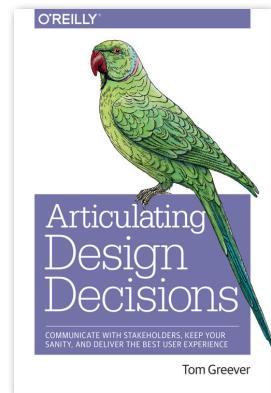
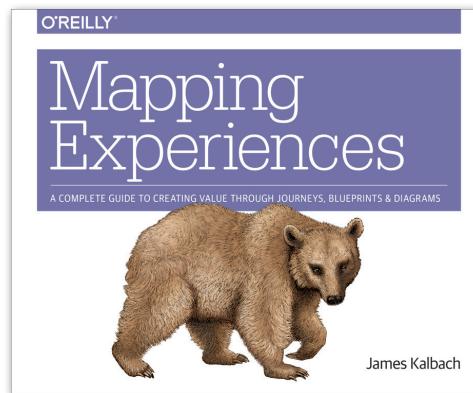
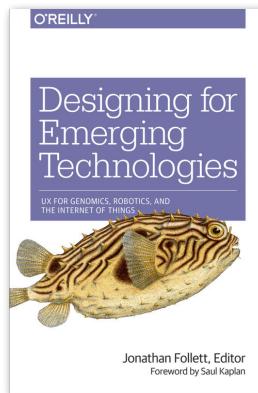
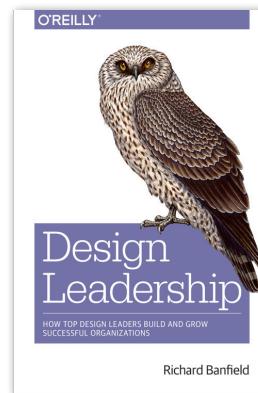
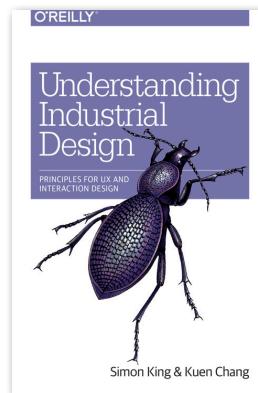
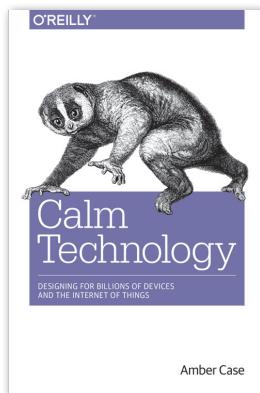


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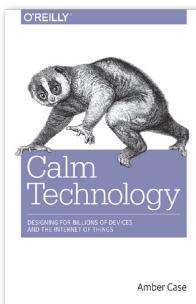
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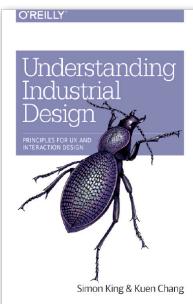
UX and interaction designers are facing many new challenges as more and more connected products come online. Whether it's for "calm technology," just-beneath-the-skin embeddable devices, or robot swarms, designers are actively seeking advice for dealing with cutting-edge projects. This sampler from the O'Reilly Design Library will help you navigate the unmapped territory ahead.

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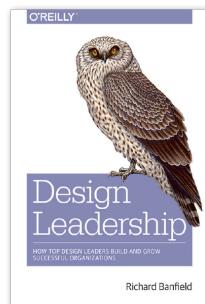
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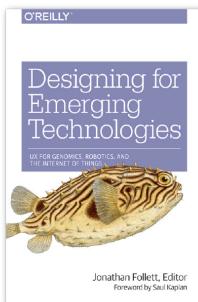
Amber Case



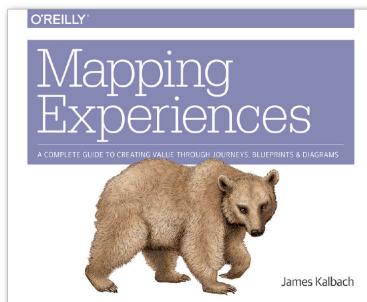
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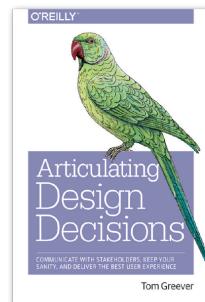
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Calm Technology

DESIGNING FOR BILLIONS OF DEVICES
AND THE INTERNET OF THINGS

Amber Case

Designing for the Next 50 Billion Devices

Four Waves of Computing

THE FIRST WAVE OF COMPUTING, from 1940 to about 1980, was dominated by **many people serving one computer**. This was the era of the large and limited mainframe computer. Mainframe use was largely reserved for technically proficient experts who took on the task of learning difficult, poorly designed interfaces as a source of professional pride.

The second wave, or desktop era, had **one person to one computer**. The computer increased in power, but it was still tethered into place. We saw the era of desktop publishing and the user interface replace difficult to use text inputs of the generation before.

The third wave, Weiser posited, would be the Internet, many desktops connected through widespread distributed computing. This would be the transition between the desktop era and ubiquitous computing. It would enable many smaller objects to be connected to a larger network.

The final wave, just beginning (and unevenly distributed), has **many computers serving each person**, everywhere in the world. Mark Weiser called this last wave “**Ubiquitous Computing**” or “**Ubicomp**.”

Weiser’s idea of Ubiquitous Computing was that **devices would outnumber individuals globally by a factor of five or more**. In other words, if there’s a world population of 10 billion (which Weiser considered not so far-fetched in the next century), then 50 billion devices globally is a conservative estimate. Obviously, the ratio will be much higher in some parts of the world than others, but even this is beginning to level off.

Some of us are still interacting with one desktop, but most of us have multiple devices in our lives, from smartphones and laptops to small tablets and Internet-connected thermostats in our homes.

What happens after we have many devices serving one person? We run up against limits in data access and bandwidth which may lead us, through necessity, into the fourth wave, an era of **Distributed Computing**. Figure 1-1 illustrates these four waves of computing.

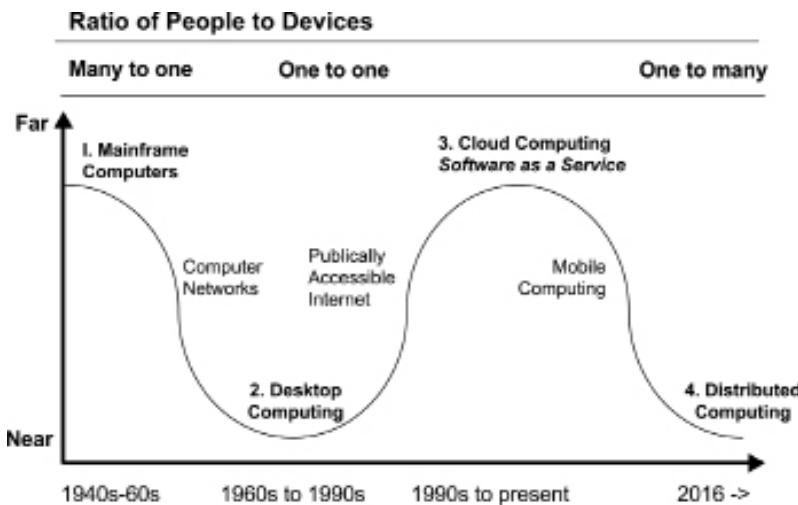


FIGURE 1-1

Waves of computing—inspired by Mark Weiser and John Seely Brown's Four Phases of Computing in the Coming Age of Calm Technology, Xerox PARC, October 5, 1996

Ubiquitous Computing describes the state of affairs in which many devices in our personal landscape possess some kind of processing power but are not all necessarily connected to one another. What we know today as the **“Internet of Things”** is meant to describe a network between many devices, so represents a *networked* stage of Ubiquitous Computing; it also implies that many everyday objects, like your tennis shoes, may also become wirelessly connected to the network, opening up a whole range of new functionality, data collection, and also security risks. Although it might be great to be able to track your daily steps, it might not be as nice if that data falls into the wrong hands. In **Distributed Computing**, every device on the network is used as a

potential node for storing information. This means that even if a central server is taken out, it is still possible to access a file or piece of information normally hosted by the central server, because these bytes of information are “distributed” throughout the network.

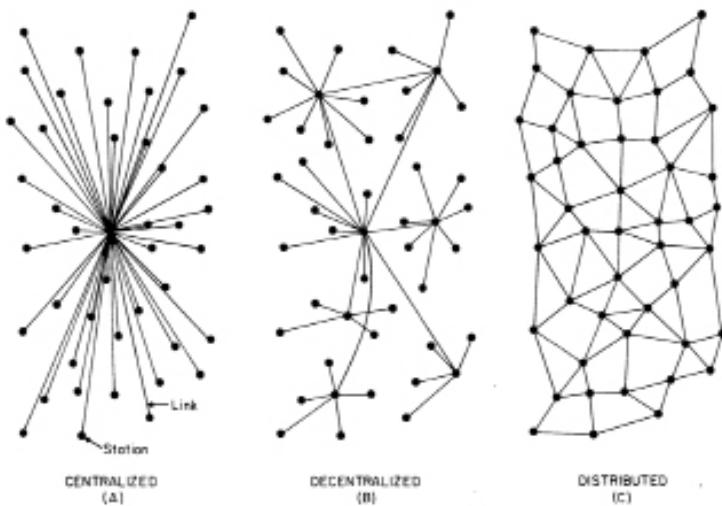


FIG. 1 – Centralized, Decentralized and Distributed Networks

FIGURE 1-2

Centralized, decentralized, and distributed systems (Paul Baran, RAND Corporation, *On Distributed Communications*, 1964; http://www.rand.org/content/dam/rand/pubs/research_memoranda/2006/RM3420.pdf)

Weiser's original vision for Ubicomp also included a philosophy about how to handle the increase in devices per person. What happens when 50 billion devices are out there? In a world like this, **the way devices communicate with us is crucial**. If we were to expand their number, but maintain our current standards of communication, we'd soon find ourselves—our entire world—buried under an indistinguishable pile of dialog boxes, pop-up boxes, push notifications, and alarms.

THE WORLD IS NOT A DESKTOP

Gone are the luxurious dinosaurs of desktop era, where code could be the size of a CD-ROM and be updated every two years. The act of using a desktop computer is an all-consuming process and a luxury that not all current devices have.

Desktop applications were able to take advantage of many resources in terms of processing power, bandwidth, and attention. A smaller, connected device today may work on tiny processors and need to make use of what they have.

Small devices must be cheap in order to be ubiquitous. They must be fast in order to be used. They must be capable of easily connecting if they are to survive. We're looking more at a whole new species than we are a mechanical set of items. That means nature's laws apply. Fast, small, and quickly reproducing will end up being part of the next generation, but **good design can make products that span multiple generations**, reducing complexity and support.

We're moving toward an ecosystem that is more organic than it is mechanical. We have computer viruses that operate similarly to the way the same systems in nature do. In this new era, code bloat is not only unnecessary—it is dangerous. To follow this analogy, a poorly written system invites illness and decay.

THE GROWING EPHEMERALITY OF HARDWARE

In the desktop era, hardware was stable. You bought a computer and kept it for several years—the hardware itself was an investment. You'd change or update the software very infrequently. It would come on a CD-ROM or packaged with the computer. Now, people hold onto the data streams and the software longer than a device itself. How many different phones has the average person used to connect to their profile on Facebook? Facebook, despite comprising dozens of rapidly shifting apps and programs, is more stable as a whole than the technology on which it is used.

No longer do people buy devices to use for a decade; at times, technology will be upgraded within a single year. Companies and carriers are now offering monthly payment plans that allow you to be automatically “subscribed” to the latest device, eliminating the process of buying each device as it comes out. It’s an investment in the *functionality* and the *data*, not the device itself. **It’s more about the data than the technology that serves it; the technology is just there to serve the data to the user.**

In the past, technology's primary value lay in hardware. Now a greater value lies in user-generated content. This means the simplest technology to get to that data wins; it's easier to use, develop, support, and maintain.

THE SOCIAL NETWORK OF 50 BILLION THINGS

In the future, connected *things* will far outnumber connected *people*.

Consider a social network of 50 billion devices versus a social network of 10 billion humans. **The social network of objects won't just be about alerts for humans via machines, but alerts from one machine to another.**

With so many objects and systems, one of the most important issues will be how those separate networks communicate with one another. This can lead to some real problems. Have you ever been stuck in a parking garage because the ticket machine won't accept your money? When an entire system is automated with no *human* oversight, it can get stuck in a loop. What if a notification gets stuck in one system and can't be read by another? What if a transaction drops entirely? Will there be notifications that the system failed, or will humans be put on pause while a *human* operator intervenes?

Technology in the real world can't work well all of the time. In reality, things mess up when you need them most. Like when you can't get to the AAA app when your car is on the side of the road, or when you can't access your insurance card when you get to the emergency room because your phone is dead or your card is at home, and your life is at risk.

Designing for the Next 50 Billion Devices

Tech can't take up too many resources in the future. The most efficient tech will eventually begin to win out, as resources, time, attention, and support become scarce commodities. People should make less complex systems or suffer the consequences.

Though technology might not have a limit, we do. Our environment also has limited connectivity and power. Things are going to become much more expensive over time.

The IDC Futurescape Worldwide Internet of Things (IoT) 2015 report predicts that “IT networks are expected to go from having excess capacity to being overloaded by the stress of Internet of Things (IoT) connected devices” in just three years.

This means that devices using too much bandwidth will experience connectivity and performance issues, and generate unnecessary costs. Solving this bandwidth limitation will take a combination of solutions, all of which need to happen at some point. One solution is Distributed Computing, which might be a natural outcome of bandwidth and content restraints. Another solution is to limit bandwidth usage by placing limits on how large websites and content can be. Updated protocols and file formats may also help. We’ll examine some of these solutions later in this chapter.

Where did telephone lines, the electrical grid, or modern roads come from? All of these required an invested government and business-based effort. Without them, we wouldn’t have the access and connectivity we have today.

Today’s telecom carriers and Internet providers build competing, redundant networks and don’t share network capacity, which makes it much more difficult for devices to communicate with one another.

It is ultimately in companies’ best interests to build more bandwidth as they grow, but the costs associated with this development could harm initial earnings and allow competitors a leg up while they build. Telecom and Internet providers might be forced to work differently in the future. If they worked together, they might be able to devise a way to share costs and rewards of building the infrastructure. If not, the government might need to take over this role, much like President Eisenhower’s creation of the Interstate Highway System to eliminate unsafe roads and inefficient routes.

LIMIT BANDWIDTH USAGE

Both the websites we visit and the devices we use to get there are designed to be resource-intensive. Websites that require significant bandwidth can slow down entire networks. The average smartphone user today is now able to stream a variety of online media at will, over cell networks and WiFi. All of this volume and inefficiency is eating up the bandwidth that will soon be needed to connect the Internet of Things. This is already causing corporate conflict, with users caught

up in the middle. In 2014, the Internet service providers Comcast and Verizon were caught throttling the traffic from video-streaming service provider Netflix. Netflix countered this limitation by paying the providers for more bandwidth, but even then, Verizon was caught throttling Netflix traffic *after* it paid for better network performance.

Over time, bandwidth constraints might naturally push people to write software that uses less bandwidth. Companies that do well in the future might use technologies and protocols that rewrite the fabric of the web, instituting protocols that eliminate redundancy in streaming data to many devices.

A *distributed Web* in which many devices also act as servers is one way the web can evolve and scale. Instead of many devices requesting data from a single server, **devices could increasingly request chunks of data from one another**. We're seeing slow developments in this area today, and hopefully many more in the future.

DEDICATE SEPARATE CHANNELS FOR DIFFERENT KINDS OF TECHNOLOGY

Connected devices could have their own connected channels. Dedicated channels could also serve as a backbone for devices to communicate in case of emergencies. That way, one network can still stay up if the other one becomes overloaded, so that millions of people streaming a popular video won't get in the way of a tsunami alert or a 911 call.

USE LOWER-LEVEL LANGUAGES FOR MISSION CRITICAL SYSTEMS

If we're going to be building truly resilient technology, we need to borrow a page from the past—where technologies were made with very low failure, or had enough edge cases. Edge cases are unpredictable problems that arise at extremes. For instance, a running shoe might work well on typical pavement, but melt on track material on very hot summer days. Oftentimes edge cases are discovered after products are launched. In the worst circumstances, they may cause recalls. In June 2006, a Dell laptop *burst into flames* during a technical conference in Japan. The issue was a defective battery prone to overheating. This prompted a worldwide recall of laptops that contained the battery, but not before six other people reported flaming machines. Edge cases are a fact of life for all products. They might be difficult to predict, but there are some ways to lessen the blow. If possible, involve industry veterans in your project and have them help think through various

methods, edge cases, and ways that the software or hardware could go wrong. Chances are, they've seen it all before. With their help, a crisis or uncomfortable situation could be prevented.



FIGURE 1-3

The first web server on the World Wide Web was a NeXT workstation (a NeXTcube) used by Tim Berners-Lee at CERN. The document resting on the keyboard is a copy of "Information Management: A Proposal," which was Berners-Lee's original proposal for the World Wide Web. Photo by Coolcaesar at the English language Wikipedia [[GFDL](#) or [CC-BY-SA-3.0](#)], via Wikimedia Commons

If we're making devices that absolutely need to work, then we can't use the same development methods we've become accustomed to today. We need to go back to older, more reliable methods of building systems that do not fail.

COBOL was the first widely used high-level programming language for business applications. Although many people consider the language to be old news today, it is worth noting that "70-75% of the business and transaction systems around the world run on COBOL. This includes credit card systems, ATMs, ticket purchasing, retail/POS systems, banking, payroll systems, telephone/cell calls, grocery stores, hospital systems, government systems, airline systems, insurance systems,

automotive systems, and traffic signal systems” and “90% of global financial transactions are processed in **COBOL**.” Cobol may be complex to write, but the systems that use it run most of the time.

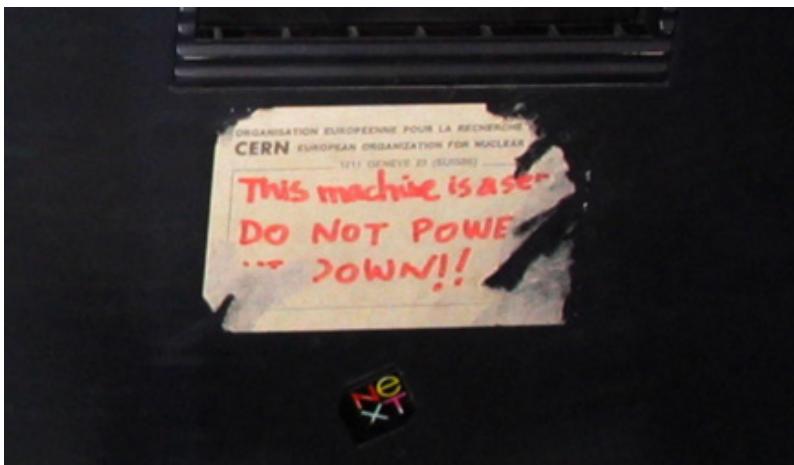


FIGURE 1-4

The partially peeled off label on the NeXT cube reads: “This machine is a server. DO NOT POWER IT DOWN!!!” Literally if this computer were turned off, there would be no Internet. Credit: Ibid

CREATE MORE LOCAL NETWORKS

Today only slightly inconvenient if websites like Twitter go down or become overloaded. What’s less cute is when the lock on your door stops working because your phone is out of batteries, or your electric car only works some of the time because it is connected to a remote power grid. The advice above is especially crucial for people and agencies building websites: *the real world is not a website*.

Do we really want the lights in our homes to connect to the cloud before they can turn on or off? In the case of a server failure, do we want to be stuck without light? No, we want the light switch to be immediate. A light switch is best connected to a local network, or an analog network. It’s OK for a website to go down, but not the lights in your house.

We need to prioritize the creation of a class of devices that do things locally, then go to the network to upload statistics or other information. Not all technology needs to operate in this fashion, but **the physical technology that we live with** and rely on daily *must be resilient enough that it can work regardless of whether or not it is connected to a network.*

DISTRIBUTED AND INDIVIDUAL COMPUTING

Increasingly, our computing happens elsewhere. We make use of data on the cloud that's far away from us, all the while having perfectly advanced computers in our pockets. There are loads of privacy and security issues with so much data going up and down to the cloud. A December 2014 report on the future of the Internet of Things made a prediction that within five years, over 90% of Internet-of-Things-generated data would be hosted in the cloud. Although this might make the access to data and the interaction among various connected devices easier, "cloud-based data storage will also increase the chance of cyber attacks with 90 percent of IT networks experiencing breaches related to IoT," as the amount of data generated by the devices will make it an attractive target.

As an illustration of this point, in 2014, the iCloud photo storage accounts of 100 celebrities were hacked and nude photos of several A-list celebrities were leaked onto the web. One way to reduce the insecurity of cloud-based data storage is to have devices run on private local networks. Doing so would prevent hackers from hacking all of the data from the cloud at once, even if some opportunity is lost in connecting to larger networks in real time.

The best products and services in the future will make use of local networks and personal resources. For instance, if sensitive data is stored on shared servers in the cloud, there are privacy and security issues. Sensitive data is better stored close to the person, on a personal device with boundaries for sharing (and protections preventing that private data from being searched without a warrant), and backed up on another local device such as a desktop computer or hard drive. Individual Computing will help keep personal data device where it is safe instead of remotely stored in a place where it can be compromised. Storing data on your personal device will also speed up interaction time. Your applications will only go to the network if they absolutely need to.

In the era of Distributed Computing, there will also be more options for where data is stored. Table 1-1 lists several data types and provides suggestions for the best places for each type to be stored. It also shows the potential consequences in case the security of this data is compromised.

TABLE 1-1. Suggestions for how to store various data types, and potential consequences of security failure

DATA TYPE	BEST LOCATION FOR DATA	CONSEQUENCES IF DATA IS LOST, OR THE NETWORK IS COMPROMISED OR DISRUPTED
Sensitive/personal data	Personal device such as a phone, laptop, backup hard drive or home computer	Loss of employment; bullying or social isolation, which could potentially lead to suicide
Medical data	On a local device that can be shared with medical professionals on a timed clock (“Share your data with this system for this purpose for a specific period of time”; afterward, the data is deleted and the system sanitized)	Blackmailing; loss of employment
Business data (LinkedIn profile)	On publicly accessible servers (shared)	N/A: This data was created with the intention of sharing it
Home automation system	On a local network within the home without access to a larger network.	Loss of access or control to lights, thermostat, or other home systems

INTEROPERABILITY

One of the biggest technology issues in the future is going to come from systems that don't talk to one another. Without connectivity throughout different networks, people can get caught in very difficult situations.

I rented a car once for a conference in Denver, Colorado. Initially it seemed fine, but once I got it onto the highway, the car wouldn't go above 30 miles per hour.

I pulled into a parking lot and called emergency roadside assistance. Instead of being instantly connected to an emergency line, I was put on hold for 22 minutes. I was told to leave the car in the lot and a tow truck would come pick it up. I was going to be late for my meeting, so I called a cab and headed into town. I figured I'd cancel my entire rental car reservation for the trip.

On the fifty-minute cab ride to the hotel, I called Hertz to cancel the car reservation. I was put through to four different people, connected by a support person to two discontinued support numbers, and had to explain my situation every time. They wondered where the car was. I told them emergency roadside assistance had picked it up. They didn't have confirmation of the pickup or who I was. Each time I called I needed to restate my information.

I finally got them to cancel the rental, and I asked for a confirmation code. Three days later, I got the charge for the full rental. I had to get corporate to call a special number to reverse the charge and explain the situation. I was stuck in an automation trap. The systems didn't talk to each other.

How can one product inform another? What can be done to inform people in different systems the entire way through a system? The real world runs on interconnected systems, not separate ones. Without ways of informing other systems, or at least informing people who are manning other systems, you can get completely stuck.

HUMAN BACKUP

Without feedback, people won't be able to tell what's going on with a system. They might assume something is happening when it isn't, or get frustrated or stuck as automation increases. For critical systems, always ensure people are around in case something breaks, and make sure there are systems that pass information from one system to another in human-readable fashion!

The Future of Technology

Poorly made products are everywhere, waiting for innovation.

We are accustomed to buying products as they come out, in seasons. People are advised not to buy an Apple product halfway through a life-cycle, but to wait for the next one. We discard the old for the new. And it makes sense: devices quickly become incompatible with current hardware and software. The last few generations of devices are unusable, somewhat toxic garbage that gets shipped off to the landfill.

The past was about having very few high-quality products in the home. Already we're finding people moving from the suburbs to walkable communities in the city. The question is: Can we improve the future in time to prevent the worst outcomes in terms of pollution, a growing population, and a warming climate, or are we going to be too late?

Want to make great products? Improve the mundane! A high-quality product can keep you employed for the rest of your life, and your community, too. So many of us are caught up in designing something "new" that we forget that we can simply improve what's already around us. All of those things you don't like in your everyday life, but put up with? Ripe for innovation! Design them in a way that lasts for more than a couple of years and you will be on your way to a successful and beloved product with passionate users.

Conclusions

In this chapter, we covered the four waves of computing and what that means for the future of connected devices. We also covered how the future of technology will run into issues such as bandwidth and design limitations, and some possible outcomes for the future of technology and humanity.

Weiser and Brown hinted at a number of guidelines in their published work. In the following chapter, we'll take these guidelines and put them into an organized philosophy of designing Calm Technology.

These are the key takeaways from this chapter:

- We've gone from many people to one computer, to many computers per person. The next wave of computing will make demands on us in terms of privacy, security, bandwidth, and attention.

