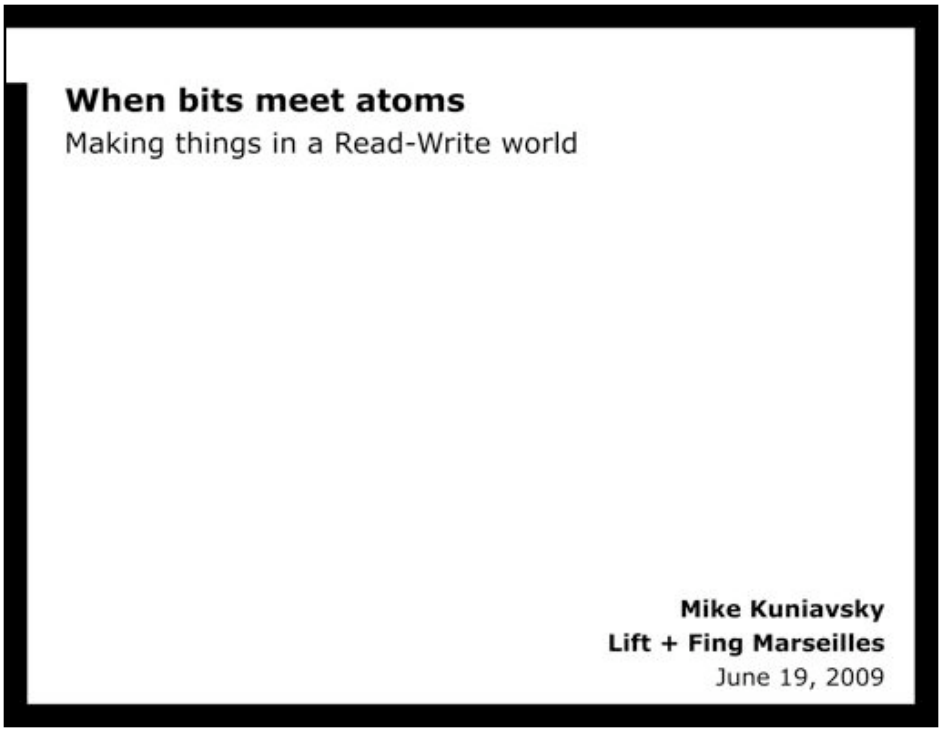
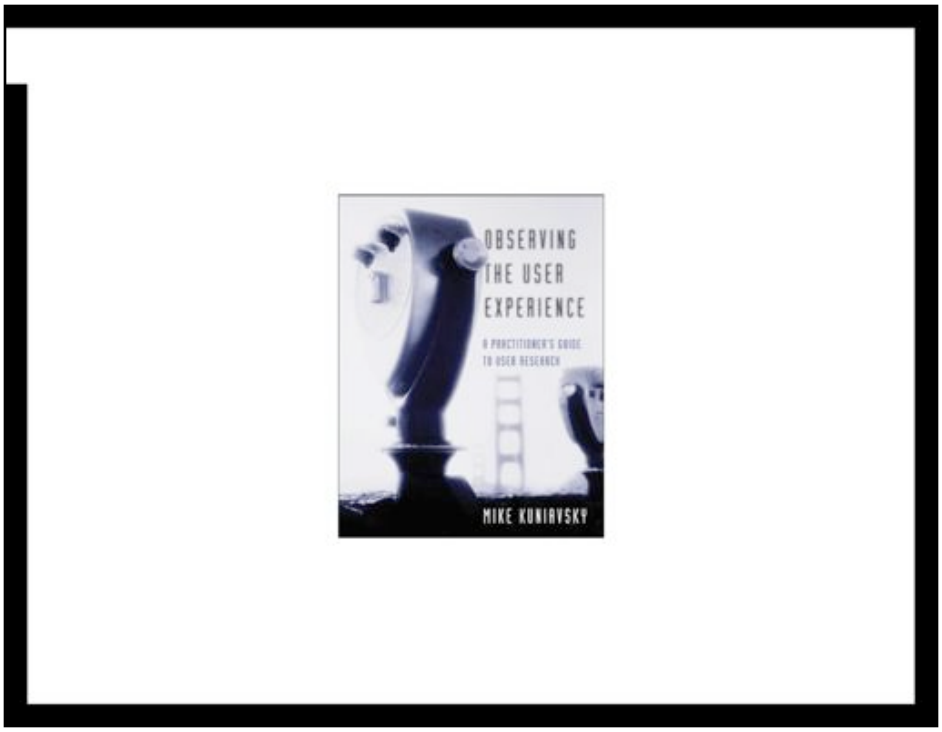


Good morning! Thank you Lift and Fing for inviting me today. My name is Mike Kuniavsky.

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.

