Information Shadows
how ubiquitous computing serializes everyday things

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Good morning! My name is Mike Kuniavsky and the first thing I should tell
you is that I have no formal background in library science, so I apologize in
advance for all terrible misunderstandings that may occur.

Photo CC by puck90, found on Flickr

I'm a user experience researcher and designer. I spend much of my time thinking about how technologies and people affect each other from social, economic, historical and technological perspectives, and how the technological side of that relationship can be made better, or at least more interesting, for the human side of it.
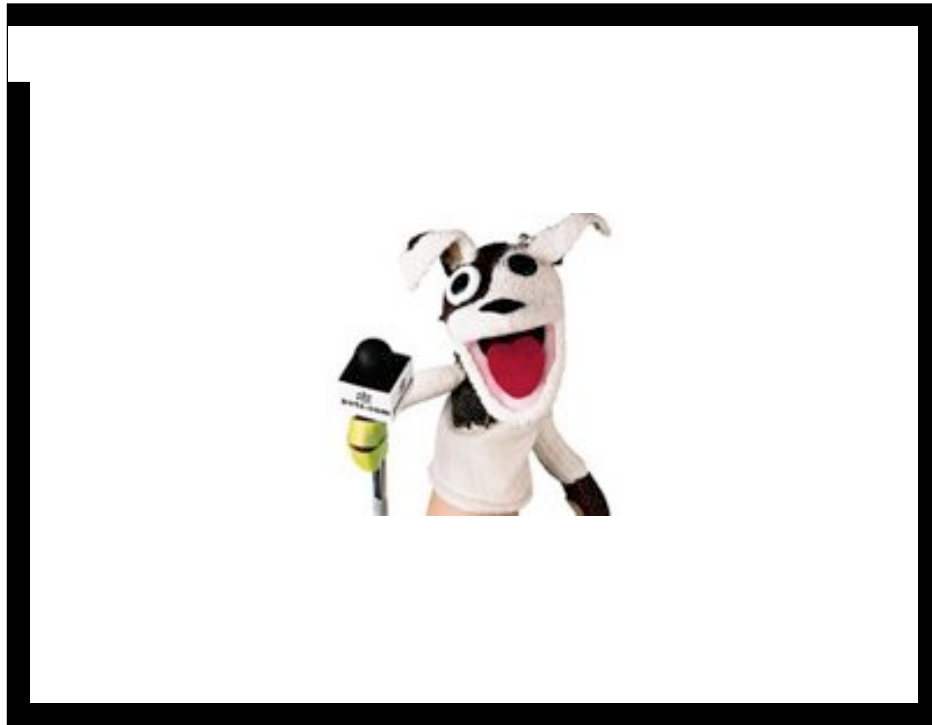
Junkyard photo CC by Sigma. Found on Flickr.

I spent a little more than 10 years doing design and research for the web. I was the designer of one of the first ecommerce websites in 1994, HotHotHot. Despite the name, we sold hot sauce.
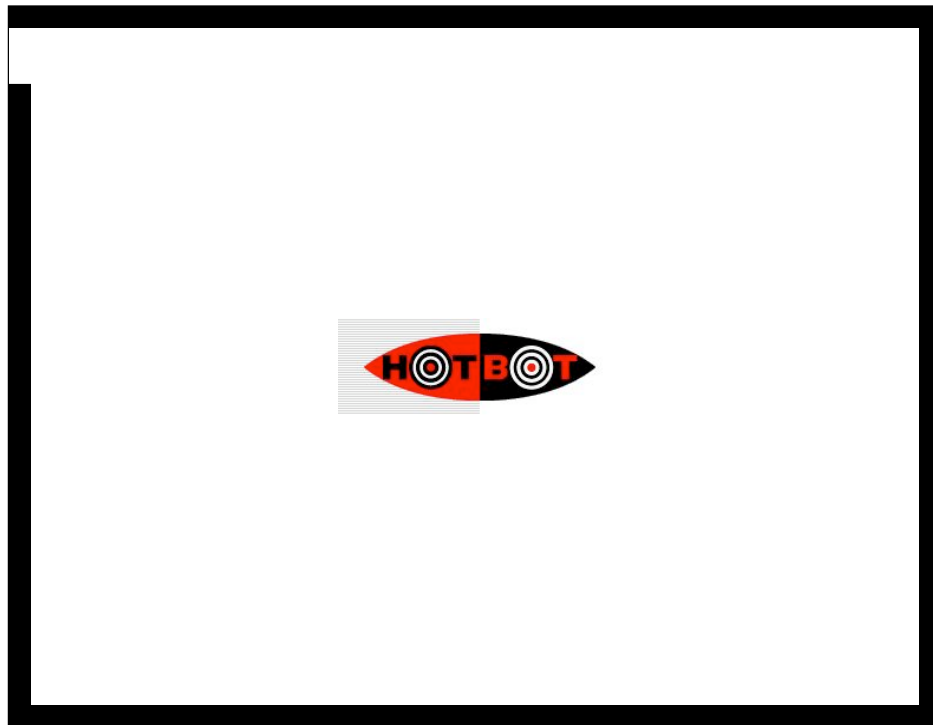
In 1996 I was the interaction designer of one of the first big search engines, HotBot.

In the late 90s I worked with many dotcoms, some famous, some--like pets.com--infamous.

OBSERVING
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A PRACTITIONER'S GUIDE
TO USER RESEARCH

MIKE KUNIAVSKY
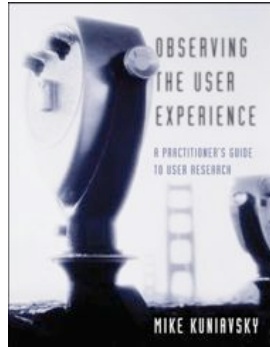
I sat out the dotcom crash writing a book based on the work I had been doing.
Ask your reference librarians to order extra copies.

adaptive **path**

In 2001 I co-founded an Internet consulting company called Adaptive Path. Things went very well, Adaptive Path is doing very well, but ten years in cyberspace is a long time. So 4 years ago I decided to pause and 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.