- We can no longer design technology in the way we designed for desktops. We need to think about how we'll design for the next 50 billion devices. We can help make the future more reasonable by writing efficient code, using lower-level languages for mission-critical systems, and creating more local networks. Consider distributed and individual computing, and design with interoperability in mind.

Understanding Industrial Design

PRINCIPLES FOR UX AND
INTERACTION DESIGN



Simon King & Kuen Chang

Chapter 4

Enduring

Create long-lasting value

“What works good is better than what looks good, because what works good lasts.” —Charles Eames

Designers strive to improve the world, looking for user needs and situations where a new product or experience could make a difference. The typical design process, with its inspiration and input from users, provides confidence that a solution will work today but often has less consideration for the future. Needs change, technology expands, and context shifts. Beyond fulfilling the needs of today, how can a design create long-lasting value?

The reasons to create a new product are usually well intentioned, but in the mid-20th century a less honorable purpose for newness was popularized. Planned obsolescence became a common business strategy to incentivize customers to keep buying. In this approach, products are purposefully designed to be replaced on a regular basis, due to artificially limited durability or the psychological obsolescence of yearly model updates.¹ There is little regard for the long-term needs of users and even less for ecological sustainability. As we will discuss in the *Sustainable* chapter, designers have a responsibility to avoid unnecessary waste and disposal. Longer-lasting products are better for users and for the environment.

When discussing the quality and longevity of products a common trope is that “they don’t make them like they used to.” This attitude is usually paired with an example of an enduring product, one that someone has owned for years or passed down between generations. Beyond an engineered durability, the basic requirement of not breaking or falling apart, what makes people keep a product in their lives? An enduring design has both functional and emotional durability, getting better or more meaningful the longer it’s used.

There are some contexts where longevity is unnecessary, where disposability is appropriate to offer safety, convenience, or integration with a time-limited event. Consider the case of single-use drug injectors, on-the-go food packaging, or conference badges. On the other end of the spectrum there are major purchases such as cars and appliances that most people plan to keep for a long time. Most products live in-between these poles, where an enduring design may be valued but is rarely offered.

Digital products won’t end up in a landfill but their longevity is no less important. We increasingly rely on digital systems to support our lives, providing information retrieval, health monitoring, security, commerce, or communication. When these systems are short-lived their obsolescence

¹ Made to Break: Technology and Obsolescence in America By Giles Slade (pg 5)

can cause very real pain and annoyance. Finding, switching, and re-integrating our lives with a new digital product is not as trivial as it appears. In theory, digital products should be able to outlast their physical counterparts by shifting and adapting their form over time. This requires a different kind of design process though; one of continual evolution and co-development with the changing needs of users.

In this chapter we will look at ways of designing enduring products, both physical and digital, by examining the qualities that can encourage longevity. An enduring product might wear in instead of wearing out, or represent the quintessential version of its category. It could be highly tailored to an individual user, or adaptable to change and easily serviced. These qualities represent different approaches to promoting longevity, but consistent between them is a shift in mindset where designers must strive to make something useful, usable, and desirable both today and in the future.

Worn In

For physical products, one of the biggest inhibitors to longevity is the simple fact that, over time, things wear out, causing the user to discard them earlier than they otherwise would. Engineers are continually developing new ways to enhance the durability of materials and finishes, but designers can also play a role by looking at the problem from a different angle. What if a design could “wear in” well instead of wearing out?

The idea of a product wearing in, or breaking in, is familiar from clothes and accessories. A leather wallet in your pocket fits better over time, an often worn hat becomes perfectly shaped to your head, and your favorite pair of jeans just keep getting more comfortable. We think of these items as improving over time, at least up to a point, because their materials soften and mold themselves to our bodies through use.

In some instances, a worn in product is a matter of pride, or at least accomplishment. Websites devoted to raw denim enthusiasts post photographs of worn-in jeans and jackets alongside details on how old they are and how often they've been washed.² The appearance of authentic wear and tear on a pair of raw denim jeans has reached a point where the UK denim brand Hiut has employed “fifty denim breakers to wear in jeans before they're sold, or auctioned, to customers.”³ Hiut's “No Wash Club” celebrates customers who wear their jeans without washing them for a full six months, the base requirement to join the club.⁴

The fervor around raw denim can seem overblown at times, but in a world where many products are designed for planned obsolescence it's a good example of not just a product, but a business model, built around longevity. Contrast that to the world of consumer electronics, where it made international news that the first buyer of an iPhone 6 in Perth, Australia dropped the phone upon

² "Fades Archives." Rawr Denim. Accessed March 12, 2015. <http://www.rawrdenim.com/fades/>.

³ Ferrier, Morwenna. "The People Who Are Paid to Break in Your Designer Jeans." The Guardian. November 28, 2014. Accessed March 12, 2015. <http://www.theguardian.com/fashion/fashion-blog/2014/nov/28/men-paid-break-in-designer-jeans-hiut-denim>.

⁴ "The No Wash Club." Hiut Denim. Accessed March 12, 2015. <http://hiutdenim.co.uk/pages/the-no-wash-club>.

opening the package.⁵ Many smartphone buyers put their pristine new purchase in a protective case immediately, in an attempt to keep it free of scratches and even fingerprints. The fades and rips of a worn in pair of jeans are judged as a beautiful accomplishment, but a scratched up iPhone is simply worn out.

Figure 4.x Simon Heijdens, Broken White Dishes

Wearing well isn't the only way to promote longevity, but when designers intentionally plan for how a product will wear they are one step closer to an enduring design. Consider the Broken White collection by London-based designer Simon Heijdens, in which a ceramic dish has unique characteristics such that "during the time it is in the user's life, it would tell and show an evolving story."⁶ The dishes appear to be undecorated when purchased, but through normal use they reveal small crack lines below the ceramic surface. These cracks "slowly begin to form a floral decoration that grows, like a real flower would."⁷

The concept behind the Broken White dishes is to go beyond fulfilling the basic functionality of a plate and reveal something more through use, an experience that renders "them increasingly precious to the user over time."⁸ There is an element of surprise at work here, where the end state of the design is unknown, and the user feels a sense of participation in its conclusion. Even when the pattern of cracks is fully revealed, the story behind the dish contributes to its timeless nature, an interesting artifact in a person's cupboard to be celebrated and talked about for a long time.

Figure 4.x Cups with Hidden Decoration

The notion of surprise is a quality often found in products that are designed to intentionally wear in. In his Cups with Hidden Decoration collection, ceramicist Andy Brayman creates anticipation for an eventual surprise by hiding a unique message that can only be revealed through wear. The cups are ringed with a 23K gold glazed band, which covers a printed question, statement, or instruction that is only revealed once the user has worn away the glaze.⁹ The gold band, which is placed where the user would naturally hold the cup, creates a "kind of lottery ticket"¹⁰ that the user scratches off very slowly, through normal actions like holding the cup or running it through a dishwasher. The anticipation of revealing the hidden sentence imbues the product with long-term value, a reason to keep the mug around and to choose it from the cupboard so that day's minor wear can contribute to the eventual disclosure of the message underneath.

⁵ "First Buyer Drops Brand-new iPhone 6." BBC News. September 19, 2014. Accessed March 12, 2015. <http://www.bbc.com/news/technology-29275039>.

⁶ Heijdens, Simon. "Broken White / Blanc Cassée." January 1, 2004. Accessed March 12, 2015. http://www.simonheijdens.com/projects/Broken%20White/Broken_White-Simon_Heijdens-.pdf.

⁷ Ibid.

⁸ "Broken White." SlowLab. Accessed March 12, 2015. <http://www.slowlab.net/broken white.html>.

⁹ "Cups with Hidden Decoration." The Matter Factory. Accessed March 12, 2015. <http://matterfactory.com/2009/07/08/cups-with-hidden-decoration/>.

¹⁰ Kane, Lily. "Making the Most of the Margins." American Craft Council. May 12, 2009. Accessed March 12, 2015. <http://craftcouncil.org/magazine/article/making-most-margins>.

At the University of Brighton, Jonathan Chapman is a Professor in the Sustainable Design program, where he champions the idea of “emotionally durable” design through his own research, classes, and workshops with industry partners. Chapman argues that design can move us away from a “throw away” culture by highlighting the journey an object has been through and celebrating the memories that we share with it. In his broadened definition of durability, he encourages designers to frame the challenge of longevity so that it’s “just as much about emotion, love, value and attachment, as it is fractured polymers, worn gaskets and blown circuitry.”¹¹

Figure 4.x Emma Whiting Stain Sneaker

The sportswear brand PUMA is one of the companies that has partnered with Professor Chapman to explore the topic of emotional durability. As part of a student competition hosted by PUMA, Emma Whiting created the Stain Sneakers, a pair of white canvas shoes that features an invisible pattern printed with stain resistant coating. As the shoe accumulates dust, dirt, and grime, a series of PUMA logos is slowly revealed, becoming more visible as the shoe gets dirtier. Stain Sneakers inverts the fashion trend of celebrating brand new sneakers by turning unavoidable wear into a positive outcome.

For companies like PUMA, the business case behind an emotionally durable design requires longer-term thinking, but it’s not incompatible with company goals such as growth and profitability. As Chapman notes, “When consumers develop empathy with products, a visceral empathy is nurtured with the brand; customers are subsequently kept loyal and market share is healthily sustained.”¹² Considering the business case for longevity is an important part of the design process and a key factor in promoting an alternative to planned obsolescence. A product can only last for a long time if a company invests in making it in the first place.

Figure 4.x Nest Thermostat

When products are enhanced with sensors and computation they gain entirely new ways of wearing in, using algorithms and data to mold themselves to a user’s behavior over time. Just as a new pair of leather shoes needs to be broken in, these devices need to learn our habits and preferences in order to provide their full value. Take for example the Nest Thermostat, which is designed to go through a learning period after being installed. The Nest records the user’s manual temperature adjustments, along with the timing of those adjustments, until it can detect a pattern and begin automatically scheduling the appropriate changes.

¹¹ "Love Objects: Emotion, Design and Material Culture." Objects and Remembering. June 30, 2014. Accessed March 12, 2015. <https://objectsandremembering.wordpress.com/2014/06/30/love-objects-emotion-design-and-material-culture/>.

¹² Chapman, Jonathan. *Emotionally Durable Design Objects, Experiences and Empathy*. London: Earthscan, 2005. 134.

This capacity to learn is something the company refers to as Nest Sense,¹³ which uses data from a combination of near and far field sensors, along with algorithms that are regularly improved through updates to the product's firmware. Nest considers every interaction "a way for the user to communicate with the device about his or her preferences for a particular temperature at a particular time and day of the week."¹⁴ Critically, this includes lack of interaction as well, using motion sensors to determine that a user is at home and inferring that a non-action is an expression of satisfaction with the current temperature. It also involves learning about the home environment, tracking how long a room takes to heat or cool so that it can improve its ability to reach a particular temperature at a specific time.¹⁵

Once Nest has learned your behavior and preferences there is an incentive to continue using the thermostat. This can contribute to longevity, but also raises questions about whether Nest's data profile is intended for "wearing in" or "locking in," where a company sets up purposeful switching costs that create barriers to competition. The difference between wear-in and lock-in can be found in the reason someone continues to use a product. For a product to wear in well, it needs to learn from a user's behavior over time, developing a kind of human and machine relationship that would need to start over if the user switched to a competitor. A system designed to lock someone in might also result in product longevity, but based on an artificial hostage taking rather than the desire for a continued relationship. For example, a user has purchased music files that are DRM encrypted, which prevents them from playing on a competitor's platform.

To further emphasize the difference and intent between wear-in and lock-in, a product that wears-in should work well with others. In traditional products, physical materials can mold to a user's behavior to improve the product over time. But Nest Sense uses data as its material, which allows for improvements to extend beyond the Nest Thermostat, making other products better as well. Using the Nest API, a product can be certified as something that "Works with Nest," enabling both products to work better together. For example, an LG refrigerator can go into energy saving mode when the Nest detects that inhabitants have left the home, the Jawbone UP24 band can trigger a temperature change when the user goes to sleep, and a Whirlpool dryer can delay running if Nest informs it that electricity will be less expensive later.

Although the way that the Nest changes over time is significantly different than the Stain Sneakers or Cups with Hidden Decoration, these products share the quality of reflecting their relationship with a user. They feel human in their recognition that a relationship changes over time, and in their subtle shifting of appearance or behavior each day. This stands in contrast to products that age poorly, where changes in appearance or functionality are always framed as a decline, gauged by how much they've worsened since they were removed from their packaging. An enduring product is one that gracefully embraces change.

¹³ "An Introduction to Learning on the Nest Learning Thermostat." Nest Support. November 4, 2014. Accessed March 12, 2015. <https://nest.com/support/article/An-introduction-to-learning>.

¹⁴ Nest Labs, *Enhanced Auto-Schedule*. November, 2014. Available from: https://s3.amazonaws.com/support-assets.nest.com/images/Whitepapers/Nest_Auto_Schedule_Whitepaper.pdf.

¹⁵ "Inside & out." Nest. Accessed March 12, 2015. <https://nest.com/thermostat/inside-and-out/>.

Quintessential

"It is usually the inconspicuous objects which really mean something to us." —Naoto Fukasawa

Design is sometimes positioned as a way to make something special, so it stands out from other, "less designed" options. But in fact, everything is designed, both the ordinary, plain version and the flashy one with patterns and flair. It's easy to spot this misunderstood definition when people refer to a product as having "less design" or being "un-designed." What they really mean is that the product has not drawn attention to itself; it has not announced itself as "special." But as the Industrial Designer Jasper Morrison has noted, "things which are designed to attract attention are usually unsatisfactory."¹⁶ He believes that "special is generally less useful than normal, and less rewarding in the long term."¹⁷

One path to an enduring design is to avoid fashion and seek normality. If a product is designed around the latest trends in presentation, shape, color, pattern, structure, or interaction then it will feel dated in a shorter period of time, triggering people to move on to a new, more "now" version. When a product is closer to the quintessential essence that defines a product category it may not attract as much attention in a catalog or showroom floor, but it will likely remain in a person's life for a longer period of time. Purchasing a trendy product is like starting two lifespan countdown timers: one for when the product will break and one for when its style is out-of-date. The latter is sure to happen first.

The topic of quintessential design was explored in 2006 by Jasper Morrison and Naoto Fukasawa through an exhibition and book called Super Normal. The pair curated a collection of objects that represent archetypical forms, including both anonymous classics whose creators have been lost to history and contemporary objects by famous Industrial Designers. The show prompted reflection on the purpose of design and how one can evaluate the essential qualities of an object. In discussing his selection process, Morrison defined Super Normal as something a product becomes through use. You can't fully judge a product at first glance, but only through "more of a long-term discovery of the quality of an object, which goes beyond the initial visual judgment and basic assessment that we make of things when we first notice them."¹⁸

This assessment of a physical product over time draws a parallel to Interaction Design, which is notoriously hard to evaluate through static images or basic descriptions. The kind of evaluation that Morrison refers to is revealed through living with something, exposing it to a variety of situations, and testing it against the unpredictability of life. Quintessential forms have more longevity because they've gone through a process of evolution, their form refined for their purpose by many different people through an evolutionary-like process. The wild mutations that Darwin observed in living creatures can be seen in products too, but these fashion-driven novelties don't tend to survive very long.

¹⁶ Morrison, Jasper, and Naoto Fukasawa. *Super Normal*. Lars Müller Publishers, 2007. 29.

¹⁷ Ibid.

¹⁸ Morrison, Jasper, and Naoto Fukasawa. *Super Normal*. Lars Müller Publishers, 2007. 99.

Fukasawa has described his process as beginning with a study of archetypal form, which he then refines to “suit today’s lifestyle.”¹⁹ This is what separates Super Normal or quintessential design from nostalgia. It is not about slavishly maintaining a design from the past, nor being different for its own sake. The middle ground of Super Normal involves finding the essence of a design and then updating it with modern possibilities such as new materials or technology.

Figure 4.x Jasper Morrison's Crate

This approach can be seen in Morrison’s work as well, such as his 2008 piece for Established & Sons called simply “Crate.” The design was inspired by a wooden wine crate that Morrison used as a bedside table. He found the anonymously designed object fit his needs quite well, so he designed a similar one, built from higher quality materials. His refined crate is constructed from Douglas-fir instead of cheap pine, and is built with stronger joints for increased stability. Visually, however, aside from a small stamp on the side, there is little to distinguish Morrison’s Crate from the typical anonymous design.²⁰

The normality and lack of personal expression in Morrison’s Crate caused a bit of controversy when it was first released, based somewhat on the \$220 price tag but also because of an expectation that famous designers should be leaving their mark in less subtle ways. We are used to designers having a signature style, and products being instantly recognizable as part of a particular brand or collection. There are times when that kind of personal expression or branded style is desirable, but if the goal is to create an enduring design then the discriminating and incremental improvement of Crate is completely appropriate. It’s no surprise that both Fukasawa and Morrison have worked with the Japanese firm Muji, a company founded on the intersection of two ideas: “no brand (*Mujirushi*) and the value of good items (*ryohin*).”²¹

It is fairly straight-forward to design for the essential qualities of a crate, but what about Internet of Things products that have increased complexity due to embedded computation and network connectivity? Because these devices are both physical and digital they encounter a broader set of situations that could cause them to become out of date. Designers can’t control all the factors that cause a product to become obsolete, but there’s no reason to throw out years or decades of design evolution just because a product is now “smart.”

Figure 4.x Kevo Smart Lock (outside photo with light ring activated)

Take for example the Kevo Smart Lock, a connected door lock that uses Bluetooth to enable a Smartphone to lock and unlock your home.²² On the digital side, Kevo offers an app with many expanded capabilities over a traditional lock such as time-limited electronic keys and an access

¹⁹ Morrison, Jasper, and Naoto Fukasawa. *Super Normal*. Lars Müller Publishers, 2007. 101.

²⁰ Carlson, Julie. "Update: Jasper Morrison Crate Controversy: Remodelista." Remodelista. April 21, 2008. Accessed March 12, 2015. <http://www.remodelista.com/posts/postscript-jasper-morrison-crate-controversy>.

²¹ "About MUJI." MUJI USA. Accessed March 12, 2015. <http://www.muji.us/about-muji/>.

²² "The Key Evolved." Kevo Smart Lock. Accessed March 12, 2015. <http://www.kwikset.com/kevo/>.

log of home entry and exit. However, the physical form of the lock from outside the house looks very typical, with a standard deadbolt appearance including a slot for a traditional key. The design blends in with its surroundings and doesn't draw attention to its new capabilities or enhanced behaviors. The lock is activated by simply touching it, which triggers Bluetooth to connect to your phone and authenticate access. The additional feedback necessary for this new interaction is handled through a circular ring of light, which is hidden until the user touches the lock.

If a “smart” device adds new capabilities to an existing product, then designers should try to build upon the essential qualities of that product category. It might be tempting to announce exciting new capabilities through a radical look and feel, but that will make the product seem dated in a shorter period of time. Instead, consider what new behaviors and feedback need to be enabled and how those can best be integrated into a trusted and familiar form.

What does a quintessential design mean for a purely digital product? Many of the same approaches of avoiding the latest trends and fashions apply equally well to an on-screen environment. There are always fads in Interaction Design that can betray the era in which a website or system was designed. Ultra-tiny pixel fonts, animated website intros, and parallax scrolling are examples of fashionable styles that helped websites look modern and fresh, right up to the point where they seemed passé.

As with physical products, the quintessential design of a digital product involves finding the essence of that product's use and purpose. What actions is the product trying to support? What are the qualities of the information? What methods of presentation, navigation, consumption, and sharing most naturally support that information? An enduring design prioritizes core actions and content while getting out of the way by minimizing interface chrome, using direct manipulation where possible, and ensuring that graphics and animation are used in meaningful ways.

One can see this focused prioritization at its extreme by looking at some of the longest-lasting software programs still in use today, the command-line tools of the UNIX operating system. The UNIX design philosophy encourages programs that are extremely focused, doing one thing well and working in a modular manner to accept and send input and output from other tools. In his book on the UNIX philosophy, programmer Mike Gancarz extolls principles such as “Small is beautiful” and “Make each program do one thing well.”²³ This philosophy has helped the UNIX operating system steadily improve over many years, without the need to rewrite everything as it evolved.

Figure 4.x iA Writer with Focus Mode

Simple, focused tools are not exclusive to command line programs. In recent years, a number of desktop and mobile applications have differentiated themselves by addressing a singular task

²³ Gancarz, Mike. *Linux and the Unix Philosophy*. Amsterdam: Digital Press, 2003. 8.

with clarity of purpose. One example is iA Writer, whose designers call it a “machine for writing,”²⁴ that strips away all but the essential qualities a writer needs to focus on their words. There are numerous distraction-free text editors designed to help writers focus, but achieving that goal requires nuance, a design that gets to the essence of the action, not just a minimal feature set.

iA Writer has unique features, such as a “Focus Mode” where the sentence you are currently writing has more prominence than others. But creating a quintessential tool for writing is less about any particular feature than finding the right balance and structure for all of them. A key part of the design is deciding where the purpose of the application begins and ends. As with UNIX tools, iA Writer is designed to be part of an overall workflow, not a monolith end-to-end solution. The goal is to prioritize writing, and thus not editing, formatting, or embedding references. This separation of tasks means that iA Writer can strive to be the writing tool that users choose for a long time, even if they change their preferred footnote manager or layout program in the future.

As discussed with Super Normal products, one can only evaluate if a product has achieved an essential quality through use. On the iA Writer website, they attempt to convey this through testimonials, including one from the American writer Augusten Burroughs, author of the bestselling memoir *Running with Scissors*. According to Burroughs, the “program is the single most useful and remarkably clever—invisibly so—device for writing.” He continues, saying that, “Only at first glance does it appear to be an ordinary text editor. Once in use, I discovered that while it has only a tiny number of features, each is just the one you want.”²⁵ The creators of iA Writer say that receiving this feedback gave them goosebumps, and it should. This is what you hear when you’ve designed an enduring product: clever but invisible utility revealed through use by having just the right number of features.

Designing a quintessential product is a humble act, a removal of the ego and an acceptance that the best, most long-lasting design may not be the one that stands out from the crowd. The notion that a product, physical or digital, can be refined to its essence is in some ways similar to the idea of invisibility that typographic scholar Beatrice Warde promoted. In her 1932 essay *The Crystal Goblet or Printing Should Be Invisible*, Warde said that, “Type well used is invisible as type, just as the perfect talking voice is the unnoticed vehicle for the transmission of words, ideas.”²⁶ A quintessential design is not truly invisible, but like good typography, it doesn’t stand out because its form is so appropriately aligned with its purpose.

Tailored

Industrial Design has historically been associated with mass production and products designed for a broad audience. New manufacturing capabilities developed during the first and second

²⁴ “Writer for Mac.” IA. Accessed March 12, 2015. <https://ia.net/writer/mac>.

²⁵ “A. Burroughs on IA Writer.” IA. October 19, 2010. Accessed March 12, 2015. <https://ia.net/writer/updates/the-pleasure-of-the-text>.

²⁶ Bierut, Michael. *Looking Closer 3: Classic Writings on Graphic Design*. New York: Allworth Press, 1999. 57.

Industrial Revolutions catalyzed the profession and created a consumer culture accustomed to repeatable goods, where each instance of a product conforms to the same design and quality. If a mass-produced product is lost or damaged it can be replaced with an identical copy as easily as taking a trip to the store. The one-off creations of craftsman in pre-Industrial times may have been better suited to an individual's unique needs, but mass manufacturing offered desirable tradeoffs such as consistency and cost savings.

In an attempt to better meet people's needs, while still appealing to a broad audience, companies will often segment their customers into groups based on interests or behavior. If the overall segment is large enough, then this approach allows a mass-produced product to address more specific needs while still justifying the upfront cost of production. Chris Anderson, author of *Makers: The New Industrial Revolution* argues that we are entering a new era in which truly individualized products can be affordably offered at scale, a kind of Third Industrial Revolution that "is best seen as a combination of digital manufacturing and personal manufacturing."²⁷ In this new era, companies can design for the smallest possible segment, a single person.

Anderson points towards the Maker movement as the dawning of this new era, highlighting early adopters who embraced technologies such as 3D printing and open source hardware. Today, these systems have matured beyond their hobbyist origins, enabling businesses to embrace mass customization over mass production. In a world where manufacturing is digital, why should every product be the same? By combining rapid manufacturing with the communication possibilities of the Internet, companies can get input from a user and dynamically tailor a design before its physically made.

Tailoring products to better fit the unique needs of an individual has been shown to increase customer loyalty,²⁸ but is also believed to reduce the "replacement rate" of a product,²⁹ meaning that people will continue to use a bespoke design for a longer period of time. This is a different approach to longevity, one based on upfront perfection rather than molding to a user over time. There's no need to keep searching for a better product if the one you have is perfect for you.

Figure 4.x Normal earbuds photo / app screens

Normal is a company founded on the idea that products should be custom made for individual users. Nikki Kaufman, the Founder and CEO, had trouble finding earbuds that fit her well, a common problem since ergonomic designs for the ear are notoriously difficult. The shape of each human ear is unique, to the point that computer vision researchers have suggested using

²⁷ Anderson, Chris. *Makers: The New Industrial Revolution*. New York: Crown Business, 2012. 41.

²⁸ Spaulding, Elizabeth, and Christopher Perry. "Making It Personal: Rules for Success in Product Customization." Bain & Company. September 16, 2013. Accessed March 12, 2015. <http://www.bain.com/publications/articles/making-it-personal-rules-for-success-in-product-customization.aspx>.

²⁹ Boér, Claudio et al.. *Mass Customization and Sustainability: An Assessment Framework and Industrial Implementation*. London: Springer, 2013. 188.

ears instead of fingerprints to identify people.³⁰ Some earbuds address this challenge by designing for an “average” ear, while others like the original iPod earbuds are round, which seems to defy the shape of any human ear. Kaufman found herself surrounded by 3D printing technology at the New York inventions lab Quirky when she realized that headphones were a product in desperate need of a more individualized fit.