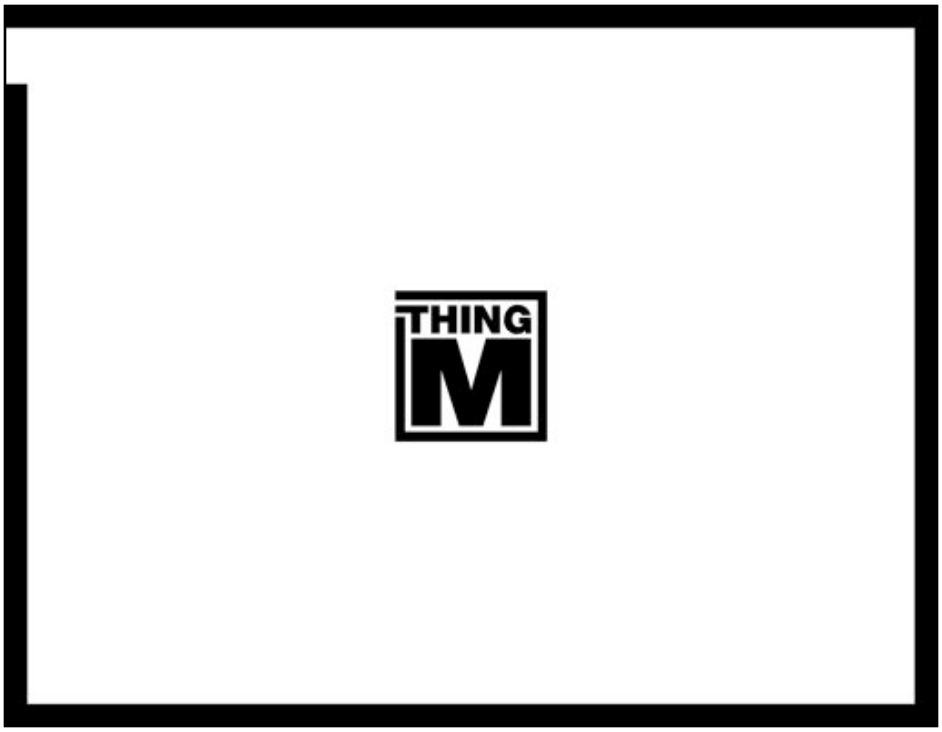
Photo CC by Cocoarmani. Found on Flickr.

I started out doing web design in 1993 and over the years I've worked with many dotcoms, some famous, some--like pets.com--infamous.

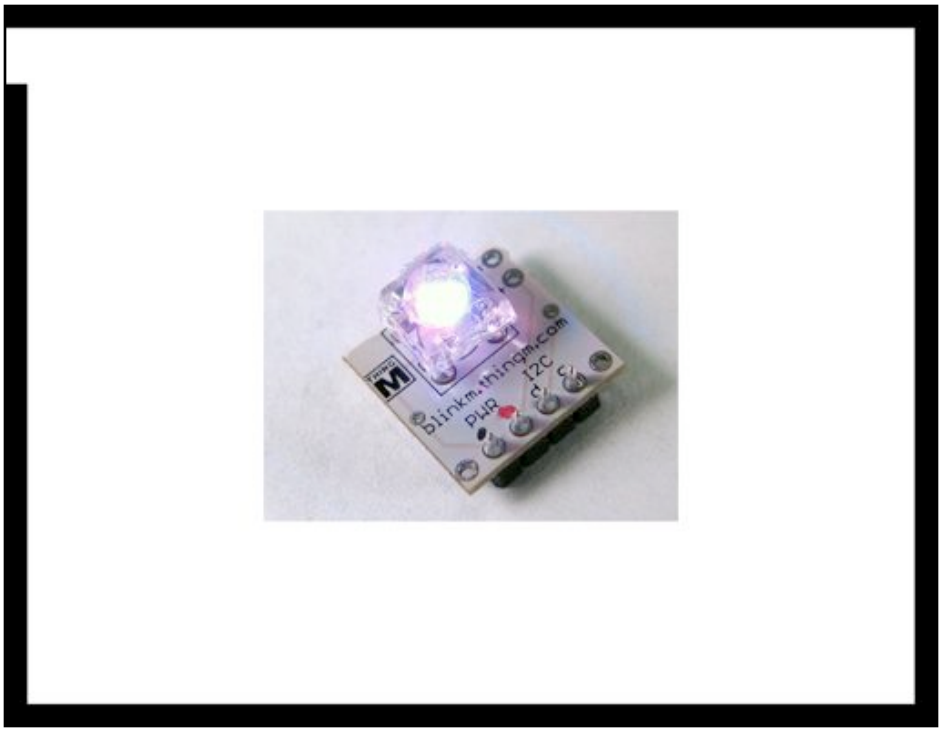


I sat out the first dotcom crash writing a book based on the work I had been doing.