Things like mobile phones, iPods, TiVos, smart refrigerators, and talking greeting cards. In other words, I decided to leave the office, leave cyberspace and walk around a bit.

Photo CC by Cocoarmani, found on Flickr
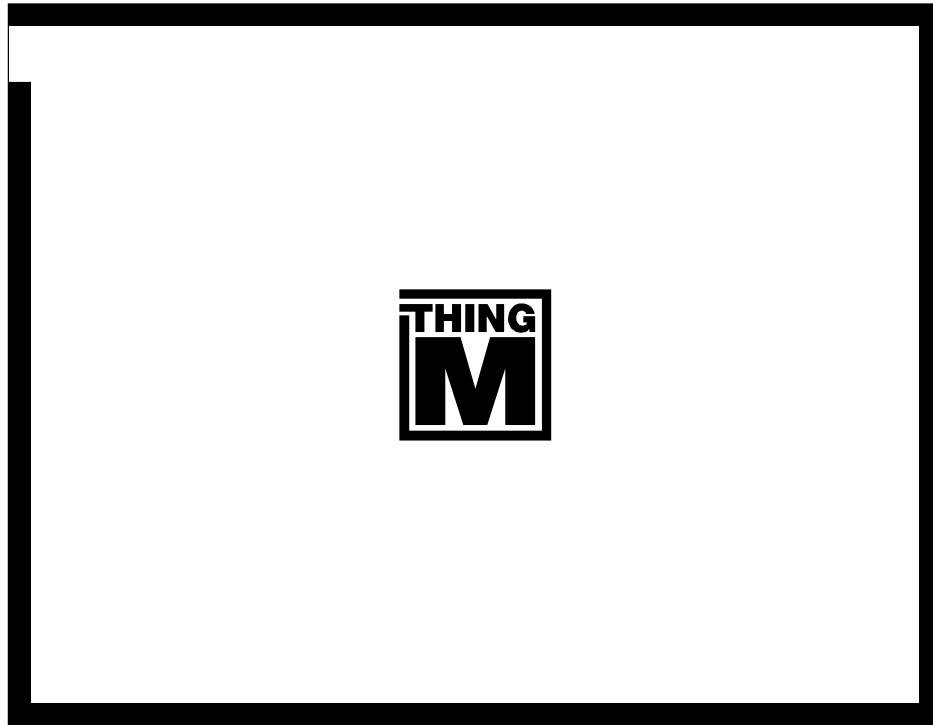
Two years I founded a company with Tod Kurt called ThingM to pursue these ideas commercially. We're a ubiquitous computing consumer electronics company.

Ubiquitous computing

So what's ubiquitous computing, which sounds either ominous or exciting depending on your attitude toward contemporary technology.

"Ubiqutious computing" was coined by the late Marc Weiser of Xerox PARC about 20 years ago to describe a concept where computers didn't have to be monolithic general-purpose devices that required special training to use

Photo CC by Richard Pluck, found on Flickr.

but could be, in his words, woven "into the fabric of everyday life until they are indistinguishable from it."

Photo: CC Mark Lacoste, original:
http://www.flickr.com/photos/croco/914189024/

He made an analogy to books: a laptop is like a single really important, really big book.

Such books exist, of course, but they're the exception.

Most books serve a special purpose and are read or consulted as needed.

But that's not how we've been treating computers.

Photo CC by chotda, found on Flickr.

In other words, in his view, and in mine, the power of information processing technology should not be limited to viewing the whole world through the lens of a single magic window..

but the power of that technology, the potential of that technology, should be brought into everyday life. When Weiser was writing, his vision was more of a dream than a pragmatic reality, but in the intervening 20 years, something happened.
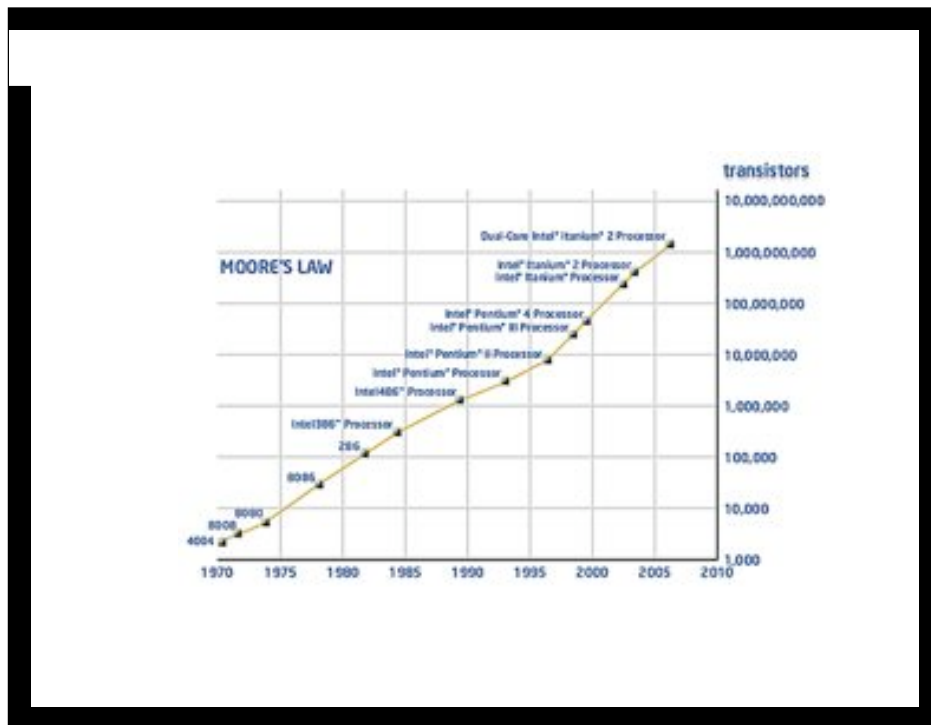
This is a graph of Moore's Law. You've probably heard of it. It started as a key piece of technology trend analysis but became a blueprint for the development of technology over the last 30 years.

