Ubiquitous Computing User Experience Design

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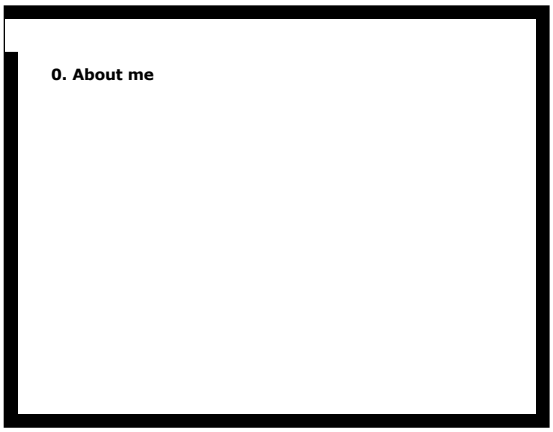


I'd like to start by telling you a bit about who I am.

I'm a user experience researcher and designer. I've spent pretty much my whole adult life thinking about how technologies and people affect each other from social, economic, and historical perspectives, and how the technological side of that equation can be made better, or at least more interesting, for the human side of it.

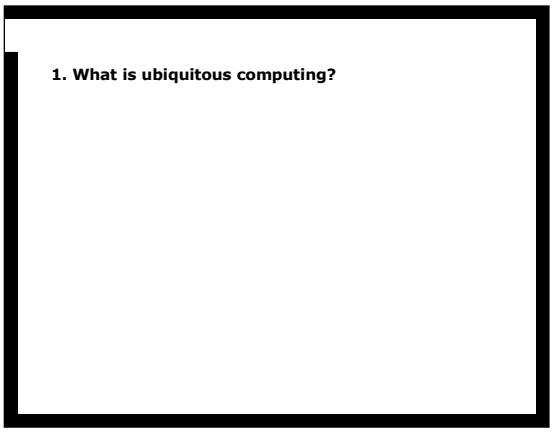
In 2001 I co-founded Adaptive Path. Around the same time, I wrote a book called Observing the User Experience.

[Observing the UX]

It's a kind of cookbook covering a wide range of user research techniques.

Four years ago I decided to take a pause after 10 years of nonstop web design to think full time about how to apply what I had learned about people and the Internet to the other computers that were increasingly embedded in our lives.

This led me to found ThingM in 2006 with Tod Kurt. We design and manufacture ubiquitous computing products.

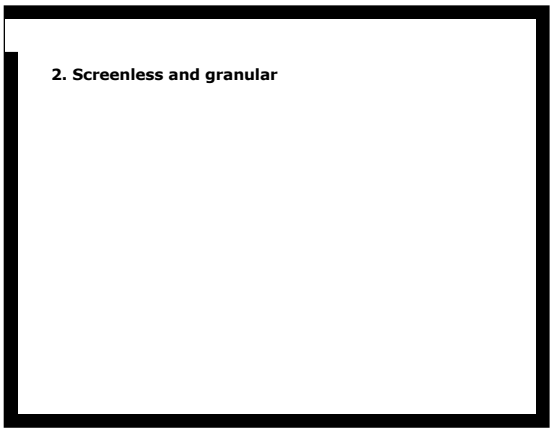


Ubiquitous computing or ubicomp was coined by Mark Weiser in the early 1990s, and like “artificial intelligence” it suffers from always being that thing that we can’t do yet, because the minute we can do it, it gets a different name.

I don’t believe in that kind of name creep, so I call everything that others refer to as ambient intelligence, pervasive computing, physical computing, domotics, etc. as ubiquitous computing, or ubicomp, and I believe that it is all around us.

From my perspective, we have been actively swimming in it since 2005. That’s the year Apple put out the iPod Shuffle, Adidas launched the adidas_1 shoe and iRobot launched the Roomba Discovery, their second generation model.

[Roomba]

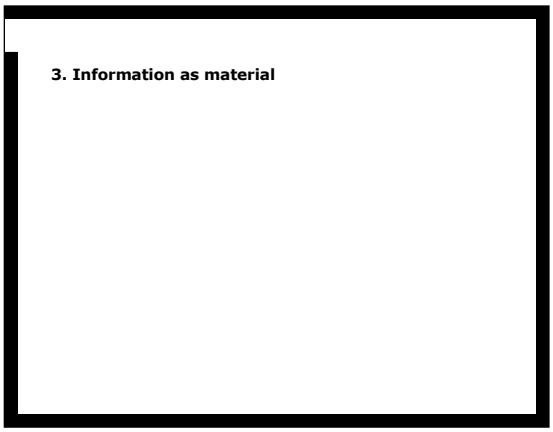


The two things that unify these devices are: 1. that they're dependent on super cheap information processing, and 2. they have no screen. I believe the latter to be a major design shift. It may seem like a step backward, but I think it's the casting off of a major anchor.

