The Care and Feeding of Users

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Sigmund Freud, the father of modern psychology, once remarked, "The only thing about America that interests me is Coney Island." Freud was not alone in his interest. Over the course of a century, hundreds of millions of visitors found pleasant diversion in that vast acreage—larger than most cities—crammed with an urban density of competing commercial attractions.

Like the World Wide Web of today, Coney Island was an anarchic sprawl, lacking any form of urban planning or overarching design. Browsing, "grazing," and the delight of accidental encounter were the rule rather than the exception. It offered something for every taste: the physical thrill of high G-forces as a rollercoaster hurled your body along a wildly twisting path; the sexual titillation of exotically costumed showgirls shimmying on stage; the long-term, episodic drama of premature babies struggling for survival in Martin Couney's "Child Hatchery" (which introduced and popularized the use of incubators in hospitals).

Most notably, Coney Island was exceedingly "user friendly": Visitors needed no tutorial sessions or user manuals to enjoy its attractions. In the distance, the potent sight of enormous rides and ornate buildings lured potential customers. Just as importantly, these huge and uniquely delineated structures defined a sort of cognitive map—or a preliminary shopping list, at least—to assist navigation on the ground. Close-up, Coney Island's pleasures became more tangible and human-scale. Colorfully dressed barkers and shills lined the streets, their sole purpose to steer passersby into a particular attraction. Once inside, rich detail, meaningful travel, and the delight of discovery marked every moment of your experience.

Coney Island provides an outstanding model of "virtual reality," a successful symbiosis of human entertainers and constructed mechanisms dedicated to human pleasure. How many hours have you spent in front of your personal computer wishing you were at Coney Island instead?

Frustrating tools

For decades, powerful new developments in personal computing have brought with them a certain frustration. Much of this frustration stems from our basic assumption that the computer is a tool and that we ourselves are users of this tool. Football has fans. Opera has aficionados. What do computers have? Personally, I am very uncomfortable with the term "user." When I use a tool, I am a "doer." When someone—a Web designer, a farmer, a child—applies knowledge and skill to accomplish some end, her role is more profound than mere usage.

Human-machine interaction has long been a hot topic among researchers as well as the designers of real-world products. Recently, cutting-edge discussions have shifted away from interface and navigation in favor of a more anthropomorphic vocabulary of software agents, autonomous behaviors, remote sensors, immersive display environments, and emergent systems. This shift may represent intellectual progress, but it also begs the revamping of our fundamental philosophies of human consciousness, shifting intentions, and the changing information landscape.

Currently, computerized tools support either the creation or the appreciation of content; in rare cases, they do both. Yet the support they provide is precarious: When we select a software package and then choose an available tool within that package, we essentially redefine ourselves and our reach. The tool in action is our surrogate self; the act of strapping on a set of highly specific powers (and, at the same time, accepting severe constraints on our other abilities) profoundly affects our creative and social activity. Our broad window onto the virtual world suddenly constricts to a tiny keyhole; and then, to successfully pass through that keyhole, we must change our own shape.

When performing specific computer-assisted tasks, we often become acutely aware of a mismatch between the machine's processes and our

own skills and mental functions. In the "good old days" of word processing, when the CPU and display could not keep up with our typing fingers, we quickly learned to just keep on going. Magically, when we paused to think of something new, the on-screen display would catch up to us. Though a bit of a bother, this became a sort of game.

Often, our sense that apparently simple computational tasks take too long is exacerbated by the mumbo-jumbo of computer jargon. Unlike self-contained, ready-to-use garden implements or kitchen devices, the "personal" computer takes us on a prolonged do-it-yourself journey. Apple Computers took a noble, early lead in the care and feeding of novice consumers, being the first to recognize that what fascinated hackers was boring and frustrating to the general population. A bad first experience could crush a beginner's lust for the new medium; thus, the ease of unpacking and setting up your new computer became a central component of Apple's design and marketing. The message to consumers was clear: You can immediately "plug and play" even if you know nothing about computers. Suddenly, the whole world was point-and-clickable.

Apple's efforts were quite successful. In 1989, I gave my mother a Mac SE for her 75th birthday. After only a half hour of instruction, she began using this personal tool to do real work. Of course, she has not plumbed the darkest depths of the operating system—yet. The problems and challenges of Apple's technology are conveniently hidden (at least partially) behind the transparent, intuitive desktop metaphor.