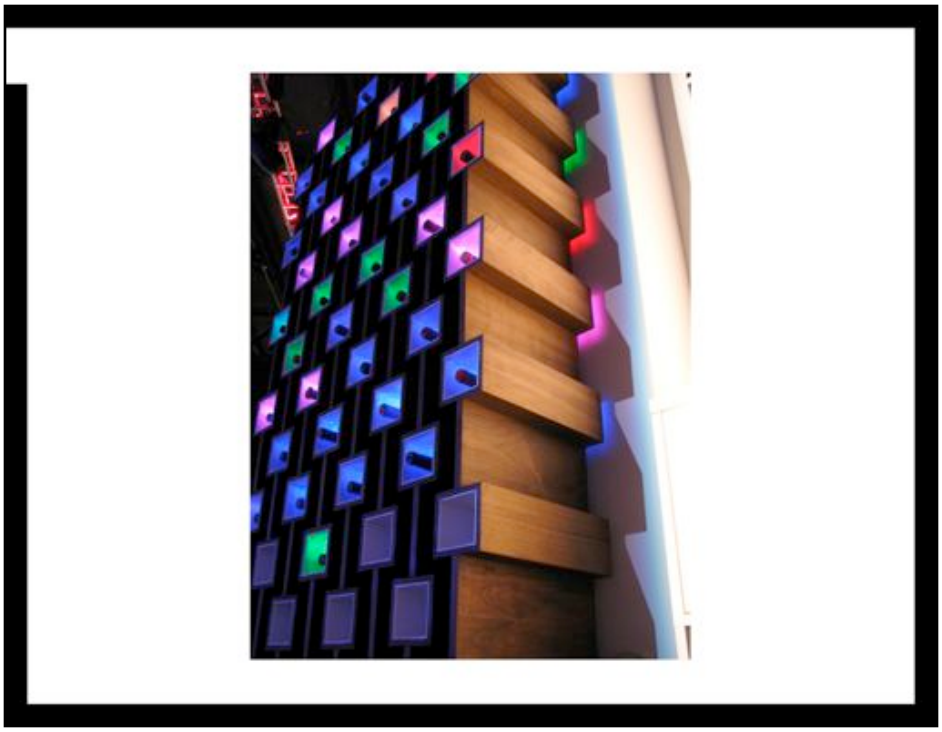
In 2001 I co-founded a web design and consulting company called Adaptive Path. Things went very well, but I was interested in other ways that technology was changing society, other than through the Web.



So in 2006 I founded a company with Tod E. Kurt called ThingM to pursue these ideas commercially. We're a ubiquitous computing consumer electronics company, which sounds fancy, but we’re pretty small.



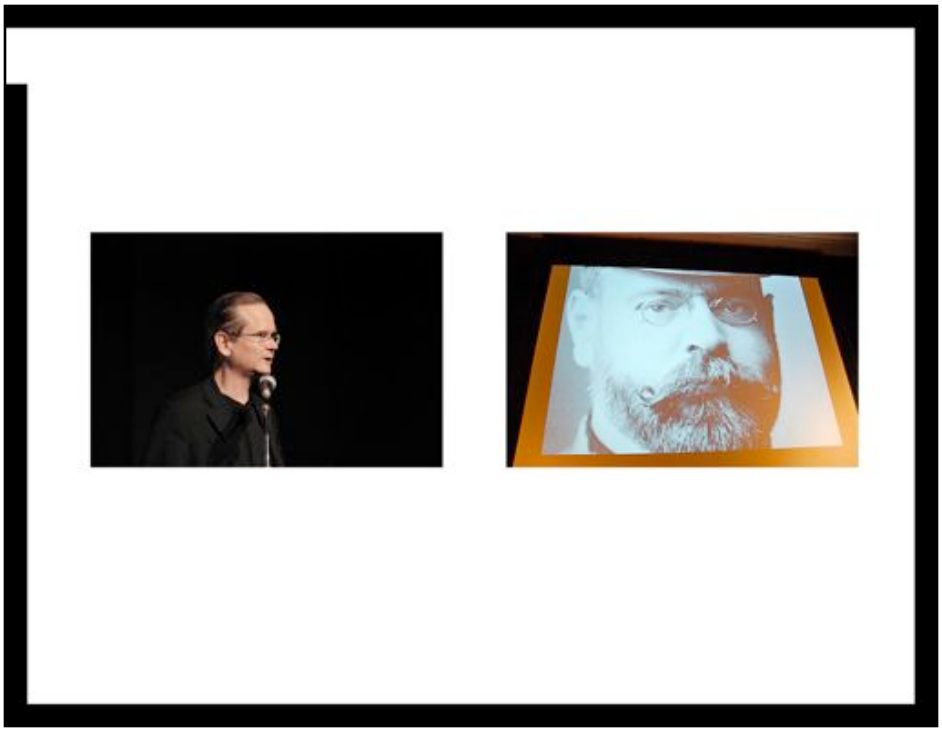
We design, manufacture and sell ubicomp hardware. This was our first product, called a BlinkM. It's a smart LED that uses a small microprocessor to make it much easier to make a light that glows in any color or pulses in any pattern.