For most of the previous 20 years, our experience of interacting with information processing devices consisted of working with laptop and desktop computers. Processing was expensive, so it had to be shoved into these devices that had to be general purpose enough to take on the form of many different kinds of tools. What shape were these devices? Well, the output was about the size of your head, and the input, well, that was about the size of your hands.

But Moore's Law has a habit of sneaking up on us. The personal computer chip that was the state of the art when Weiser was first writing about ubiquitous computing was the Intel 486. The 486 correspond roughly to the beginning of the modern, internet-connected computer and is a very powerful device. When it was released, it cost $1500 in today's dollars. Today, that amount of processing costs 50 cents and that economic shift has created major shifts in manufacturing and engineering that have only recently begin to emerge in design.

Now it's possible to incorporate information processing of that power into lots of things. Things that don't have to be general processing devices. Things that don't have to have screens. Things that don't have to be of a certain size. Manufacturers do it every day, though until recently we haven't considered what they do to be worthy of being called interaction design. Why? Because there was no screen.



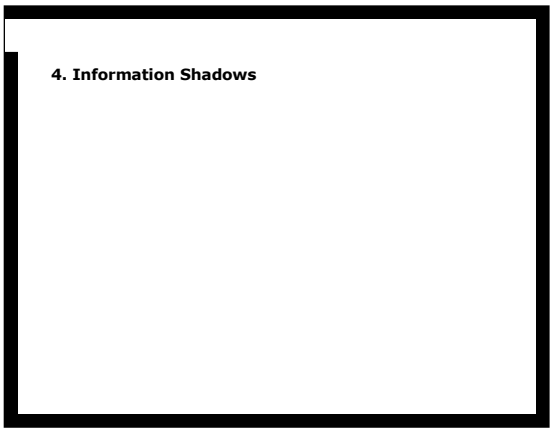
What happens when you take away the screen is that embedded information processing starts behaving like a material. A material that we're unfamiliar with, but a material that can be designed with.

Just like any other new material, it creates some new capabilities, and imposes new constraints. And just like a material, it can be used to create everything from complete objects all the way to individual components.

At ThingM we tried to embrace the idea of ubicomp as a material. We created a smart LED we call BlinkM.

[BlinkM]

It's an RGB LED with a microcontroller attached to it. It runs our firmware that abstracts out the electronics engineering and color theory required to get an RGB to glow a specific color or to smoothly fade between two colors. I think of it as a kind of "atomic unit" of ubicomp with a single pixel of output, input, networking and a processor. It's designed to be easily used INSIDE other things, like a manufactured material rather than a raw mineral. You can buy one for about 12 bucks through a number of online electronics retailers.



Information processing as material is one half of the ubicomp puzzle. The other half of ubiquitous computing is wireless networking. If you couple embedded processing with wireless networking you start to get all kinds of new interesting possibilities. One of these is machine identification.

Since the start of the Industrial Revolution, manufactured goods have had identifying marks. From silversmiths' hallmarks to barcodes to RFIDs. With ubicomp you can start using these identifying marks to get access to the metadata about the physical objects they're attached to. Until now it's been decoupled from the objects themselves, but that's going to change as we start identifying and tracking individual objects.

These objects exist simultaneously in the physical world and in the world of data. We call that object's digital representation its "information shadow." You can use the shadow to ask questions about the objects. How much is this worth on EBay? Which of my friends has one? Will this go with my Mom's china? When is the next one schedule to arrive?

[bottle of wine]

Take wine. Wine is of course a physical consumable, but among enthusiasts, the importance of the information about wine--getting, sharing, comparing, evaluating, commenting-on--becomes nearly as great as its consumption. To paraphrase Yahoo!'s Tom Coates, with identification we can now glue handles to the information shadow. Once it has handles, we can grab it and throw it around. In other words, we can start mashing up the physical world in the shadow world.

What this means is that although in the past there was a fairly clear distinction between an object, a digital representation of that object and the metadata about that object, now that distinction has significantly blurred. There is now a range of objects that exist to varying degrees as information shadows.

At the one end is media. It's completely dematerialized.

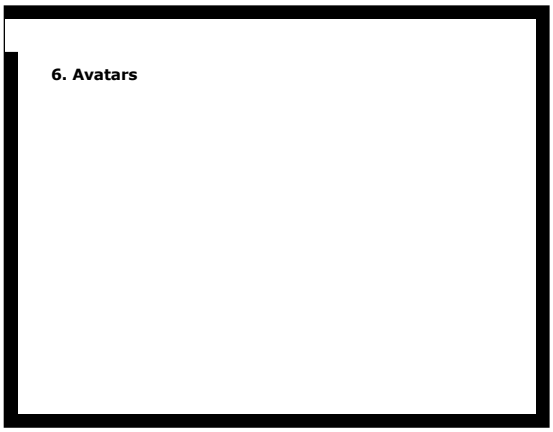
[DVD]

The physical DVD is just the documentation of an agreement between you and the distributor that you have a certain set of rights to a certain set of bits.

