of such a display would lead to greater accountability amongst the staff and students of the course. We displayed a very simple version (Figure 7) over a few months, and it worked. Meetings tended to start on time, and not get rescheduled too often.

Figure 7. The basic Schedule display showed events clearly, but was felt to be boring and unattractive.

Figure 8. Students visualisations conveyed a variety of cultural messages in terms of tone or attitudes towards the course (clockwise from upper left: The Spiral Schedule by Noel Douglas and David Eveleigh; The Flower Schedule by Peter Hodgson, based on a concept by Rachel Murphy; The Gear Schedule by Richard Lloyd and Jae Sung Ryu; The Metallic Schedule by Shiro Wilde).

The visualisation seemed ugly, however, so we set a student project to design different representations of the schedule. With about half a dozen alternative visualisations being developed (see Figure 8 for examples), it became clear that the differences among them had less to do with the functionality of the visualisations— though of course these varied—and more to do with the cultural implications of the aesthetics they employed. Some seemed friendly and happy, with smiling people or flowers representing events. Others seemed cold or even hostile, using abstract slabs of material or even gigantic cogwheels that emphasised the mechanical nature of the school year.

Considering a wide range of representations for the same sort of awareness information emphasises the distinction between perceptual cues meant to inform and those meant to evoke emotional and imaginative reactions. The particular aesthetics of the interface—whether it is austere, businesslike, or friendly—convey cultural messages, not only to those within the group using them, but to outsiders. The choice of a metaphor used to express the course schedule, for instance, is not merely constrained by how well it maps to the nature of events or to time itself, but also to whether it implies the course to be relentless, humane, joyful, or alien. Even more abstract representations have connotative effects in the aesthetics they employ, their choice of colours, forms, and visual style.

That elements of form tangential to a product's core functionality send powerful cultural messages is familiar to anybody who has bought their own clothing, yet it often seems overlooked in the development of high technologies. This has implications for any software, from word processors to virtual environments, but particularly for those aimed at supporting collaboration. It is impossible to avoid the sociocultural messages conveyed by designs, or the constraints they place on the peripheral messages that might be sent. Moreover, it is possible to use them, to create effects that provide a useful context for the more focused information that is the explicit aim of the system.

Projected Realities

Another example of a project exploring how systems providing awareness information might be used in public spaces was aimed at enhancing the presence of the elderly in their local communities. This work was undertaken as a part of Presence, a European Union project that involved 7 partners from 4 countries, working with 3 communities (see Gaver & Hooker, 2001; Gaver & Dunne, 1999). The Projected Realities system focused on the Bijlmer, a troubled area outside of Amsterdam. A large planned community, based on Le Corbusier's Radient City, it was initially conceived to provide more pastoral settings for workers from Amsterdam. Today it is an area with a very bad reputation within the Netherlands. With high unemployment, crime, and a large immigrant community, it is viewed as a dangerous and unpleasant place to live.

In familiarising ourselves with the area (see Gaver et al., 1999), we realised that despite its problems the Bijlmer has many attractions. It is culturally rich community: the influx of immigrants means that many diverse traditions colour its hidden markets, meeting places, and places of worship. It has a strong sense of place, and people identify themselves as part of the community. And it can indeed be a pleasant area, particularly in the spring or summer, when people bring their caged birds outside to sing in the parklands that surround the massive housing blocks.

In designing a system to enhance the presence of older people, then, our initial focus on the area's security problems grew to encompass broader issues concerning the mixture of different cultures and attitudes. Realising that local inhabitants felt the area's notoriety was exaggerated, we wanted our system to communicate both within the Bijlmer and between the Bijlmer and the rest of the Netherlands, allowing local citizens both to discuss the area's problems and celebrate its unique multicultural advantages.

The Projected Realities system was designed to collect the opinions and attitudes of individuals and combine them into increasingly more public formats (Figure 9). The prototype system consists of five connected elements:

- Elders were asked to generate slogans—short statements about their lives and the Bijlmer—and collect images in meetings before the system was tested. Each slogan and image was rated along three dimensions to produce a crude numerical representation of its meaning.