We also have bigger plans. Here's an RFID wine rack prototype we made for WIRED Magazine's NextFest in LA. In this rack, each bottle has an RFID tag on it, and there's a reader in every cell. The rack knows exactly which bottle is in which cell and projects different kinds of information directly onto the wine bottles.

I also run an annual mini-conference called Sketching in Hardware, where I bring together a small group of people from the technology, education, art and design worlds to talk about how to make creating electronics as easy as drawing with a pencil.

Today I want to talk about what happens when bits and atoms collide, and I'd like to start by talking about the work of Lawrence Lessig.



Professor Lessig is a Stanford University Law Professor who has spent much of the last decade talking about copyright and culture. He invented the Creative Commons licensing system because he believes that current copyright laws do more damage to culture than they help it. He has recently been talking about what he calls Read-Write culture and Read-Only culture. In this discussion, he quotes composer John Philip Sousa, who complained that before recorded music many people, average people, nonprofessionals played music. He was worried that people's musical abilities, and thus an important expression of creativity, would disappear because recorded music would stop average people from expressing themselves musically. Moreover, from a cultural perspective, this was a significant loss of innovation. As people played musical instruments and sang for each other, they changed and reinterpreted the music. Some of these variations would then became popular, and were reinjected back into culture, creating a virtuous cycle that generated rich, flexible cultures all over the world.

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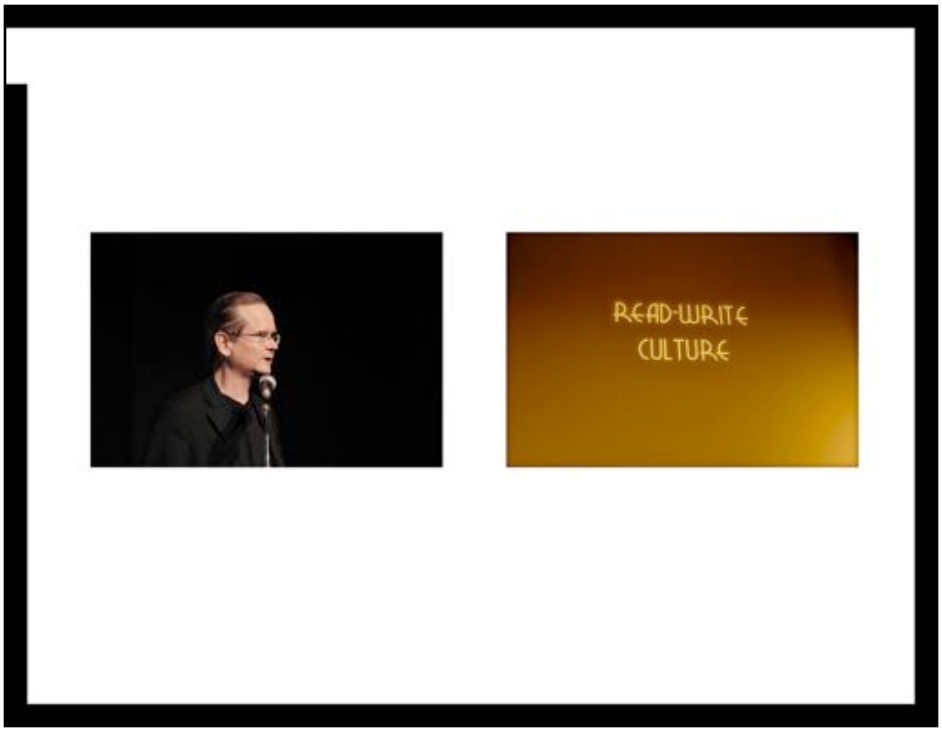

He calls this a Read-Write culture and contrasts it to the Read-Only musical culture of recorded music. In Read-Only culture, self-expression is limited to selecting among pre-packaged options and according to Lessig, it's an abnormality in history. Every century, except the 20th century, is Read-Write. He suggests that digital technology has made the 21st century a Read-Write culture again, but that our 20th Century laws and organizations have not yet recognized it, so he's fighting for the legal recognition of the fundamental nature of this relationship.