Normally, this graph is read as a trend representing how computers are getting more powerful, but it also represents trend that shows how technology is getting smaller and cheaper.

The personal computer chip that was the state of the art when Weiser was initially writing about ubiquitous computing was the Intel 486. It's in the middle of this chart. The 486 correspond roughly to the beginning of the modern, internet-connected computer and is a very powerful device.

1989: $1500*

33MHz, 20MIPS

2008: $0.50

20MHz, 20MIPS

* CPI Adjusted to 2008, original price: $900

In the 19 years since it came out, thanks to the economics of Moore's Law, that processing power has become a commodity and it's possible to buy a chip with nearly as much power for about 50 cents.

Such commoditization of a technology profoundly changes the social response to it.

When something is expensive, you're going to have one of it and it's going to have to do a wide variety of different things. Maybe one of the reasons Gutenberg printed bibles was because he knew a bible is a kind of a general purpose book with a guaranteed wide audience.

A closer example is the electric motor.

in 1918 electric motors were expensive, so you bought one for the house and then you bought attachments for it. The motor was a general purpose tool that was adapted as needed.

That's the way Kitchen Aid mixers still work, but that's more of a quirk of the Kitchen Aid. In 1918, it was an economic necessity because few people could afford to own many electric motors.

However, when something is cheap, you can have more than one of it. When you have more than one of a given thing, you get specialization. The concept of the self-contained kitchen appliance appeared when motors became cheap enough to hide. Instead of a juicing attachment, you have a juicer. Instead of a blending attachment, you have a blender.

When you can have dozens of a thing, they get hyper-specialized, as those of you who have ever shopped for appliances know.

This is what we're already seeing with computer and networking technology.

The age of objects with embedded processors is already here. Let me give you some examples. Mobile phones are of course a kind of portable computer.

Photo CC by Scott Ableman, found on Flickr.

So are cars. This is a Toyota Prius display, but cars have had multiple embedded computers in them for 25 years.

Photo CC by -Ant, found on Flickr.

This is the Cuddle Chimp, a robotic toy. There are hundreds of robotic and computer augmented toys on the shelves and they cost little more than toys that have no information processing in them at all.

This is the Adidas 1 shoe, which has a embedded microprocessor that analyzes the running surface about 20 times a second and adjusts the stiffness of the heel in between strides in response.

And this is a Blendtech blender that has programmable blender cycles. If you've been to Jamba Juice or any of the other big smoothie chains, you've had the products of these.

Whole new classes of objects with embedded computers are being added on a regular basis.

In other words, we already live in the world that Weiser envisioned, and both we and it are changing in response.

Information shadows

A key piece of this is digital, machine-readable, identification.

Silverplate Marks   **Sterling Hallmarks**

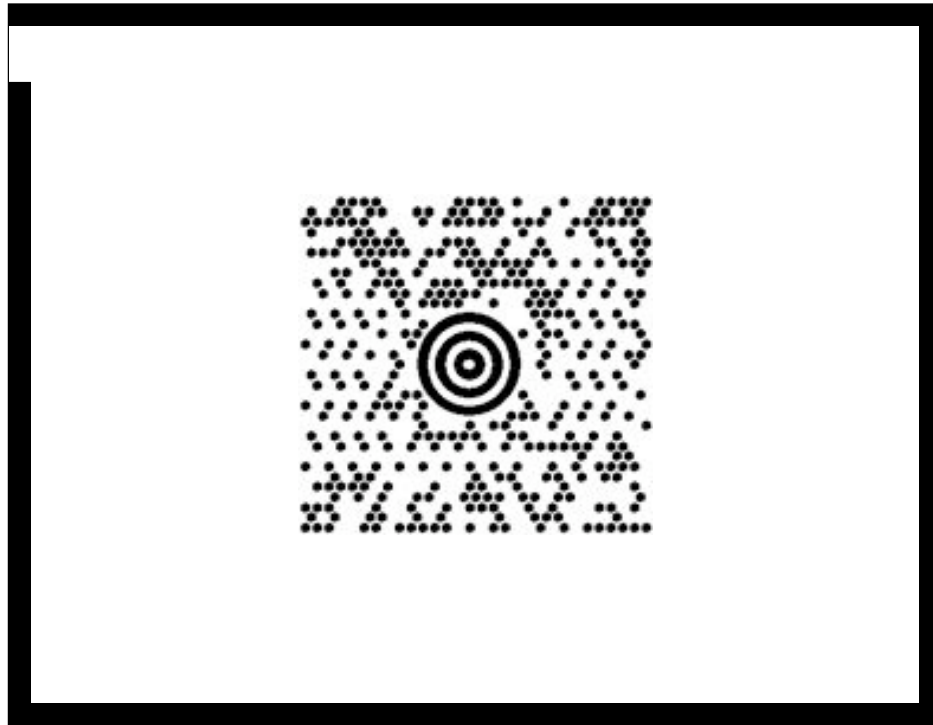Things have long had identifying marks, from silversmiths' hallmarks.

To barcodes, but mating machine-readable identification with pervasive networking greatly increases the value of the marks.

Photo CC from http://www.flickr.com/photos/dumbledad/298650884/

For example, when a machine-readable identification method such as an RFID or a high density visual code…

is combined with the wireless networking of a mobile phone, a new way of interacting with everyday objects is created.

Point certain phone cameras at a QR-CODEd object and it takes you to a URL that the phone, which is a kind of portable networked computer, automatically follows.

You can see where a product was made and, for example, what the nutritional value is. You can get third party reviews of the product. Does it do what it says it's going to?