Normals are in-ear headphones that are 3D printed to perfectly fit your ears. Custom earbuds are not a new idea, but they were previously limited to a high-end market where a fitting session involves sitting very still as silicon is squirted into each ear to make a mold. With Normals, this fitting is done through an app, which prompts users to take a photo of each ear while holding up a quarter for scale. This photo is used to create a custom “earform,” one for each ear, that is 3D printed in a storefront factory in New York. The app allows users to pick the color of the earform, cord, and housing, all of which is assembled and shipped within 48 hours.

The name Normal is a reversal of a problem people often express, that “my ears are so weird, nothing fits.”³¹ This kind of self blame is similar to when a user struggles with poorly designed software, faulting themselves for usability challenges rather than the product designers. In a world of mass produced physical products, finding a good fit can be a foraging expedition, and there’s no guarantee that anything will work perfectly. This is where the company’s slogan expresses a new vision for tailored products, the normalization of the idea that “One Size Fits None.”

Figure 4.x Vitsoe 606 Universal Shelving System

The uniqueness of our bodies is matched only by the idiosyncratic environments we inhabit and the collections of belongings we fill them with. Every person lives side-by-side with their unique assortment of items, trinkets, and oddities that they struggle to find the perfect place for in a home that was built without knowledge of these particular items. Storage solutions abound, many of them offering flexibility and modularity, but none as tailored and designed for longevity as the Vitsoe 606 Universal Shelving System, designed in 1960 by Dieter Rams.

Included in the cost of the Vitsoe 606 is the planning service, which begins with a conversation and a photograph. The individual in need of shelving measures the room in question and discusses their needs with a Vitsoe planner, who explains that the process is more of a collaboration, in that “we don’t plan a system for the customer, we plan a system with the customer.”³² This handholding is allowed to take as long as necessary to find the perfect combination of shelves and drawers, custom designed for a particular wall with all its constraints

³⁰ Mosher, Dave. "Ears Could Make Better Unique IDs Than Fingerprints | WIRED." Wired.com. November 12, 2010. Accessed March 12, 2015. <http://www.wired.com/2010/11/ears-biometric-identification/>.

³¹ Morell, Katie. "Nikki Kaufman of Normal: Custom Earphones Without the Custom Price Tag." OPEN Forum. October 1, 2014. Accessed March 12, 2015. <https://www.americanexpress.com/us/small-business/openforum/articles/nikki-kaufman-normal-custom-ear-puds-without-custom-pricetag/>.

³² "606 Universal Shelving System." Vitsœ. Accessed March 12, 2015. <https://www.vitsoe.com/us/606>.

of outlets and lighting fixtures. When the design is complete, the unique set of components is packed and shipped to the customer's home.

Vitsoe was founded on the idea of "designing down-to-earth furniture that could be used for as long as possible."³³ Although the planning process results in a custom fit for your home today, the 606 system is designed around interchangeability, with components that can be rearranged and added to over time. It is not meant to be permanently installed, but to move with you and your stuff, reconfigured as necessary for each location. After a move, the planners will take into consideration the pieces you already own and suggest additions or changes to perfectly fit the new space. The company values longevity, marketing the fact that they have been making the same product for over 50 years and encouraging customers to have confidence in starting small and adding more later, even if it's just "one more shelf in 20 years' time."³⁴

Information about a person is the enabler of any tailored product, whether customized to fit their body, home, or life. The internet has made it easier to learn about and communicate with potential customers, which has driven a 21st century boom in personalized products. The desire for mass customization in physical products is partly influenced by expectations that users bring from the digital world, where a certain level of tailoring is expected due to the inherently dynamic quality of the medium. It's no longer surprising that the Amazon homepage is full of products based on our browsing history, or that Google prioritizes search results that are relevant to our location. Tailoring is often a key value proposition for digital products, whether it's Netflix highlighting a movie you'd like to watch or Foursquare sending you a push notification that you're near an interesting restaurant.

In the early years of the web, knowledge about a user and their preferences had to be built up over time and was limited to what they chose to reveal to that specific site. Today, the possibilities have changed, as data collected elsewhere can more easily be imported, shared, and utilized. Consider what happens when a website or app requires someone to log-in via Facebook Connect. Linking a Facebook account to this third party not only eases the onboarding process but also provides a wealth of personal information including a user's demographics, preferences, interests, and friends. This allows the product to offer a tailored user experience from the very first moment.

The increased ease in sharing and importing personal data means that digital products must do more than simply provide access if they wish to achieve longevity. What matters is the specific way that a product tailors the data, creating a relationship with the user that feels more like a helpful guide than a system to be used. Enduring products blend into the fabric of your life, becoming something you increasingly rely on even as you think less about them.

The more information a product has about your preferences, history, schedule, contacts, finances, health, and travel plans, the more it can predict the actions you'll want to take and

³³ Vitsoe, *606 Universal Shelving System*. 2010. Available from: https://www.vitsoe.com/site/download/331/606_Universal_Shelving_System_brochure.pdf.

³⁴ Ibid.

automatically provide the information you need. One can see this in Google Now, where the company that wants to “organize the world’s information and make it universally accessible and useful,”³⁵ is going one step further to provide “the right information at just the right time.”³⁶ The premise of Google Now is that Google knows you so well they can deliver the right information without you having to search for it. Music to listen to, groceries to buy, traffic alerts, sports scores, schedule reminders, or nearby attractions are all served up contextually based on where and when Google thinks you’ll need that information.

In his 2007 TED Talk, digital visionary Kevin Kelly reflects on the first 5,000 days of the web, and ponders what will happen in the next 5,000.³⁷ One of the trends he sees is that we are becoming codependent on digital products, increasingly at a loss without access to the information and capabilities they provide. We already outsource our memory to Google, permitting ourselves to forget a phone number or address because we know how easily we can find it. Kelly acknowledges that some people perceive this as a problem, but he takes a long view of technology and points to our dependency on other systems we rarely think about such as the alphabet and writing. In Kelly’s envisioning of the future, the web will become more personalized in a good and supportive way, but that “total personalization in this new world will require total transparency.”³⁸

Total transparency sounds like a scary idea, but Kelly takes pains to differentiate this concept from total surveillance. In Kelly’s optimistic view the notion of transparency “suggests a more active role, rather than an imposed view. You have to BE transparent.”³⁹ Of course in recent years the issue of Internet privacy has come to the forefront after the Edward Snowden revelations of NSA domestic spying. We have at least partially gone down the wrong path, the one where the web resembles a panopticon prison, where all of our actions can be seen without us knowing if someone is watching.

Design has a role to play in the debate between surveillance and transparency. One definition of privacy is “the choice to reveal oneself selectively,”⁴⁰ which Interaction Designers can support by providing people control over how their data will be captured, used, and shared. The benefits and tradeoffs of transparency should be made clear. If a user chooses greater transparency they will receive a more tailored experience that improves over time. If they choose not to share, a standard experience will always treat them like a stranger.

³⁵ "Company." Google. Accessed March 12, 2015. <https://www.google.com/about/company/>.

³⁶ "What Is It." Google Now. Accessed March 12, 2015. <https://www.google.com/landing/now/#whatisit>.

³⁷ Kelly, Kevin. "The next 5,000 Days of the Web." TED. December 1, 2007. Accessed March 12, 2015. http://www.ted.com/talks/kevin_kelly_on_the_next_5_000_days_of_the_web.

³⁸ Ibid.

³⁹ Kelly, Kevin. "Total Personalization Needs Total Transparency." The Technium. May 5, 2008. Accessed March 12, 2015. <http://kk.org/thetechnium/2008/05/total-personaliz/>.

⁴⁰ Hughes, Eric. "A Cypherpunk's Manifesto." A Cypherpunk's Manifesto. March 9, 1993. Accessed March 12, 2015. <http://www.activism.net/cypherpunk/manifesto.html>.

While physical products are just entering an era of mass customization, digital products are struggling with the ethical challenges that emerge when you know so much about a user. As computation is embedded into objects, these privacy considerations will find increasing relevance in the world of physical products. Even today, the personal data captured to tailor a Normal headphone or Vitsoe shelving unit should raise questions about how that data is stored, used, and shared. Tailoring is a powerful option to create enduring products that blend seamlessly into our lives, but that comes with a new level of responsibility to provide both trust and control.

Adaptable

A traditional human-centered design process involves observing user needs and designing products, services, and systems to address them. This process is well intentioned, meant to make sure that people's needs and desires are prioritized above engineering possibilities or business imperatives. However, it can also lead designers to focus too narrowly on situations that exist today, neglecting how people's lives might change over time. Architect Christopher Alexander contrasts this to the way that nature works, where you have "continuous very-small-feedback-loop adaptation going on, which is why things get to be harmonious... If it wasn't for the time dimension, it wouldn't happen."⁴¹ No matter how well suited a product is for today, to be enduring it must adapt to a changing world and evolve over time with the needs of its users.

When designing for adaptation, there are two distinct approaches a designer can take, depending on how well they can foresee a future state. Adapting to anticipated changes means that user needs are structured in a predictable progression. If a design can evolve to support the next known step then it can effectively replace one or more products. Adapting to unanticipated changes, such as shifts in technology, society, or policy, requires a more flexible approach. Unplanned product evolution is a process of co-creation with users.

Anticipated Changes

Figure 4.x Fold Pot

The Fold Pot by Italian designer Emanuele Pizzolorusso is an example of a simple product that adapts to accommodate an anticipated change.⁴² A houseplant is expected to grow, at least if properly cared for, and will eventually need to be transplanted into a larger pot to make room for its lengthening roots. The Fold Pot, which is made of flexible silicon, can adapt to support a growing plant by flipping up the folded sides to double its capability when the time comes to add more soil. The pot looks "correct" whether folded up or down, supporting two stages of the plant's growth without compromising its design during either one.

⁴¹ Brand, Steward. *How Buildings Learn: What Happens after They're Built*. London: Penguin Books, 1995. 21.

⁴² "FoldPot 3pcs Set ~ Growing Plant Pots." Shop by Pizzolorusso. Accessed March 12, 2015. <http://shop.pizzolorusso.com/product/foldpot>.

Similar to plants, products designed for babies and young children are ripe for adaptation due to the rapid pace in which they are otherwise outgrown. Many parents choose to purchase a baby crib that can later convert to a toddler bed, a sensible adaptation that increases longevity and saves storage space. When a child is ready for more nighttime freedom the side rails of the crib can be removed without rearranging the whole room.

Figure 4.x Kalon Studios Echo Crib + Echo Bed

The Echo Crib, by Los Angeles design firm Kalon Studios, is a beautiful example of crib to bed adaptation. Its solid maple construction is meant to last for generations, but can also grow with a single child in a few different ways. The rails can be removed, turning the crib into a toddler bed, and the optional Echo Bed conversion kit aesthetically integrates curved safety rails for a more gradual transition from crib to bed. The designers believe that “Graduating from a crib to a bed is a milestone for children that should be fully experienced.”⁴³ To achieve that goal the bed is set low to the ground, allowing a child to build confidence by easily climbing in and out once the rails have been removed.

Charles and Ray Eames explored modularity in their much of their work, including their classic fiberglass chairs which feature a wide variety of interchangeable bases. Their approach provides an instructive example of how modularity alone is different from designing for adaptation. On Herman Miller’s website, users can configure an Eames chair for a dining room, office, nursery, or school by selecting from a diverse set of shells, bases, colors, and finishes. The bases can technically be swapped out later, but this is not the primary positioning or intent behind the design. The modular system was originally chosen for manufacturing efficiency and affordability, not to encourage adaptation of a single chair over time. Swapping out a base to fit a new need is clearly possible, but not explicitly encouraged, as evidenced by the fact that Herman Miller’s website does not offer bases and shells separately.

Figure 4.x Orbit Infant System (SmartHub)

A more explicitly adaptive use of a modular base can be found in the Orbit Infant System, a series of products and add-ons designed to ease the transition of a moving a baby between car, destination, and home. Created by Orbit Baby, the system is centered around a standardized SmartHub base that allows the Orbit car seat, stroller seat, or bassinet to snap securely into place and rotate forward, backward, or sideways. The SmartHub can be installed in the backseat of a car, but is also integrated with the Orbit stroller and rocker bases, allowing for numerous combinations including a car seat on a rocker, stroller seat in a car, or a bassinet on a stroller base. A key goal for the system, which any parent can relate to, is to transport a child without waking them up.

Figure 4.x Orbit Infant System (Upgrade Kit and/or Sidekick)

⁴³ "Echo Toddler Bed (or Conversion Kit)." Kalon Studios. Accessed March 12, 2015. <http://kalonstudios.com/shop/us/echo-toddler-bed-76>.

The Orbit Infant System can also adapt to support a growing child, since the toddler car seat snaps into the SmartHub as easily as the infant version. If a second child is born, the stroller can be extended with another base using the Helix Plus Double Stroller Upgrade Kit. Older children can ride alongside an infant using the Sidekick Stroller Board add-on, a foldable wooden extension styled after a skateboard with grip-tape on top.

It's telling that the designers at Orbit Baby have referred to their product as a system since founding the company. When a product offers a significant level of flexible adaptation, beyond the simple two stage transformation of the Fold Pot, its value is inherently located in the connections between its parts. The individual components have innovative features on their own, such as the one-handed collapsing of the stroller base, but their value is only unlocked when combined with other parts of the system. There is a network effect within the Orbit Baby product line, where adding a new component that uses the SmartHub increases the value of all the Orbit products a parent already owns.

Anticipating the changing needs of a parent with a growing child, or a second child, is relatively straightforward. The Orbit system gets better over time, as new extensions are designed, but all of the additions so far have remained in the realm of infant transport. Imagine if Orbit branched out further, designing components that are optimized for moving groceries or postal mail instead of children. This kind of radical shift in purpose or use case is rare within physical products, but happens all the time in the digital world.

Startups refer to a shift in user group or product focus as "pivoting," and many try to pivot as fast as possible to discover the most desirable and profitable outcome. Perhaps the best known example of a radical pivot is Flickr, which began as a photo sharing feature within an online game called *Game Neverending*. As the photo feature got popular, the rest of the product was scrapped and the startup pivoted to focus fulltime on photo sharing.⁴⁴ A fundamental shift of this proportion is obviously jarring to an existing user base, but it highlights the essentially mutable nature of digital products. An enduring digital product continually adapts, in ways both small and large, to accommodate shifts in technology and user needs. The end result may include changes the designers never anticipated.

Unanticipated Changes

Designers are used to observing a need in the world today, whether functional or emotional, and crafting a particular experience to satisfy that need. How can designers plan for unanticipated changes in the future? How can they design for the unknown? Although the future is murky and unpredictable, designers can put structures in place that allow products to adapt over time.

Designing a user experience is like a bit like creating a script for the user, not a rigid one like in a movie with set lines and linear scenes, but a flexible one in which every moment has a range

⁴⁴ Graham, Jefferson. "Flickr of Idea on a Gaming Project Led to Photo Website." USATODAY.com. February 28, 2006. Accessed March 12, 2015. http://usatoday30.usatoday.com/tech/products/2006-02-27-flickr_x.htm.

of possibilities and potentialities depending on the actions a user takes. This script defines the intended experiences a designer has in mind for the user and, during the design process, a series of scenarios might be developed to communicate this intentionality to stakeholders. However, once a product is out in the world, a user can rewrite the script of a product in various ways. They can appropriate, misuse, and combine products, using them for unplanned purposes and in unplanned contexts.

The philosopher Don Ihde uses the term “multistability” to refer to technologies or products that are successfully used in a different ways based on context.⁴⁵ Because of their wide reach, most digital experiences achieve some form of multistability, where users redefine the purpose of the product in an unexpected way. Websites and apps that allow for user generated content or communication will regularly have users who ignore, subvert, or simply reinterpret the purpose of the platform. They successfully use the capabilities provided for means other than intended, such as stores who use Instagram as an ecommerce platform.⁴⁶ Other times, users try to extend a system’s existing capabilities, exposing a desire for features that don’t exist. For example, when users on a discussion forum create site-specific shorthand to make searching more effective.

When users reinterpret or extend a product, designers have a choice to either ignore, actively prevent, or incorporate the new usage. A high degree of multistability could mean that a product is bumping up against a different world than it was designed for, one where needs have changed or society has shifted. Or perhaps it’s just kids messing around. Figuring that out, and adapting as necessary, is how product evolution is co-developed with users. Designers have two main roles to play: encourage multistability and pay attention to whether the official identity of a product needs to change.

One way to encourage multistability is to design products where users can easily perceive the capabilities and limitations of the system. Ubiquitous computing pioneer Mark Weiser refers to this as being “seamful,” in contrast to being seamless. Designers often strive for seamlessness, where all parts of a system work flawlessly, and invisibly, to support a singular experience. The problem with this approach is that the underlying enablers of the experience are effectively, or literally, sealed away from the user. This creates a tightly controlled “script” for the product, removing some autonomy from the user, and requiring that everything work flawlessly behind the scenes. In contrast, if there are visible seams, ideally what Weiser called “beautiful seams,” then users can more easily understand and adapt the capabilities of a product.

Professor Matthew Chalmers, of University of Glasgow, has further explored Weiser’s notion of seamful design. One example he gives is the status bar on a mobile phone, which could technically go beyond signal strength to indicate the specific cellular tower it’s connected to. Normally this information is hidden, but exposing it could help users know when a phone is

⁴⁵ Verbeek, Peter. *What Things Do: Philosophical Reflections on Technology, Agency, and Design*. University Park: Pennsylvania State University Press, 2005. 136.

⁴⁶ Wortham, Jenna. "On Instagram, a Bazaar Where You Least Expect It." Bits. March 8, 2014. Accessed March 12, 2015. <http://bits.blogs.nytimes.com/2014/03/08/on-instagram-a-bazaar-where-you-least-expect-it/>.

jumping back-and-forth between two different towers.⁴⁷ Extending that example, the physical casing of the phone could use color or texture to indicate the location of embedded antennas, helping users to avoid accidentally attenuating the signal with their hands. Recognizable seams help users develop a mental model for how a product functions and find workarounds for when it doesn't.

The most direct way that a digital product can reveal its seams is by exposing an API, or Application Programming Interface. An API allows users, or user/developers anyway, to directly access the capabilities of a product, separate from the official experience that designers have created. Many popular products have APIs, including Flickr, Facebook, Instagram, and Twitter. This is why third-parties are able to build entirely new Twitter clients, tweaking the official design or offering new ways to use the platform.

Twitter also provides an instructive example of how to pay attention when users extend a product. The core features that define Twitter today, @ replies, #hashtags, and retweets, are all features that were originally developed by users.⁴⁸ Early adopters used the constraints of 140 characters per message in creative ways, adding codes such as @, #, and RT that other users copied in their structure and meaning. As their usage reached a critical mass, Twitter added official support for these conventions. It's possible to find the user who first used a hashtag or retweet, but the individual is not the point. The adaptation was necessary because the collective decided that's how the product should evolve.

Figure 4.x YY singer screenshot

Sometimes the collective leads a product down an entirely different path than the designers originally intended. Take for example the Chinese video-based social networking site YY. The website began as place for gamers to stream video games as they played, letting others around the world watch as they vanquished foes on virtual battlefields. Because typing is difficult while gaming, the site included a high-quality audio feed for users to chat or talk about game strategy. Over time, the company realized that some users weren't playing games at all—but singing—using the audio stream as a platform for karaoke.

YY didn't shut down these singers who appropriated the website for performances, but they also weren't sure how to respond. As an experiment, they created a contest where they gave users virtual tickets to vote for their favorite performers. A light bulb went off when they noticed that users were selling their tickets on Taobao, a Chinese online marketplace, for roughly 25 cents apiece. After that, YY embraced singing as an official use of the site and developed a variety of virtual currencies at different price points that users can gift to their favorite performers. If you like a singer, you can give them an emoji lollipop, cotton candy graphic, or throw virtual roses on their stage. These simulated gifts translate into real money, and the singers get a cut of the

⁴⁷ Chalmers, Matthew, and Ian MacColl. "Seamful and Seamless Design in Ubiquitous Computing." *Workshop At the Crossroads: The Interaction of HCI and Systems Issues in UbiComp*, 2003, 17.

⁴⁸ Seward, Zachary. "The First-ever Hashtag, @-reply and Retweet, as Twitter Users Invented Them." Quartz. October 15, 2013. Accessed March 12, 2015. <http://qz.com/135149/the-first-ever-hashtag-reply-and-retweet-as-twitter-users-invented-them/>.

profits. Streaming video games are still allowed on YY, resulting a strange kind of split personality, but karaoke now drives over half of the company's revenue.⁴⁹

We have looked at two different scales of unanticipated adaptation. Turning hashtags into search links was a small but powerful improvement to Twitter, while YY underwent a larger transformation in features, identity, and business model. Organizational learning theorist Chris Argyris calls these "single-loop" and "double-loop" changes. In a single-loop, adaptations can move a product forward but are largely meant to maintain equilibrium, like a thermostat turning on and off. In a single-loop adaptation designers tweak the system to support evolving needs of existing users. In a double-loop, minor adjustments are not enough, and major new features or a new identity might be necessary. Double-loop changes are rarely anticipated by a designer and are commonly driven by what economist Eric von Hippel refers to as "lead users,"⁵⁰ people who are not satisfied with existing products and hack or appropriate others to approximate the experience they want. Lead users may be extreme, but designers should pay attention because what seems unique today may be commonplace tomorrow.

Repairable

Everything will eventually break. Whether physical or digital, some part of a product or system will stop working no matter how durable or adaptable. Enduring products plan for this eventuality and are designed to be easily repaired, preferably by the user. Today's products are complex, involving scores or hundreds of components. Repairability avoids having to throw a product away when just one of those parts fails.

In the past, America had a stronger culture of repair, where one was expected to take worn out shoes to a cobbler, or a broken radio to the service center. The increased pace of consumerism and mass production have changed that, though this shift is not universally felt around the world. Take for example India, where lower incomes drive demand for increased longevity and city streets are filled with repairmen who specialize in particular items from umbrellas, to bikes, to cellphones. In America, where cobblers and other repair crafts are in steady decline,⁵¹ people seem more willing to just throw things away. But the culprit is not only disposable income and callous attitudes. Products are no longer made to be repaired. The soles of shoes are irreversibly attached with glue, appliances fit together with irreplaceable plastic snaps, and electronics prioritize thinness over repairability.

The difficulty of repairing modern products has gotten so bad as to spawn advocacy groups. The Repair Manifesto is one such call to arms, highlighting environmental, budgetary, educational, and empowerment reasons for repairable design.⁵² Another is the Right to Repair

⁴⁹ Chace, Zoe. "YY Changes Its Tune After Karaoke Is A Hit." NPR. December 15, 2014. Accessed March 12, 2015. <http://www.npr.org/2014/12/15/370878848/yy-changes-its-tune-after-karaoke-is-a-hit>.

⁵⁰ Von Hippel, Eric. *Democratizing Innovation*. Cambridge: MIT Press, 2005. 22.

⁵¹ Dydzuhn, Karen Kovacs. "Cobblers in Decline." Westport News. June 21, 2011. Accessed March 12, 2015. <http://www.westport-news.com/news/article/Cobblers-in-decline-1433387.php>.

⁵² "Self-Repair Manifesto." iFixit. Accessed March 12, 2015. <https://www.ifixit.com/Manifesto>.

group, which fights for legislation that gives car owners the tools and information to fix their own vehicles, or take them to independent repair shops.⁵³ Vehicles have had a historically strong repair culture, but as they become increasingly embedded with computation and sensors, manufacturers are requiring that repairs happen only at authorized shops. The Digital Right to Repair coalition calls for similar action from medical device companies, electronics manufacturers, agricultural conglomerates, and data centers.⁵⁴ Their argument is that companies are creating a monopoly on repair and unfairly restricting what consumers can do with the products they own. In some instances the government has responded against this corporate suppression of user autonomy, such as the recently passed bill that requires wireless companies to unlock a user's phone.⁵⁵

Autodesk, makers of design and engineering software, maintain a knowledge base on how to design for improved product lifetimes. One of the tools they offer is a quick reference guide, a helpful list of tangible considerations that make a product easier to disassemble, repair, or upgrade.⁵⁶ Not every product can achieve all of their suggestions, but checklists like this are a useful tool for designers to share with team members and a goal they aspire to achieve.

Fig 4.x Flor modular carpet system

One of the goals on the Autodesk list is “Use modular assemblies that enable the replacement of discrete components.” A great example of this principle in action can be seen in the carpet company Flor, which has rethought how floor coverings should be assembled and replaced. Instead of a giant roll of carpet, Flor is a modular system of carpet squares, 20 inches on each side, which can be assembled by the user to make custom rugs. The Flor system allows a rug to be tailored to your space and personal style, but also makes damage incredibly easy to repair. If a stain occurs, from a pet accident or a spilled glass of wine, then only the affected tiles need to be replaced.

Fig 4.x Teenage Engineering OP-1, with accessories

Another Autodesk guideline is to “Make replacement parts available and affordable.” This is of course not always under a designer’s control, and highlights the need to champion repairability throughout all roles in the organization. One example of a design-led approach can be found in the company Teenage Engineering, makers of the OP-1 portable synthesizer. Replacement parts and add-on knobs for the OP-1 are available from the company, but users often complained of the high cost, which was largely driven by shipping. To address these concerns the company released CAD files of the parts, so users can 3D print them on their own. If a user

⁵³ "Right To Repair Coalition." RightToRepair.org. Accessed March 12, 2015. <http://www.righttorepair.org/>.