So is a plane ticket. Soon, the medical prescription.

Some things you can't fully dematerialize, of course. What happens to those? Well, I'm greatly influenced by Bruce in my thinking about this. Back in his first Viridian lecture, I believe, he talked about how digital identification means that we no longer have to replicate objects. We can share them in all kinds of new ways. Why does everyone on the same block need a wheelbarrow or a power drill or a $500 KitchenAid mixer, when we're not all using them at the same time?

When an object can be machine identified and wirelessly tracked, you can stop treating it as a single instance and you can start thinking of it as an instantiation of a subscription. What is then sold is an agreement to provide a specific service on demand. You own a dotted line in the shape of an object. The dotted line is filled in as you need it, with a specific rendition of the object.



ZipCar and other car sharing services are an example of this. As are vacation clubs. Automated bike rental services like they have in Paris and Berlin. They are all examples of subscription objects. How many people have heard of Bag Borrow or Steal? It's NetFlix for high end purses.

[Prada purse]

You don't need to pay $1000 for that Prada purse you're going to carry twice. A Bag Borrow or Steal subscription entitles you to fill in your dotted line with a real, super-expensive high end purse whenever you need it.

For heavily information-dependent objects this trend toward subscription is even more drastic. Network connectivity allows the same information to be accessed and manipulated through a variety of devices. Value shifts to the information, rather than the device that's communicating it. Devices become secondary, they become temporary representations of information-based services. Take the mobile phone.

[old mobile phone]

The mobile phone is a physical manifestation of a service, but is not a service itself. It's a projection into physical space. It is an avatar of the service. An ATM is an avatar of the money management service your bank provides. A bank web site is another. A bank teller is another still, one that's significantly more flexible than the ATM, but not available as often. The physical avatar is one small corner that pokes out of the fourth dimension into our world. Sometimes it looks like this thing, sometimes it looks like that thing, sometimes like a series of things.

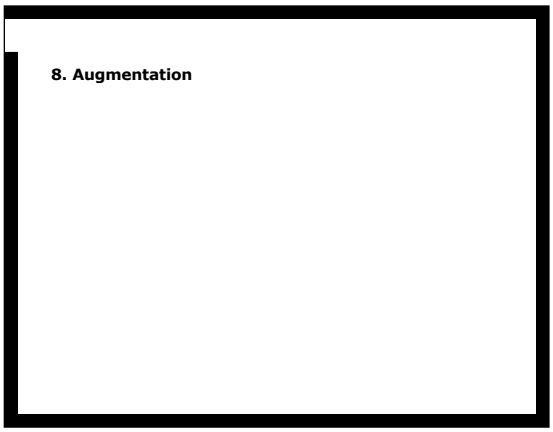
When designing user experiences for ubiquitous computing, the design of the service becomes as important as the design of the device. This is the genius of the iPod: it's an avatar of the iTunes Music Store. The Zip car is an avatar of the Zip Car service. A Kindle book is an avatar of Amazon. Of course these are not the first service avatars.

[old phone]

The infrastructure that this avatar represents was fantastically expensive. The internet and the phone networks have greatly lowered the barriers to creating new such services. For example, networked temperature sensors allow for fine granularity weather sensing services, body monitors provide real-time telemetry to doctors, your house can publish an RSS feed about when your plants need watering. The capabilities of mashuppable data services that manifest themselves as physical devices is enormous. ThingM, my company, developed WineM, our prototype smart wine rack, as an avatar of a wine metadata delivery service.

The rack uses RFIDs on each bottle to tracks where every bottle is and then displays information using glowing LEDs behind the bottles.

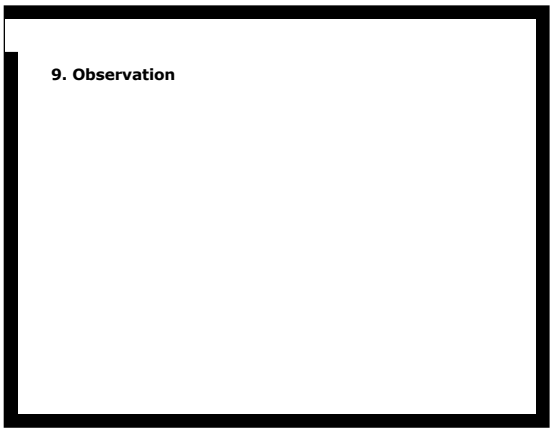
We treated the rack as one way to provide access to a service that associates a specific bottle with the metadata about it, which is in turn part of a system that links wine producers, distributors, retailers and consumers together so everyone in the chain benefits from adopting the technology. The rack is a manifestation of the service, but the service can be available through many other devices.



