Machines of Loving Grace

User experience design in
ubiquitous-computing environments

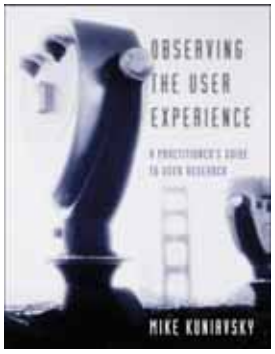
Mike Kuniavsky
IA Summit, 2005

Hi, I'm Mike Kuniavsky. This is a talk that was originally going to be given by Adam Greenfield and me, but unfortunately Adam can't be here today.

This talk combines a fast introduction to the history and ideas behind ubiquitous computing with an outline of some user experience and Information Architecture issues in the design of ubiquitous computing and communication systems.

Intro: who am I?

- I wrote a book



And started a company

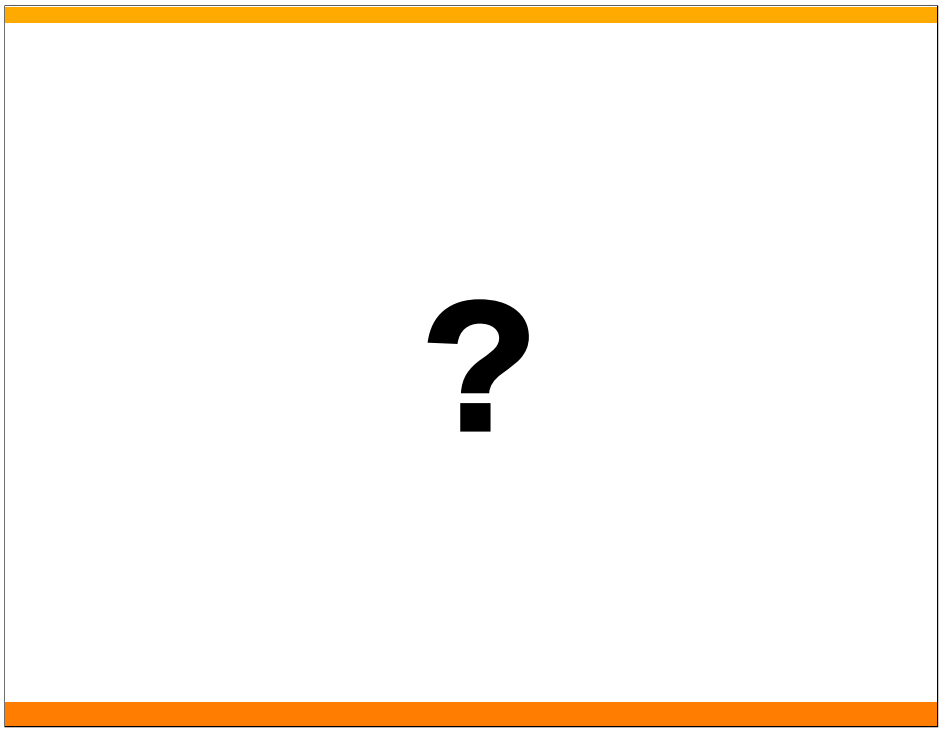
adaptive path

I am a consultant specializing in user experience design and user research.

I wrote a pragmatic book on user research techniques a couple of years ago and co-founded a San Francisco user experience and information architecture consulting company called Adaptive Path.

Let me start by explaining the train of thought that led me to ubicomp.

As a consultant, I've helped a number of organizations design better web sites and software by understanding their users.



It’s frustrating to see the same mistakes being made, and I puzzled over it. A couple of years ago, I started stepping further back to think about the context of creating technological solutions.