⁵⁴ "Home." Digital Right to Repair. Accessed March 12, 2015. <http://www.digitalrighttorepair.org/>.

⁵⁵ Bessler, Abigail. "Obama Signs Bill "unlocking" Cell Phones." CBSNews. August 1, 2014. Accessed March 12, 2015. <http://www.cbsnews.com/news/obama-signs-bill-unlocking-cellphones/>.

⁵⁶ "Improving Product Lifetime." Autodesk Design Academy. Accessed March 12, 2015. <http://academy.autodesk.com/library/sustainable-products/improving-product-lifetime>.

doesn't have access to a 3D printer they can order these versions through the Shapeways service at significantly lower cost than directly from Teenage Engineering.⁵⁷

The stated goal of releasing the CAD models for the OP-1 accessories was to make users happy. This kind of attitude is the exact opposite of planned obsolescence, and results in a high degree of loyalty and user evangelism for the product. The open source accessories are not encumbered by license restrictions, which allows users to modify them or build their own knobs, cranks, or wheels to enhance their synthesizer. Releasing the source for parts that are still in production may not be viable for every company, but should at least be considered for products and accessories that are no longer officially supported. Imagine a product "sunsetting" process where a company no longer takes responsibility for repair, but hands over the necessary tools and information to the user community.

For physical products with embedded computation, hardware components aren't the only type of repair to consider. The firmware and software drivers that allow these products to boot and connect to other devices can break when changes are made to the underlying operating system or third-party APIs. Generally, users consider these fixes the responsibility of the company, but this kind of support doesn't last forever. Similar to releasing CAD files for parts, companies should consider enlisting the open source community to repair their legacy products. Some companies avoid this problem completely by using open source components from the start, such as Buffalo routers, which pre-install the open source DD-WRT firmware.⁵⁸

Fig 4.x iFixit screenshot

Along with obtaining parts or source code, users need access to technical documentation to guide them through a repair process. Older electronics, like CRT televisions, used to tuck a printed repair manual inside of the casing itself, but most products today aren't even designed to be repaired. The website iFixit seeks to remedy this situation through a wiki-based structure where detailed repair manuals and step-by-step photographic teardowns can be collaboratively created by users. The founders of iFixit "believe that the easier it is to fix something, the more people will do it."⁵⁹ They see their information platform as a social good that "lengthens the life of products and conserves vital resources."⁶⁰

There are many important roles in supporting repairability, but the underlying iFixit philosophy is one that designers everywhere should strive towards. What small change in a design could make it easier for a user to repair a broken product? If we want our products to endure, we have a responsibility to empower users to repair them.

⁵⁷ "Teenage Engineering Make CAD Files Available to 3D Print Replacement Parts." Shapeways Blog. September 24, 2012. Accessed March 12, 2015. <http://www.shapeways.com/blog/archives/1647-teenage-engineering-make-cad-files-available-to-3d-print-replacement-parts.html>.

⁵⁸ "Wireless Networking." Buffalo. Accessed March 12, 2015. <http://www.buffalotech.com/products/wireless/wireless-n-routers-access-points>.

⁵⁹ "Media Info." iFixit. Accessed March 12, 2015. <https://www.ifixit.com/Info/Media>.

⁶⁰ Ibid.

Layers of Change

In this chapter we have looked at various approaches to promoting product longevity. Each of these qualities can be designed for individually, but combining different techniques may prove more valuable. The longevity of buildings is an analogous example we can look to for inspiration. Buildings routinely outlast their original occupants and even their original purpose. To do this, they change over time, in similar ways to what we've discussed for products. Architect Frank Duffy has said that "there isn't such a thing as a building. A building properly conceived is several layers of longevity of built components."⁶¹ Stewart Brand expanded upon Duffy's notion of layers that change at different rates in his book *How Buildings Learn*.

Figure 4.x Layers of Change Diagram

Brand's "shearing layers" provide a common sense way to think about various time scales within a single design. The six layers (Site, Structure, Skin, Services, Space Plan, and Stuff) accelerate as they move inward. Any homeowner can relate to his observation that the exterior *skin* of a building will last a couple of decades, while *services* like plumbing, HVAC, and elevators might change in half that time. A *space plan* might adjust every five years, while our *stuff*—from furniture to books—moves around all the time.

For products, the time periods are generally shorter, but similar to buildings every product has components that can change at different rates. Consider this attempt to map a smartphone onto Brand's building layers:

Site	company, brand
Structure	processor, touch screen, charging port, battery, sensors
Skin	color, headphones, OS theme
Services	operating system, application launcher
Space Plan	apps, plug-ins, protective case
Stuff	music, photos, video, text

The mapping between buildings and smartphones isn't perfect, but it doesn't have to be, because every product can have its own unique number of layers. Each layer changes at a different speed, but in relationship to the ones below and above it. Slower layers tend to constrain faster ones, so choices made about Structure limit the possible Services and decisions about Space Plan affect the possible Stuff. Many products today are part of a larger ecosystem of products and services, so designers should consider all parts of that ecosystem as they map out how various layers enable and constrain each other.

⁶¹ Brand, Steward. *How Buildings Learn: What Happens after They're Built*. London: Penguin Books, 1995. 12.

What are the layers of change for the product you're designing? What approaches to longevity are appropriate for each layer? As designers, we want our work to provide lasting value in the world. Using the techniques in this chapter we can intentionally design for longevity, creating the conditions for a product that works well today and in the future.



Design Leadership

HOW TOP DESIGN LEADERS BUILD AND GROW
SUCCESSFUL ORGANIZATIONS

Richard Banfield

Planning for the Future

Introduction

Designers, and especially digital designers, are often creating work on the cutting edge of technology. This can be both exciting and frustrating. Getting a grip on which technologies will survive the market's demands and which are just passing fads can feel like a daily investigation. As my ten-year-old son said when he was asked what career he wanted one day, "How can I know that? The things I'll be working on haven't even been invented yet." We live in a time where things change so fast that even the not-too-distant future can seem ambiguous. Knowing how to plan for a future that is unclear can be a design leader's most challenging strategic task. External forces aren't the only thing leaders need to concern themselves with; their entire company is also looking to the leader to show the way forward.

Given the ambiguity of the future, the act of planning can seem daunting to many design leaders. Seasoned designer and leader, Jules Pieri, CEO of Grommet, puts planning into perspective when he says, "Today in this business, it isn't as simple as, 'Oh, this is my planning week' or 'This is a planning meeting.' I have to step back at the beginning of every year and write what is called a CEO letter. I reflect on the top learnings from last year and the top goals of the coming year. That is probably the only formal time when I absolutely am thinking that way. But the rest of the year, it's about connecting the outside world to the one inside this business. As one of my investors said to me, 'Jules, your job is to be out there and absorb it. You've got to do that. Nobody else can.' That was actually kind of liberating...because [he said it during] a heavy operating phase....[I]t gave me permission to do some things that I wouldn't do before. Design leaders

might feel they don't have the time to do this, but it's their responsibility." Lifting your head out of the daily operations and focusing on the outside world is a requirement of leadership. As the saying goes, it's the leader's role to work *on* the business—not *in* the business.

I'm personally a big fan of planning in both my personal and professional life. For me, it's a process that evolved from simply writing a few annual resolutions to creating detailed plans for each aspect of my life. My favorite planning trick is to pretend I have to present my plan to a large audience of my peers. It forces me to think through the elements that might be questioned by others in similar positions to me. Preparing a keynote presentation for this fictitious audience seems to trick my brain into taking each goal or step more seriously. I've heard of other leaders who make their plans more visible by creating vision boards or timelines. These techniques might seem quaint until you realize these are exactly the same methods used to design products and websites. Mood boards, experience maps, user stories—they are all just formalized processes for visualizing and planning for an unknown future.

Natural Planners Versus Learned Planning

I wondered if our design leaders were natural planners or whether it was a skill they developed over time. My personal experience was that planning was a learned skill, but from observing my fellow studio owners in action, I discovered that some leaders come to this work more naturally. Either way, effective planning skills generally come with experience, and the extent of the planning that's required changes as the needs of the organization change. "I would not say I'm a great planner. I think it's something I'm becoming better at," says 352 Inc.'s founder Geoff Wilson. "I think historically our agency was lacking a little bit of vision because of the fact that we lived very day-to-day and didn't necessarily look long-term. Today, I do think planning is very important from both a strategic perspective as well as from a financial perspective, and it's something that I'm becoming better with and more disciplined about." Even well-established companies like 352 Inc. seem to learn the value of planning only when they reach a certain maturity.

In the case of whether to plan or not, size does seem to matter. Smaller companies worry less about long-term planning. It's just not that important to them. However, the growth of a studio or firm means new attitudes about planning are necessary. Success up until then can often be attributed to having really talented people, so a lack of planning doesn't affect their outcomes too much. I call this

the “smart-lucky-strategy.” A small group of smart and lucky people can get away without a strategy for some period of time—sometimes years. The problem comes when projects get more complex, the group grows, and communication becomes harder or good luck dries up. A growing organization demands a different approach.

Planning strategies vary among design leaders. “Am I a planner? Yes and no,” says Sarah Tesla. “I plan ahead enough in order to feel confident about my next move and whether or not I would fail in that move. But beyond that, no. I like to have big ideas that would be interesting to reach, but I’m a little bit more of a ‘live in the moment’ kind of person than I am a meticulous planner.” Everyone we spoke to approaches planning a little differently, but they all acknowledged that it is essential.

Even if you’re not a live-in-the-moment type of person, Tesla’s approach to crafting a big idea that’s interesting to her is exactly where good planning starts. Regardless of the size of your group or organization, you’ll need a clear vision of where you’re headed—the clearer the vision, the better. Clear visions also need to engage your emotions. Big ideas create motivation and excitement for the team trying to reach them. Big ideas are worth getting out of bed and going to work for. Small ideas are easily forgotten. When we started Fresh Tilled Soil 10 years ago, we convinced ourselves we could be the first choice of user-experience designers for all category leader clients. It was an insanely big goal for two guys in a basement without much experience in this space. We are a decade into our journey, and we hear weekly from our prospects and clients that we were indeed their first choice. In hindsight, our big, hairy, audacious goal doesn’t seem so scary after all.

Reflecting on the need to adjust planning habits, Velir’s Dave Valliere confirms that for him it’s an evolving skillset. His approach to planning has gone from passive to proactive. “I would say that over the last few years, my desire to plan ahead has changed. When I first moved into my role in leadership, it was very reactive. I think we hit an inflection point as an organization. About five years ago, we were about 50 people. We didn’t have a lot of organization, both in our own internal structure and how are the staff organized—literally any sort of organizational structure around our process for delivering to clients. We had a lot of issues with deployments to production that were causing outages for clients. Albeit they weren’t huge outages, but they were noticeable.” Valliere admits that sometimes it’s the pain and frustration of a situation that forces the learning moment. Under the pressure of fast growth, the solutions to planning for a more

stable future often require some quick experimentation. “During that time, I was very reactive to those situations. We were trying to plug holes. And sometimes when you’re plugging those holes, you’re only aware of what’s right in front of you and not looking a little bit more broadly or a little bit over the horizon. It was hard to be more strategic and think about planning. We were growing a lot and we were adding a lot of new staff. We were onboarding a lot of new accounts. Figuring out an organization that scaled to support that while you’re in some of those issues at the time is a little messy. You’re trying things around an organizational structure. And I do remember a couple of instances where we tried something from an organizational management structure that just wasn’t right and had to switch it around.”

Valliere stepped back from the Band-Aid approach to planning and spent about a year thinking about what was going to have the biggest impact on Velir over the next 10 years. By spending a lot more time thinking about the steps that would get them there, he was able to gain control over their growing pains. He continues, “What will get us to that space? Do we really want to double-down as an implementation firm? Or do we want to expand into a more full-service agency where we’re offering services that go beyond just pure development and implementation? These were the things I was thinking about.” By asking the right questions, he was able to work with his executive team to find the answers. The next stage was planning the steps that would implement those answers. “This was important, both from the perspective of building a portfolio and getting the right staff involved and trained. So I would say from that perspective, we’ve been able to think more and plan more. For me, things have gotten more comfortable. I’m a lot more effective at thinking about what we want to be doing in terms of these new service areas, and then asking, ‘[W]hat are the steps that we can then step through over the next however-amount-of-time-it-will-take to try to get there?’”

“I think it’s been a mix of both natural and learned skills,” says Scott Baldwin of Yellow Pencil. “I’ve always been a ‘zero inbox’ kind of guy, just about. I’m pretty good at kind of trawling through...my information. But I think a lot of it is just coming down to having a clear head and taking clear actions at the right times.” Having a clear head means having the strategies to deal with everything from email to annual budgeting. Developing these strategies often comes from experimenting with what works for your style of leadership. Being in touch with your leadership style helps you choose the best planning methods. “We’ve taken an absolutely strategic approach to planning,” says Jason Grigsby of CloudFour.

"A few years ago, we did a bunch of Strengthsfinder¹ exercises. These are the tools found in the Strengthsfinder books." By identifying what the executive team was good at, they were able to find solutions that best meshed with their strengths. "I don't think I can turn off that strategic part of my brain. According to the Strengthsfinder tools, I fall into the achiever, strategic, futuristic categories. I spend way, way too much of my time in thinking mode. ... A lot of what we're doing is trying to figure out how we will get to where we want to go."

That Pesky Ambiguous Future

We also asked the design leaders what they see when they look at the industry as a whole. We wanted to know what they see coming down the line in the way of opportunities, challenges, and trends. Dominic Bortolussi of The Working Group sees a future where clients want more than just design and development services. "I think one thing that we're uncovering for ourselves is that as the size of our clients grows—they're getting bigger and bigger, national and international companies—we're realizing that they're looking for someone who provides more than just the production, more than just slapping design on a piece of software. They're looking for the smarts and the strategy in advance of that. We've always provided that, but we never focused on that until recently because our genesis was as a development shop."

As design teams grow and their skills go beyond pushing pixels, the desire to take on more strategic work increases. More strategic work means more internal planning. Delivering on complex projects requires teams with training in strategic thinking. "In the past, we were just the guys behind the scenes who'd be coding the apps," says Bortolussi. "As the size of our projects has grown, the need for that type of strategy has grown. That means that agencies like ours are going to need to be able to offer more and more of that type of work in concert with the development process. Using the agile process, which is something that we've adopted over the last three or four years, strategic thinking is very tightly intertwined with the production. Every cycle...goes through a piece of strategic process and strategic thinking about what you want to develop and why you want to develop it and how to prioritize that."

The lesson here is that planning for successful outcomes at the project level also means flexing your planning muscles at the company level. The two are

¹ Strengths Finder 2.0 by Tom Rath - <http://www.strengthsfinder.com/home.aspx>

always connected. You can't deliver strategic value to your clients if you can't answer those questions for your own design organization. "Educating our clients into that process is going to lead to better things, better production, better software," continues Bortolussi. "I think that's a common theme that we've seen with a lot of our peer agencies around here. Rather than just being the design and dev shops, they're being asked their thoughts and expertise on how to design a [website] for a client based on their business needs."

Habanero Consulting has been in business for two decades, and CEO Steven Fitzgerald is planning for several more decades of business. With so many short-term-focused planning methodologies like Agile and Lean gaining popularity, you might mistakenly think that long-term planning was only for your dad's generation. You'd be wrong. Whether they actively plan for the future or not, all our design leaders think about what the long-term future will mean for their teams and opportunities. Planning far ahead can seem daunting, but that far-away future appears to excite our design leaders. "That's what's fascinating and cool and, frankly, super inspiring for me," says Fitzgerald. "We're very detailed on measuring employee engagement and workplace health. Aside from some systems issues, one of the key areas for us to get better at and, as a company, to improve engagement in right now is clarity of vision. We've been on a three- or four-year journey to get clear about where our next step is and where we're going....I said to the team, 'There's a change in the world that we feel we want to play a role in.' It's all related to our purpose around helping organizations and people thrive. My belief is that we need to create a long-term vision that says, 'These are our values, this is the opportunity in the market, this is where the world's going to spend their money...', and then position ourselves—to poorly quote Wayne Gretzky—[to] skate to where the puck's going to be in terms of the market."

Planning for the future means picking a strategy that isn't going to fade with time. Hitching plans to trendy technologies or fashionable industries can often result in temporary success. To be able to deliver on a long-term plan, our design leaders always reference the core of why they are in business. Aligning their plans to the fundamentals is how they ensure a timeless strategy. "I think vision needs to come from thinking about why you exist, your purpose, [and] understanding how that will most successfully unfold over time," says Fitzgerald. "You need to think about the other market dynamics and the other realities of that. We want to drive our vision based on how we can best live our purpose over time. That gives me a different perspective to think about where we want to go as a

company and the role we want to play in creating this bigger change. It's related to the impact we can have on our customers and their cultures, and helping their organizations thrive."

"For me, it's constantly learning," Greg Hoy says of thinking about the future and the surprising rewards it brings. "One of the absolute gifts that happened to me was starting Owner Camp.² One of the motivating factors was to create a potentially alternate revenue stream moving forward. I didn't anticipate that it would provide so much professional development opportunity for me. Talking to people like yourself who do what [you] do and learning from them, and learning what the life cycle of a leader might be. For me, I'm kind of in the awkward teenage years of running an agency. I've got braces and headgear and I'm still trying to figure out [whether I am] doing the right things. At the end of this, are we're going to blossom or are we going to have to retreat? You think about all those things. You think about what constantly energizes you moving forward."

Aligning Plans to Culture

The size, structure, and culture of your design team will often have a significant influence on the plans you create. Each group will be different, and it's the responsibility of the design leader to recognize what the organization can honestly support. Planning to do something just because everyone else is doing it is naive at best and disastrous at worst. Just like the individual strength-finding exercises, leaders need to ask what their organization excels at doing. This also means recognizing what their weaknesses are. For companies that have the culture or structures that support developing their own internal products, this can mean they are able to support plans for that. "One thing that I really want to get into as an agency is to be able to develop our own products and start to have product revenue...to complement our service revenue," says Geoff Wilson. "This is scary for agencies. Usually you hear horror stories of this not working, but we're trying to be very, very disciplined about it. I think that's really important for our long-term survival. I think that to have a diversified stream of income, so it's not 100% client-services-focused, is where I want to see us get to."

"Our planning for the future is really about finding a way to keep the culture and grow the culture, because we think that the success of our future is predomi-

² Owner Camp is a retreat held several times a year by the Bureau of Digital for owners and senior executives of design studios.

nantly [reliant] on our culture,” says Funsize founder Armendariz. “Our business comes from word of mouth, so to date we’ve never invested any money in marketing or business development.³ A lot of our business comes from the fact that people know we have a very good culture, and a lot of the cool things that we’re doing come from the culture. In terms of how I see it, most of my planning is going to be involved in maintaining, grooming, and bettering our culture.”

“I would say, fairly loose,” Brian Williams says of their approach to connecting plans to any one technology or sector. “Our view is that change is inevitable. We’re in an industry that’s constantly changing. Stuff that works now won’t work in two years, didn’t work two years ago, that sort of thing. We’re constantly seeing that, whether it’s the tech stack that we’re using [or] the process that we’re using, the tools are always changing [and] the client’s needs are changing. Since we sometimes work with startups, we have to be cautious of their ups and downs. Some of the startups are hot right now, but when that bubble bursts in a year or two, they’ll be gone. So we can’t be overly reliant on that.”

Relying too much on one market sector or trend is dangerous. Flexibility with planning is always a balance between what’s good for the organizational culture and what’s good for the market. Greg Hoy confirms Williams’ line of thinking, “You have to keep asking yourself, do client services still energize you moving forward? Does focusing on a particular niche energize you more than another? Can you construct an organization around you to keep you motivated so you are in that niche and constantly energized? I think about that stuff a lot. I’m not the guy to be designing sites and performing critiques and things like that, but I think I offer some experience in other areas that some newer people in our office don’t have that I could potentially leverage into some new business opportunities for us. I’m always thinking about what’s next and how I can add value to the organization, [and] we’ve kind of filled the stuff that I used to do with other very talented people.”

Williams goes on to describe how they avoid the rollercoaster ride associated with tech trends and fashionable industries. “So we have built the entire structure around this bet on change. Our future planning is often saying, ‘Well, what are we interested in doing in terms of the teams? What kind of technologies do we want to play with? When we look out two years from now, or five years from now, what types of clients do we want? What types of solutions are we trying to solve?’ That sort of thing, but it’s not very rigid. We’re not trying to make an exact

³ Update: Funsize recently hired a head of business development.

plan for how to get there. We want to have a clear vision in terms of what we're trying to achieve, but we...accept the fact that change is going to be constant." Connecting plans to a timeless vision works best for design organizations. Instead of choosing a trending technology, design leaders focus on the underlying reason that technology exists. For example, social media isn't the trend, it's the desire for humans to remain connected so they can share information. That basic human desire probably won't ever go away. A smart design leader sees that and gears their plans to leverage that in their choice of tactical investments.

This focus on the underlying principles of human behavior is not just limited to technology and industry verticals. Design leaders also recognize that foundational principles relate directly to how they lead, manage their people, and curate their cultures. "Some of this is the trendy management approaches we see and hear in the media," observes Williams. "You hear it all the time. One example is to fire people quickly. It's not meant in a callous way at all because it's doing nobody any good to have the wrong person in the organization. We learned pretty quickly that I don't like that 'hire slow, fire fast' kind of thing. I think the idea of firing fast is a little too cold for our structure and culture. I think the idea of finding people who are unhappy and unsuccessful, and [figuring out] a way to get them out of the organization [and to a place] where they will be happy and successful is a good thing. I think that's important." Williams goes on to explain that when he needs to let someone go, he'll spend a lot of time finding the right place to send that person. Identifying job opportunities helps them leave with their head held high and without having to face the financial challenges of being unemployed. Williams believes that planning for those outcomes reinforces the culture of his company and ensures a more positive future for everyone on the team.

Planning for Success, and Not the Other Thing

In the absence of a plan, leaders will very often end up at the helm of a rudderless ship. Worse still is that someone else's plan might hijack the ship and set it on a path that has dire results. This hijacking happens subtly and often goes unnoticed until it's too late. It starts with something small like a request from a client to do a non-core project. A client suggests that the design firm adopt a new project that's out of their wheelhouse so that the client's needs can be addressed. Next thing you know, the design firm is hiring people they don't really need for a project they don't really want. The client isn't at fault. They just see a competent design partner suggesting they can respond to a request. Before long, the design

leader finds herself running a business that's spread too thin and has no prospects for the services they currently offer. These distracting events aren't a problem if you're focused on what you stand for and how you'll get there. The problem is when you have no plan. So how then do successful design leaders plan for a positive outcome?

The first step appears to be getting the company plan aligned with what the firm can be really good at, and aligned with the reality of the market. Knowing your cultural strengths, understanding the market trends, and then connecting the dots is the best way to start. Steven Fitzgerald explains how they identified their sweet spot, "We're in a really interesting industry right now where in the long term we feel that technology, process, and culture in our organizations need to come together in different ways than they do right now." Says Fitzgerald, "The product design industry uses technology in a way that's oriented around making processes easier. We know that there's massive opportunity for technology, process, and culture to play a role in changing how people relate to each other, how they relate to their organizations, how great their careers are, and the productivity those organizations get from those people."

Developing a strategy isn't just about filling a need. It's a careful study of what the restraints are for a solution to be created, and then determining which policies and guidelines will get the company to the point where they can deliver the solution to their clients. "It's not simply using technology to make something like a payroll process simpler or a supply chain simpler," Fitzgerald continues. "That's what technology is used for today, and it's very important, but it's using the combination of technology, process, and culture to shift the overall experience that people have. We need to change the experience that organizations have with their people, and change the whole dynamic so we create more thriving organizations." This big-picture thinking described by Fitzgerald elevates the planning out of the minutia of what tech to focus on and up to the level of creating transformative experiences that are timeless.

That's just the first step. The next step is figuring out how to communicate that transition to the market so they can see the value of these solutions. "We have to create a bit of a shift in the next five years," says Fitzgerald. "The question is, how do we get our market and our customers thinking about us more in terms of some of those bigger cultural changes? How do we become transformation agents?" These challenges do not only present themselves to larger design firms but are important for internal design groups and smaller consultancies to consider as well. User-experience and product designers are frequently lumped

in with graphic designers and engineers. Crafting a strategy that differentiates solutions and illustrates relevant outcomes is the biggest challenge. “Our industry, and organizations like us, are typecast as technology companies or design organizations or agencies,” Fitzgerald says. “It’s tough to get out of that typecast, to get involved in the right conversations, to be involved in organizational change, to get into the meat of that. Yet we know that what we have to offer is critical to create those outcomes in the organizations we’re dealing with, so we have to overcome that hurdle.”

It’s clear that in order to remain relevant, design leaders will need to focus less on individual technologies and more on product-wide or organizational solutions. Leaders will have to focus on not being known just as a technology-oriented or design-oriented consulting firm but one that is associated with very specific business outcomes. It could be experiential or cultural change, but it can’t just be about technology. “I think [we made mistakes] around being too broad on our tech stack, for example,” says Williams. “We realized pretty quickly that trying to be a technologist that could work in any tech stack really just meant that we weren’t very good at anything. It’s easy to sell that way but not necessarily the way to do our best work, so narrowing in and being more specialized has been good.”

Connecting the Dots

It might seem obvious that plans should have some return for the organization, but it’s worth understanding how that happens. Returns take many forms and may not always be financial. Non-financial plans tend to be long-term in nature and thus can be more complicated to address when short-term needs, like cash flow, are on the organization’s mind. For design leaders to create continuity between planning and returns, there has to be a link to what the plans will mean for the people in the organization. If the team can’t see the returns that will result from the design leader’s plans, they will be less motivated to make the behavior changes required to reach the planned goals. This is why the difficulty in measuring the returns on cultural and brand-specific plans makes them easy to ignore. The link between finance and nontangible outcomes is sometimes hard to describe, so it’s essential that design leaders develop the communication tools to deliver this message clearly.

