Designing Calm Technology

Mark Weiser and John Seely Brown

Xerox PARC

December 21, 1995

Introduction

Bits flowing through the wires of a computer network are ordinarily invisible. But a radically new tool shows those bits through motion, sound, and even touch. It communicates both light and heavy network traffic. Its output is so beautifully integrated with human information processing that one does not even need to be looking at it or near it to take advantage of its peripheral clues. It takes no space on your existing computer screen, and in fact does not use or contain a computer at all. It uses no software, only a few dollars in hardware, and can be shared by many people at the same time. It is called the "Dangling String".

Created by artist Natalie Jeremijenko, the "Dangling String" is an 8 foot piece of plastic spaghetti that hangs from a small electric motor mounted in the ceiling. The motor is electrically connected to a nearby Ethernet cable, so that each bit of information that goes past causes a tiny twitch of the motor. A very busy network causes a madly whirling string with a characteristic noise; a quiet network causes only a small twitch every few seconds. Placed in an unused corner of a hallway, the long string is visible and audible from many offices without being obtrusive. It is fun and useful. The Dangling String meets a key challenge in technology design for the next decade: how to create calm technology.

We have struggled for some time to understand the design of calm technology, and our thoughts are still incomplete and perhaps even a bit confused. Nonetheless, we believe that calm technology may be the most important design problem of the twenty-first century, and it is time to begin the dialogue.

The Periphery

Designs that encalm and inform meet two human needs not usually met together. Information technology is more often the enemy of calm. Pagers, cellphones, newservices, the World-Wide-Web, email, TV, and radio bombard us frenetically. Can we really look to technology itself for a solution?

But some technology does lead to true calm and comfort. There is no less technology involved in a

comfortable pair of shoes, in a fine writing pen, or in delivering the New York Times on a Sunday morning, than in a home PC. Why is one often enraging, the others frequently encalming? We believe the difference is in how they engage our attention. Calm technology engages both the *center* and the *periphery* of our attention, and in fact moves back and forth between the two.

We use "periphery" to name what we are attuned to without attending to explicitly. Ordinarily when driving our attention is centered on the road, the radio, our passenger, but not the noise of the engine. But an unusual noise is noticed immediately, showing that we were attuned to the noise in the periphery, and could come quickly to attend to it.

It should be clear that what we mean by the periphery is anything but on the fringe or unimportant. What is in the periphery at one moment may in the next moment come to be at the center of our attention and so be crucial. The same physical form may even have elements in both the center and periphery. The ink that communicates the central words of a text also, though choice of font and layout, peripherally clues us into the genre of the text.

A calm technology will move easily from the periphery of our attention, to the center, and back. This is fundamentally encalming, for two reasons.

First, by placing things in the periphery we are able to attune to many more things than we could if everything had to be at the center. Things in the periphery are attuned to by the large portion of our brains devoted to peripheral (sensory) processing. Thus the periphery is informing without overburdening.

Second, by recentering something formerly in the periphery we take control of it. Peripherally we may become aware that something is not quite right, as when awkward sentences leave a reader tired and discomforted without knowing why. By moving sentence construction from periphery to center we are empowered to act, either by finding better literature or accepting the source of the unease and continuing. Without centering the periphery might be a source of frantic following of fashion; with centering the periphery is a fundamental enabler of calm through increased awareness and power.

Not all technology need be calm. A calm videogame would get little use; the point is to be excited. But too much design focuses on the object itself and its surface features without regard for context. We must learn to design for the periphery so that we can most fully command technology without being dominated by it.

Our notion of technology in the periphery is related to the notion of affordances, due to Gibson by popularized by Norman. An affordance is a relationship between an object in the world and the intentions, perceptions, and capabilities of a person. The side of a door that only pushes out *affords* this action by offering a flat pushplate. The idea of affordance, powerful as it is, tends to describe the surface of a design. For us the term "affordance" does not reach far enough into the periphery where a design must be attuned to but not attended to.

Three signs of calm technology

Technologies encalm as they empower our periphery. This happens in two ways. First, as already mentioned, a calming technology may be one that easily moves from center to periphery and back. Second, a technology may enhance our *peripheral reach* by bringing more details into the periphery. An example is a video conference that, by comparison to a telephone conference, enables us to attune to nuances of body posture and facial expression that would otherwise be inaccessible. This is encalming when the enhanced peripheral reach increases our knowledge and so our ability to act without increasing information overload.

The result of calm technology is to put us at home, in a familiar place. When our periphery is

functioning well we are tuned into what is happening around us, and so also to what is going to happen, and what has just happened. We are connected effortlessly to a myriad of familiar details. This connection to the world around we called "locatedness", and it is the fundamental gift that the periphery gives us.