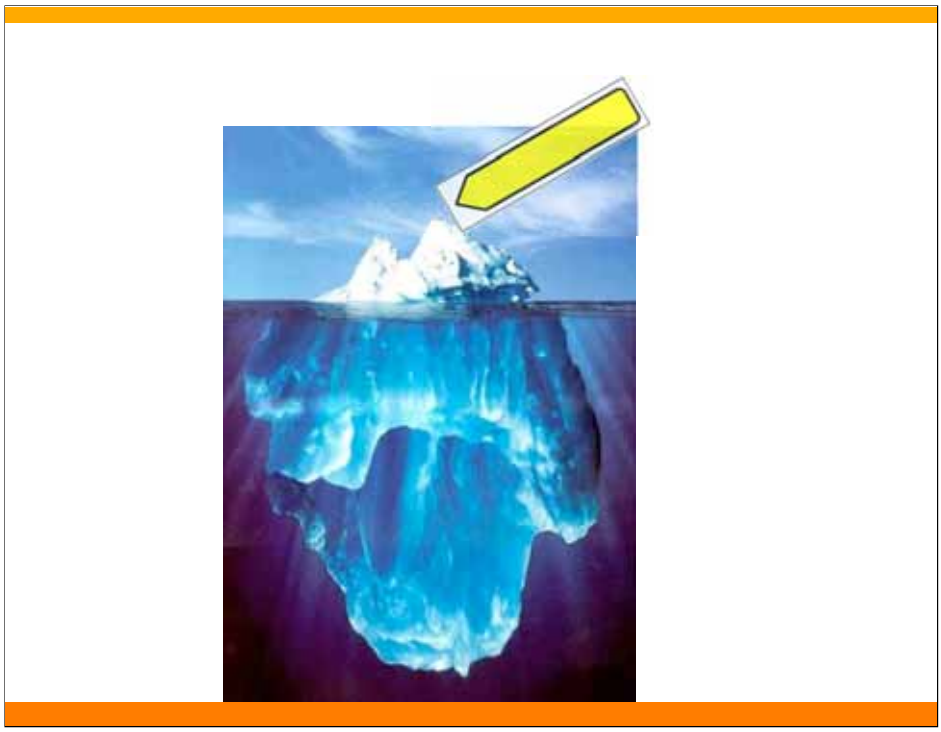
I am now convinced that the social and cultural context a product is created in, both from the user’s perspective and the culture of the organization that creates It, are critical to its long term success. So I started looking beyond software.

This cell phone is more than this. It is not a tool in the traditional sense as a hammer. It's not even just the handset.

It’s this. A phone is the way that someone uses it, the collection of data that's on it, the user’s relationship to it and the system it provides access to.

It’s also this. It's the network of people who are using it and it’s a physical manifestation of a service. A cell phone isn't very useful without the network of services it represents.

And although the cell phones is not unique in this, it’s unique in how popular it is.



Thus, the phone is really the first of a breed of specialized small computing devices. It is the first popular *intimate computing appliance. It uses* computation and wireless communication in a social matrix to create experiences.

And it's not alone. When computers are small enough to be in phones, they're small enough to be in all kinds of things.

This is a piece of software for the Microsoft Actimates Barney, released about 8 years ago. If it didn't say "Microsoft," would you ever know that Barney was a computer?

No, but it IS a computer and it can do things that computers can do that no other things do, and this disjuncture, the fact that it has the look of an everyday object, but the functionality of a computer, is a fundamental shift.

That fundamental shift has a name, and that name is ubiquitous computing.

Ubicomp, a short history

- Ubiquitous computing is the method of enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user.

  - Mark Weiser, 1993

The ideas behind ubiquitous computing were first formulated and the term was coined in 1989 by the late Mark Weiser at Xerox PARC.

Ubicomp, key concepts

- Embedding
- Specialization
- Personalization

- The opposite of virtual reality (Weiser)
- The eventual disappearance of "the computer" (Norman)

Embedding = information processing is an integral part of the physical design of the product

Specialization = a focus on a specific task that's augmented, NOT general purpose devices

Personalization = devices and data are bound to individuals

The core point is that information processing and management disappear into the functionality of our tools.

Electrification

This is not the first time we've seen the disappearance of technology into utility.

We've seen this before. Electricity distribution disappeared into the functionality of our everyday objects.

Electrification

Here's Weiser's example using an ad from the 1918 sears catalog. You buy the somewhat expensive electric motor and you get attachments for it for your pedal-powered sewing machine. Also notice the vibrator.

Ubiquitous electrification

We no longer think about electricity and its distribution as much as we think about its uses: a blender is not a motor with a special blending attachment, it's a blender.

Compare that idea with what's happening with computers today.

Computing

Look familiar? Here's the computer core—the motor—and here are the attachments you can get for it. The paper tape attachment, here's the teletype attachment, here's the video terminal attachment.

That all seems quaint…

Computing

…but you know things haven't changed much. Here's a bunch of different stuff, but it's still the same philosophy.

The key point is that our use of technology changes and our relationship with it changes as the price point of that technology changes. When computers were expensive, you only got one and it has to do everything. Well they're not expensive anymore. Thus, enter…

Ubicomp already exists, but is very young. Its promises the possibility for having computer-augmented tools for living that are computers, but use computation and communication to make the tools do what they're supposed to do, better.

