Materials that dematerialize

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i290
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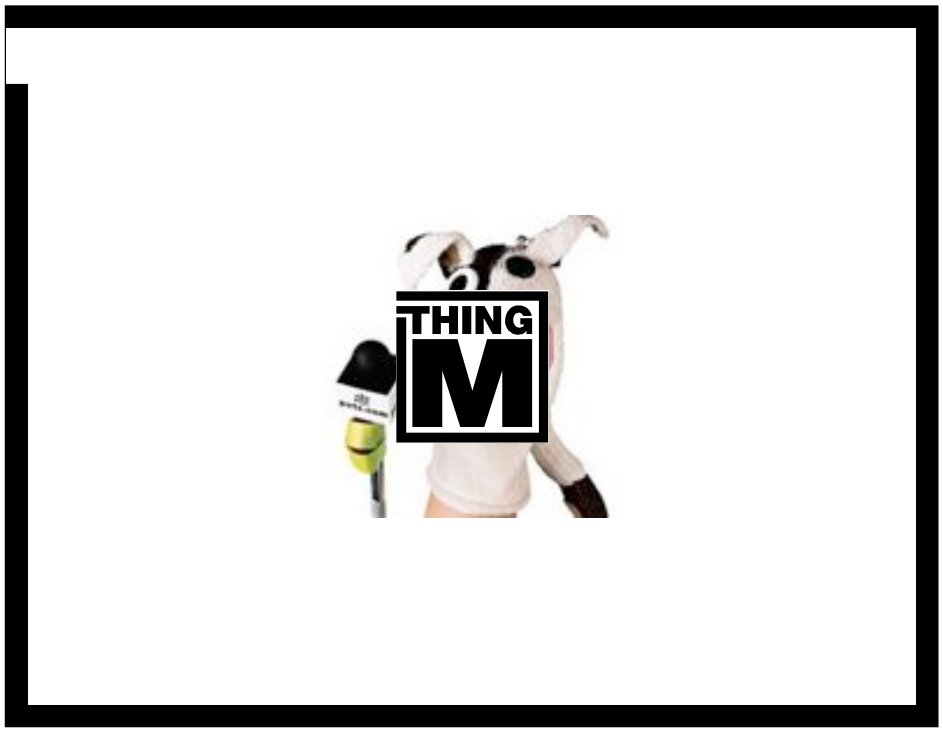
I’m a user experience researcher and designer. I spend much of my time thinking about how technologies and people affect each other from social, economic, historical and technological perspectives, and how the technological side of that relationship can be made better, or at least more interesting, for the human side of it.

Junkyard photo CC by Sigma. Found on Flickr.



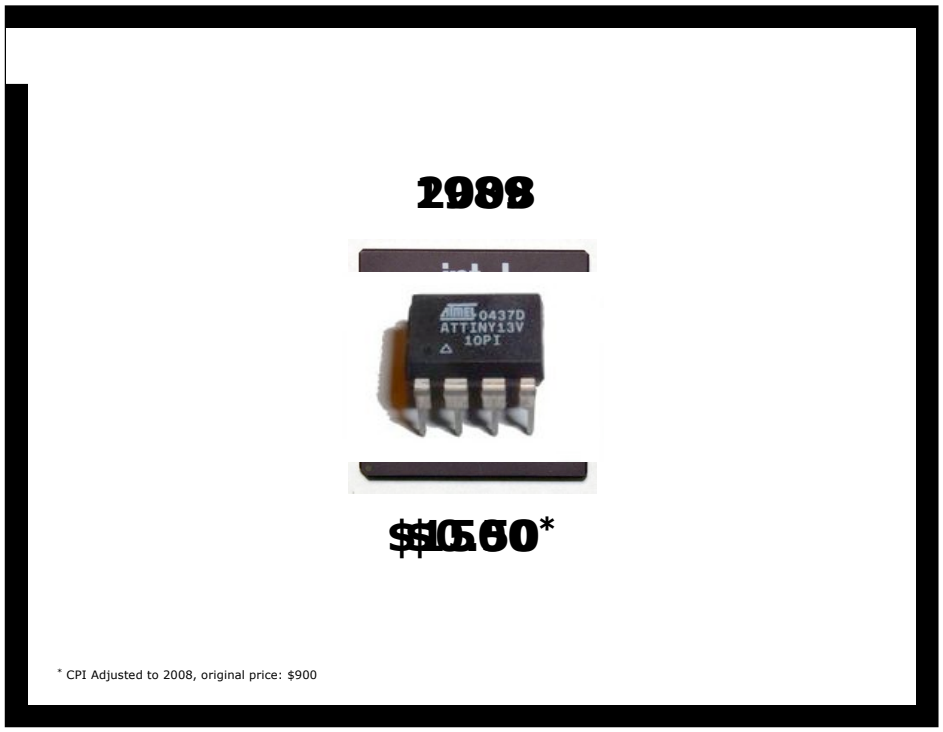
I spent 10 years doing design and research for the web. Some of the products I worked on were pretty famous, some famous, some infamous.