Photo CC, found on http://www.flickr.com/photos/hiromy/330745745/
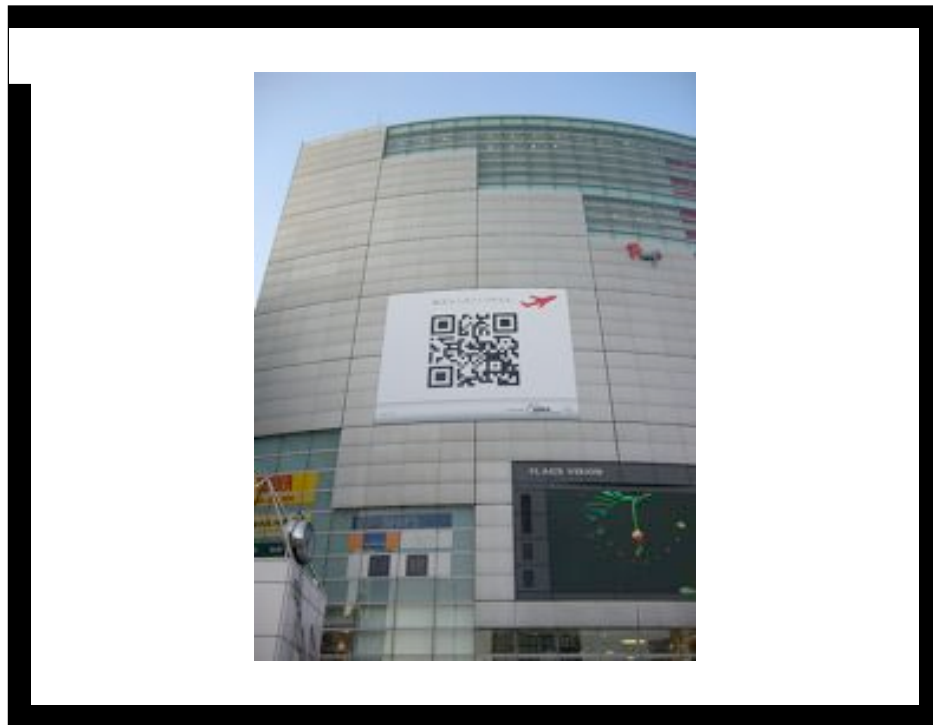
Once you have that capability, you can attach meta Information to anything.

Photo CC, found on http://www.flickr.com/photos/dotben/54783107/

Such machine-readable identification technologies let you see a lot more of the social life of everyday objects. How much is this worth on Ebay? Which of my friends has one? Will this go with my Mom's china?

SmartCorq

I call this digital representation as accessed through a unique ID, an objects' "information shadow" and I now see them attached to just about everything.

Paraphrasing Yahoo!'s Tom Coates, first we learn to digitally point at a thing's information shadow, then we can glue information handles to it. Once the shadow has handles, we can grab and throw the information around.

I think it's telling that Tom developed this way of thinking of objects as having digital handles while developing the BBC's online program guide. TV shows are a kind of serial and he had to learn to think about that data and how that data could be used, while trying to organize this mass of serialized information.

Let me give you another example of information shadows.

Photo CC by lovestruck, found on Flickr.
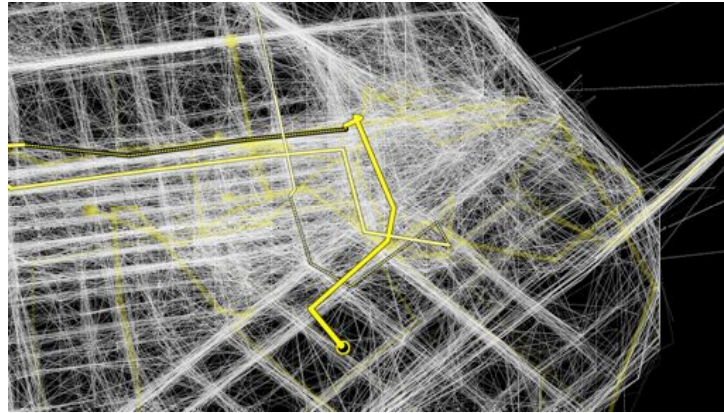
A geographic coordinate is a simple kind of information shadow. Here's a map of the trails of San Francisco yellow taxis as they move around the city. Every cab has a unique identifier, a GPS device and a wireless network connection that updates its location in real time.

The unique identifier is the handle and the GPS coordinate is the information shadow.
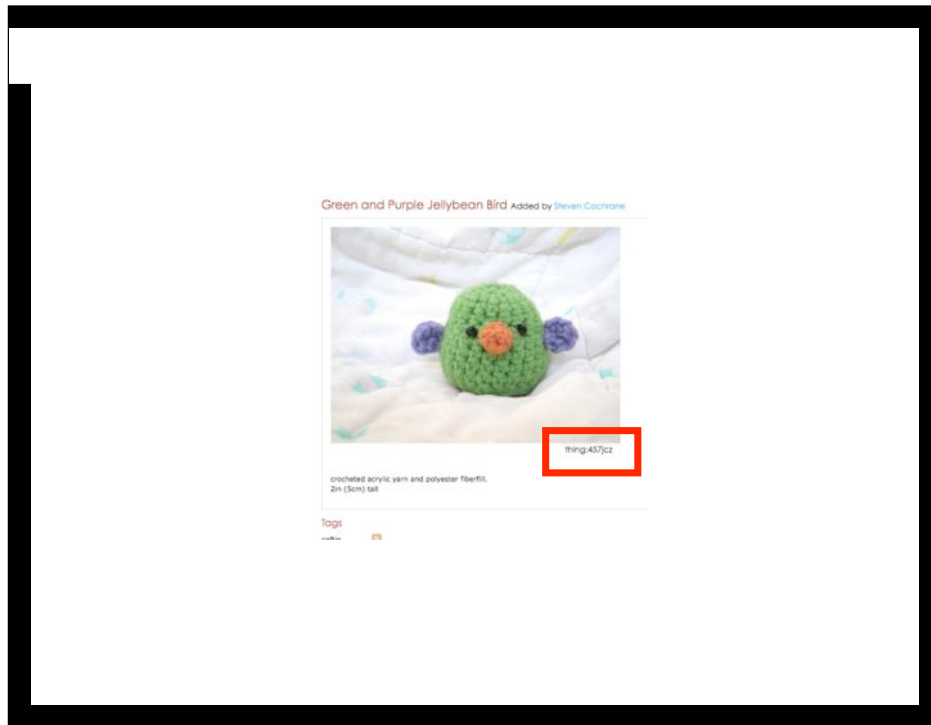
So how can we throw this around? We can use this data to do something as basic as suggesting what street corner to wait at for the next cab, or as complex as understanding downtown migratory patterns to make urban planning decisions.