Toyota Prius w/Bluetooth, Robosapien, Adidas 1, iPod Shuffle

…not ubiquitous computing

The Electrolux Screenfridge does not use computation to augment the core functionality of the fridge, it's an expensive and awkward case mod. Not much more than duct taping a laptop to your fridge.

Many names

- Ubiquitous computing
- Ubicomp
- Intimate computing
- Pervasive computing
- Ambient intelligence

- And many names for the underlying technology:
  - Mobile computing
  - Physical computing
  - Distributed sensors
  - Embedded systems
  - Etc.

More to come

- Key technologies affecting the near-term future of ubicomp
  - Miniaturization
  - Wireless standards
  - Low-power, fast CPUs
  - Better batteries
  - IPv6

Crossbow Motes

Motorola/Burton Bluetooth Tuque

Designing for ubiquitous user experiences is terra incognita. We just started figuring out how to make Web pages not totally suck and this is a whole new game.

My goal today is to outline some of what I think are the major issues in designing user experiences for these devices and to show how information architecture is a key component of that.

Immediate issues

- No screen!
- No keyboard!

Let's start at the beginning. Input and output. Your interface are dramatically different. On the bright side, no screen=no screen real estate problems! Lots of other kinds of things don't have screens or keyboards, either. A pencil doesn't. A bookshelf doesn't. A car has a couple of buttons. Traditionally industrial design, but now there's an information management and access component. I have a couple of thoughts…

Systems

We can no longer think of the things in isolation. Ubicomp devices provide access to larger systems and need to be designed alongside those systems. The design of the system becomes as important as the device. Your cell phone is worthless without the network and Apple was savvy enough to understand that the iPod needed an infrastructure, which is why iTunes exists.

William Eggleston's "Untitled" (1973)

Systems

Acura HandsFreeLink. The car and phone are both expressions of the phone network.

The user experience is with the larger system as much as it is with the individual objects. This is where IA fits in: These devices present narrow slits through which to get knowledge from systems that can provide potentially massive quantities of it. That knowledge needs to be structured comprehensibly.

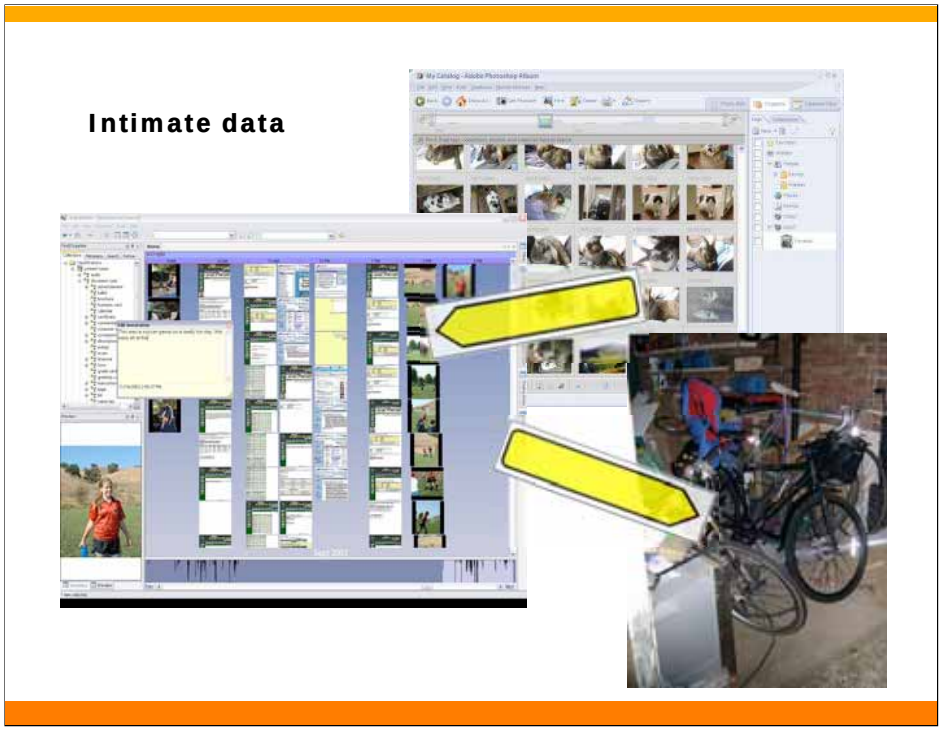
Intimacy

Leapfrog Leap Pad, iPod and SonyEricsson 630, Ring WiFi detector.