Communicating plans to the team consistently and effectively is a skill all design leaders need to have. Communicating a vision so that everybody else gets involved isn’t just about presentations and motivation posters on the studio wall.

Sarah Tesla of Make describes the components of communicating a plan to the team when she says, “It should be a combination of two things. One is the vision of the business. This might not be something that you plan for formally, but it’s important that everyone is on board with that vision. The second thing is beneath that. It’s planning from a financial perspective, and certainly there’s a bit more fiscal responsibility there. You can’t...be too reckless and say to the team, ‘Oh well, money could run out and, you know, we’ll just figure something out when we get there.’ No, it’s not quite like that. I’ve got more of my shit together in that space. And not that it’s always perfect, but it’s healthy enough that it doesn’t feel too challenging.” Tesla makes it clear that things are always changing. Even when plans are made, there should be an understanding that feedback will be received and adjustments are not far away. “If anything, you should plan for your vision to change and evolve. You have to be open to that, and not attached to things. I set the tone for what the vision might be, but ultimately I’m looking for cues from everyone on the team to...give me an indication of what could be the best way forward.”

“I live in the future,” says Jules Pieri. “I don’t think of it as a formal process. It’s more about making connections. I have to expose myself to ideas and technologies regularly to do that....So it means getting out of the office, it means reading, it means talking to people and applying discipline I learned early in my career as a designer. Nobody’s paying me to design the past, or even the present, right?” Pieri is a consummate design leader and it’s clear that she uses her design training in her everyday thinking. Researching first, then making connections to possible solutions is in her bones. “As CEO, I had to figure out how to get the information I needed to do that job. To me, that always meant hitting the road, figuratively and literally. Talking to customers, looking at competition, looking at the capabilities of my own company. Once I have the information, it’s a sort of [a] blend of instinct and reaction to reality.”

Vince Lavecchia of Instrument explains how they connect the dots on big, long-term projects like building a new office to house their 100-plus employees. These types of projects affect both financial and cultural outcomes. “We definitely look at the financial goals and say, ‘Hey everyone, we’re building a building.’” Lavecchia knows that having a creative workspace allows his team to generate better quality work so investing in a new office is essential. Office space, team size, reputation, and quality of work all mingle to create a reputation for the firm that keeps the work coming in. He’s quick to point out how these things are intertwined. “We know we want to maintain a certain level of success and perfor-

mance on the financial side and that's going to allow us to keep reinvesting in the company. We just have to be responsible to those numbers, but once you set those goals, then it's just about having the discipline to force everybody to manage their projects and their teams to reach those goals. In that way, we are not financially focused because we firmly believe that if we do insanely good work, we're going to keep getting insane work, and people will naturally find out about us and see it and want our work. We create demand by putting out insane work. We keep the supply managed so that we're always in demand. We've been intentional about hiring size and not blowing up. We could definitely be larger if we wanted to maximize money, but we've intentionally been careful about that."

Connecting Plans to Specific Revenue Outcomes

Many of the design leaders we interviewed have routines around their planning processes. For some of the more seasoned leaders, these routines are deeply ingrained in their everyday activities. You might even say they are habits. Understanding that these habits or routines have the ability to bring plans to life is something the design leaders talk about frequently. "I never, never, never slow down on the sales side even though we could be busy and we would have client work booked out for the next six months," says Brian Williams about the time he spends actively implementing his plans for the future. Williams' daily activities are seen through his lens of what will happen in the months ahead. "That might seem like forever and we might feel like there's no need to sell, but six months goes by very quickly and all of a sudden we might have nothing in the pipeline. Always be selling is a big thing." William's insistence on thinking about selling means he's constantly planning for positive sales outcomes. This is a good reminder that planning isn't always an annualized event but a daily habit that can be reinforced through ritual and routine. Making the time for daily reflection and connecting big-picture goals to daily activities is another thing that makes these design leaders successful.

Allotting time to planning new initiatives and integrating them with daily activities doesn't happen by accident. Geoff Wilson describes how they plan to take ideas that the team has and deliberately turn them into products that can generate new revenue. "We ask each team to think of at least one product idea that they as a team would get behind and would like to bring to market. We get all of our teams together and they think of ideas. We go over the ideas with them over the course of a few months and then we solidify the idea that each team is going to pursue." What Wilson does next is an example of thoughtful planning.

"Once we have these ideas, we give each of our teams three days. We take three days off of client work, shut the whole entire agency down...and we do a hackathon, company-wide." This focused time allows his teams to get the work done without distractions. Instead of giving them something superficial, suggesting 20% of their time towards these projects, Wilson dedicates the entire company's resources to the project. This planning gets the best results in the shortest amount of time.

Planning these high-impact projects this way has significant time advantages, but it's the entire experience that Wilson is excited about. Not only is his team building something of value but they are reinforcing positive team dynamics and bonding culturally with one another. "It's a tremendous event [and] a lot of fun. Everyone gets really into it. People stay up late all three nights. Both years we've done it, we've had at least one team stay up all night....At the end of the three days, they have to do a business pitch where they have to pitch the concept for their business product. This is similar to how they might pitch a venture capitalist for investment. They have to pitch the concept of their product and they have to demo their product, whatever they were able to get accomplished in the three days. They do a live demo for us and they do this to a panel of judges. We bring in external judges to help us judge it. This year, [we brought in] Dan Mall from SuperFriendly and Andi Graham, owner of Big Sea. We had six judges in total and they helped us judge the different projects and pick the winner. We give the winning team two months off of client work to build an MVP⁴ of their product to allow us to actually bring their product to market, and if the product produces any revenue for the company in the future, we share a percentage of [it] with the team."

Sales and spin-off products aren't the only way to plan for positive bottom-line results. Packaging knowledge or services can be just as effective in planning for new revenue streams. Several years ago, we launched an apprentice program that quickly became a source for new talent at Fresh Tilled Soil. Within a few semesters, the program was generating hundreds of thousands of dollars in revenue. Our experience wasn't unique. Other design leaders have used their industry knowledge to build teaching and apprenticeship programs. Jason VanLue's Envy Labs turned their online design skills platform, Code School, into a million-dollar business that eventually sold to Pluralsight for \$36 million. "Right now I'm very, very passionate about teaching," says Dan Mall. "I find I get the most

⁴ MVP: Minimum Viable Product

fulfillment out of that. And SuperFriendly is a small company. It's one person, one employee. I have no plans to grow larger than one employee, but the thing that I'm doing right now is I run an apprenticeship program. I do a 9-month apprenticeship with people that have an appreciation for design and development but don't know anything about it. My goal is to get them from zero to sixty in nine months. The future for me, if all goes well, is to run full-time apprenticeship and maybe another business. SuperFriendly the agency, the collaborative, is its own business. SuperFriendly the apprenticeship, or SuperFriendly the academy or whatever, becomes its own business as well." These planned-for outcomes have a double or even triple bottom line because they add value to the organizational culture, improve revenues, and lift the community as a whole.

Be Bolder and Wiser

In the interviews with the design leaders, we asked what advice they would give to a younger version of themselves. "I thought about that recently because I spent a lot of time wandering in my twenties, playing music and working odd jobs and not really getting my shit together," says Smallbox CEO Jeb Banner. "It wasn't until I met my future wife that things started to click in a lot of ways. To my younger self, I'd say, 'Enjoy the chaos and forget the bad times more. Enjoy the openness,' and probably mostly, I'd say, 'Don't be ashamed. Don't be shy. Don't be afraid to put yourself out there. Be bolder.'"

Some suggestions for planning in ambiguous times are more practical. If you're a new design firm like Funsize you might not have the experience and history for your banking partners to support you in times of need. In those moments the best advice is to treat cash as king. "Well, the first thing that we did," says Anthony Armendariz, "is get the AmEx card and get the line of credit. We'd talk to other design companies and we'd come back and say, 'Okay, let's get the line of credit.' We were so new that we hadn't filed our first year of taxes so we couldn't get the line of credit. What can we do? Well, we pretty much always had three to six months of cash in the bank, to make sure that if for some reason we lost all of our business today, we could cover payroll for six months. We don't necessarily like being that cash heavy, but that's provided us with the ability to not freak out about things like that." Being financially literate and conserving cash flow isn't just being practical; it's a requirement of keeping a business in the black. Getting the right guidance on fundamentals like this separate, healthy design businesses from those that barely survive month to month.

Nothing escapes reality. Even big hairy audacious goals need a roadmap to get them to their destination. Planning for a better future means getting practical. Big goals need big plans. “I plan to change the way businesses work,” says Banner of his long-term goals. “I feel very strongly that the workplace is fucked up. Someone mentioned at a conference that 20% of employees are engaged by their work, and that, to me, that is the big opportunity. If we want to build really meaningful brand experiences, it starts with the employee or creator experience. Everything I’m doing right now is moving towards, ‘how can we build a more meaningful employee experience for us, as well as the sister companies and our clients?’ These plans are not there yet on a thought leadership level, so I want to push myself into that realm as a thought leader. I need to do more writing. I plan to write a book this year. I’m taking a month off in July to do some introspection and writing. I’m sketching out ideas right now, and I’m open to it being whatever it becomes.”

Staying Relevant

Whether design leaders make big plans or small plans, they all need to connect to what the market needs are at that point in time. With the constantly shifting technologies, methodologies, and skills needed to deliver value, possibly the biggest challenge is remaining relevant to clients. “At a very high level, I think staying relevant, is the biggest challenge” says Armendariz. “This was the core topic of the presentation that I gave at a conference recently. If you look at history, in our early days of designing digital products, we had a bit of a mish-mash of different skills. Because of interactive authoring tools and animation tools, we knew a little bit about motion graphics, we knew a little bit about sound and audio, we knew a little bit about interaction design, visual design, and we used all these tools ... and canvases that we worked in. Then as the web got more mature and as iOS was released, our skills got a little bit narrow. We developed these very narrow skillsets. Now if you look at the way that technology is going, not just in the user interfaces themselves but all the different kinds of digital products that are out there, if we don’t stay sharp across a wide range of skillsets, I think we could very easily see ourselves being irrelevant. It happens so fast that it might not necessarily be three years from now, but maybe even a year from now.”

Focusing in on one or two areas seems counterintuitive but it’s the only way to keep ahead of the shifting landscape. You can’t make everyone happy by spreading yourself too thin across dozens of domains. Being relevant to everyone means you’re no longer relevant. “In our shop, we only do design, so this might

make more sense when I say this. We've learned very quickly we can't just get away with delivering flat PSDs and wireframes and prototypes anymore. If we can't figure out how to bridge that gap between design and technology, and speak the same language that an engineer is speaking and working in their environment, which honestly is the canvas—Photoshop isn't the canvas, the technology is—then we're going to be irrelevant. I've already seen a lot of other design shops struggling with that. I think we need to put a lot of planning for the future in that area. We need to always be building new skills in that area."

Final Word

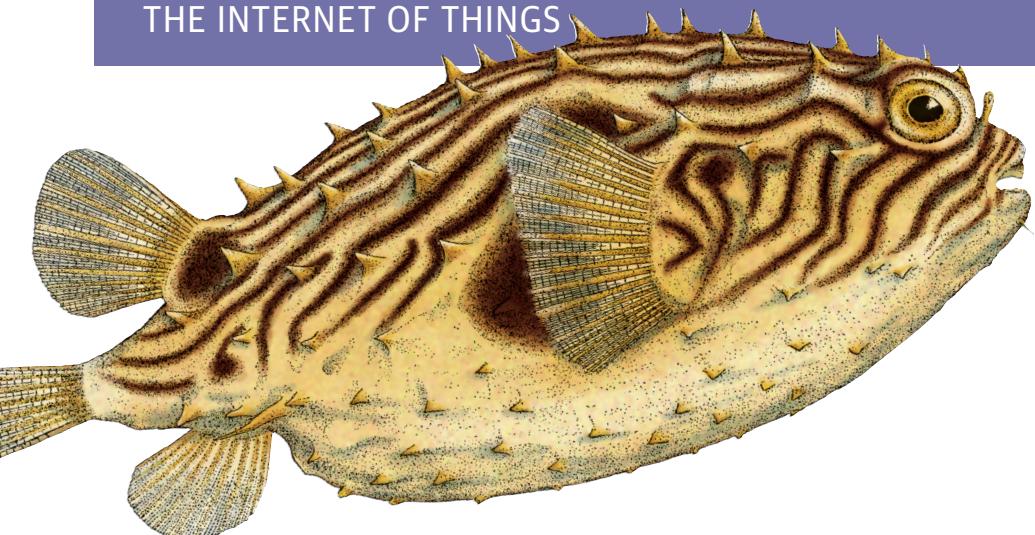
Planning isn't a solitary exercise. Design leaders can't be expected to take on the challenges of the future without help. The best plans happen when the design leaders get input from their team, their advisors, and their partners. Our interviews confirmed that the most successful design leaders rely on outside input. "I honestly don't think that I would be able to do what we do without my partners," says Devbridge Group cofounder Aurimas Adomavicius. "When we founded the company, there were five of us. Now, we've grown to eight partners in the business. I really don't think we would be who we are if it were just myself alone or the original founding three. It's also been incredibly important for us to bring in partners as we grow who are much more sophisticated in specific areas than we are. We started this business without really having done this before....We knew tech, we knew design, but we didn't know how to build a business. As we scaled and as we've brought in partners, we looked for people who were phenomenal in their areas or known in the community for engineering. Then we brought in a person who did product ownership at Rolls Royce." Adomavicius explains that as his team grew, he actively planned to hire people with specific skills to get the business to its destination. "As you assemble that team, you can bring in these players that will essentially lift the organization to a different level when they join the company. Then we formed the functional board out of the shareholders in the organization. We're considering now also creating an outside advisory board where we can bring in some other people that we've established relationships with over the course of growing this business, ... either partners in some of the ventures we're in, or just people that we really respect and we're friends with, who can potentially help guide us in the future."

Key Takeaways

- Great plans first require a clear vision, guiding principles, values, and action steps.
- Creating plans allows you to focus the business activities and avoid distractions.
- Planning is a team sport. Get help from partners, advisors, mentors, and team members.
- The future is ambiguous so plans never survive intact. Make plans that are flexible enough to adjust to an ever-changing future.
- Planning for the future is often about finding a way to keep a culture that works.
- Big goals are worth getting up for but can only be achieved when you have clear plans.
- Companies and teams don't grow linearly. Plan for spurts of fast growth with slow periods in between.
- Long-term planning is not fashionable, but it's still the best approach to return value to the company and the team.

Designing for Emerging Technologies

UX FOR GENOMICS, ROBOTICS, AND
THE INTERNET OF THINGS



Jonathan Follett, Editor
Foreword by Saul Kaplan

Embeddables: The Next Evolution of Wearable Tech

ANDY GOODMAN

Technology That Gets Under Your Skin

Wearables are getting all the headlines at the moment, but future headlines will be all about *embeddables*, tiny computing devices implanted inside your body that monitor your health, improve your functioning, and connect you to the digital world.

In addition to wearables, there is currently a lot of buzz in technology and design circles about living services, the Internet of Things, and smart materials. As designers working in these realms, we've begun to think about even more transformative things, envisioning a future in which evolved technology is embedded inside our digestive tracts, sensing organs, blood vessels, and even our cells. Everyday objects will become responsive and predictive, connecting us to the data sphere and reducing the distance between our skin and the surfaces of the technological world around us. As Figure 8-1 depicts, what we see further out, beyond the realm of wearables and implants, is the future symbiosis of the human body and the machine.

In his 2005 book *Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies—And What It Means to be Human* (Broadway Books), Joel Garreau explores the progression toward a post-human future defined by four converging technologies that are going to radically transform our interaction with the world: genetics, robotics, information, and nanotechnology. He dubs these the GRIN technologies, and they will drive the development of embeddable devices. With a few exceptions such as pacemakers and artificial hips, technology has

always been at one distance removed from our bodies and brains. Not for much longer. The interface between the manufactured world and humans is going to become almost invisible.

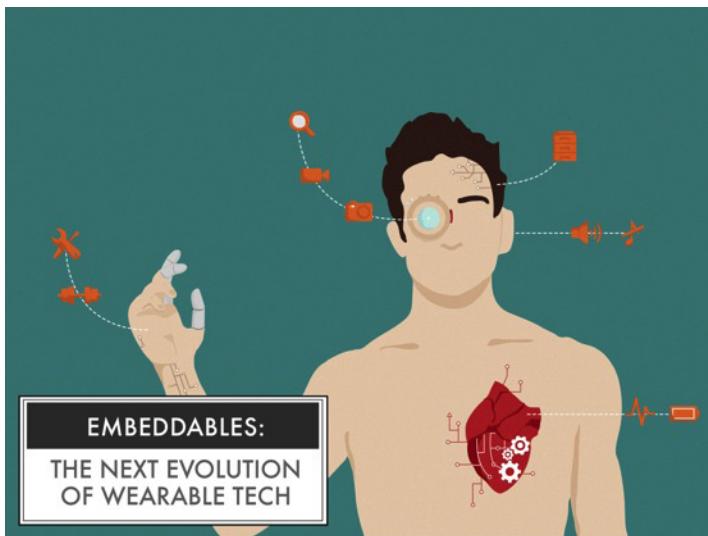


Figure 8-1. The future symbiosis of the human body and the machine

The monolithic device with a screen might be on the verge of disappearing. It is being enhanced with numerous smaller devices, which might soon replace it as the way to access information. We will arrive at a more ambient experience in which sensors capture information about us and feed that information into systems quietly working away in the background. Wearables will give way to embeddables, nano-scale machinery inside our bodies, which can monitor, modify, assist, and enhance us.

These systems will act as mental and sensory prosthetics, increasing exponentially our knowledge, perception, and manipulation of the world around us. The early uses we are seeing in domains such as healthcare and fitness will extend further to virtually any domain we can think of. Communications, entertainment, socializing, learning, work, even self-actualization—any human activity we can think of is going to be modified and amplified with an invisible mesh of data and processing that we will drift through, mostly obliviously.

Embeddables are not just going to be a revolution in functionality, but will dramatically alter how people fit into society, affect human psychology, and even propel us toward intellectual transcendence.

Just looking at visual experience and sensing, we can see how this could come about. Imagine being able to perceive different light frequencies, the world in microscopic detail, or far distant objects in the universe. This would have a profound effect on our understanding of reality and our place within it.

Before we can start dreaming about the evolutionary acceleration that might be granted by these technologies we have to come back down to Earth for a while. There are many practical barriers that need to be considered. Embeddables will be sitting so close to us that the right balance between unobtrusiveness and practicality will have to be found. Systems that can predict and even meet our needs without us having to intervene will be the ones that resonate and find an audience.

We can already see with the rather too rapid backlash against Google Glass that people are very particular about what they put onto their bodies and how “social deviance” could become a big barrier to adoption. Parodies of people wearing Google Glass on shows such as *Saturday Night Live* and the fact that the *New Yorker* has dubbed early adopters “Glassholes” shows exactly the problem with wearable tech. It can open us up to ridicule. The designs of future wearables will need to subtly integrate with our clothing and our bodies or become fashion statements in their own right if they aren’t to become an evolutionary dead-end on the technology tree.

Likewise, the design paradigms that we invent for these ambient systems in which the entire body becomes an interactive canvas will need to steer clear of a different kind of social deviance. Maybe in the future we will become accustomed to the jerking, twitching, winking, nodding motions of the Glass wearer in the way that it has become socially acceptable to browse your phone while someone is talking to you (“phubbing”), but for now it looks deeply peculiar.

Although conversations on the subject are not mainstream yet, embeddables are emerging as a new topic for debate. According to a recent panel at Venture Beat “‘Wearable’ computers will soon be inside us.”¹ Embeddables are going to have significant consequences for the delivery of digital services as screen-based interaction becomes less prominent, and possibly even disappears.

This chapter discusses the scientific, social, and creative context of the embeddable revolution. It addresses what you, as a designer or engineer, will need to take on board to operate in this space. What was once a craft based on visual cognition will change dramatically into one that takes account of other senses and will need to be based on a much deeper understanding of human culture, rituals, psychology, physiology, and motivation.

Permeable Beings: The History of Body Modification

To see the future, first we must understand the past. Humans have been interfacing with technology for thousands of years. We seem to be intrinsically built to desire this communion with the manufactured world. This blending of the mechanical and biological has often been described as a “natural” evolutionary process by such great thinkers as Marshall McLuhan in the 1950s and more recently Kevin Kelly.² So, by looking at the long timeline of body modification we can see waves of change and future ripples.

For as far back as we have physical evidence, humans have been changing the appearance of their bodies deliberately both for art and seduction and as an unconsciously instinctive action. The purpose could always be distinguished as one of two categories: first, to modify states of social acceptance; second, to improve physical attributes and to repair or mask damaged or aging body parts. Far from the religious ideal of humans being born perfect, it is quite clear that we are painfully aware of our physical shortcomings and will do sometimes quite extreme things to present a more pristine, memorable, or powerful image.

1 Young Sohn, Samsung chief strategy officer at MobileBeat 2013, San Francisco (<http://bit.ly/1CjLwf>)

2 *What Technology Wants!* by Kevin Kelly (Viking, 2010)

The resigned, almost welcoming capitulation to aging and death that shaped religious and philosophical narratives of early human cultures is certainly no longer a norm (if indeed it ever was).

Few people are totally content with the bodies they ended up occupying, but recently, we have developed the capability to change them in much more fundamental ways, from the gene up. The enhanced human will have improved attributes such as sensing and thinking (aided by computation), and better physical characteristics, such as endurance, resistance, and longevity. If you think this is a distant prospect, recent developments in artificial organ technology and robotics are bringing this sci-fi scenario closer than we might imagine. Although it is too early to agree with Aubrey De Grey's assertion that we will be the last generation to experience death,³ it is safe to say that our children and grandchildren will certainly have a very different physical life experience than any humans who came before.

If we previously defined the two primary categories of body modification as "decoration" and "optimization and repair," there is now a third category of body modification brought about by the GRIN technologies. We can call this *extension*. Even though it is unlikely that we will be able to fundamentally change our physiology—we aren't likely ever to be able to fly for instance—there are myriad enhancements available to our standard functioning that will boost us in a dizzying range of ways.

Decoration, Meaning, and Communication

Before we plunge through into this future of the extended human, it is worth thinking a little about the past, to see from where the motivations and roots of this seemingly universal urge came. What is it that made people so yearn to change themselves, and what is it about this urge that in the end makes us human?

MARKING THE SKIN

Tattoos have been a part of human culture as far back as we can find evidence. The earliest records are from the Palaeolithic era, 35,000 years ago. We can only assume that we humans have been marking

³ "I think it's reasonable to suppose that one could oscillate between being biologically 20 and biologically 25 indefinitely." —Aubrey de Grey, 2005

our skin even further back in prehistory. The reasons have varied over time. Otzi the Iceman from 33,000 BC had what is known as acupuncture tattoos; these symbolic dotted and dashed lines were placed as a method to “heal” various parts of the body. Tattoos have often been used to supposedly confer magical powers.

Later, the Picts in Britain used Woad markings to scare their enemies. This theme continues in many other cultures where the tattoo is the mark of the outsider and the underclass. Japanese and Chinese bandits used tattoos to mark themselves as a member of a criminal fraternity, and still do to this day. The art receded in Western culture for a long period but was reintroduced in the nineteenth century by explorers returning from the Pacific and Southeast Asia. Tattoos then began the slow transition from a sign of someone outside of mainstream culture toward their present manifestation as a commonplace decorative lifestyle choice.

PUNCTURING THE FLESH

In parallel to skin coloration is the practice of piercing, puncturing, or putting objects inside the skin for ritualistic and decorative purposes or to communicate meaning. One of the most graphic and memorable is the Sioux Sun Dance during which young males enter manhood by twirling around a pole on ropes attached to their bodies with sticks pierced through their chests. Less dramatic but even more invasive are the stacked hoop necklaces worn by young Masai women in Kenya, the horrific practice of Japanese foot binding, and the extreme physical acts of the Indian sadhu or European monk scourging himself with whips and branches. It is a short distance from these practices to the extreme body modifiers, reshaping their form to ones they find more pleasing, even if it means having surgery to appear more like a tiger or a Vulcan (whether they live longer or prosper more has yet to be determined).

Self-injury and mutilation is deeply ingrained in culture and cannot be ignored in the continuum of embedding. These have strong historical precedents in Shamanic ritual and are in a way a distant beacon that anyone who desires to modify their body heads to in some sense. Body dysmorphia and gender reassignment, female genital mutilation, and eunuchisation exist in many societies. Whether we see these acts as extreme behavior, oppressive cultural ritual, or as just a quirky part of the spectrum of human sexuality and self-image is not the discussion for today.

RESHAPING THE BODY

Changing the body, its shape, its color, even its gender is becoming acceptable in contemporary society; the roots of this inevitably go back further than we would imagine. Many cultures have long traditions of surgically changing the sex organs, for ritual or social purposes, or of performing dramatic reshaping of other body parts.

Although many of these examples can be shocking from our current perspective, we can think of extreme body modifiers as potential “early adopters,” and in the same way that tattoos and piercing have become an everyday fashion statement today, perhaps these more extreme modifications will become normalized eventually. A *Terminator*-style robotic eye projecting scarily from your head might be just seen as a cool accessory 20 years from now, especially if it plugs you in constantly to the grid and means you never need to miss a tweet or a Facebook status update.

THE FUTURE OF BODY DECORATION

What would the embeddable version of Facebook be like? We can maybe see some premonition of it in a recent advertising stunt in Japan in which young women were paid to have advertising displayed on their skin; a few rather foolhardy individuals have even agreed to have brand logos tattooed on their bodies. No doubt some clever marketing company in the future will persuade people to plaster themselves with advanced OLED films and spray their hair with nanoparticles that can change color, the pixel becoming molecular.