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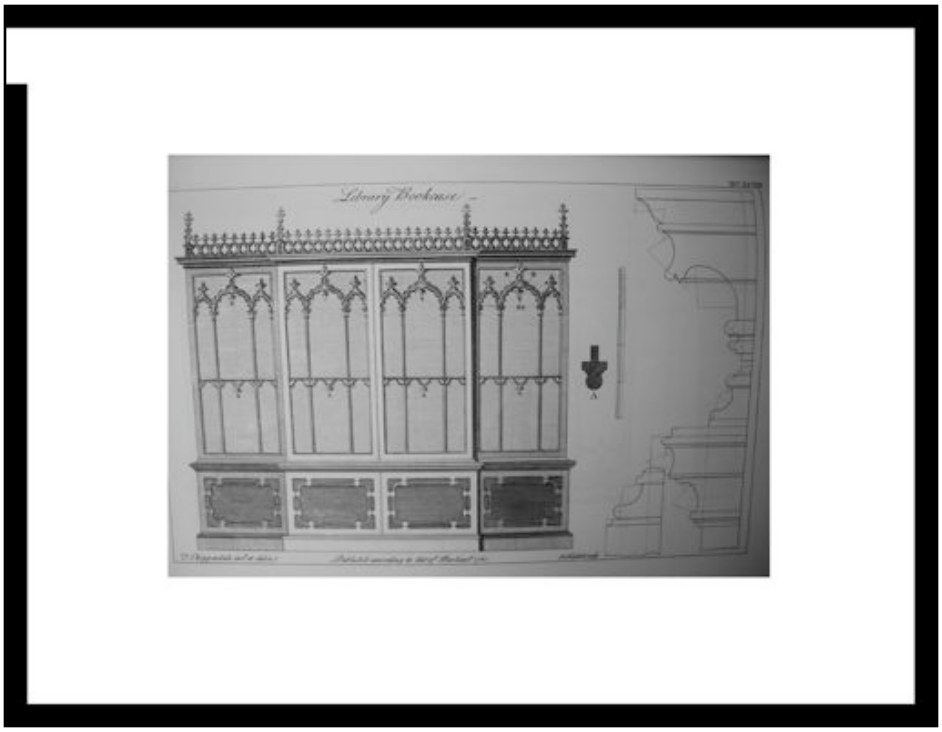
I want to talk about how his point applies to all manufactured products, not just music.

I’m not a historian like Dominique Pestre, but please excuse me if I make some generalizations about the history of making things. Before mass production, the basic materials of most technologies—wood, stone, metal, plants, animals—were widely available. Transportation was expensive, and except for some esoteric objects such as rugs and spices, what mostly moved around was knowledge, communicated through word of mouth and ritual. Villages had blacksmiths, carpenters and stonemasons who took information they heard and localized it for [click] the local population and materials. This was Read-Write material culture.

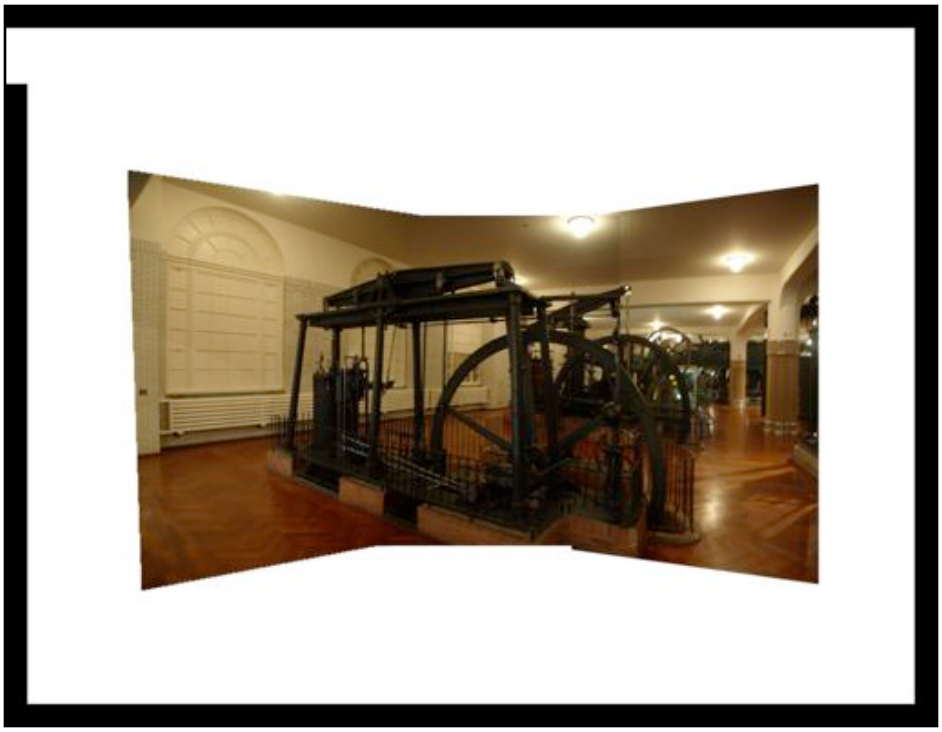
Photos CC by Mike Kuniavsky

Let me give you a specific example of how this culture worked from just before the Industrial Revolution, just before everything changed. This is Thomas Chippendale. He was a well-known furniture maker in 18th Century England. You know chairs with legs that end with an eagle's claw that's holding a ball? I believe he invented that. But that's not where most of his fame or fortune came from.