- Volunteers were given booklets containing "menus" of the images to take home. Periodically they were telephoned in their flats by an automatic telemarketing system running from a central server in a local flat. The system would prompt them to use touchtones to select the picture that most accurately reflected their mood of the moment.

- The numerical representations of selected images from a group of volunteers were amalgamated into a summary score. This controlled the selection of one of a set of slogans displayed on sloganbenches set in local neighbourhood (see Figure 10). The sloganbenches incorporated mechanical scrolls with the elders' slogans written upon them; controlled via touchtones sent by CB radio, they reflected the attitudes of phone volunteers. In addition, buttons allowed passers-by to change the slogans themselves.

- Periodically, the server polled the benches to determine which slogans were being displayed. Results from the three benches were again amalgamated, and used to select images to be shown on an imagebank incorporating five 28inch monitors in a large cabinet (see Figure 11). Originally intended to be set along a roadside on the outskirts of the Bijlmer, for practical reasons we tested this piece in a well-trafficked area near a tram station within the Bijlmer itself.

The system was designed to create a spreading expression of attitudes within the Bijlmer, with feedback and feedforward components. Displays on the imagebank and sloganbenches were not simply chosen by individuals or groups, but responded to choices made by individuals in their homes, or working with the sloganbenches. Each of the public displays thus acted as an imprecise barometer of local attitudes, with an emergent pattern of issues and attitudes radiating from homes to neighbourhood, and finally to a kind of public face for the area.

Figure 9. The Projected Realities system allowed attitudes to spread from homes to displays in local neighbourhoods and on the outskirts of the Bijlmer.

Figure 10. Slogan benches showed a selection of statements handwritten by local elders, controlled locally by buttons or automatically by radio.

Figure 11. The imagebank showed fragments of local scenes to reflect attitudes revealed by the sloganbenches.

The Projected Realities system relies on the same kinds of peripheral awareness as systems that are proposed for office places or businesses. The images and text are not offered for focused scrutiny on a day to day level. Instead the intention is that they would become part of the background of peoples' lives, like billboards or signposts, that they might notice as they passed on their way to work, to shop, or to socialise.

From Workgroup to Cultural Awareness

The Schedule and Projected Realities systems illustrate how peripheral awareness can extend beyond defined workgroups to larger and more diverse cultures. On the one hand, this sort of awareness may be an unintended side-effect of the forms and aesthetics used to achieve a different primary goal, as when multiple redesigns of the Schedule highlighted the messages that might be conveyed about the atmosphere and tone of the course itself. On the other hand, cultural awareness might be the intended aim of a design as it was with the Projected Realities system.

The aesthetics and tone of an interface can be useful in conveying information about the cultural values of those who use it, but the point is not simply that interfaces should be aesthetically crafted, and certainly not that they should necessarily be beautiful. Instead, designers need to develop sensitivity to, and control of, aesthetics in order to convey desirable connotations, or at least to avoid conveying undesirable ones. Sometimes this is achieved through crafted designs, but other times it can be realised through constraints put on communications media. For instance, constraining the sloganbenches to accept handwritten slogans was useful in emphasising their non-commercial nature.

Systems such as these also raise issues about the media appropriate to support peripheral awareness. For instance, the sloganbenches used text to convey hints about peoples' concerns and attitudes. This seems counterintuitive, as reading text usually seems to require focused attention that would disrupt ongoing tasks. Nonetheless, public advertising, clearly meant to be picked up at the periphery of viewers' attention, often relies on a substantial amount of text. This may have to do with the different primary activities involved in different situations. In business contexts centred on reading, writing, and talking, text often seems too distracting to use for awareness systems (though see Redström et al. 2000). If the primary task is travelling through the city, on the other hand, there seems plenty of spare attention to devote to reading short written pieces.