Once we have that handle, the possibilities open up quickly, and this is the key to the power of machine-readable identification.

Source: stamen.com

Product Details
Product Dimensions: 15 x 4 x 8 inches ; 3.5 pounds
Shipping Weight: 9 pounds (View shipping rates and policies)
Shipping: item can be shipped only within the U.S.
ASIN: B000RWEGCO
Item model number: 22208
Average Customer Review: ★★★★ (10 customer reviews)
Amazon.com Sales Rank: #293 in Electronics (See Bestsellers in
Date first available at Amazon.com: June 1, 2007

Would you like to update product info or give feedback on ima

Another example: Ulla-Maaria Mutanen, a Finnish researcher, realized that when Amazon extended ISBN to create their ASIN system they suddenly allowed anyone to reference any product Amazon sells or has ever sold. The ASIN is the handle that we can use to throw Amazon information shadows around. Amazon has built a large portion of their business around the fact that people point at their objects in a million ways, but at the core of that is always the ASIN.

Green and Purple Jellybean Bird Added by Steven Cochrane

thing:457jcz

crocheted acrylic yarn and polyester fiberfill,
2in (5cm) tall

Tags

Amazon sells a lot of stuff, but they don't sell everything. Mutanen went beyond her initial observation to create a new system, Thinglink, that extends the idea of having a digital handle to any object, however unique or mundane. She hopes that Thinglink will let everything be as easily addressible as Amazon's products, so that even the most humble homemade product can have the kind of social life Amazon's products have.

Some things are crying out for having their information shadows so easily accessible.

For many wine enthusiasts, for example, information about wine is as important as wine itself, and they may spend as much time researching and talking about wine as they do drinking it, probably more.

Other things have become subsumed by their shadows. We all know what happened to music

Now…

Amazon's Kindle is trying to do that to books.

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 sufficiently blurred that there is a range of objects that exist to varying degrees as information shadows.

Photo CC by scurzuzu, found on Flickr.

Some things have dematerialized almost completely.

When was the last time you thought of a plane ticket as a physical thing?

These kinds of identification and tracking technologies are not wholly new. However, until recently, information handles have not extended far beyond the world of digital objects and machine readable identification has not extended beyond the logistics and shipping industries. That's soon going to change.

My view of serials

In the rest of this talk, I'm going to speak about how I believe the world of serials and the world of ubiquitous computing intersect.

First, however, I'd like to tell you how I think of serials. I come from outside the library world, so my view of what a serial is may be naïve, so first let me tell you what I imagine when I think "serial":

I think of a journal. And what's a journal?

Well, from my perspective, it's an agreement between a publisher and subscriber that one will provide information of a certain type to the other. This service traditionally manifests as a softcovered book.

The New England Journal of Medicine mails my doctor housemate medical information every week. Next week this one will be replaced with a similar one

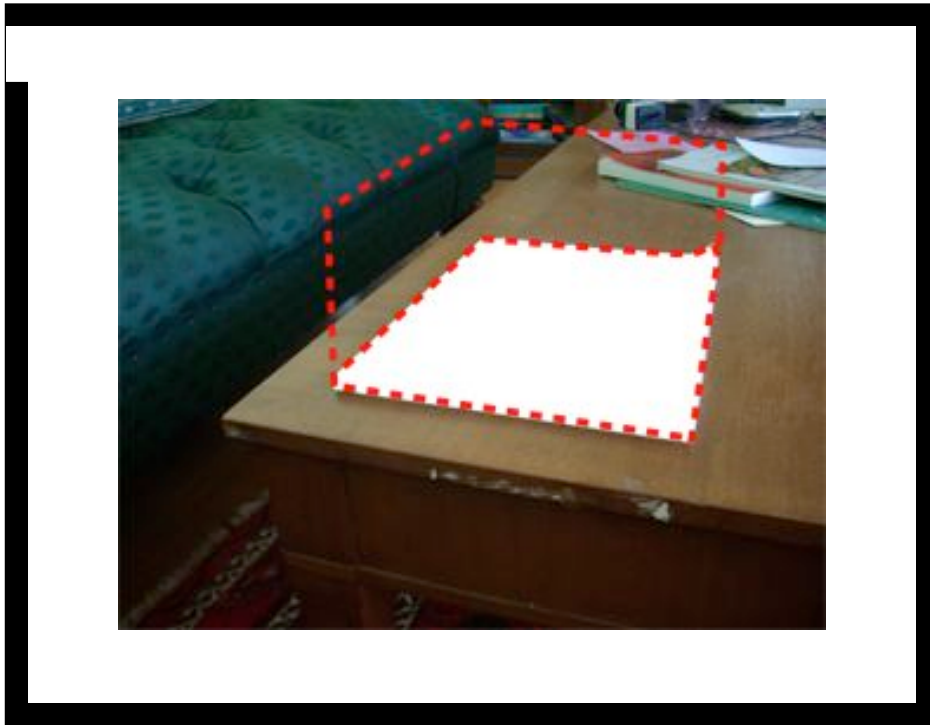and similarly the week after that

and the week after that

Etc.

When I look at this journal on our coffee table, I see a dotted line in the shape of a soft-covered book.

The outline is regularly filled in with something that addresses a set of concepts that are defined by the agreement between publisher and the subscriber.

Furthermore, the space inside the dotted line represents what can be thought of as a slice through a single object, some of which has been created, and some of which hasn't.

When I think about purchasing a subscription, I think about buying some paper that represents a chunk of the contents of that larger object

Photo CC by heipei, found on Flickr.

and as long as I, the subscriber, am interested in that broad set of concepts, I kept buying new chunks.

What I, the subscriber, own is the ageement for the service. The paper manifestation of that agreement is one way that the aggrement can be satisfied and the service provided. There can, of course, be other manifestatations, but at the core for me is idea that when you subscribe, you buy the dotted line and you own whatever fills in that dotted line.