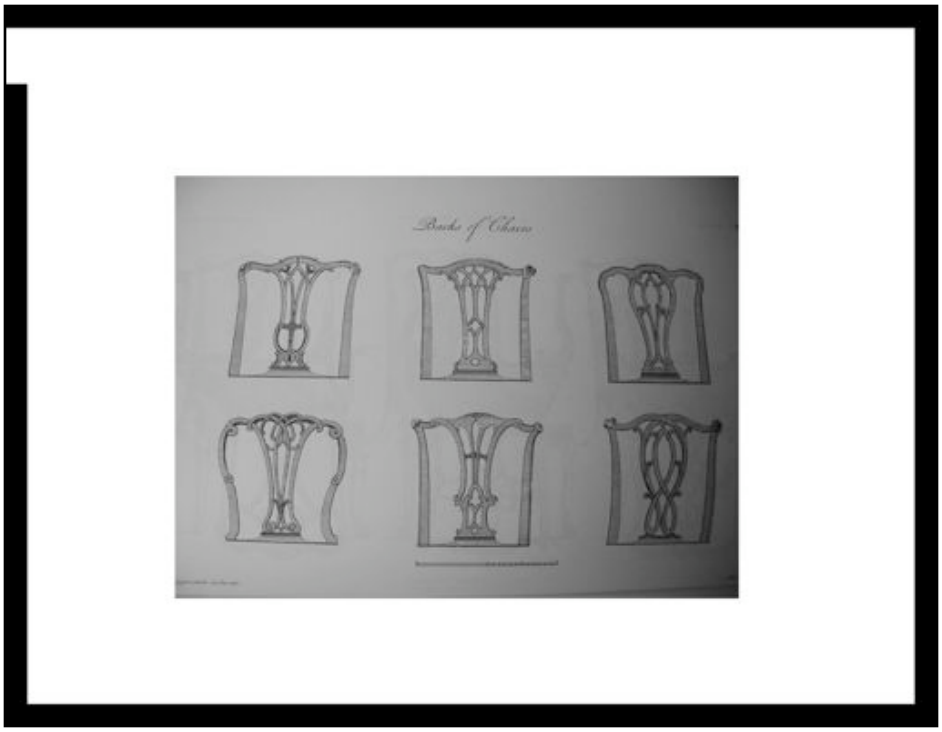
It came from this, a book he published in 1754. Notice what it is: it's a book of DESIGNS for furniture. Information. Directions. It's called the Director because it's full of directions. Now why would he do this? Why would he give away his unique secrets?



Because he was working in a Read-Write culture. He knew that he wasn't going to sell much of his actual furniture in Boston: wood furniture is just too expensive to ship across the Atlantic and his workshop can only put out so many pieces, but by publishing the Director he would profit from the designs' publication and his reputation would benefit because he would have a lot of influence. And he did. The Director was a big hit in both England and its colonies and an entire style of furniture, whether he designed it or not, became known as Chippendale furniture. He was the first person who wasn't a king to have a style of furniture named after him.



Soon, however, the environment in which the Director was successful changed. The mechanized tools of the Industrial Revolution, such as this steam engine, could make manufacturing much more affordable. Chippendale's furniture, which was reserved for the upper class, for gentlemen, became more affordable, but that affordability came at the cost Read-Write culture.



If you look at the Director, it's full of variations because Chippendale expected that each piece was made individually. By showing all of these variations, he's essentially saying "I am defining a design space for you" but the specific pattern would be up to the individual craftsman. In fact that's how people treated it. There's actually little handmade Chippendale-style furniture that looks identical to what is in the Director.

However, after mechanized production, consumers' choices became limited to choosing between prepackaged ideas. You couldn't design your own Chippendale chair back, you got the one that the factory made. And although the new low price was very important it came at the expense of the flexibility of ideas. Now, to change an idea required retooling, changing the tools themselves, which is expensive, and happened very rarely.

And thus, the beginning of two hundred years of Read-Only culture was born.

The end of Read-Only material culture, as I mark it, began in 1985, with the release of the Apple LaserWriter, which was the first mass market device that merged the flexibility of bits with the tangibility of atoms. It could provide the precision and control of Industrial Revolution tools, with the flexibility of pre-Industrial Revolution techniques. It did this by making the instructions, the code, the knowledge for every part of the finished product changeable, while the end result was completely consistent.