4 years ago I stopped working on the web and 2 years ago I co-founded ThingM with Tod Kurt.

We design and manufacture ubiquitous computing products.

As a technology designer I use the history of other technologies to drive some of my thinking.

I would like to start by tell you a story about alumimum. In 1885 it was the most expensive metal on earth. More expensive than gold or platinum. So expensive that a 3 kilogram block of it, the world's largest, was put on top of the world's tallest structure, the Washington Monument. The same year, a chemist figured out that you could use electricity to extract it from bauxite. By 1886, it was discovered that it was actually the most common metal on earth, and we know what happened.



Something similar has happened with information processing. At the beginning of the Internet era we had the 486 as the state of the art and it cost $1500 in today's dollars. Today, you can buy that same amount of processing power for 50 cents.

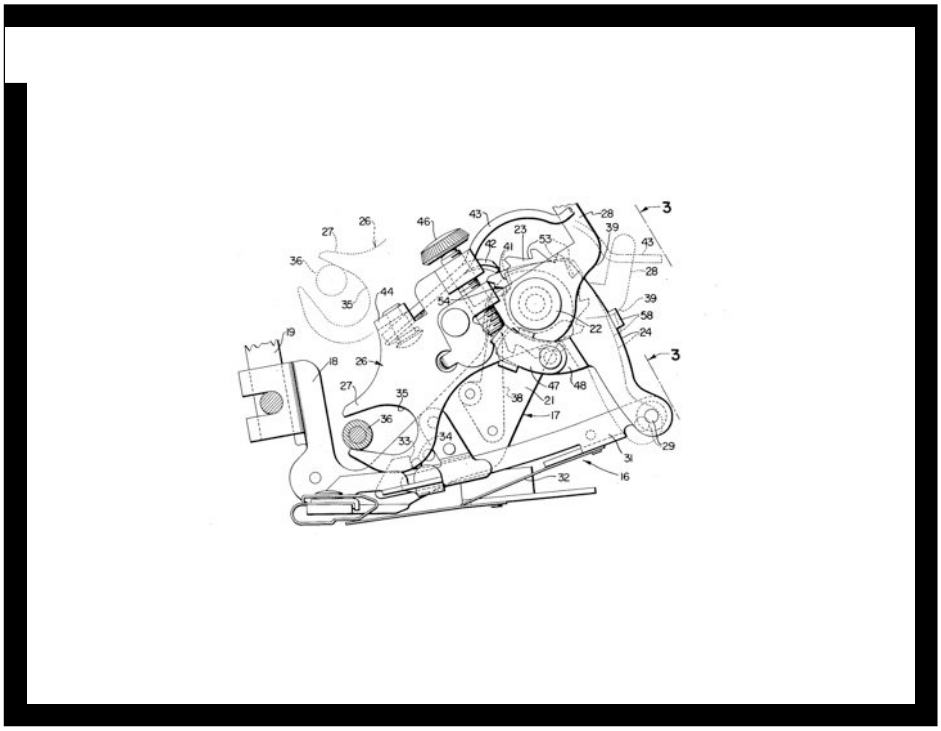
When computation is this cheap, it stops being the focus of design--it's no longer the precious jewel on the monumental structure. It's just one of the blocks that goes into the construction of an object.

In other words, computation, information processing, has become a material to design with.

Once including a CPU has become a line item in the calculation about what to make it out of, the question is how we use this new material. What are its properties? What are its constraints?

Aluminum provides lightness, rubber is an insulator and springy. Information processing has a number of interesting ones, but I believe the most important one is behavior.

Source: Flickr, Kate_A



Objects that use information processing do not act as expected based purely on their physical properties. Traditional things mostly exhibit easily identifiable relationships between causes and effects (for example, something is pushed, it falls down). It's possible to disassemble the most complicated everyday mechanical object, say this thing, and with some work determine how it functions and what it does.