As the technology matures, we face new lessons in frustration. One serious dilemma facing tool design is that, to be profitable, a tool must support the broadest possible diversity of users. This mindset has largely yielded dumb, monolithic, use-one-at-a-time tools.

However, we are about to witness a profusion of complex tool systems wherein several autonomous tools simultaneously cooperate to assist you—in fact, they will probably compete ferociously among themselves for the privilege. The tools of the future will be intelligent, dynamically adaptive, customizable, and personalizable to a staggering degree. With experience, they will

An overview of metaDesk. Real and virtual objects meaningfully coexist in the metaDesk environment. A 2D graphical map is rear-projected onto the desk surface. The placement and orientation of special landmarks (3D physical objects made of plexiglas) are tracked by electronic sensors; changes are reflected in the map beneath. At the right of the picture, a movable "information lens" displays a synthetic 3D rendering of the scene.

learn and grow and wear to fit the specific craftsman's hand. Their complex functionality will be deeply couched in metaphor or story, and their internal operations will be hidden from view, until demanded.

The emergence of complex, semi-autonomous tools underscores the importance of building a good model of the user into the box.

Three interesting naysayers

Recently, Jaron Lanier (of immersive VR and data glove fame) pitted himself against the *Wired* mindset by arguing against the desirability of software "agents." This is not the first time that an extreme advocate of the digital revolution has criticized the direction his field was taking—remember Joseph Weizenbaum's provocative "Computer Power and Human Reason?"

In 1966, Weizenbaum wrote Eliza, the world's first "ChatBot" program. Eliza exploited a handful of simple word-manipulation tricks to emulate the conversational form and style of a Rogerian psychoanalyst. People spent countless hours exchanging teletype messages with this program; many insisted it possessed the deep knowledge and wisdom of a trained psychiatrist, although it
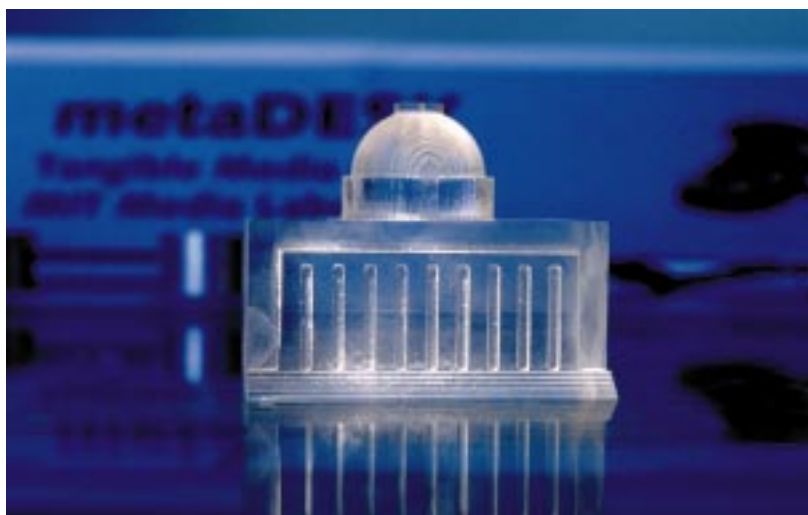
MIT's "Great Dome." This physically constructed, graspable 3D object is a tangible landmark intimately coupled with a virtual map of the MIT campus. When the Dome's location or the orientation of metaDesk is changed, the virtual map reorients itself accordingly.

was actually as dumb as a stump. Some psychiatric professionals even argued that Eliza could treat patients. Weizenbaum was so startled and distressed by this phenomenon (quickly dubbed "the Eliza effect") that he felt the imperative to cross media platforms—from computers to print—and remind us that the computer's mind and voice is, by nature, very different from our own (a response some call "the Eliza side-effect").

Lanier's main concern seems to be that a proliferation of autonomous agents working on our behalf will turn us into a lazy and passive species. This is difficult to evaluate. Our daily lives are already filled with labor-saving, instant-gratification devices and pastimes; how much lazier and more passive can our species get? Lanier's argument ignores the bifurcation between tools and content. Should we have to give up the wheel and the plow to sweat more and cultivate less? Should we outlaw tractors and chain saws in the interests of a quieter, wooded world, thereby limiting expansion? On one side, civilization measures progress by the amount of work done, by economic expansion. On the other side, civilization measures itself by artistic output, pleasure, and the pursuit of knowledge or spirituality. The grounds for debate are not level.