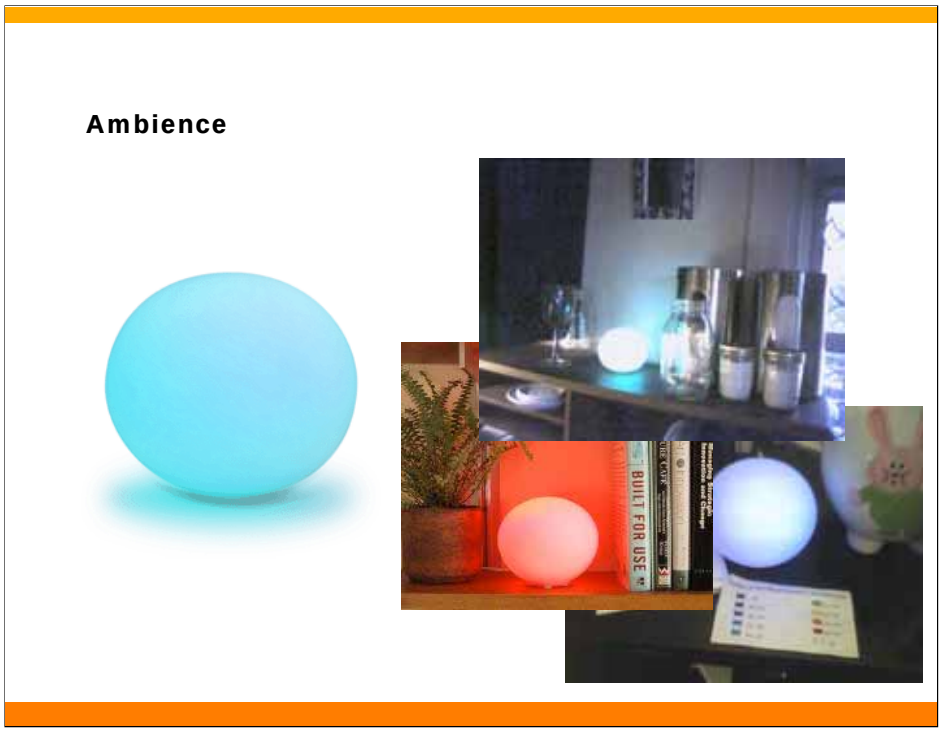
Small, specialized devices naturally lend themselves to a closeness to people's lives and work that didn't exist when computers were big and disconnected.

Intimacy

Intimacy spans the range of magnitude: Tabs, [wearables] Motorola Bluetooth headset; pads, [PDA, phone, camera and] LifeNet HealthBuddy, boards: Prada magic mirror



This kind of intimate data collection has the potential to create huge personal information spaces. Here are Adobe Photoshop Album and Microsoft MyLifebits. Few people take the time organize their garages, why should they behave differently with their data? It's an IA problem. A huge one.



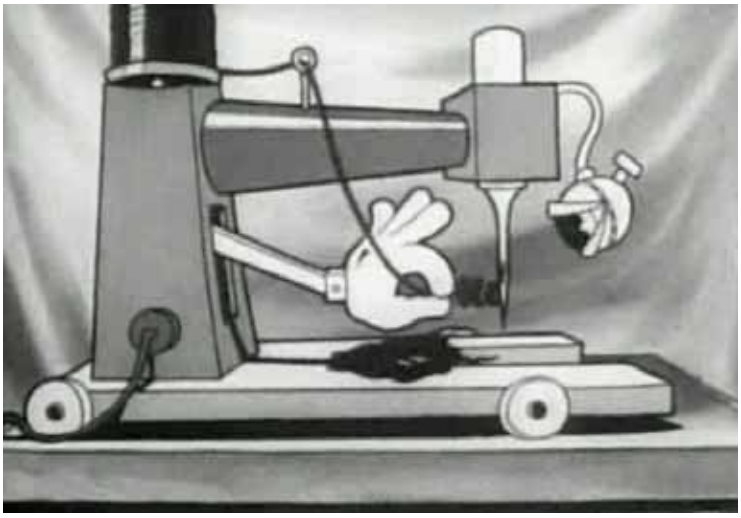
With all of these devices around, we start getting into questions of attention economics. How do we present the right information without overwhelming people? One solution is ambience display. Ambient Orb. It's not the center of attention: people keep it with their spices, books and piggy banks.