However, that doesn’t work for objects made with information processing.

The same is not true for this device, which we know is a phone, but which could be a calculator, a remote control or any number of other devices that have a keypad, a screen and electronics. The numbers on the chips could help identify some of its functionality, but it would never tell you that you can send a text message with it.

The relationship between causes and effects in an object made with information processing is much more difficult to identify. Key aspects of its functionality are in software, which is very difficult to observe and can change what the device does without warning. Thus, these devices exhibit unpredictable behavior that is closer to that of animals or people than to traditional machines.

That's the key property that makes information processing so valuable. Let me give you an example. This is the Cuddle Chimp. By itself, it's kind of an ugly chimp doll. But it acts like a newborn baby, and that behavior puts it in a different class from all of the other chimp toys, which means that the manufacturer can charge more for it, which means that behavior creates competitive advantage, which means that by the natural forces of the market we are only going to see more devices with information processing-produced behaviors. The toy industry, one of the most competitive of all, has been deep in the ubicomp business since Tickle Me Elmo came out in 1996.

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.

It predated the Nike + iPod by two years and I think it's the more profound product because it represents the distilled knowledge of kinesiologists, coaches and runners to adjust the behavior of your shoe as you're running. It deeply embeds computation into its function, rather than keeping it as an attachment.

This is a Blendtech blender. With it you can program a specific sequence of blender power, speed and duration and associate that sequence with a button on the blender.

In other words, it allows you to embed experience and knowledge about food processing into the tool, which can then produce that as a behavior, rather than requiring the operator to have that knowledge and develop the experience.

Jamba Juice uses these extensively. Some master food scientist in Jamba's food labs has figured out a sequence that represents a "good enough in most situations" way to prepare their product. This way, their staff don't have to be trained in the fine points of blending. It may seem like a small thing, but consistent blending is the cornerstone of their company and this embedding of knowledge into the tool wouldn't have been possible without ubiquitous computing. The behavior is the value.

Let me give another example. Say I'm an oven designer. Should I put in a mechanical timer or digital timer in this oven? The question becomes not one of "is this hypothetically possible?" but "Will the behavior created by this feature bring me enough new customers to offset the small marginal cost of the hardware?"

Lets look at what these folks decided.

[overlay]

They put in a networked digital timer. You can adjust your oven from anywhere on the Internet.

I see this as an example of designers exploring the capabilities of a material.

Information processing as a material is still unfamiliar, like nylon was in 1940, but now that the the economic threshhold has been crossed to make it a commodity, the design challenge is to use this material to make things better, easier, more profitable, or more fun.

This is leading to whole new classes of objects with embedded computers being created on a regular basis.

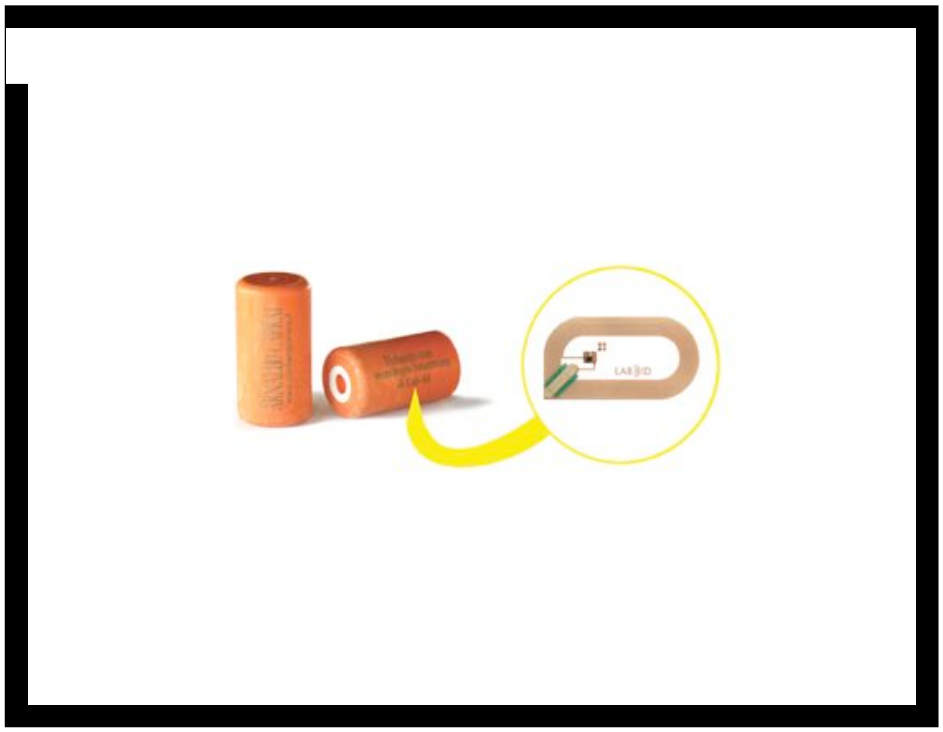
Identification is another piece of this ubicomp/Internet of Things puzzle and, tangentially, I think those two terms refer to the same social-technological phenomenon. They're just coming at it from different directions.