Lanier raises a second interesting concern. Personal agents will define our virtual presence in an ever-widening cyberspace. If the computer's representation of ourselves and our interests is unsophisticated or poorly formed, will our lives be damaged? It will be difficult to map much of ourselves into these hexadecimal hunting dogs. Will we be held responsible if our CyberDog chews up a neighbor's data? Will the widespread use of agents

force us to redefine our own self-image?

Lanier's most troubling point is his concern that clever programmers (or salesmen) will be able to hack into our personal software agents, turning them into automated propagandists—or worse, exploiters—that actively serve someone else's economic and political interests rather than our own. Recently, the flap over peculiarities in Microsoft's Registration Wizard and Prodigy's on-line service drove home the point that current-day software is already capable of spying and tattling on us behind our backs—whether or not the manufacturers consciously intended it to do so.

More than anything, Lanier's article once again calls our attention to the ongoing prize-fight between technological ethics and pragmatism. The fear of morally challenged software is in the air. As the complexity and transparency of our software tools increase, we see less and less of their internal functioning. How can we be sure that they are trustworthy?

Recently, I phoned a friend's office for the first time, only to be greeted by the voice-mail message of the previous occupant. Later, I met my friend on the street and asked, "Why haven't you changed the voice on your telephone answering machine yet?"

"The messages she gets are more interesting than mine," was his reply.

Palpable and mute

Don Norman reminds us that design exerts a pervasive influence on everyday things. Why is that? How does design emerge? When a person wants to do something, the "something" that she can do is constrained by the physical world, her cognitive and emotional capabilities, and the tools and materials available to her. In the previous Visions and Views column, Tom diFanti et al. speculated that the desktop metaphor, which has reigned supreme for the past two decades, will soon dematerialize. As the display environment becomes defenestrated—freed from a 2D windowed layout—and omnipresent, we will regain some of the terrain we abandoned as early adopters of a marginal tool set.

Tangible interfaces

We are bridging the gap between real and virtual worlds as researchers explore new forms of computer-mediated interactions among people, bits, and atoms. Designers are creating tangible user interfaces—digitally augmented spaces, surfaces, objects, and instruments that make bits

physically accessible and manipulable via graspable objects and ambient media. These interfaces emphasize visually intensive, hands-on foreground interactions and convey information subtly through our peripheral perceptions of ambient light, sound, air flow, and water flow. The room itself, the information that flows through it, the objects it contains, and the people engaged with it become collaborative co-actors.

As computing becomes ubiquitous, its affordances—as well as its architecture—will become increasingly distributed. No longer will we have to sit flattening our buttocks as we squint at a tiny monitor full of e-mail. Instead, we will glean information as we stand, lean, pace, or gesture within a beautiful, dynamic, and information-rich immersive environment. Sometimes we will go to the computer, sometimes the computer will come to us.

Tangible affordances

Soon designers, draftspeople, and others will work with tangible affordances such as Hiroshi Ishii's metaDesk, currently under development at MIT. In the metaDesk environment, the designer can readily transition from 2D to 3D, or to a more information-filled view, simply by moving an independent viewing element over the broader desk surface. The current physical incarnation of this "information lens" is reminiscent of the swing-arm-mounted fluorescent magnifier lamps so fashionable in the 1950s and 1960s. The metaDesk also incorporates assorted physical objects and instruments, tracked by optical, mechanical, and electromagnetic field sensors. The metaDesk brings these physical objects and instruments to life as tangible interfaces to a range of graphically intensive applications and networked computers.

The soul of Ishii's research lies in his commitment to making our everyday surroundings beautiful and communicative. In a small office cubicle, subtle shifts in the ambient lighting remind you that it is time to pick up your child from day care. A beautiful glass bottle sits on a small table; by removing its delicate cork, you can hear the "sounds" of the Internet. These physical affordances lead us away from the notion of one monolithic screen that says it all; instead, they place us within a landscape where virtual and real converge to delight and satisfy the explorer. Even an office setting can be filled with small, unexpected moments of profound beauty.

As Archibald MacLeish, former Poet Laureate of the United States, wrote, "A poem should be palpable and mute / as a globed fruit." We hope that one day our computing might be as well.   **MM**

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