In this perhaps quite unappealing future we lease our skin to advertisers who can display their latest products and services across the surfaces of our bodies. Animated soda jets shooting up your chest, and tropical holiday montages rippling across your back. Sponsored narcissism!

SCREENS AND INDICATORS ON SKIN

The ground breaking work done at MIT by Pattie Maes to turn the Internet into a sixth sense explores how micro projectors and gestural interaction can lead toward intangible interfaces that float around us and hover over the surface of our bodies. It is not a big leap to imagine a more advanced technology wherein the glowing pixels are actually under the surface. Emails could appear on the back of your hand, a fingertip could go blue when you are mentioned in a tweet, or an entire

display with all your social messages could appear on the inside of your wrist or open palm. Bizarre, maybe, but our constant need to be connected could see this kind of scenario happen (Figure 8-2).



Figure 8-2. What would the embeddable version of Facebook be like?

We do like to have and hold shiny plastic and metal devices, but they are pretty annoying as well, getting stolen, running out of batteries, or being dropped and shattering on hard surfaces. Beyond the physical inconvenience of a device with a screen there is a deeper problem happening; this is the “connected but alone” alienation created by screen devices.

SCREENING OUT THE WORLD

Screen is an interesting word; it simultaneously means an object we look at and something behind which we hide. Even a small hand-sized device becomes a barrier in social situations, absorbing our gaze and taking us elsewhere, away from our present company. Soon, however, we might be able to discard the screen altogether. Voice-activated tech such as Siri, Tellme, Google Voice, Kinect, and Nokia Drive all lead toward *zero UI*.

Zero UI refers to systems by which our movements, voice, and glances can all cause systems to respond to us through our environment. At its extreme, it implies an invisible user interface (UI) without a screen where natural gestures trigger interactions, as if the user were

communicating to another person. It would require many technologies to converge and become significantly more sophisticated, particularly voice recognition and motion sensing.

Advanced context-aware automation will take us to the brink of a truly connected world in which sensors and embedded intelligence help us glide through space, subtly enhancing us and adding layers of information to the world. Humans are, in the end, analog beings. Our digital tools should only be an aid to reality; they should not replace it.

So, a combination of pigment altering implants—some kind of evolution of OLED technology—voice control, and ambient sensing will actually allow us to ditch the device entirely, to achieve a kind of telepathy, and for the body to become a remarkable interface to the digital world. The hope would be that this would actually begin to break down the barriers of atomization and disconnection that we have blindly put up around us in the march to the future. The likely truth is probably that we would become even more distracted, self-absorbed, and disconnected from the physical world around us.

Optimization and Repair

The amazing thing about the body, and the mind likewise, is how malleable it is, how easy it is to change it though habitual activity (either toward refinement or toward degeneration). We are not just permeable beings, we are fluid beings.

The speculative futurists writing at the beginning of the twentieth century proposed a future human, thin, weak, and with poor eyesight, but always with a giant head and brain. I suspect they would be very surprised to see what we have become a century later. Even now we find this image compelling. Dr. Alan Kwan⁴ has imagined what we will look like 100,000 years from now, with the need to have adapted to space travel, and he revives that familiar image of the large-skulled, saucer-eyed alien.

In contrast to supposed evolution to a big-brained weakling, the body is now hard and taut, we are taller, we live longer, and we run faster, jump higher, throw farther, and hit harder than those early futurists

⁴ Dr. Alan Kwan, M.Sc., Ph.D. Bioinformatics, Computational Biology, Washington University and MIT

could ever have imagined. Rather than diminishing the importance of the body, our techno-knowledge era has deified it, made it something to worship, strive toward, and attain, whether by hard graft or quick expensive shortcuts.

The science-fiction trope of the not-too-distant scenario in which we are plugged into some virtual reality simulation while our bodies waste away in nutrient pods would seem to be a complete misdirection. Rather than becoming immaterial and disconnected from the body, our contemporary self-image is becoming even more located in our physicality, our looks, our youthfulness, and our fitness.

STOPPING THE CLOCK

The counterpart to *optimization* of the body is *repair* of the body, with the aim of delaying the onset of aging. Until very recently, this has involved very crude types of body part replacement, with some of them of questionable benefit. As medical science and genetics has progressed, we are finding that there are some significant barriers that will limit our ability to stop the clock. Our cells have a definitive lifespan, known as the *Hayflick limit*, which determines how many times an organism's cells can recycle before they die. In humans, it is 50. Almost all animals share this property and it is for very sound evolutionary purposes. It seems like the battle against the onset of death is doomed to failure; the only way to stop the cell clock from counting down would be to introduce telomerase into the cell. The problem with this is that instead of dying slowly of aging, you will with almost 100 percent certainty die quickly from cancer.

The notable exception to the aging process was thought to be the species of lobsters found off the coast of the northwest United States. Theoretically immortal, these creatures simply did not age, and their cells did not grow older; they just keep growing bigger and bigger. Sadly it has been recently proven that they do succumb to old age, but not in the way we would consider normal. They become so big that eventually they don't have enough energy to molt and die inside their shells.

THE ARTIFICIAL BODY

Almost a million people in the United States have certain joints replaced every year. This is a relatively new science, with the first hip joint surgery being as recent as 1948. This type of surgery has of course much older and cruder antecedents with varying levels of effectiveness. Glass

eyes are still in use and peg-legs seemed to work pretty well for pirates, but one wonders how useful a set of wooden teeth would be. It is actually apocryphal that George Washington had wooden teeth; in fact, he sported a rather fancy pair made from metal, ivory, and actual human teeth. Happily, the science of body part replacement has accelerated dramatically in recent decades.

Now, of course, we are progressing rapidly into two exciting areas: very advanced robotic prosthetics, and 3D printed body parts. These technologies seem destined to be immensely important to humanity as we struggle to repair the damage that we inflict upon ourselves through the simple act of living.

Great leaps forward in robot hands and prosthetic limbs are beginning to redefine the experience and definition of disablement. As Paralympic athletes are beginning to demonstrate, technology (allied to iron will) can eradicate the difference between someone with their body intact and those with parts missing or broken. What the technology is making possible is not just to repair or replace the body but to improve it. We will explore this in the third part of this chapter.

There is amazing progress being made in the field of artificial eyes and ears. Hearing aids are becoming increasingly sophisticated, and when combined with a Google Glass-like technology, the possibility of totally neutralizing the effects of deafness is almost upon us. Sensory augmentation provided by object-sensing canes for the blind and bionic eyes sending electronic images straight into the optical cortex might eventually eradicate blindness.

These advances, though, will seem archaic compared to the optimization and repair that will be possible when nanotechnology reaches maturity in the healthcare domain. It is easiest to imagine the technologies being applied here because in a sense they already are, particularly with the early exploration of gene therapy we have been seeing for the past 20 years. Gazing out a little way into the future, we can see treatments and products emerging that are not only tuned to our own individual genomes but specifically to the genome of the bacteria or DNA of the virus that is the causing the problem. When nanotech and genetic technologies merge, interventions would be performed in a much less invasive way, and we could change the way we cure diseases utterly.

Futurists gazing at healthcare describe a “medicine factory,” a pill-sized capsule containing a miniaturized camera and other sensing apparatus designed to analyze gut flora for imbalances that could lead to diseases. Imagine that you swallow one of these factories (Figure 8-3), which then sits quietly in your intestine, monitoring the growth of different bacterial colonies. When something harmful is detected, this information is transmitted wirelessly to your doctor, who would instruct the medicine factory to start manufacturing the appropriate genetic treatment delivered through a “deactivated” virus vector. Over time this process could actually be automated and take out the presence of a human being altogether so that the factory goes about its business curing you of disease with little fuss. These sophisticated new treatment protocols would make a modern gastroscopic exam look positively medieval.



Figure 8-3. A pill-sized capsule containing sensing apparatus designed to find imbalances that could lead to diseases

The Extended Human

The subject of the extended human would not be complete without looking at our ongoing work to develop thinking machines. Although we have so far explored the physical and visual side of body modification, it is equally important to understand how we are going to enhance human cognition and sensing. There is a fantastic joke on

the webcomic XKCD, which states, “Every time Wikipedia has a server outage my apparent IQ drops by 30 points.” We are in a very real way already augmenting our minds with computational power, it’s just that there is no direct connection into the brain, and we still need to use relatively crude interface tools to make use of the enhancement.

Of course, calling these relatively crude is only partially serious; they are in fact fabulously sophisticated compared to the way we have historically interfaced with machines. From the abacus and the Pascal adding machine, through to the nineteenth century Jacquard loom, and even the extraordinary Colossus and the punch card computers of the 1950s, during our first few millennia of machine cognition we were not able to make machines that were anything like us. To use these machines we had to become like them. We had to think like them and talk to them in their language. They were immobile, monolithic, mute devices, which demanded our sacrifice at the twin altars of engineering and math. Without deep knowledge, they were impenetrable and useless lumps of wood, metal, and plastic. What happened next (in a truly “ahead of its time” invention) was the first idea that began the slow shift in emphasis to a more human-centric way of interfacing with the machine.

THE MOTHER OF ALL DEMOS

Something in the zeitgeist demanded that the 60s would see a humanistic vision appearing in the rapidly expanding sphere of computer engineering. Right on cue, in 1968 an event occurred that would forever change the way we interacted with computers. In one epochal presentation, Douglas Englebert demonstrated a mouse, hypertext, and video conferencing for the first time to an astonished audience. This demonstration wasn’t just remarkable because of the raft of totally transformational technologies that had emerged seemingly fully formed in a single instant, but the fact that they all pointed to a relationship with the machine that was now loaded in favor of the human. Anyone could use this technology; it was a true liberation of the secrets that had been locked up with the Engineer High Priests.

As is typical, for a long time after this game-changing moment, nothing much happened, except, that is, iteration after iteration of the same metaphors shown on that day in 1968, each a further refinement or regression, depending on the quality of design.

The next truly systemic change really came about 30 years later in the 1990s with the first experiments in virtual reality, touchscreens, and voice control. Again, a long period of refinement followed, and those technologies are now commonplace and are defining new forms of human-computer interaction, with the emphasis very firmly on the human.

So, when put in a timeline, it is clear that we have dramatically shifted the meeting point of man and machine, as depicted in Figure 8-4. It is now almost entirely weighted toward the human languages of symbols, words, and gestures. Nevertheless, that last inch seems to be a vast chasm that is very hard to breach. Think about all those interpretation errors that Siri makes (after all it is in some ways no smarter than an 80s text-based adventure), all those frustrating attempts to navigate virtual spaces and grab virtual objects, the clumsy approximation of body mapping of the Kinect, and the obvious flaws of the Leap Motion (trying to use it for applications in a desktop interface is inconsistent and very frustrating).

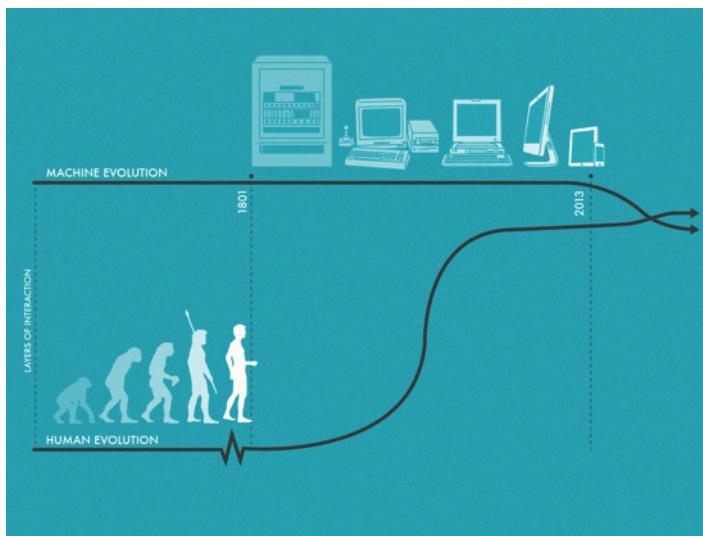


Figure 8-4. The meeting point of man and machine has dramatically shifted over time.

On top of that we have the amusingly titled *gorilla-arm syndrome* that plagues all gesture controlled systems; simply put, it is just too uncomfortable to hold your arm in the air for extended periods. It looks cool when Tom Cruise is flicking through swathes of digitized criminal

records in the movie *Minority Report*, but it probably isn't as much fun using a gesture system to work on an Excel spreadsheet for five hours. Fret not! Help might be around the corner, from perhaps an unexpected direction—algorithms.

A PREDICTIVE WORLD, A WORLD OF SENSORS

We are yet to devise interfaces that can effortlessly give us what we want and need. We still must learn some kind of rules and deal with an interpretation layer that is never wholly natural.

Some early attempts at predictive interactions exist: the Japanese vending machine that recognizes the age and sex of the user and presents choices based on demographic breakdown, and the brilliant but scary ability of McDonald's to predict what you're going to order based on the car you drive with 80 percent accuracy. The latter was necessary so the fast-food chain could reduce the "unacceptable" 30-second wait while your drive-in order was prepared.

The sensor world that makes these kinds of predictive systems possible will only become richer and more precise. Big data will inform on-demand services, providing maximum efficiency and total customization. It will be a convincing illusion of perfect adaptation to need (Figure 8-5).



Figure 8-5. A convincing illusion of perfect adaptation to need

EMBEDDED TECH BRINGS A NEW LANGUAGE OF INTERACTION

The new language will be ultrasubtle and totally intuitive, building not on crude body movements but on subtle expressions and micro-gestures. This is akin to the computer mouse and the screen. Apple's Macintosh interface would never have worked if you needed to move the mouse the same distance as it moved on the screen. It would have been annoying and deeply un-ergonomic. This is the same for the gestural interface. Why swipe your arm when you can just rub your fingers together. What could be more natural than staring at something to select it or nodding to approve something? This is the world that will be possible when we have hundreds of tiny sensors mapping every movement, outside and within our bodies. For privacy, you'll be able to use imperceptible movements, or even hidden ones such as flicking your tongue across your teeth.

Figure 8-6 presents an interesting scenario for you to ponder: you see someone at a party you like; his social profile is immediately projected onto your retina—great, a 92 percent match. By staring at him for two seconds, you trigger a pairing protocol. He knows you want to pair, because you are now glowing slightly red in his retina screen. Then, you slide your tongue over your left incisor and press gently. This makes his left incisor tingle slightly. He responds by touching it. The pairing protocol is completed.



Figure 8-6. A new language of interaction

What is nice about these microgestures and expressions is that they are totally intuitive. Who doesn't stare at someone a second too long when they fancy them, and licking your lips is a spontaneously flirtatious gesture. The possible interactions are almost limitless and move us closer and closer to a natural human-computer interface. At this point, the really intriguing thing is that the interface has virtually disappeared; the screens are gone, and the input devices are dispersed around the body.

Is this scenario really that outlandish? Let's look at the technologies being developed currently that might make it possible.

Immersive displays

Samsung and other technology companies are currently working on contact lens screens; these are experimental right now and suffer the problem of how they are powered. The answer to that might be very close at hand, though, as other research is being conducted into using the body's energy (both kinetic and heat) to power embedded devices.

Skin-top computer

The skin-top computer would use some kind of distributed circuitry on and in the body that can map movement and capture all kind of body data such as blood flow, temperature, sweating, hormone levels, and so on. The first tattoo-like printed circuits are already available; it might not be too long before a Skin-Top Arduino community emerges.^{5,6,7}

Thought control

Finally, there are the developments happening in thought control. We have already seen early experiments in creating visual maps of the thoughts of dreaming people, and though this is probably some distance from enabling telepathy it is certainly intriguing. Crude mind control of computers has been around for some time and in a rather alarming experiment conducted in 2013, one scientist could make a subject move his arm to push a button just by thinking about it. Both participants had nothing more than an electrode cap on and some

5 Paintable circuits on the skin, developed by Bare Conductive, UK.

6 "Epidermal Electronics" Paste Peelable Circuitry On Your Skin, Just Like A Temporary Tattoo, Popular Science Magazine, Nov 2011.

7 Stamp-On Circuits Could Put Your Phone On Your Finger, FastCo Design, Nov 2013.

clever code connecting them. Apparently, the subject could resist if he wanted, which provides some reassurance that we won't soon all become remote-controlled zombies.

WHAT WILL IT BE LIKE TO LIVE IN THE EMBEDDED WORLD?

Technology often outpaces our ability to understand and accept it, especially if you are over a certain age threshold. Eventually, though, we normalize everything; carrying a computer in your purse that is more powerful by a magnitude than those that ran twentieth century corporations and launched man into space is no big deal, we just use it to play Candy Crush mainly anyway. But, it would have seemed inconceivable to previous generations.

However, we can assume with some assurance that embeddable technology will have a more profound effect on us than we can imagine. A famous experiment, the Libet test, attempted to measure how quickly the conscious mind can send a simple somatic control (for example, press the red button). The extraordinary discovery was that the conscious mind triggers after the order is sent to the finger to push the button by a few microseconds. What does this mean? Essentially an unconscious part of the mind is deciding to push the button and the conscious mind is just agreeing with it. Imagine if we have systems operated in this way running around us in all scenarios. We would constantly have this disconcerting feeling that we were not operating under free will, but that some unknown force was driving us. There actually is: our genes, as Richard Dawkins points out.

So, how can we devise systems that don't force us down into the *uncanny valley* (which you can read about in more detail in Chapter 6). We need to make magical systems, where sensors, immersive displays, learning systems, and mind and gesture controls harmonize to give us exactly what we always wanted.

Consider one final scenario, presented in Figure 8-7 and Figure 8-8: you are sitting at home drinking coffee from your embedded-connected Nespresso service. The sensor in your tongue captures the response of your taste buds and the little nanobot that has made its home in your veins monitors the release of endorphins into your bloodstream. The data gathered are sent to the Nespresso factory, which analyses the readings and discovers that the flavor and caffeine level are not creating an optimal response in your body. Later that day you are standing at a

bus stop; the Nespresso factory has custom-made a coffee that is perfectly suited to your tastes. It sends the aroma profile to an interactive poster next to you, which releases the delicious smell and tells you that the new flavor is available for delivery to your home, and that you will get an introductory 15 percent discount if you purchase it right away.

Now, that's not creepy in the slightest, is it?



Figure 8-7. The sensor in your tongue captures the response of your taste buds



Figure 8-8. The factory has custom-made a coffee that is perfectly suited to your tastes

Just Science Fiction, Right?

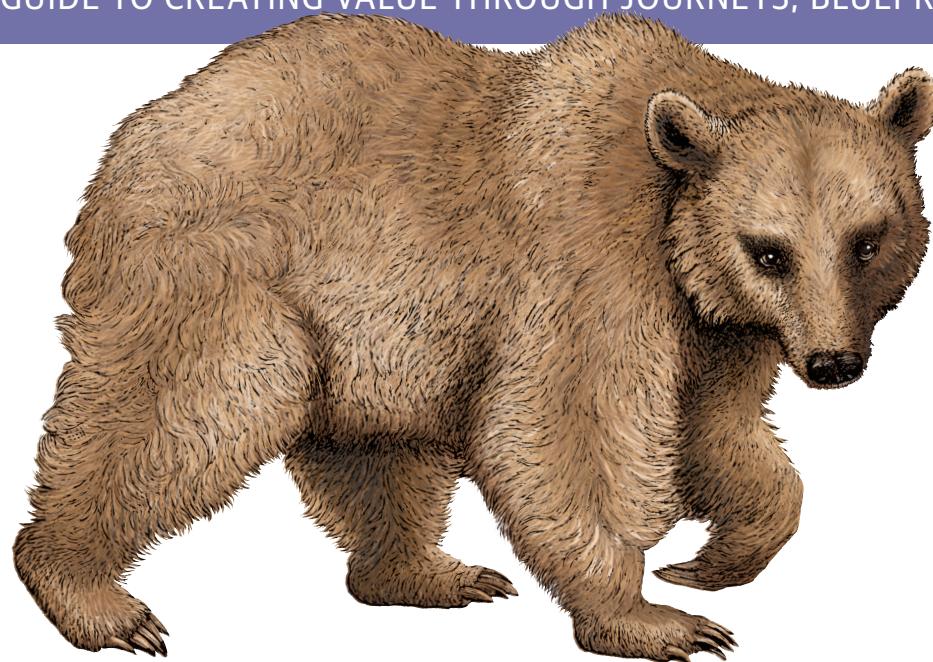
If the emerging technology curve approaches anything like the kind of acceleration predicted by such futurists as Kurzweil, Watson, and Kelly, the issues discussed in this chapter will become central to designing new digital services over the next few years. As designers and technologists we must ensure that we are prepared for the next wave or we might find ourselves left behind. The revolution is only just beginning.

Key Questions to Consider

1. What kind of learning systems will be needed to take complexity and strangeness away from the users of these services?
2. What kind of services that predict and even meet our needs without us having to intervene will be the ones that resonate and find an audience?
3. How will embeddables be designed so that they blend invisibly with the body? How will we avoid looking like the Borg in *Star Trek*, or becoming socially inept when we begin putting technology onto the surface and inside our bodies?
4. What is the timeline for the embeddable revolution, and what do tech companies need to do to prepare for this future?
5. What are the new types of control mechanisms and interaction metaphors that we are collectively going to have to consider for these types of intangible interfaces?
6. What skills will designers need to learn as we move away from a visual craft to one that takes into account the other senses, the body, and the mind?

Mapping Experiences

A COMPLETE GUIDE TO CREATING VALUE THROUGH JOURNEYS, BLUEPRINTS & DIAGRAMS



James Kalbach

CHAPTER 8

Envisioning Future Experiences

In the preface, I urged you to empathize with the people you serve. The advice is clear: view your offering from the outside-in rather than the inside-out.

But it's important to first develop empathy before conceiving new solutions. Distinguish *gaining* empathy from *applying* empathy, a point Indi Young makes in her book *Practical Empathy* (Rosenfeld Media, 2015). She writes:

You can't apply empathy until you've developed it by listening deeply to a person...People try to act empathetic—to take someone's perspective, to walk in his shoes—without first taking time to develop empathy.

I've experienced this trap in the past. At a prior company I worked for, for example, a small team spent two months behind closed doors developing a new concept that helped people plan events. They had virtually no contact with potential customers.

To anyone who had already gained empathy for the target users it was clear this solution had serious flaws. It didn't address actual user needs, and it didn't match their mental

model. Despite the team's passion, the concept was doomed from the outset. They would have better spent their time developing empathy first.

RAPID TECHNIQUE

Note that I am not advocating big, upfront research. Ideally, empathy building is a regular ongoing activity. But grounding yourself in reality first saves time and reduces risk later. It need not take long, and visualization tends to make the process go quicker.

The process of mapping helps teams acquire develop common understanding of a person's experience. For this reason, this book has focused on *current state* visualizations—diagrams of the world as it exists today. After gaining empathy, then envision a future as you think it should be.

One approach to represent the intended experience is to create *future state* maps of the experience—separate, full-fledged illustrations akin to those described throughout this book. However, this is time consuming and is often not needed.

Instead, it's typically possible to include future experiences within the current state map, for example at the bottom of a diagram (see Figure 8-1). This highlights the transition needed to move from the present to the future. Both cause and cure are captured in one place.

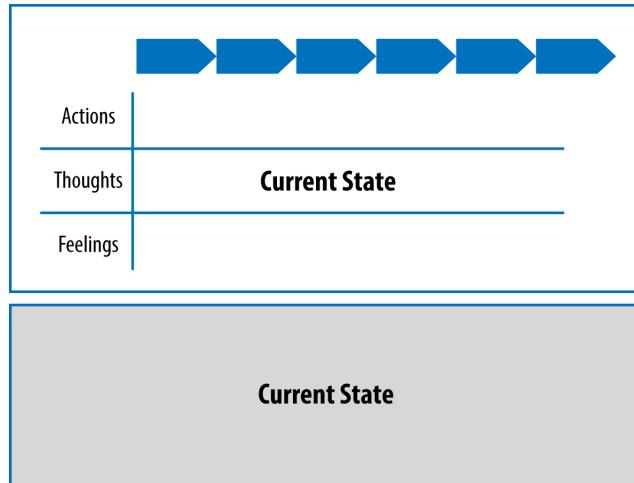


FIGURE 8-1. Mapping the current state to the future state shows the relationship between the two.

But also, it's more efficient to use complementary techniques to illustrate the future state creates greater impact. This chapter deals with some of these techniques, including storyboards, scenarios, storylines, and design maps, as well as user story mapping. By the end of the chapter you should have a good idea of how to visualize future experiences with complementary techniques.

Storyboards

Storyboards come from filmmaking. The process organizes a series of illustrated panels to represent the flow from scene to scene. A storyboard allows creators to experiment with different sequences of action.

The technique is also used in product and service design. Each step in the experience is given a panel with a rough description of what should happen at that moment. Storyboarding is a way to quickly flesh out concepts before building a prototype.

As a modeling tool, storyboarding helps you put personas in action, taking various constraints and context into account. If an alignment diagram is a map of the landscape, storyboards are specific routes through that landscape.

Storyboards let you focus on the emotional highs and lows of a *specific* experience. They also allow you to focus on extreme cases. For instance, you can create a storyboard for a novice user of a system and compare it to what a power user might experience in another storyboard.

More than that, storyboards allow you to test ideas and “debug” them conceptually. They serve as the first iteration of an idea and allow teams to think about the service in terms of how the experience unfolds over time. This saves an enormous amount of time and pain later.

Storyboards are also collaborative documents that anyone can contribute to. Their informal nature invites contributions from others, fostering teamwork and collective decision making.

They become part of the common language of the team and function as a shared reference.