Manufactured things have long had identifying marks, from silversmiths' hallmarks to barcodes.

These are the link between the object and information about the object and every object that has one exists simultaneously in the physical world and in the world of data.

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

I call this data the object's information shadow. Until recently, accessing the information shadow was very difficult. The world of objects and the world of information shadows were separated by the difficulty of access. In a store, you don't know what the barcode means, the store does, because only the store had the database and the hardware. And even they only know a small part of what's going on because a barcode only identifies the class of objects, not the individual object.



The combination of new digital identification technologies such 2D barcodes or RFIDs with ubiquitous computing and wireless networking changes all that..

SmartCorq

Now you can see the information shadow of the SPECIFIC object you're looking at.

Each object is unified with its information shadow and you can query it. You can now know about where it was made, if it is a real Gucci, what it is made of, what your friends think of it, how much it sells for on Ebay, how to cook it, how to fix it, how to recycle it, whether it will go with your mother's drapes, whatever. Any information that's available about an object can now be available immediately.

We are witnessing right now the beginning of mashups between the physical world and the data world and that will accellerate very rapidly as digital identification becomes more commonplace.

Source: Yottamark

One consequence of this is another fundamental shift in the nature of familiar objects. And let me give you an example of that starting with the library world, since we are, after all, here in the former school of library science.

Take a journal. What's a journal? 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 that's delivered on a regular basis.

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

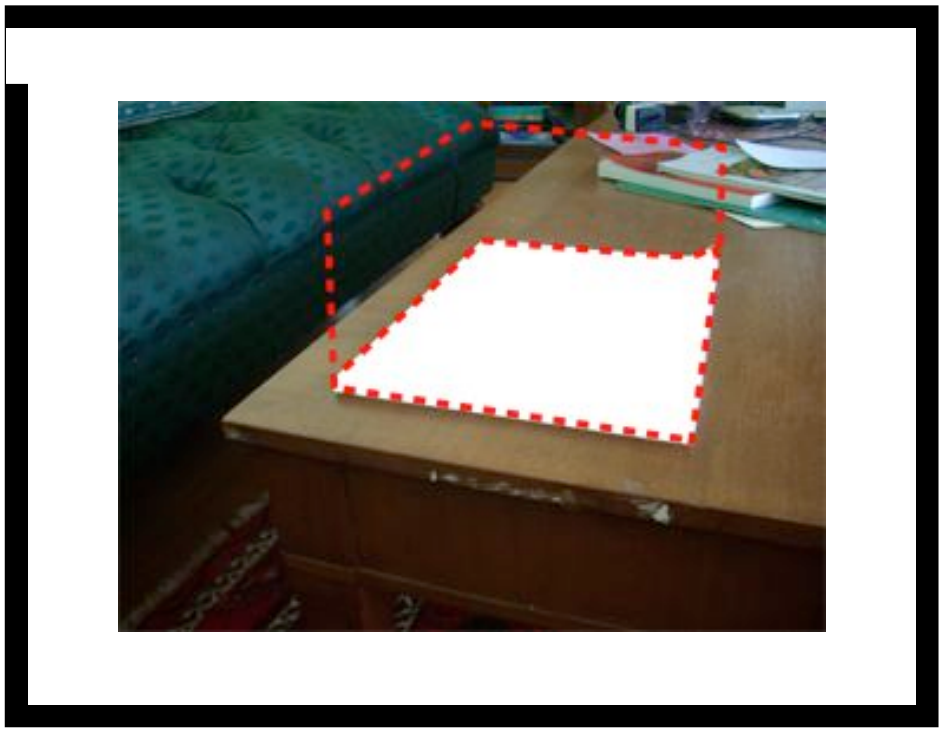
and similarly the week after that

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.