A dotted line around the world

Now, I believe that journals are no longer the only things that have implicit dotted lines around them.

A familiar dotted-line object is the timeshared condo. Allow me to compare a timeshare to a journal. In a journal, the form and update period are fixed, and the content is variable. Similarly, in a timeshare, the form and usage period are fixed, and the occupants are variable. You could say that in this view, the timeshare is subscribed to you although of course, then you're paying to be the contents, and that's probably taking the metaphor too far. Or maybe not.

In both cases, what you own is the possibility of an object, rather than a specific object. Also, unlike rental, which is a time-limited agreement that implies no rights before or after, both a journal and a timeshare represent a kind of true ownership. You have some rights to that property forever, even if-- in the case of the journal--it may only mean being able to keep the paper manifestation on your shelf forever.

Now I'd like to talk about a related concept called a "vacation club" that extends the timeshare idea and this kind of relationship even further.

Photo CC by opacity, found on Flickr.

Disney has one, of course. Ownership of a Disney Vacation Club property, for example, last about 50 years and gives you the right not to a fixed property at a fixed time, but the right to vacation at something like 500 different properties at just about any time.

In this agreement, neither the place, nor the time is fixed, only the rough outlines of the experience you're going to have.

So what do you own for 50 years?

Not getting into the literal legal definition, roughly speaking, you own the right to request a class of things that changes with every instantiation.

Exactitudes®

58. Toppers - Rotterdam 2002
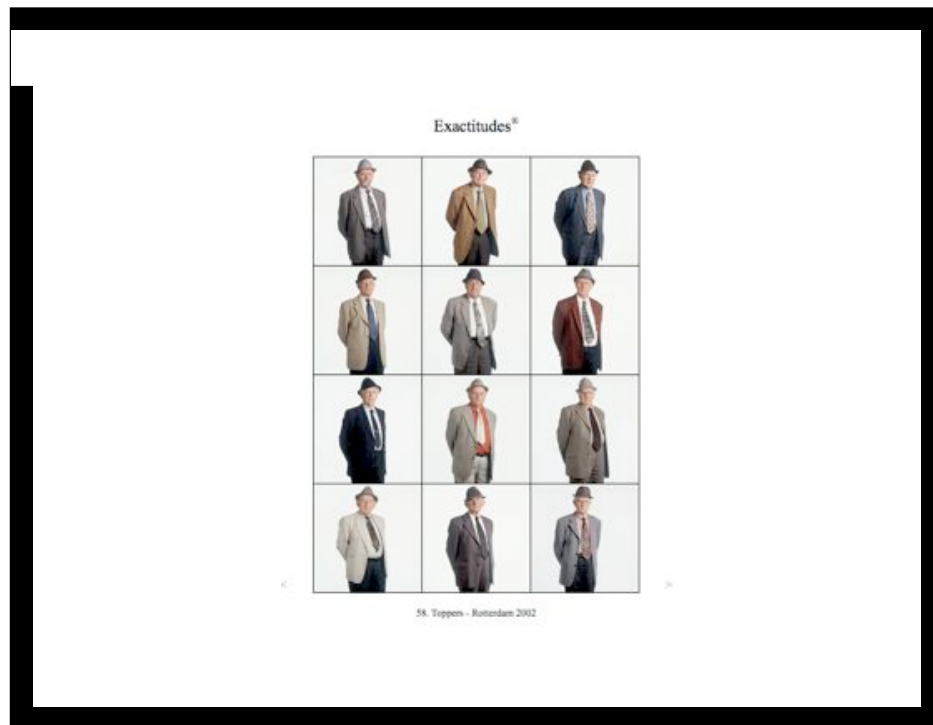
But it changes in a way that is *predictably* different.

I think these types of goods point to a new model of relating to everyday objects, one that's enabled by ubiquitous computing and which could fundamentally challenge and change what it means to own something. I believe that it could shift the nature of many everyday things from existing as monolithic objects to being closer to something that's between a service and a serial.
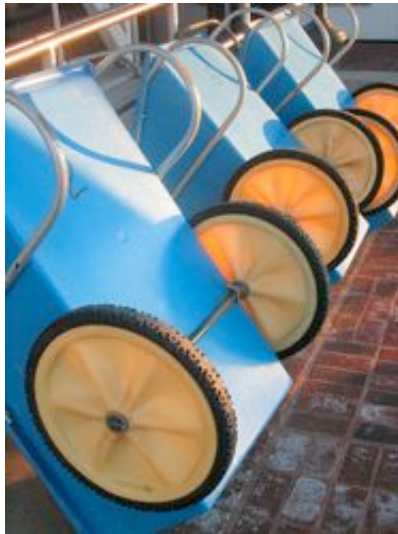
To paraphrase science fiction writer and ubiquitous computing theorist Bruce Sterling, why should I own a bicycle and my neighbor own a bicycle, when we typically don't need to use one at the same time? Why does everyone on the block need to own their own wheelbarrow?
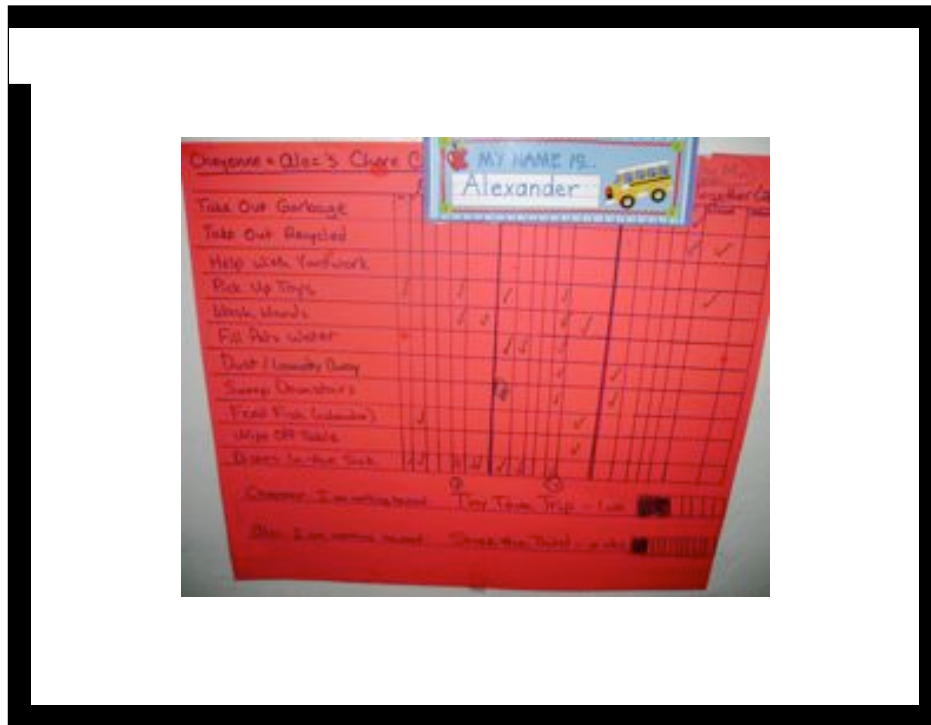
Photo CC by alykat, found on Flickr.