Examples of calm technology

To deepen the dialogue we now examine a few designs in terms of their motion between center and periphery, peripheral reach, and locatedness. Below we consider inner office windows, Internet Multicast, and once again the Dangling String.

inner office windows

We do not know who invented the concept of glass windows from offices out to hallways. But these inner windows are a beautifully simple design that enhances peripheral reach and locatedness.

The hallway window extends our periphery by creating a two-way channel for clues about the environment. Whether it is motion of other people down the hall (its time for a lunch; the big meeting is starting), or noticing the same person peeking in for the third time while you are on the phone (they really want to see me; I forgot an appointment), the window connects the person inside to the nearby world.

Inner windows also connect with those who are outside the office. A light shining out into the hall means someone is working late; someone picking up their office means this might be a good time for a casual chat. These small clues become part of the periphery of a calm and comfortable workplace.

Office windows illustrate a fundamental property of motion between center and periphery. Contrast them with an open office plan in which desks are separated only by low or no partitions. Open offices force too much to the center. For example, a person hanging out near an open cubicle demands attention by social conventions of privacy and politeness. There is less opportunity for the subtle clue of peeking through a window without eavesdropping on a conversation. The individual, not the environment, must be in charge of moving things from center to periphery and back.

The inner office window is a metaphor for what is most exciting about the Internet, namely the ability to locate and be located by people passing by on the information highway.

Internet Multicast

A technology called Internet Multicast may become the next World Wide Web (WWW) phenomenon. Sometimes called the MBone (for Multicast backBONE), multicasting was invented by a then graduate

student at Stanford University, Steve Deering.

Whereas the World Wide Web (WWW) connects only two computers at a time, and then only for the few moments that information is being downloaded, the MBone continuously connects many computers at the same time. To use the familiar highway metaphor, for any one person the WWW only lets one car on the road at a time, and it must travel straight to its destination with no stops or side trips. By contrast, the MBone opens up streams of traffic between multiple people and so enables the flow of activities that constitute a neighborhood. Where the WWW ventures timidly to one location at a time before scurrying back home again, the MBone sustains ongoing relationships between machines, places, and people.

Multicast is fundamentally about increasing peripheral reach, derived from its ability to cheaply support multiple multimedia (video, audio, etc.) connections all day long. Continuous video from another place is no longer television, and no longer video-conferencing, but more like a window of awareness. A continuous video stream brings new details into the periphery: the room is cleaned up, something important may be about to happen; everyone got in late today on the east coast, must be a big snowstorm or traffic tie-up.

Multicast shares with videoconferencing and television an increased opportunity to attune to additional details. Compared to a telephone or fax, the broader channel of full multimedia better projects the person through the wire. The presence is enhanced by the responsiveness that full two-way (or multiway) interaction brings.

Like the inner windows, Multicast enables control of the periphery to remain with the individual, not the environment. A properly designed real-time Multicast tool will offer, but not demand. The MBone provides the necessary partial separation for moving between center and periphery that a high bandwidth world alone does not. Less is more, when less bandwidth provides more calmness.

Multicast at the moment is not an easy technology to use, and only a few applications have been developed by some very smart people. This could also be said of the digital computer in 1945, and of the Internet in 1975. Multicast in our periphery will utterly change our world in twenty years.

Dangling String

Let's return to the dangling string. At first it creates a new center of attention just by being unique. But this center soon becomes peripheral as the gentle waving of the string moves easily to the background. That the string can be both seen and heard helps by increasing the clues for peripheral attunement.

The dangling string increases our peripheral reach to the formerly inaccessible network traffic. While screen displays of traffic are common, their symbols require interpretation and attention, and do not peripheralize well. The string, in part because it is actually in the physical world, has a better impedance match with our brain's peripheral nerve centers.

In Conclusion

It seems contradictory to say, in the face of frequent complaints about information overload, that more information could be encalming. It seems almost nonsensical to say that the way to become attuned to more information is to attend to it less. It is these apparently bizarre features that may account for why so few designs properly take into account center and periphery to achieve an increased sense of locatedness. But such designs are crucial. Once we are located in a world, the door is opened to social interactions among shared things in that world. As we learn to design calm technology, we will enrich not only our space of artifacts, but also our opportunities for being with other people. Thus may design of calm technology come to play a central role in a more humanly empowered twenty-first century.

Bibliography

Gibson, J. The Ecological Approach to Visual Perception. New York: Houghton Mifflin, 1979.

Norman, D.A. The Psychology of Everyday Things. New York: Basic Books, 1988.

MBone. http://www.best.com/~prince/techinfo/mbone.html

Brown, J.S. and Duguid, P. Keeping It Simple: Investigating Resources in the Periphery. To appear in *Solving the Software Puzzle*. Ed. T. Winograd, Stanford University. Spring 1996.

Weiser, M. The Computer for the Twenty-First Century. *Scientific American*. September 1991.

Brown, J.S. http://www.startribune.com/digage/seelybro.htm

Weiser, M. http://www.ubiq.com/weiser