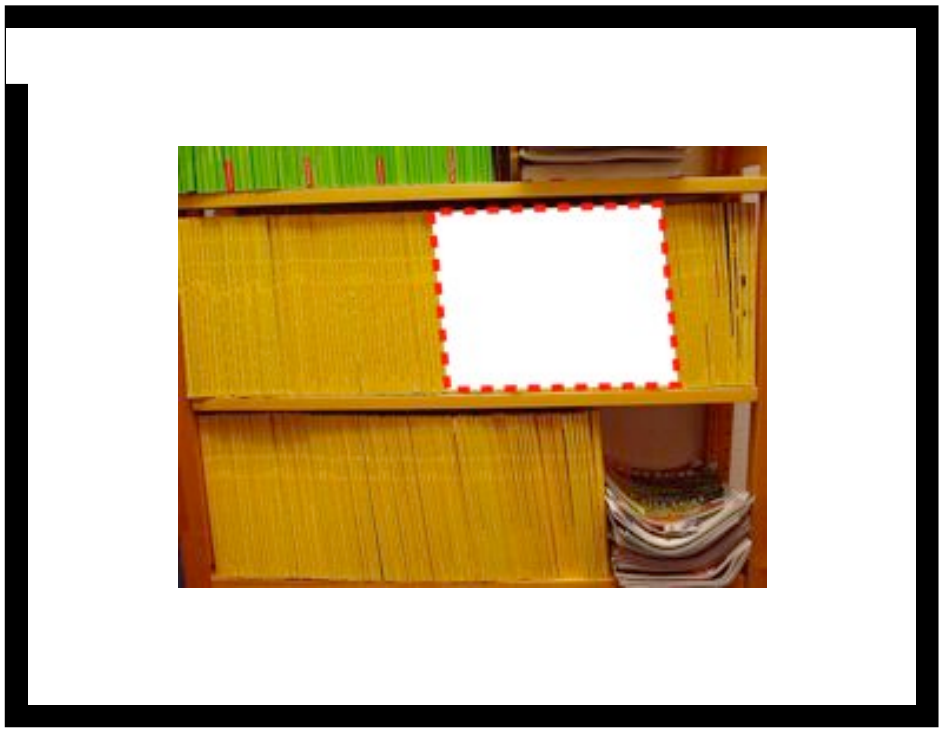
The outline is regularly filled in with something that addresses a set of concepts that are defined by the agreement between publisher and the subscriber.



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

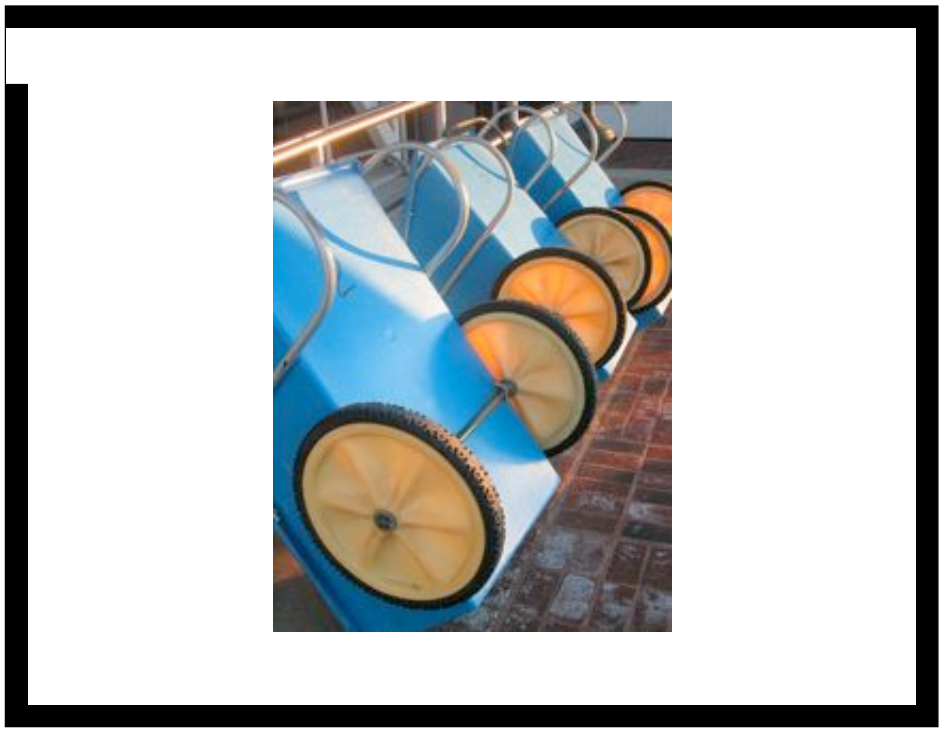
Photo CC by heipei, found on Flickr.