Until recently, the logistics of sharing everyday objects have been complex and have happened only where traditional ownership was financially prohibitive or where the people involved were highly motivated, such as at a commune, summer camp or in the military.

Photo CC by kindee, found on Flickr.

As anyone who's lived with roommates will tell you, sharing is difficult

Photo CC by christinerenee, found on Flickr.

and the tools are primitive.

Ubiquitous computing gives us tools to track, trade and share objects much more efficiently than any previous technology.

Let me give you an example.

Photo CC by rexandsharkey, Found on Flickr.

City Carshare, the first car sharing company, wouldn't exist without ubiquitous computing technologies.

When you buy into their service, you get a dotted line car and a key fob that has an RFID in it, which is essentially a small microprocessor and radio. The car is connected to a central network. You can only open the car and start the engine when your specific keyfob is scheduled to open and start it. Like the yellow cabs I showed earlier, it uses a GPS to track where the car is, whether it's been dropped off at the right location, and how far it's been driven. All of that is transparent to you, the owner of a membership. You treat it much like your own car and have access to it 24 hours a day, 7 days a week, with very little advance notice. It's of course different than your own car--you can't leave your CDs in it--but it's certainly a lot more like your own car than a rental.

However, unlike a single car, it's a car possibility space. This is an ad from Zipcar, a similar service to City Carshare and it shows the implicit power of this kind of system. It shows how your relationship to your car can change if that car is a dotted line object.

ZipCar ad

Here's another example: Germany's Call-a-Bike program run by the rail service. The program is completely based on ubiquitous computing technology. You need a bike, you find one of these bikes, which are usually at major street corners. You use your mobile phone to call the number on the bike. It gives you a code that you punch in to unlock the bike lock. You ride the bike around and when you've arrived, you lock it. The amount of time you rode it automatically gets billed to your phone, by the minute.

Photo CC by probek, found on Flickr.
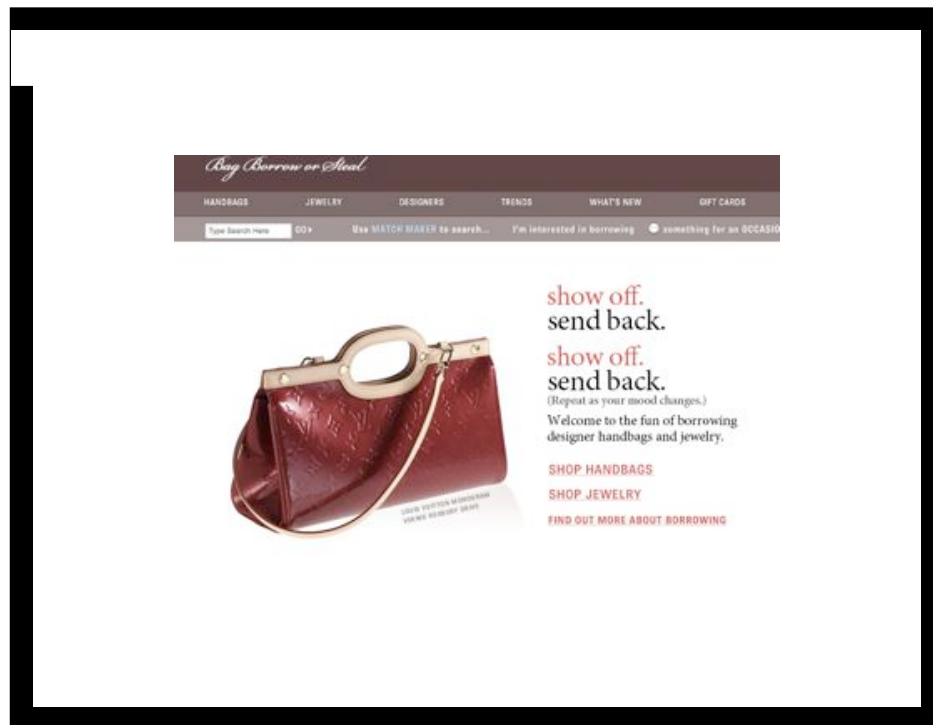
Here's another example that's not technically ubicomp, but points to some exciting possibilities. Bag, Borrow or Steal is a designer purse subscription site. It works like Netflix, but for really expensive handbags.

It's fashion by subscription and it again points to a new way of thinking about everyday objects.