Figure 8-2 shows an example of a simple storyboard created in a workshop by UX designer Erik Hanson. It was used to demonstrate the essence of a new idea, which evolved and changed over the course of the ensuing discussion.

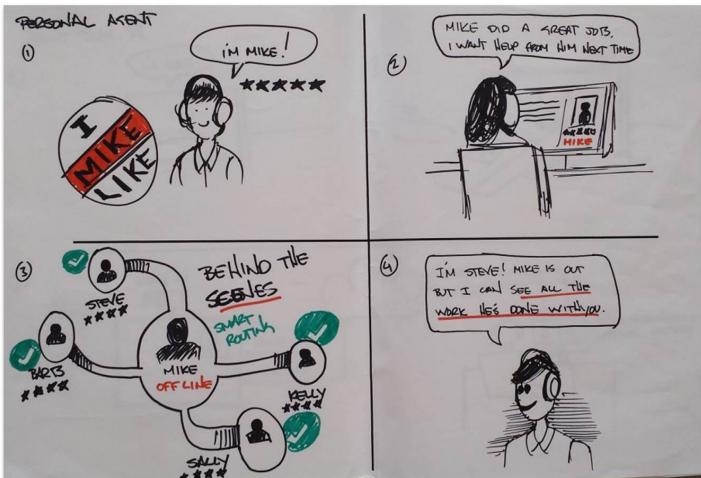


FIGURE 8-2. A simple storyboard can be very effective, like this one created by UX designer Erik Hanson.

More formal storyboards take time. For instance, I helped create a storyboard of the intended experience on a recent project. The concept allowed people to take a picture of a technical problem and request help from a network of experts and friends.

First, I sketched a rough sequence of interactions using a drawing app on my iPad (see Figure 8-3). As a team, we iterated on this sequence several times. Then, we enlisted the help of Deb Aoki, a professional comic artist and graphic facilitator, to make the panels into a more presentable storyboard (see Figure 8-4).

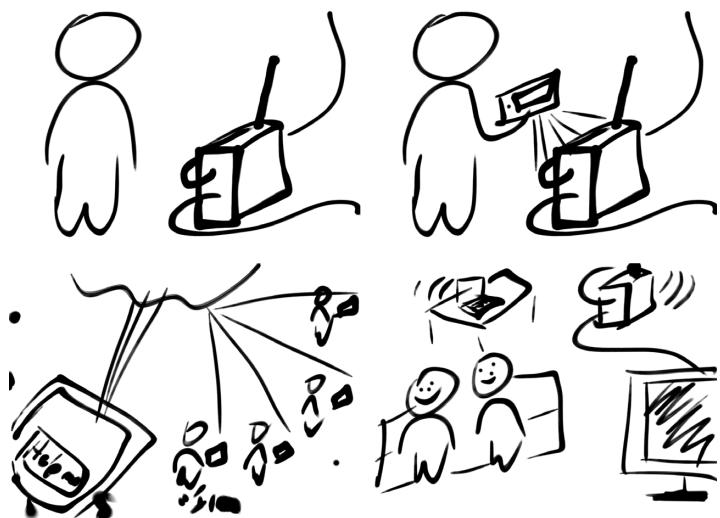


FIGURE 8-3. A draft storyboard shows an intended experience.

The touchpoints and interactions are clearly depicted in this storyboard. But there is also a focus on the human experience: the initial problem is described, and the emotions of the resolution are represented. The storyboard helped form the idea and socialize the concept with others in the organization.

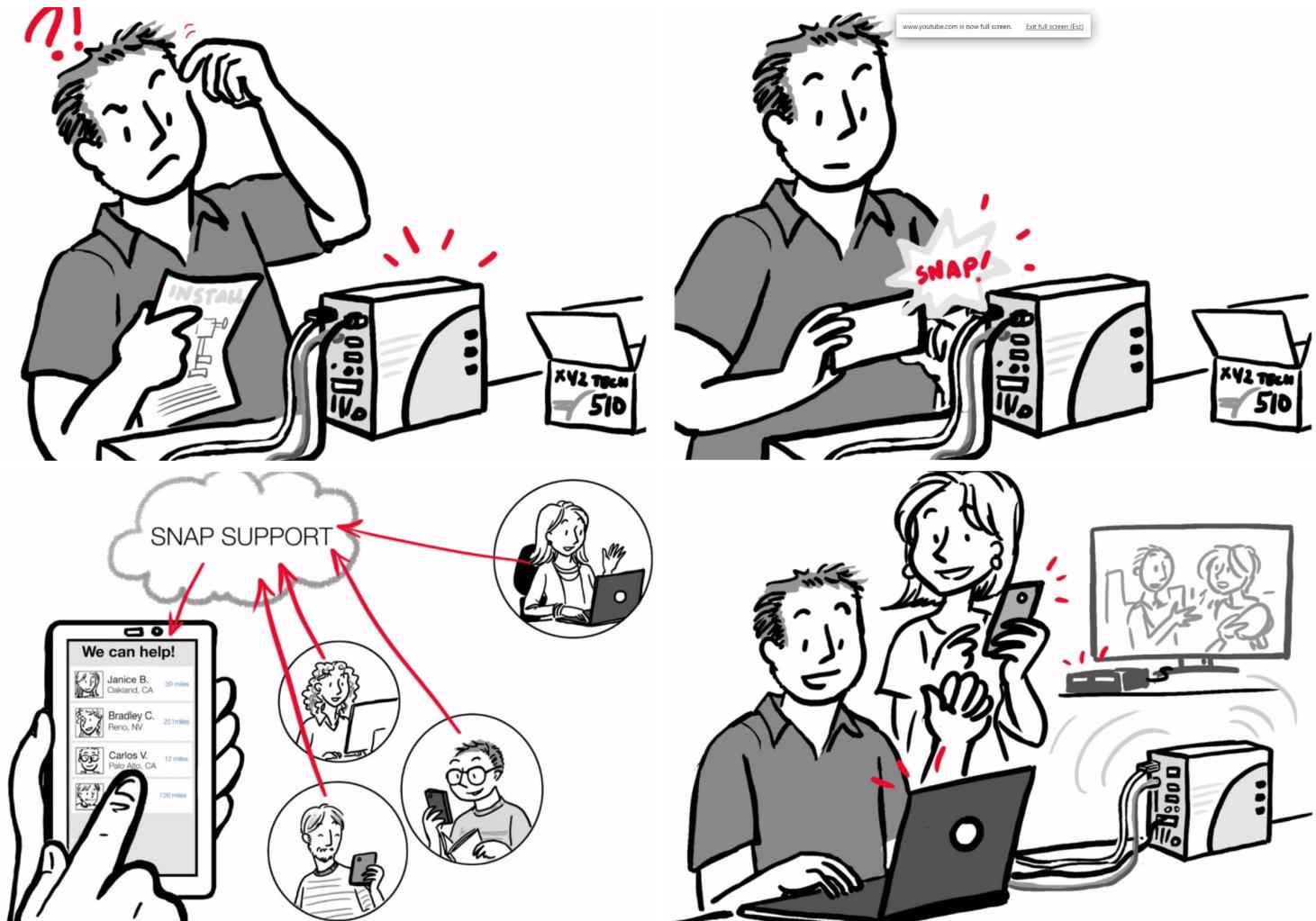


FIGURE 8-4. A revised version of the storyboard in Figure 8-3, created by expert illustrator Deb Aoki.

Comic strips are like storyboards and used to communicate a vision. Figure 8-5 shows an example from Kevin Cheng's book *See What I Mean* (Rosenfeld Media, 2012). Obviously Cheng is an expert illustrator. But don't be daunted: he breaks down the technique into its basic components to show that anyone can get started creating comic strips at some level.

Overall, storyboards are a type of visual storytelling. They depict the steps in an interaction and foster a shared understanding of a vision. You don't need to be an expert illustrator to create storyboards: sketching basic shapes and stick figures is all that's required to get started. Have an expert create a final version, if needed.

Scenarios

Scenarios are detailed descriptions of an intended experience from the individual's perspective. They go hand-in-hand with storyboards, but are text-based rather than illustrated. Since no drawing is involved, the barrier to create them is even lower than with storyboards.

Consider this example of a scenario from the beginning of the landmark article "The Semantic Web" by Tim Berners-Lee, inventor of the World Wide Web, and his colleagues. These are the opening lines of his landmark article that set the stage for a broader, more technical discussion later on in the text:

The entertainment system was belting out the Beatles' "We Can Work It Out" when the phone rang. When Pete answered, his phone turned the sound down by



FIGURE 8-5. Comics are an effective way to envision future ideas, like this one by illustrator Kevin Cheng from his book *See What I Mean*.

sending a message to all the other local devices that had a volume control. His sister, Lucy, was on the line from the doctor's office: "Mom needs to see a specialist and then has to have a series of physical therapy sessions. Biweekly or something. I'm going to have my agent set up the appointments." Pete immediately agreed to share the chauffeuring.

At the doctor's office, Lucy instructed her Semantic Web agent through her handheld Web browser. The agent promptly retrieved information about Mom's prescribed treatment from the doctor's agent, looked up several lists of providers, and checked for the ones in-plan for Mom's insurance within a 20-mile radius of her home and with a rating of excellent or very good on trusted rating services. It then began trying to find a match between available appointment times (supplied by the agents of individual providers through their websites) and Pete's and Lucy's busy schedules.

In a few minutes the agent presented them with a plan. Pete didn't like it—University Hospital was all the way across town from Mom's place, and he'd be driving back in the middle of rush hour. He set his own agent to redo the search with stricter preferences about location and time. Lucy's agent, having complete trust in Pete's agent in the context of the present task, automatically assisted by supplying access certificates and shortcuts to the data it had already sorted through.

Almost instantly the new plan was presented: a much closer clinic and earlier times—but there were two warning notes. First, Pete would have to reschedule a

couple of his less important appointments. He checked what they were—not a problem. The other was something about the insurance company's list failing to include this provider under physical therapists: "Service type and insurance plan status securely verified by other means," the agent reassured him.

The words not in italics come from the original source of this scenario and indicate touchpoints with the Semantic Web. This example has many qualities of a well-written scenario. It's easy to understand, it's enjoyable to read, it describes an experience rather than technology, and it offers a clear vision. Scenarios describe the ideal user experience. They give personas a voice and set them in motion. And as with storyboards, scenarios allow you to focus on edge cases. They let you explore specific experiences, including extreme situations.

RAPID TECHNIQUE

Scenarios also help validate an idea. For instance, I once participated in an ideation workshop where we spent hours writing up our favorite ideas as scenarios. It was very telling:

some of the most attractive ideas were difficult to describe in terms of the user experience. Based on these scenarios, we were better able to prioritize our ideas.

Rarely can you go from a rough idea on a sticky note directly to implementation. Steps are needed in between to expand on the features of a concept. Scenario writing is a quick way to involve everyone on the team and represent an intended experience in detail for evaluation and feedback.

Storylines

Storytelling is not only a means of communicating a vision, it helps make sense of complex problems. According to digital product strategist Donna Lichaw, author of *Storylines* (Rosenfeld Media, 2015), you can use the principles of storytelling to guide the design of products and services.

To do this, Lichaw relies on a structure common to most all stories, called *the narrative arc* (Figure 8-6).

This structure is not new. It can be traced all the way back to Aristotle. It is a timeless form used to tell stories over thousands of years and across cultures.

The elements of the narrative arc are:

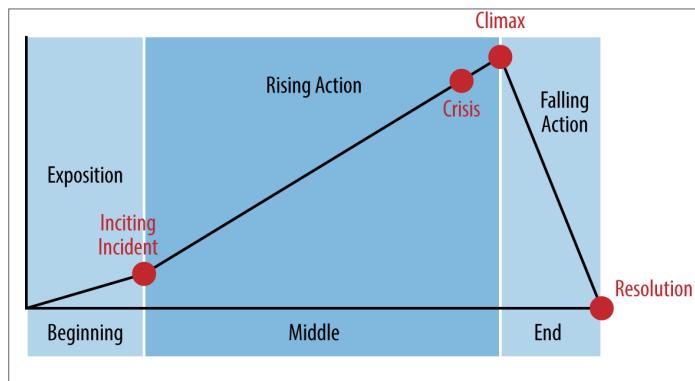


FIGURE 8-6. The archetypal narrative arc shows the rise in action before the resolution.

- *Exposition*: Good stories establish the context and introduce the characters and situation at the beginning.
- *Inciting incident*: This is the point where something goes wrong or there is some change to the situation.

- *Rising action*: A good story builds over time. Intensity and action increase as the story unfolds.
- *Crisis*: The story culminates at the point of maximum friction. It's the point of no return.
- *Climax/resolution*: The climax is the most exciting part of the story and the point at which the audience realizes that all might be well again. This is when the problem that was surfaced at the inciting incident is resolved.
- *Falling action*: But wait, there's more. After the climax, the story comes back down in action and begins to end.
- *End*: This is the very end of the narrative. Typically, there is a return back to the original state.

The point of storylines is not storytelling, but rather building products and services *as if* you are crafting a story. In other words, apply the narrative arc to the design process itself. To do this, Lichaw recommends first mapping out an ideal journey against the narrative. Then design your product or service based on that flow.

Figure 8-7 shows an example of using a narrative arc to plan the content of a digital service. The intent is to make the user's journey into a dramatic, engaging story. The result is a strategy for content and features that meet audience needs in an engaging way.

Applying narrative arcs in design workshops is straightforward. Together with Lis Hubert, Lichaw describes the process in their article "Storymapping: A MacGyver Approach to Content Strategy" (*UX Matters*, 2014).



FIGURE 8-7. An example of a narrative arc and envisioned content from a workshop shows the rise of action and resolution.

1. Hold a workshop with a broad set of stakeholders
2. Draw the user's journey as a narrative arc on a whiteboard
3. Map individual pieces of content users would need at each stage
4. Below that, record existing content
5. Identify gaps and weaknesses in the existing content
6. Prioritize and plan a broader content strategy

Following these steps results in a content strategy with focus and meaning. It aligns teams to a common purpose and yields more engaging services in general.

Design Maps

Design maps are simple diagrams of an ideal experience co-created by a team. The technique is described by Tamara Adlin and Holly Jamesen Carr in Chapter 10 of the book *The Persona Lifecycle*.

Creating a design map is a simple practice that requires only sticky notes and a whiteboard. The result is a map of an ideal experience. There are four basic elements in the map, each with a different color note:

- Steps: Blue notes denote the steps a given persona takes in a process.
- Comments: Green notes provide more details about each action, including thoughts, feelings, and pain points.

- Questions: Yellow notes capture questions a team has about the experience. They highlight their gaps in knowledge and assumptions about the proposed experience.
- Ideas: Pink notes are used to capture ideas how to provide a better service.

Figure 8-8 shows an example of a design map for a fictitious app. The steps, in blue, form the basis of the chronology across the top of the map. Comments, questions, and ideas appear below each step, forming an interlocking grid of sticky notes.

Interestingly, Adlin and Carr recommended using design maps asynchronously. The idea is to place a map in a common office area and invite colleagues to contribute to it individually. Over the course of days or weeks, team members can add questions and ideas as they come to light. With this, the map grows organically over time.

Otherwise, design maps can be used in workshops to envision a future experience. For instance, I once used design maps in an alignment workshop with three breakout groups. First, each group created an ideal *flow* for one of three experiences we were targeting. They also added *comments* to describe the steps in greater detail.

Then, I rotated the groups so that they were now working with another group's design map. They read the steps and comments on the new design map and posed *questions* about each step on a different color sticky notes.

Finally, I rotated the groups once more. After we read all of the steps, comments, and questions of the preceding groups,

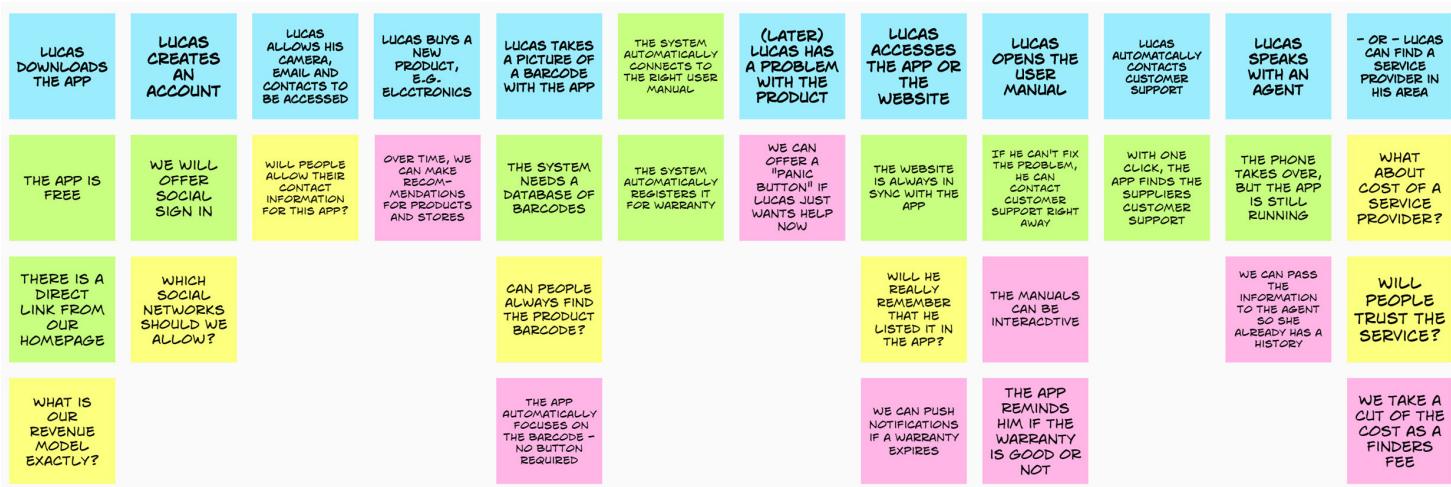


FIGURE 8-8. An example of a design map, modeled after the technique outlined in *The Persona Lifecycle*.

the task was to *brainstorm* new ideas at the bottom of the map. We also sketched the best ones as wireframes. In total, each group engaged with all three diagrams and got to build on their colleague's thoughts.

Figure 8-9 shows part of one whiteboard used for this exercise. Note that the color coding of sticky notes varied from what Adlin and Carr set out. Instead, we used yellow notes for steps, blue for comments, pink for questions, and green for ideas. But the process for creating the design map was the same.

User Story Mapping



FIGURE 8-9. A section of a design map created in a workshop shows the various types of information on different-colored sticky notes.

Putting It All Together: Which Techniques Are Needed When?

This book is about possibilities. Throughout, I've highlighted many tools for mapping experiences from different perspectives. The point is that mapping an experience is not a singular activity, and there are many ways to go about it.

But with possibilities comes choice. Which diagram should be used in which situation? How do you select the appropriate model? I believe there are three types of models needed:

1. Models of individuals: who are you designing for? Personas, proto-personas, and consumer insight maps stand as models of the individual.
2. Models of context and goals: maps of experiences seek to describe the broader circumstances in which they occur. What are the jobs to be done? What are their feelings and motivations?
3. Models of future experiences: finally, create models for the future state so the organization can see where it's heading. What do solutions look like? How can we represent them for evaluation?

The range of models covered in this book is shown in Figure 8-10. At a minimum, you'd select one from each group. More are possible, of course, but be careful of model proliferation. The goal of creating visualizations is to clarify human experiences to your audience. Too many different models may only confuse them.

There are different approaches to the process, depending on your situation. Alternatives for a quick, informal set of diagrams might look like the following options:

- Proto-personas > Experience map > Storyboards
- Proto-personas > Design map

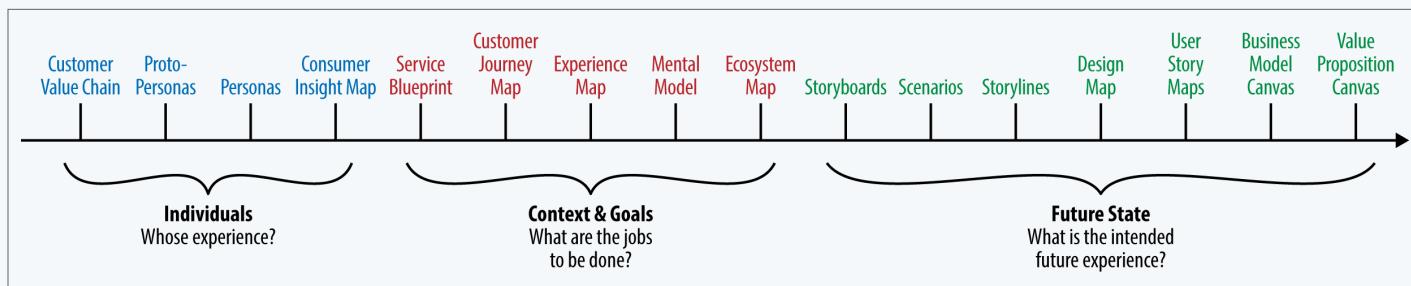


Figure 8-10. A sequence of techniques discussed in this book can be categorized into three groups: diagrams about individuals, context and goals, and future state diagrams.

A more formal process might include these diagrams:

- Personas > mental model diagram > scenarios and storyboards > value proposition canvas
- Consumer insight maps > service blueprint > storylines > business model canvas

My childhood neighbor had a Mr. Potato Head toy. If you're not familiar with this toy, it's a featureless plastic head to which you add various facial features. The resulting combinations can be humorous, e.g., Groucho Marx glasses with big red lips.

Producers of software typically want to avoid creating products that look like Mr. Potato Head. But without a common vision of what you are building, it's possible to unknowingly combine elements that don't go well together.

Agile development—the leading approach for software development—strives to break the product down into small chunks, called user stories. These are short descriptions of a feature told from the user's perspective. User stories typically have a common format:

As a <type of user>, I want <some goal> so that <some reason>

While utilizing user stories makes development more manageable, it can also cause teams to lose the big picture of what they are building. Focusing on individual features gives a team tunnel vision, losing the overall picture of what is being built.

To avoid the Mr. Potato Head effect in software development, Agile coach and expert Jeff Patton came up with a technique called user story mapping. He advises development teams to not assume everyone has the same view of the final product. In his book *User Story Mapping* (O'Reilly, 2014), Patton describes this phenomenon and how to overcome it:

If I have an idea in my head and I describe it in writing, when you read that document, you might quite possibly imagine something different...However, if we get together and talk, you can tell me what you think and I can ask questions. The talking goes better if we can externalize our thinking by drawing pictures or organizing our ideas using index cards or sticky notes. If we give each other time to explain our thoughts with words and pictures, we build shared understanding.

Don't assume that everyone has the same mental model of the outcome. More importantly, visualizations go a long way toward building a shared understanding (see Figure 8-11).

Keep in mind the intent of mapping: to tell the overall story of individuals and their interactions with an organization, both past and future, to help the organization make sense of their playing field.

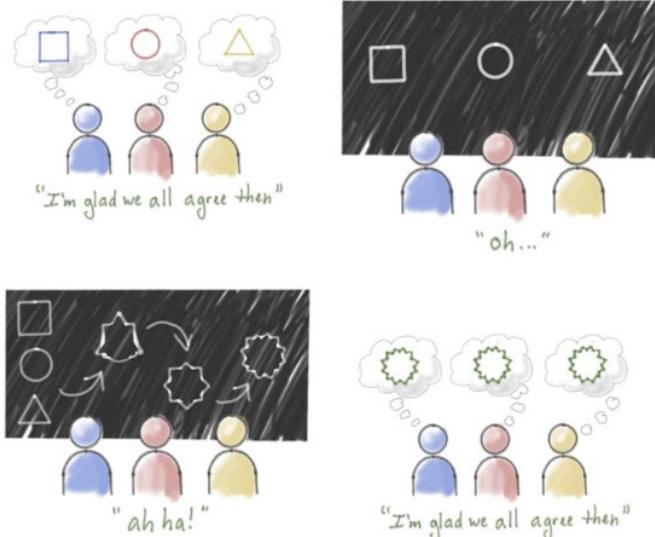


FIGURE 8-11. Don't assume everyone has the same picture of the solution in their minds.

A strength of user story maps is that they are simple to comprehend. Figure 8-12 shows an example created by Steve Rogalsky, an expert agile coach with the company Protegra. You can see the alignment of user activities (in orange and blue sticky notes) to planned features (in yellow).

User story mapping has its roots in task modeling as pioneered by Larry and Lucy Constantine.* The technique is flexi-

ble, with different ways to approach creating a map. The main elements that most user story maps include are as follows:

- User types: A brief description of the different roles the system is designed for. These are typically listed at the top or on the side (not shown in Figure 8-12).
- Backbone: This is a sequence of user activities listed across the top of the diagram. Frequently a more granular description of user tasks that form a flow across the phases accompanies them. These are listed horizontally just below the phases of the backbone.
- User stories: The body of the map contains stories needed to achieve the desired outcomes. These are typically prioritized and separated into releases.

The backbone is similar to the chronology in an experience map. A user story map, however, tends to lack much of the detail and context of an experience map, such as thoughts and feelings. Instead, it focuses on software product development.

The process to user story mapping requires team participation from the very beginning. Follow these steps to involve everyone in the map's creation:

- Frame the idea: As a team, discuss *why* you are building the product. Identify and record the benefits and problems it solves. Also decide on *who* you are building the product for. Write your responses down at the top of the map.

* See, for example, Larry Constantine, «Essential Modeling: Use Cases for User Interfaces,» *ACM Interactions* (Apr 1995). As well as other writings by Constantine and his wife, Lucy.