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.

I believe that item-level digital identification and behavior created through embedded information processing combine in a way that implies that journals are no longer the only things that have implicit dotted lines around them.

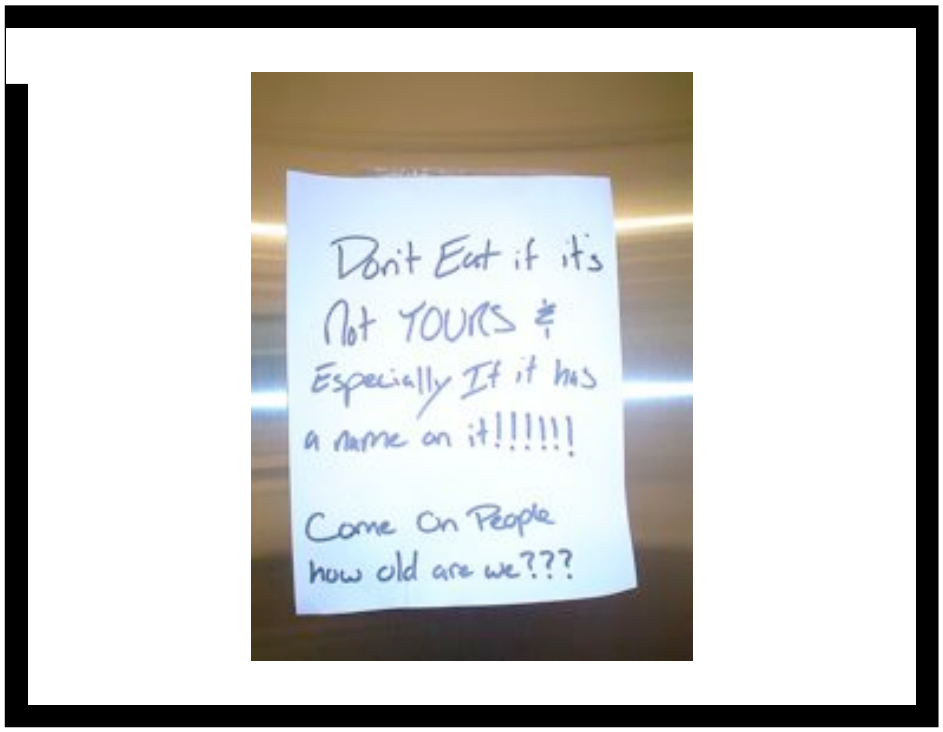


To paraphrase science fiction writer and ubiquitous computing theorist Bruce Sterling, why should I own a bicycle and my neighbor own a bicycle, when we typically don't need to use one at the same time? Why does everyone on the block need to own their own wheelbarrow?

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 and digital item-level identification technologies.