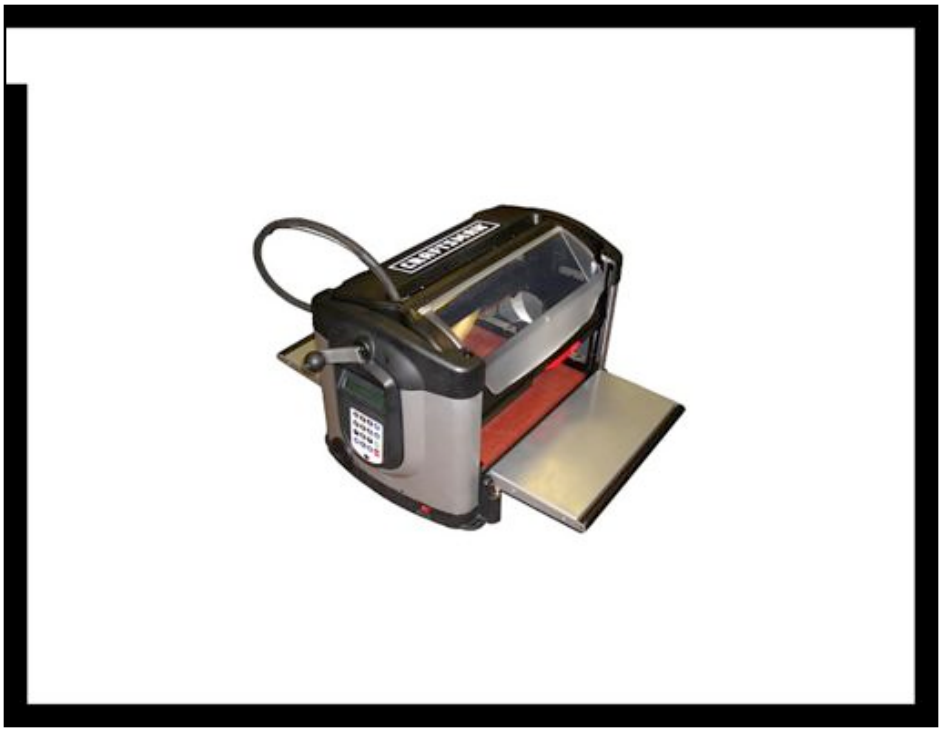
Now, someone can buy the tool, have it produce great results without any modification OR look at the knowledge that's embedded in it AND change it to suit their needs.

Until desktop publishing, typesetting was very expensive. Now, what was an expensive process reserved for special occasions is nearly disposable.

Let me show you how the idea of the LaserWriter is expanding to virtually every kind of manufacturing.

This is a home digital embroidery machine made by Brother. Ten years ago, a commercial embroidery machine cost about $30,000. Today, you can get a home one for five hundred dollars. It comes with a selection of patterns and software that control a needle and multiple threads to make a elegant, flat, clean image. This is knowledge that is embedded in the tool, but knowledge that you can manipulate using a piece of software communicating to it through a USB cable. Software makes retooling much easier, without losing any of accuracy of the process.

Because of this capability, communities for selling and sharing embroidery patterns have been created and have become very active. It's just like desktop publishing was in 1988 and it’s pure Read-Write culture.



Similarly, commercial 3D milling machines that drill patterns out of wood or metal run in the tens of thousands of dollars. This is the Sears Compucarve. It is a desktop 3D milling machine that costs less than $2000. Again, you hook up your computer to it, download data and it produces an end product for you. Consistently, but also flexibly.

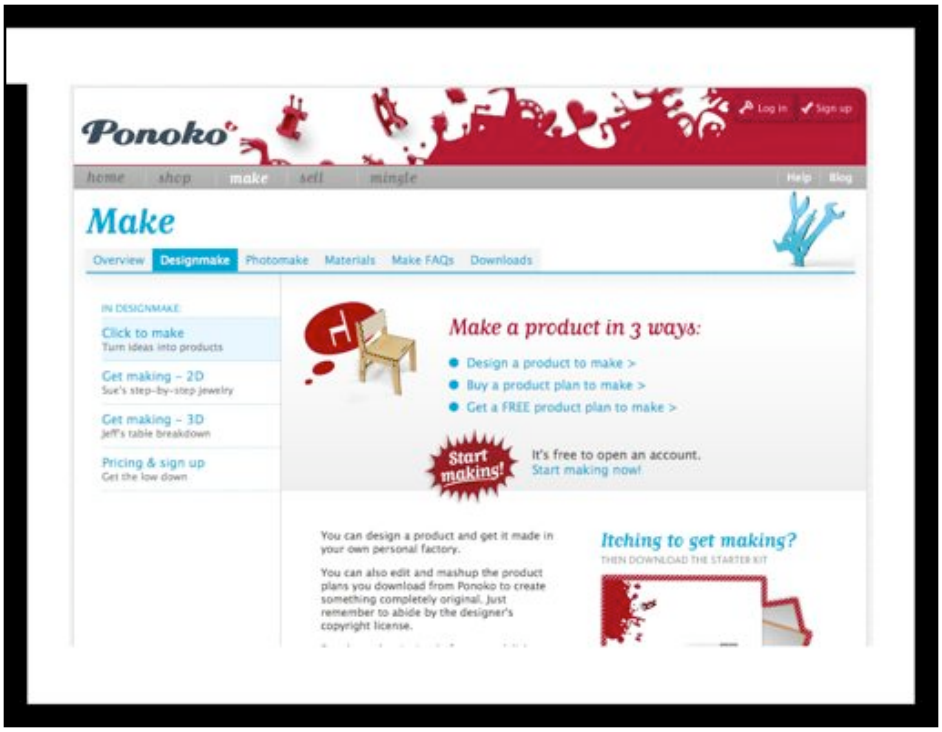
Let me show you how some people are using technologies like this. This is a lamp created by .MGX, a Belgian company that uses 3D printers to make lamps and sculptures. It's about the size of a basketball. I don't know if they still do this, but they used to ship every lamp with a CD containing the design, so if you had a setup like theirs, you could print one for yourself or they could print you a second one. Theoretically, no two lamps could be the same, yet each one could be instantly replicated.