Photo CC by bs70, found on Flickr

The changing nature of everyday objects

Information shadows and dotted-line objects are related. The shadow of an object allows it to be tracked and managed so that it can become an instance of a dotted-line object. In other words, it's the trackable metadata of physical objects that allows for their efficient conversion to services, to subscriptions. It was technically possible before, of course, and variations on these ideas have existed for a long time…
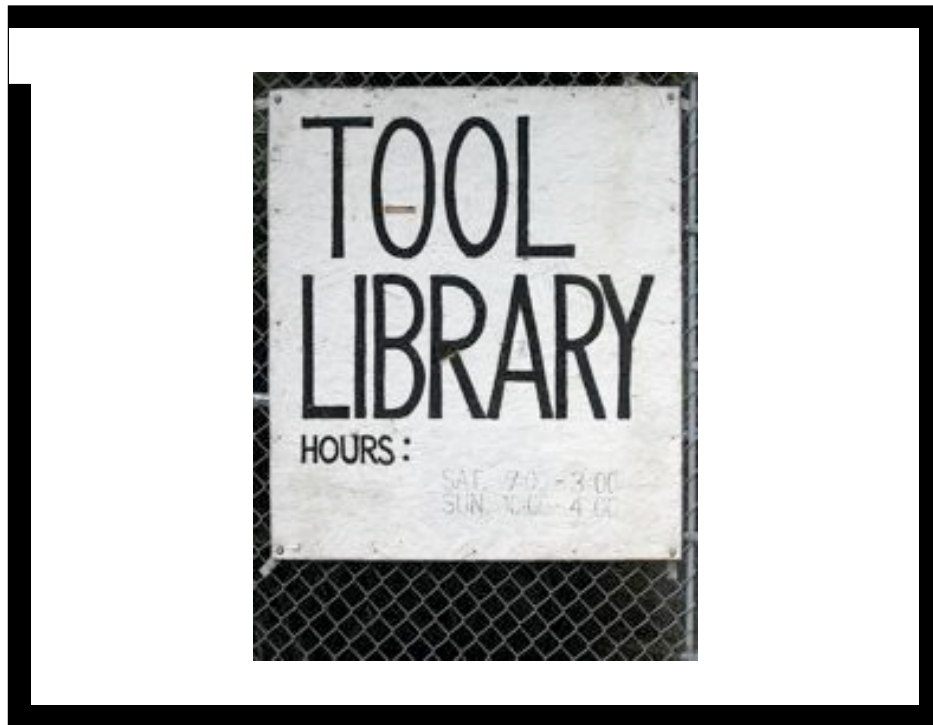
but it was not widely practical until the technology enabled these relationships to be embedded in many kinds of everyday objects and once embedded, to be automated.

This points to a fundamental change in the nature of everyday objects.

Photo CC by takomabibelot, Found on Flickr

One that simultaneously opens great possibilities and raises deep questions about ownership and privacy.

Economist Jeremy Rifkin coined the term "The Age of Access" to define this change. He says it represents a shift from ownership of objects to access to services.

Photo CC, found on http://www.flickr.com/photos/antara365/823844803/
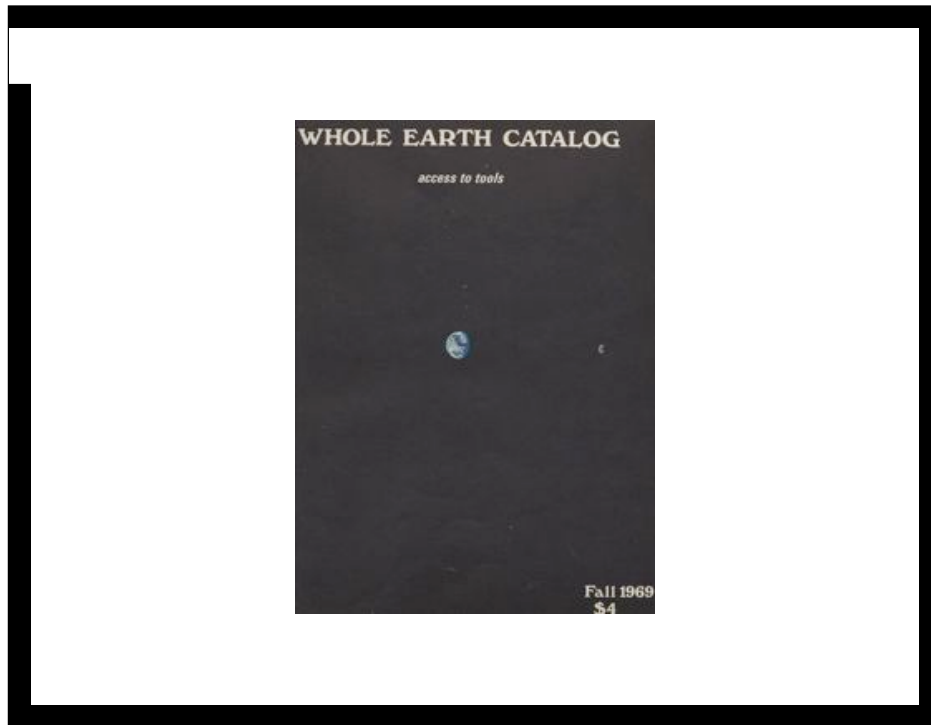
This is not unlike the philosophy of the Whole Earth Catalog, which promised access to tools, but now the tools are services. Rifkin wasn't talking about ubiquitous computing, but I believe that ubicomp represents a key enabling set of technologies that are going to introduce a deep social shift in our understanding of what is a service and what can be provided as a subscription, as I've shown.

Shadow wrangling

That's where you come in.

Technologists typically leave out the information management challenges
when talking about technological shifts. However, you understand those shifts
better than anyone else, since you have been on the forefront of the integration
of information shadows and physical objects longer than just about everyone.

Your job is to wrangle information about information. You have developed concepts, language and procedures for managing a broad range of knowledge about a broad range of entities. You understand how to name, classify, organize, curate and preserve continuity among dotted-line objects. You know how they differ from non-dotted-line objects.

Right now your focus is predominantly on informational objects, but why should that be the only kind of object that you consider? Why not think about how your work here can apply to the serialization of everyday objects?

Photo CC by larskflem, found on Flickr

What I'm saying that the world of dotted-line objects needs people who understand how to manage information about these objects. The field needs people who will corral, label and organize the information shadows. It doesn't know that yet, since the phenomenon is so new, but it will. The world will need shadow wranglers, and that's you.

THING M

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