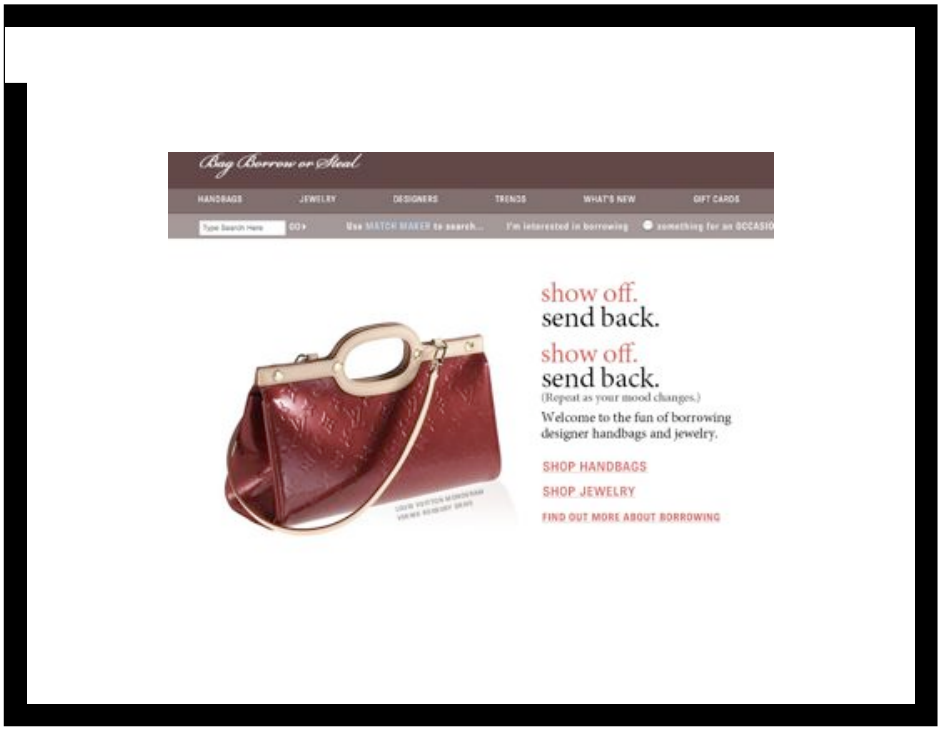
When you buy into their service, you get a dotted line car and a key fob that has an RFID in it, which is essentially a small microprocessor and radio. The car is connected to a central network. You can only open the car and start the engine when your specific keyfob is scheduled to open and start it. 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.

Information shadows behavior, and such dotted-line objects are related. The shadow of an object allows it to be automatically 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…

Photo CC by bs70, found on Flickr

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 and of their role in society. As information processing as a material creates the possibility for new things, item-level tracking dematerializes familiar things. It simultaneously opens great possibilities and raises deep questions about ownership, privacy, design, experience, identity. Our roles change to being clusters of trackable things, and as trackers of things, as users of devices made with information processing and parts of systems made with it. It challenges everything about our relationship to material culture. And I think that's pretty amazing.

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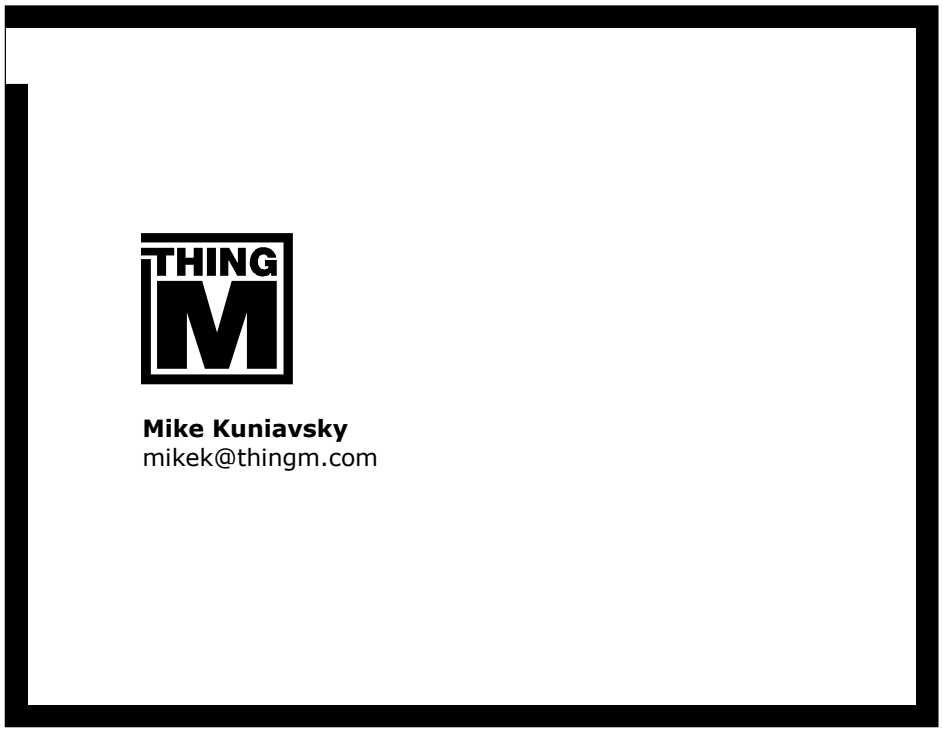

Thanks!