This is the product of an Oakland company called Because We Can. They make custom furniture and interiors. They use a computer controlled wood cutting machine that costs about $5000. Their stuff is all made locally, sustainably and exactly to the specifications of their customers.

An alternative energy generator created by All Power Labs, another Bay Area company. It converts burned trash into a gas you can drive you car with. Their components are made of steel that has been cut using a computerized plasma cutter that costs about the same as the first LaserWriter. They have open sourced the design so that you can download the design and make your own generator if you have your own plasma cutter.

Finally, I want to mention the FabLab, which is a project by the MIT Center for Bits and Atoms. It's an ambitious project to create a general-purpose platform for making just about anything using a collection of computer-controlled manufacturing machines. It's still in its early stages, but it has the potential for fundamentally challenging manufacturing, in general. Here's a picture from a FabLab in Afghanistan, where girls are learning to use computers and laser cutters.

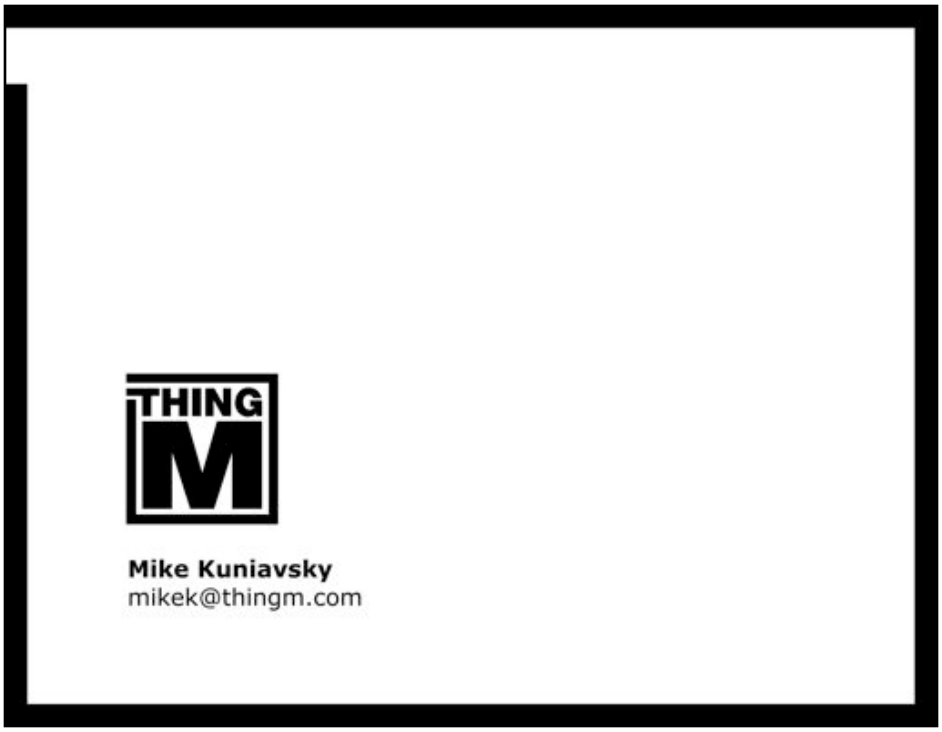
Photo CC by Todd Huffman, found on Flickr: http://www.flickr.com/photos/oddwick/3452098090/



And just like laser printers and photocopiers created new service businesses such as copy shops, these technologies have also created new business models. This is Ponoko, which is a laser cutter by mail company. The founders walked around IKEA and realized that they could make about half the things in it using a $20K laser cutter and locally sourced materials, and it could be customized and made on demand. That way they could use local wood from a local forest that would be made in a local cutting center and then trucked to a local home, while still having world class design. Instead of moving wood and plastic around the world like IKEA does, and making things that no one wants, they mostly move instructions and only make something when there's a demand for it. The amount of energy saved is huge, as is the flexibility.

And this gets to my final point: energy for moving atoms is only going to be more expensive, while moving and manipulating knowledge is continuously dropping in price. Digital Read-Write culture started with the LaserWriter and the MP3 and will expand to every other kind of making. Why? Because the coupling of bits to atoms is only going to make more economic sense as time progresses. And just as the economic and energy situation of the 18th Century England created the conditions for the Industrial Revolution and Read-Only culture, today's conditions will dismantle the thinking of the last 250 years about how things are made and how we, as consumers and producers of culture, relate to it.

Photo CC by TechShop



Thank you.