Tobias Skog's Mondrian weather display

Swarovski chandelier designed by Ron Arad

Antenna Design's Power Flowers installation for Bloomingale's

Effects of ubicomp: changes in expectations

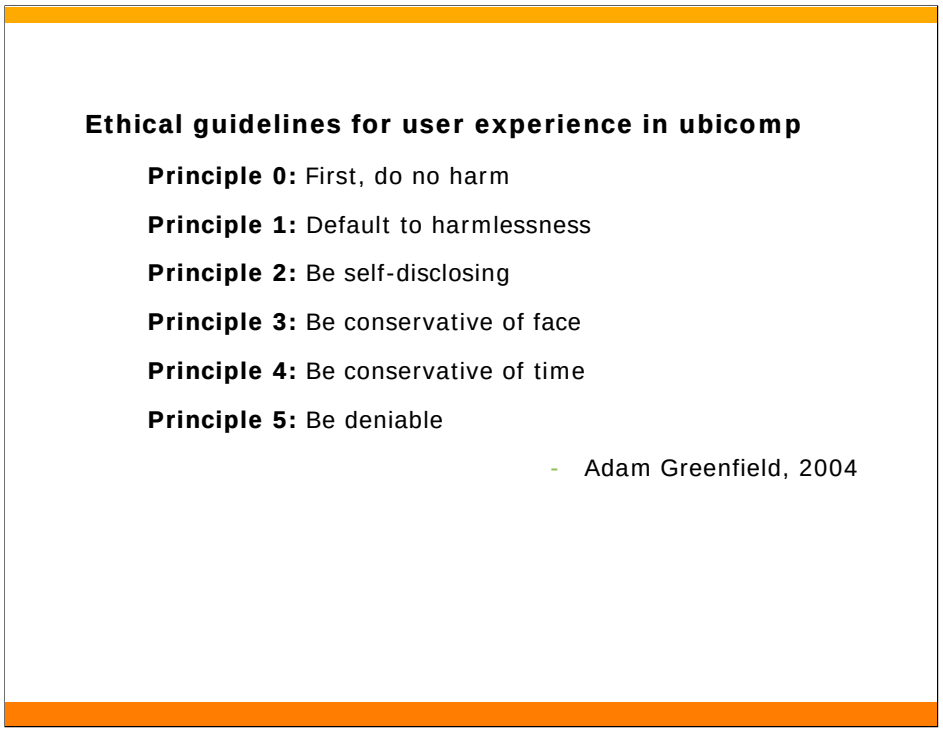


This is where the electric motor analogy breaks down. The mechanical relationship that a motor has with the tool that it's part of is much easier to grasp than the information processing relationship a computer has with the ubicomp tool it's part of. The relationship becomes animist, a projection of psychology onto our electronics. A world where the objects in your environment are aware of you and of each other may be great, but it can also be intimidating.

Effects of ubicomp: threatened civil liberties

Very easy to create surveillance. This has two effects: it slowly erodes our civil liberties as more devices come to watch and know about us and it shifts our attitude toward technological objects. We may move from treating them as assistants to superintendents, parents or minor deities. That's a problem.

SafeTzone amusement park monitoring system, X10 wireless cameras.



P1: must default to ensure their users' (physical, psychic and financial) safety. P2: must allow immediate querying of their ownership, use, capabilities, etc., so people can make informed decisions regarding their use. P3: do not unnecessarily embarrass, humiliate, or shame their users--too much info removes plausible deniability, an important human characteristic; P4: do not introduce undue complications into ordinary operations; augment, don't complicate; "undo to 3 minutes ago" P5: must let users opt out at any point.

Technology and control

Our relationship with technology and automation has never been an easy one. Designing for ubicomp can't be overcome until the complexity of the problem is admitted and tackled, and we shouldn't let our anxieties about the technology stop us. We've always had anxieties about our technology.

Dave Fleischer, "Betty Boop's Crazy Inventions" (1932)

Thanks!

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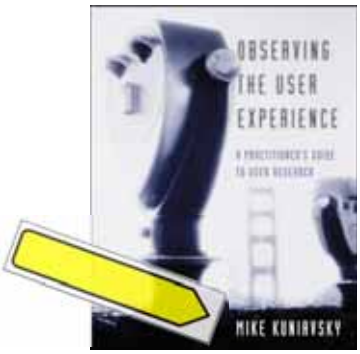

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Title comes from title of Adam's "Boxes and Arrows" essay, which in turn comes from the title of Richard Brautigan's poem "**All watched over by machines of loving grace" (1967). There was also an early 90s goth(ish) band of the same name and a recent song by Brave Captain.**