How do you start designing in this environment? Let me tell you a couple of things I've done that seem to work.

The first is augmenting everyday objects. Why invent a new kind of object when you can take an existing object and augment it with the capabilities of these new technologies that allow it to do its job better?

One of my favorites is furniture, obviously. Let me tell you why. It's big, so you can put a bunch of technology in it, it's stationary, it's usually near power and, most importantly, it has a bunch of well-known existing use patterns that can be targets for augmentation. Appliances are a kind of furniture, so are cars, which are essentially a matching couch and two chairs inside a really specialized room. But anything can be augmented. We have 50000 years of cultural artifact production to work with, and trying to invent something completely new seems beside the point to me.



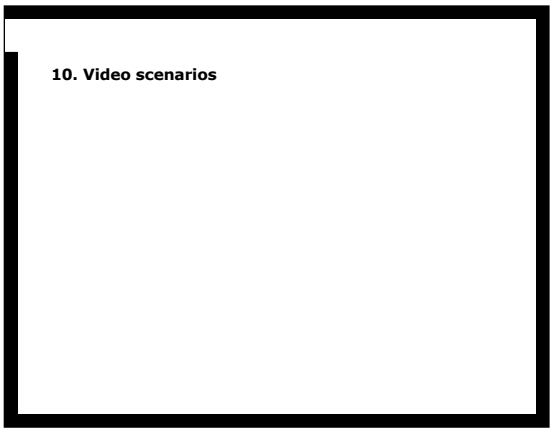
How do you know what objects to augment and how to augment them?

My second recommendation is an obvious one. You observe people. When you design ubicomp devices, you're designing appliances: focused, single function devices that support specific activities. You are not making computing platforms, but tools. How do you know what tools to make? Well, you pick an activity and look at how people do it. Let me read you an excerpt from July's Appliance Magazine, written by Randall Sandlin, the director of industrial design for Electrolux home products.

[Read from Appliance Magazine]

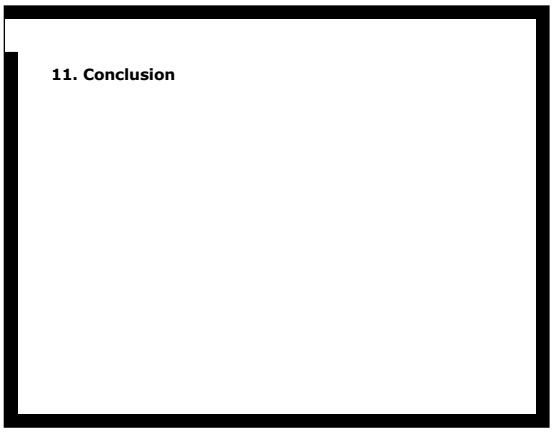
Sound familiar? It's design research and I'm very happy that the appliance designers are embracing it, because their products are one of the most common kinds of ubicomp products made today. There's nothing more important than observing people. It's the ultimate innovation and risk management tool.

I do have a slight criticism: When you're doing field observation, you are not being an ethnographer, you're not "holding ethnographies," you're not ethnographizing. A real ethnography is not based on an afternoon of hanging out at someone's house. That's "design research." Anthropologists have a hard enough time finding paying work, let's not take their terminology away, too.



Once you have an idea of what task you're going to do, what do you do then? Well, from my perspective, the focus of design should always be the experience, not the technology. If you know something is potentially feasible, pretend it already exists and explore the effect it has. This is called the scenario video, but I prefer the colloquial concept of "fake it until you make it."

In the 2D world, you can do this with paper prototypes, flash mockups like what the Office team did, or Wizard of Oz simulation. In the ubicomp world, this translates to using the tools of film and theater. Video scenarios like Adaptive Path Aurora video give you insight not into what could actually be, but what the constraints are. The product is what you learn, not any technology you design or the video you make, although the video makes for nice documentation of your thought process.



In general, designing ubiquitous computing user experiences is, at the broadest level, no different than designing user experiences in other media: it's still about balancing the needs and desires of people who participate in the experience with those who produce it. And this brings me to my last point.

[Pleo]

I believe that ubiquitous computing holds amazing promise for making the world a better, happier and more interesting place. One that's a little more magical than what we have now. We, the interaction designers, have the responsibility to make it that better place. Manufacturers are going to make ubicomp devices with our without us, and this technology is going to be the next big thing, simply because it's so cheap. It is our job to make technology work for people, regardless of whether there's a screen involved or not. I think that far too much attention has been paid to screen real estate speculation in the last 10 years, and it's time to burst that bubble.

Thank you.