As with all peripheral awareness systems, it is difficult to gather reliable evidence about the effectiveness of systems such as the Schedule or Projected Realities. On the one hand, our experience with using the Schedule over several months indicated

that it worked well within our group, but there were few or no indications about how it was perceived by people outside the department. The Projected Realities system was tested briefly within the Bijlmer, and reactions were positive— people found the benches and imagebank intriguing but not alienating, and thought that the slogans and images were appropriate for raising awareness within and outside of the Bijlmer. But, as with emotional communications prototypes, these events can only be indicative about possible long-term reactions.

FROM WORK TO EVERYDAY LIFE

As digital technologies move from the workplace to everyday life, they have tended to bring the values of the workplace with them. Devices such as organisers and PDAs, even computers, scanners, and web browsers all imply that people away from work are concerned with same things they are at work: time management, memo writing, information gathering, and content creation. Equally limiting is most "entertainment software," which seems to assume that when we're not working, we're playing games. There is little recognition of the other activities, desires, and aspirations that technology might support outside the workplace.

The projects described here illustrate both some of the values that technologies might embrace, and possible strategies for supporting them. On the one hand, technology might help bridge the physical distance between people who want to be together. Anybody who has been in a long-term relationship knows that telephones and email provide only a superficial connection with one's partner. They are unsatisfactory ways of emulating the intimacy of physical co-presence. By using forms of interaction that are more sensuous and less explicit and symbolic, the systems described here might go some way towards allowing a visceral awareness of absent lovers and friends. In the end, even if they are never a totally satisfactory surrogate either—probably a good thing— at least they might complement more explicit forms of communication in bridging separation.

At the opposite extreme, technology might help bridge the emotional and cultural distances that separate cohabitants of urban spaces. Current uses, however, often tend to isolate people, rather than bring them together. Personal stereos allow us to move through the city in our own auditory world. Public televisions or Internet kiosks allow people to disengage with one another and focus on a centralised media spectacle. Mobile phones may allow us to learn about the everyday lives of users as they chat in the street or on public transport, but largely because they have escaped engagement with immediate surroundings.

Such technologies have valuable roles to play in contemporary society. As I have tried to illustrate, however, it is possible to counter their isolating tendencies with systems that bring strangers together. Interventions such as the Bench Object might usefully confront people with the physical presence and sheer visceral reality of other people. Displays like the Schedule might convey messages about the groups using them, beyond their immediate value for coordination. Finally, systems such as Projected Realities might allow people to share their opinions and beliefs as a sort of legitimate graffiti, communicating with their neighbours and other communities.

It is fitting that the systems described here should rely on forms of peripheral awareness, because despite their development in and for work environments, systems used to support peripheral awareness in the workplace also have an element of

subversion about them. The idea that casual sociality that is not directed towards clearly productive ends might be an important factor in shared work challenges criteria of rational, measurable efficiency for collaborative work systems. Yet this idea seems, at times, to be gaining credence within the industry. It might even be hoped that, just as peripheral awareness moves from workplace systems to those supporting everyday life in the home or the community, so will values and ideas from those spheres find their way back into the workplace.

The designs I've described in this short note also suggest some of the ways workplace awareness systems might expand to embrace more human values. First, designers might experiment with a wider range materials and interactions—such as the heated seats, ear warmers and hand-written slogans described here—that expand the sensory range of telecommunications. These can offer new forms of aesthetic pleasure, allowing systems to evoke deeper and richer experiences on the one hand, and to convey more complex cultural messages on the other. Second, workplace systems could make a virtue of less explicit forms of information, allowing, as the systems described here do, their users to read meaning into fragmentary clues about distant events as a way of encouraging a mutual engagement of imagination. Finally, such systems could more explicitly seek to create links across disparate workplace cultures, allowing people to express their values and attitudes across workgroups both explicitly and through implicit aesthetic choices. By bringing ideas and values from everyday life into the workplace, new awareness systems could not only support collaborative tasks, but collaborative relationships.

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