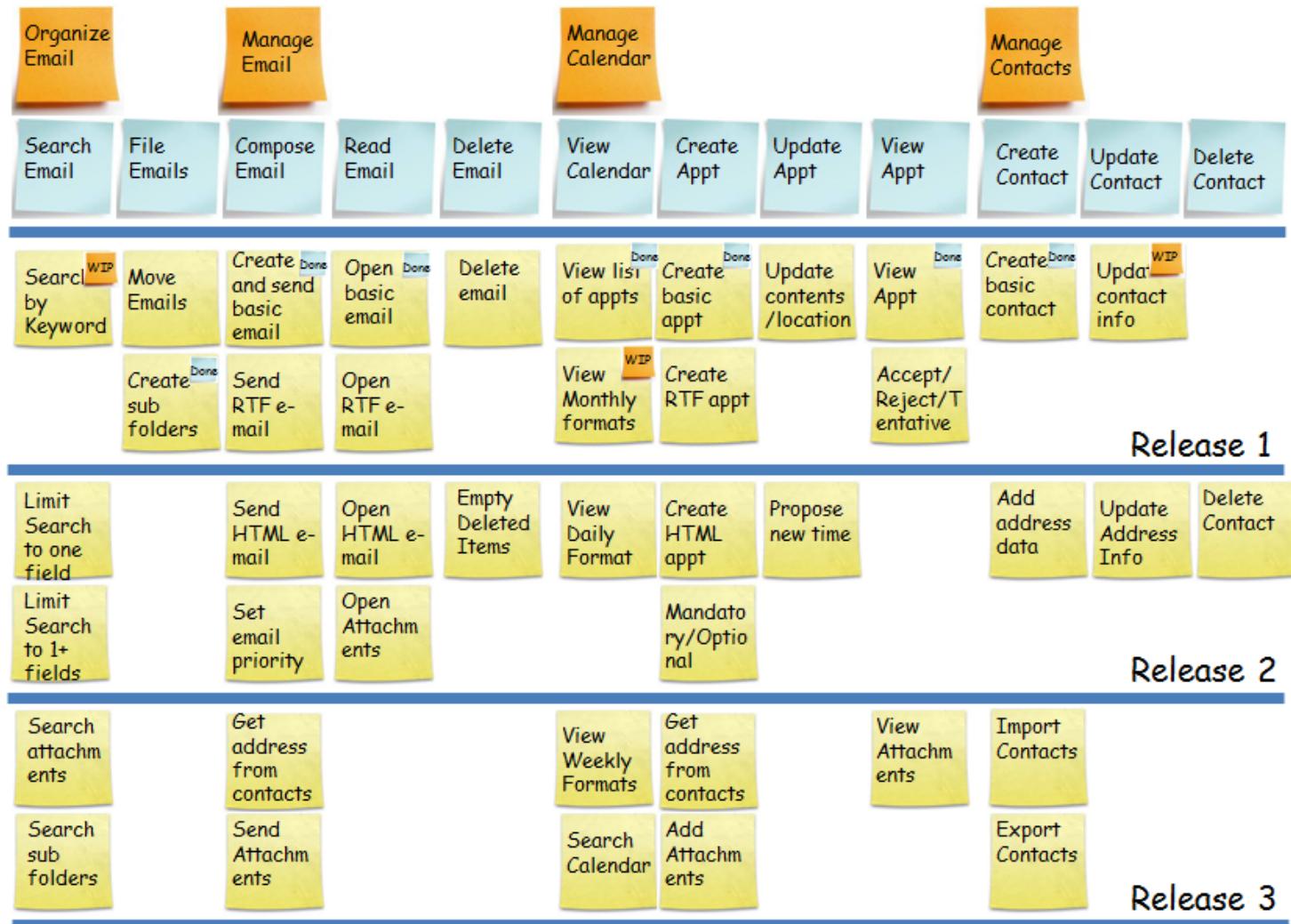


FIGURE 8-12. Story maps align development tasks with the intended user experience.



FIGURE 8-13. This example of a user story map created by a team in a face-to-face workshop reveals prioritization of efforts into releases.

- Map the big picture: Illustrate the flow of the solution chronologically, including details about specific actions. If possible, include the pains and joys users have today to inform your development decisions.
- Explore: Use the map to facilitate conversations about desired outcomes and the intended experience. Describe the features to support users and record them as stories on the map. Sketch solutions as needed, and go back and interview customers as well.

- Create a release strategy: Break the user stories into different releases, starting with the minimum that's necessary to reach the desired outcome.
- Build, measure, learn: As development progresses, track the team's learning against the user story map. Keep it in a visible place and refer back to it often.

Typically, the exercise is done offline, utilizing sticky notes and a whiteboard. For instance, Figure 8-13 shows an example created in a team workshop. However, it's also possible to map stories visually online using software such as LucidCharts or MURAL (<http://mural.al>).

A user story map illustrates how user stories relate to one another in an overarching model. This allows teams to grasp the entirety of the system. More importantly, they align planning and development with actual user experiences. Ultimately, it's about a shared understanding of software a team intends to build to guide decisions, improve efficiency, and result in better outcomes.

Customer Journey Mapping Game

By Christophe Tallec

Working with multiple stakeholders is a challenge. They may have a different vision of the world driven by their individual goals and perspectives, whether coming from engineering, business, or public policy backgrounds.

We Design Services (WDS), a leading service innovation firm, developed the *customer journey mapping game* to facilitate communication in such complex environments. The game uses the customer journey as a catalyst for team interaction.

While several configurations of the game are possible, a typical process has the following steps:

1. Prepare the game: Before the game session, create a blank journey worksheet with swim lanes for relevant touchpoint and information types. Then furnish a set of cards representing possible touchpoints. These will vary depending on the domain and situation involved.
2. Select personas: Start the game by having the participants choose a persona. Ask, "Whose journey are you going to map?"
3. Set goals: Define a goal for this persona. What is the overall need and what are they trying to get done?

4. Add touchpoints: Then, for the selected persona, place the touchpoints in the order they might experience them. Do this step as a team.
5. Reflect: Find patterns in the experience across the different touchpoints. Where are there gaps and problems? Where are the emotional highs and lows? Where are there opportunities for the organization?
6. Repeat: Select a different persona or change the goals, and repeat the process. How do the journeys differ? What are common patterns across them? How would extreme users experience the touchpoints?

We piloted this technique for a major French city that wanted to gather stakeholders for a co-creation exercise. The goal was to reinvent urban transportation.

This project was a challenge because of the widely different perspectives of the different people around the table (Figure 8-14). The participants came from car manufacturing companies, large commercial firms, public transit companies, and labor unions, as well as users of the system.

Introducing this new methodology allowed us to develop a common language shared by everyone and dominated by no one. This language helped identify shared value between the different stakeholders.



FIGURE 8-14. Playing the journey mapping game engages everyone in the workshop.

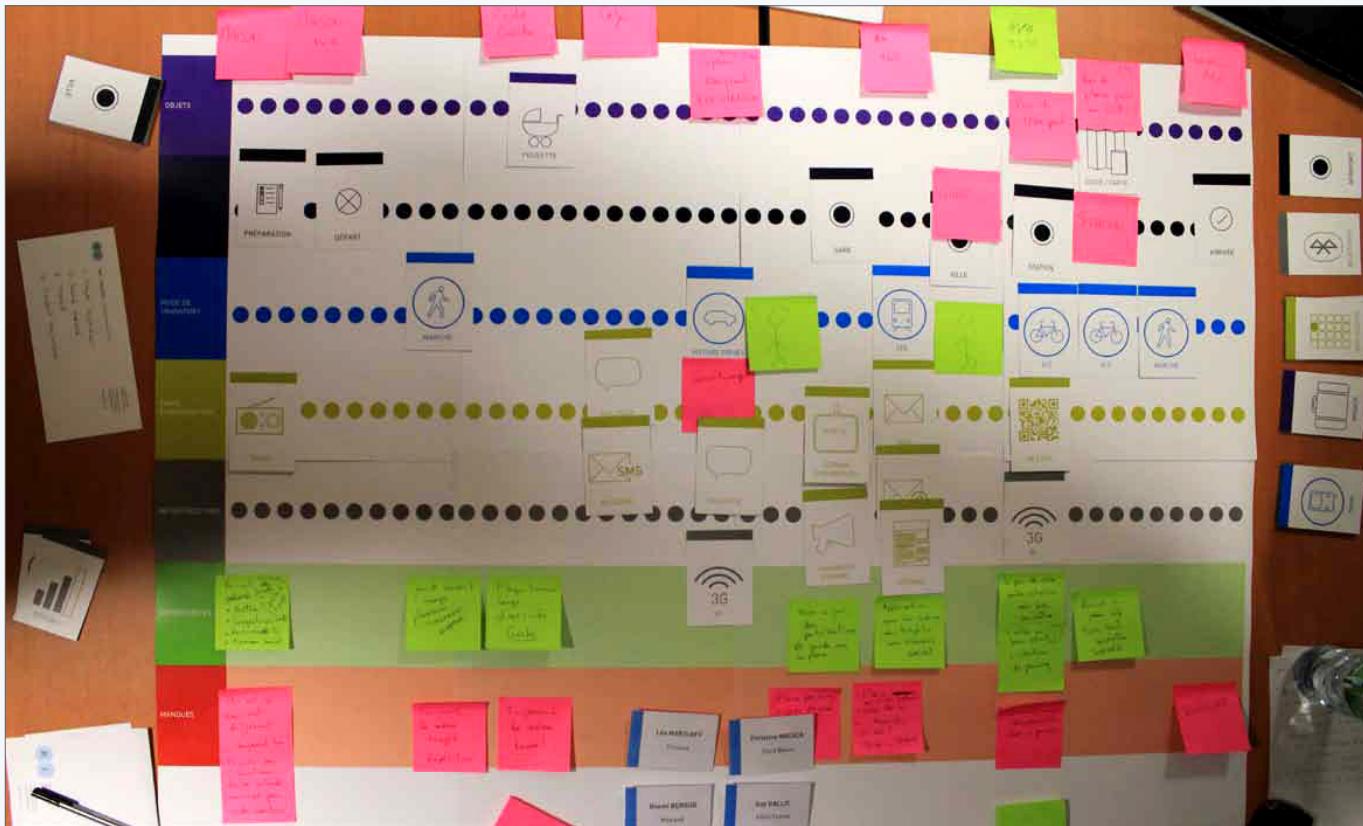


FIGURE 8-15. An example of a customer journey game board and elements.

This initial workshop confirmed that mapping the user journey as a group is an efficient way to visualize common touchpoints, interests, and ways to create value. It proved to be eye-opening for participants.

In this case, participants reported an increased sense of team alignment and cross-functional collaboration, in general, after our workshops. Unfortunately, it is rarely used by local governments looking to re-energize their local ecosystem.

The underlying problem is siloed thinking. The journey mapping game breaks down those departmental barriers and allows companies to think holistically and collaboratively.

We tested our approach with other companies and have invariably found that aligning disparate points of view allows them to uncover new business opportunities.

The customer journey mapping game was originally developed by Christophe Tallec and Paul Kahn. Figure 8-15 shows an example of what a completed game round looks like.

Tallec and Kahn also created an online version of the journey game. You can access this template online at: <http://prezi.com/1qu6lq4qucsm/customer-journey-mapping-game-transport/>.

About the Contributor

Christophe Tallec is the founder of We Design Services (WDS), a leading service innovation agency in France, advising organizations such as Airbus Group, SNCF, The National French Post Office Groupe La Poste, Qatar Foundation, World Bank, and other industries. WDS is committed to delivering cutting-edge experiences.

Further Reading

Donna Lichaw, *Storylines* (Rosenfeld Media, forthcoming)

Donna regularly writes and teaches about storylines. This is a complete volume on the techniques she's developed over the years. You can find more information online, including a pair of articles on UXMatters.com. Also see the book's page on the Rosenfeld Media website for updates and additional information: <http://rosenfeldmedia.com/books/storylines/>.

Jeff Patton, *User Story Mapping* (O'Reilly, 2013)

Patton pioneered the technique of user story maps and details the approach in this book. It is well written and gets to key points quickly. Latter chapters include details on validation through lean processes.

John Pruitt and Tamara Adlin, *The Persona Lifecycle: Keeping People in Mind Throughout Product Design* (Morgan Kaufmann, 2006)

This is one of the few full-length books on personas that is often cited as the key reference source on the topic. At nearly 700 pages it is thorough and comprehensive. Chapter 8 discusses design maps in detail.

Diagram and Image Credits

Figure 8-2: Storyboard sketched by Erik Hanson, used with permission

Figure 8-3: Draft storyboard created by Jim Kalbach

Figure 8-4: Storyboard created by Deb Aoki (<http://www.debaoki.com/>), used with permission

Figure 8-5: Comic created by Kevin Cheng from his book *See What I Mean* (Rosenfeld Media), used with permission

Figure 8-6: Narrative arch diagram created by Donna Lichaw, used with permission

Figure 8-7: Photo of storyline exercise by Donna Lichaw, used with permission

Figure 8-8: Example design map created by Jim Kalbach

Figure 8-9: Image of design map by Jim Kalbach

Figure 8-11: Illustration from Jeff Patton's book *User Story Mapping* (O'Reilly, 2014)

Figure 8-12: User story map created by Steve Rogalsky of Protegra (<http://www.protegra.com>), used with permission

Figure 8-13: Image of user story map by Steve Rogalsky, used with permission

Figure 8-14: Image of workshop participants playing the journey game, by Christophe Tallec, used with permission

Figure 8-15: Photo of an example journey game board by Christophe Tallec taken from www.servicedesigntools.com, used with permission



Articulating Design Decisions

COMMUNICATE WITH STAKEHOLDERS, KEEP YOUR
SANITY, AND DELIVER THE BEST USER EXPERIENCE

Tom Greever

Designing for Vision

An artist is not paid for his labor but for his vision.

JAMES MCNEILL WHISTLER

BEFORE WE CLOSE OUT THE BOOK, I want to emphasize how important design is to organizational and product development. Most of us consider ourselves designers of the things that our company produces: web designers, interface designers, or product designers. But in our roles, we shape the vision and perception of the entire organization with our work. We are more than just designers of things; we are designers of the business. In a very real way, we are *business designers*. I am amazed at the power we designers have to shape the organization, and yet how few designers actually realize or use this power to its fullest extent. The fact is, design has the power to change the future, to influence people, and to benefit you and your career. Our fate is in our own hands when we understand that we can inspire people with our creativity. Imagining the future can earn your team praise, get the attention of stakeholders, and give you a shot at actually making something meaningful.

We need to recognize that we have the power to imagine the future, the ability to create something that didn't exist before, and the ideas to inspire the entire organization. We can use these tools for good, for the betterment of the product, and the satisfaction of our own work. Learning to talk about our designs extends beyond the conference room; it begins with purposeful habits of practicing creativity and staying inspired. Few other jobs have the same ability to create excitement around something that doesn't exist, and so for this final chapter, I'd like to go on a journey of discovering just how powerful it can be when we design for vision.

Recognizing Our Power

You have more power than you realize. Designers have the skills and ability to cast a vision for a preferred future—a future that doesn’t exist yet and won’t exist without our help. Our role should not be to just iterate and moderately improve an interface, but to create an awareness of incredible new possibilities. We have the power to influence the future with expressions of our ideas that make the future seem real, attainable, and exciting.

You see, most people can’t do what we do. They don’t think visually, and, even if they did, they lack the skills to put pen to paper and sketch out something that looks like what’s in their head. This makes us special; we have unique skills that most other people around us don’t. We can choose to use them in a way that will benefit our organization and our own careers.

Our value as designers is not just locked up in the day-to-day mechanics of pumping out new wireframes, theming an app, or brainstorming ideas. Sure, those things are valuable and that’s probably the main reason why we have a job, but it’s not the only way (or the most important way) that we are valuable. We create more value when we help other people see the future; when we take ideas born out of a simple conversation and provide the context or skin it needs to feel real.

This power is the reason we keep photos and video of special moments: because the visual representation of those moments suspends our memories of those events. We are transported into those moments again and again when we look at them. Naturally, we want to share those moments with other people so that they too can experience what we did. We post on social media and relive them over and over. Those images, those visuals, are as much a part of the experience to us as the experience itself.

IMAGES MAKE THE UNREAL REAL

When you build a house, you start with an empty plot of land and it’s difficult to visualize how you will live there, but after you see the drawings of what it will look like, you grow excited and anxious. When you see your baby on an ultrasound for the first time, tears well up inside you because it hits home that this is really happening. Things that exist only in our mind become something completely different when they’re expressed visually.

We can make these images

A friend wants to start a new business, but the website you create for her is what will really make it feel like a legitimate enterprise. Your boss jotted down some ideas at lunch, but you can take those ideas to the next level. In the middle of the night, you had a crazy idea and you can flesh it out to show to other people. We have what it takes to create the images that make the unreal real. Most people can't do that.

Right or wrong, sometimes the visual of a product alone sets our expectations about it: making promises about functionality, telling us how we'll be better with the product in our lives, and asking us to try it. Attractive visual design has become the hallmark of good products. In fact, we might be influenced more by the way a thing looks than the way it actually works. That's how much power design has. When we see something that's well designed, we might think the product itself is great before we've even tried it. The point is that our designs have the effect of making people believe in what we've created, even if it only exists on paper. That gives us a lot of power when it comes to our designs. We can use this power for good, to move our teams and projects forward into a preferred future, and to create a new reality that didn't exist before.

The reason this is important to communicating to stakeholders about design is because we have the power to inspire people with our work. Expressing a vision for what the future could look like to stakeholders gives us the opportunity to earn their trust, demonstrate commitment, and get them genuinely excited about what we're doing. It's a huge deposit in the bank account of trust. Often, these inspirational designs will help our team move forward because our stakeholders will be on board with the vision. They'll see just how excited we are to work on this project and they'll want to help us accomplish this vision. With a vision of a preferred future, it's easier to get support, funding, research, and any other resource you might need to accomplish your vision. Your stakeholders will be saying, "This is awesome. What do you need to make this happen?" It puts you in a position of *making* the future happen rather than waiting around for someone else to tell you what it is.

Here are just some of the reasons how designing for vision can improve our careers:

It gives us a creative outlet.

Designing for vision provides an environment for us to express something that we might not otherwise have the opportunity to express.

It creates a conversation with other people.

Our designs get them dreaming about where we're going, what's possible, and what's ideal without any of the usual constraints.

It brings people together.

Individuals are no longer stuck obsessing over one little thing; the entire team can get a sense for where we could or should be headed.

It builds credibility.

People see you as a thinker, a visionary, as someone who is interested in providing long-term value, not just value for the immediate need.

It lives beyond us.

These designs can be so exciting that they get passed around to other people in the organization. Long after we're gone, they still might be hanging onto that vision of the future.

And so, for these reasons, our ability to create visuals that communicate beyond words has the power to bring people into a world that didn't exist before. We can show them what the future is like before the future has even been created. A picture is as close as you can get to being in this new future without actually being there. People can become really excited when they see what it will look like. This is what it's like designing for vision.

Practicing Creativity

Designing for vision requires that we are purposeful about practicing creativity on a regular basis. You've got to step away from your project and dream a little bit now and then, even if the idea never sees the light of day. Sometimes, the prospect of making one...more...control...seems mundane and boring. If you're bored of your day-to-day job, this is a way to make it exciting and fresh.

FIND INSPIRATION

One of the missing ingredients for learning to design for vision is a lack of inspiration. Some people might consider pursuing inspiration a waste of time compared to the act of simply getting things done. But when the goal is to create something completely new that didn't exist before, it's almost impossible to do that well without an external, aspirational, creative stimulus that models how we might approach our own endeavors.

The easiest and most practical thing you can do is to simply look at other people's products. Find designs that you like, discover how they might be applied in your context. Download and use as many apps as possible. Collect a repository of favorite websites that you can reference when the time comes, browse through pattern libraries, try new open source tools, read case studies, go to a conference, read a book—there are almost too many resources to help you find and create inspiration that you have no excuse, other than the practice and habit of making it happen.

SEE UX EVERYWHERE

There are models everywhere—including those outside the world of tech—that can influence your thinking and passion for designing digital products. We tend to see the world through our lens of UX and may comment on the usefulness of everyday objects as a matter of pride. Turn those powerful observational skills into an opportunity to find patterns in the real world that will inform your designs in the digital realm. Ask yourself this: how does the design of this thing apply to my current project? Is there something it does well that I can use? Start seeing everyday objects as opportunities for learning and inspiration in your own work.

USE A DIFFERENT CANVAS

An alternative way to get the most out of your creative mind is to stimulate it in a different way. Pursue a different artistic endeavor; try something completely different from your usual design-a-thing day job. Find something that allows you to create, express yourself, and sink into a mode of creating so that the worry of delivering melts away. Without hard expectations about what you create, you'll be free to think more clearly and enjoy the process. This could be cooking, landscaping and gardening, painting, photography, or any other creative hobby that interests you and will spur you to greater comfort with your creative self.

You might even do something out of your comfort zone, something that you're not at all interested in or are not particularly skilled at. Being uncomfortable has the fortunate side effect of causing us to see things in a different light, to approach problems in a different way. When we have no bearings on how to behave or what to do, we have no choice but to be creative and make it up as we go along.

For me personally, I am restoring a classic car as an act of deliberate creativity. For several years now, I have been working on a 1969 Triumph GT6+, a small British sports car. Prior to starting this project, I had very little mechanical knowledge. In fact, on the day the car arrived at my house, a neighbor stopped by, pointed to the distributor on the engine block and said, "Wow! You don't see those anymore." I had no idea what that part was, so I just laughed uncomfortably and replied, "Yep, you sure don't!" But since that time, I've completely dismantled the entire vehicle, cleaned and painted each part, and am now meticulously putting it all back together.

In the process, I've learned a lot of about engines, but I've also learned a lot about design. I'm inspired by the engineers who created these cars before there were computers. I'm amazed at the ingenuity of working within such limitations and I'm baffled that humanity figured out how to make a car in the first place! But building a car has given me a way to step away from my desk, to pursue something creative that is 100 percent outside of my comfort zone. I rely on other people for advice and tools. I am constantly reading and learning about these old cars. It's a slow process, but one that has freed my mind and given it new places to go, be inspired, and enabled me to return to work, armed with fresh ideas.

The takeaway here is to find something that can add to your fulfillment of designing interfaces and push you to greater limits of creativity.



Before (top) and after (bottom) photos of the frame and engine from my GT6. I didn't know much about cars before starting this project, but the process has given me a creative pursuit away from the screens and digital interfaces of my daily life.

IDEATE AND ITERATE

Ideation and iteration are both important to ensure that we're practicing creativity. Generating new ideas should be one of your primary outputs. Iterating on those ideas, then, gives us a chance to refine and mature them. These approaches are important when working on visionary vaporware that has no current basis in reality. Thinking of a single new idea and expressing it in a mockup isn't too difficult, but it's far more difficult to come up with five completely different or derivative ideas. That's what we need to do regularly: learn to generate as many ideas as possible and iterate to make as many different versions as possible. Set a goal for yourself to create at least five completely different designs. Don't reuse elements; create new ones. Begin with a blank canvas each time. Then, approach the same problem with a different

use-case. Go about creating each one by setting the previous design aside. The more ideas and versions you have, the better. The exact quantity you produce or the fidelity of these ideas isn't important. The goal is to make it a habit of thinking differently about our projects and forcing our brains to learn (and relearn) how to design.

Making It Happen

Practically speaking, designing for vision is creating visuals that express your vision of a preferred future. You design mockups of your product, website, or app, but instead of being constrained by all the limitations you know you have (engineering, marketing, support), you create what you believe to be the best possible product and illustrate that with some form of interactive prototype or static mockup. You can then show or present these designs to your team or executives to inspire them to want to achieve the same goals. The purpose is to create a conversation that results in the organization chasing after something that is bigger than the current vision (perhaps even impossible), but is inspiring and motivating.

However, frozen in the day-to-day maintenance of our jobs, we often overlook just how influential our ideas can be. It's hard to think about vision and the future when there are so many other things to do.

Documentation needs to be written. The mockups need to be updated. And I have to get ready for a meeting this afternoon. How could I possibly take the time to design for something that doesn't even exist? That isn't even part of my project?

It can be hard to see the value of creating something that's not on everyone's radar. No one is expecting you to do this. No one is explicitly paying you to create visionary, inspirational stuff (usually). It's sort of above and beyond your normal activities and so it can be a challenge to find the time to create things just for the purpose of inspiring others. But the long-term benefits of being purposeful about this direction are well worth it.

We have to be purposeful about making the time and space to do this every so often, whatever is the most efficient for you while not interfering with your regular work day. The following sections offer some tips for setting aside the time you need to design for vision.

FIND A DIFFERENT ROUTINE

One of the most important things you can do is to find a completely different time and space to go dream about the future. You want to break from your usual routine so that your brain isn't even in the same mode that it usually is when you're pumping out UI controls on a daily basis. Finding that routine is about looking for a different *time, space, activity, and materials* that will help you to relax, free your mind, and get down to the business of creating things.

Time

You might want to limit yourself to a certain block of time each week to be sure that it doesn't interfere with your work. It can be easy to get carried away and spend all your time making stuff that doesn't pay the bills. So set aside a specific window of time that you think will be helpful. A former boss of mine let me spend every Friday on these kinds of endeavors, but you might be even more limited than that. Set aside one or two hours each week. One hour is more than enough time to mock up an idea if you remove the usual constraints. It's just enough time to get your thoughts flowing, but not enough to disrupt your daily work.

If that still seems like too much, set aside 15 minutes every day. Just 15 minutes. It's not enough time to get any serious designs made, which is why it can be so effective. You're forced to come up with ideas and solutions quickly because there isn't enough time to think deeply about any one concept. The focus is more on ideation. Set a timer and begin sketching your ideas. Jot them down before the timer goes off. Each day you'll have these small snippets. Which ones do you go back to? Which ones seem to have the most potential? At the end of a few weeks or months, you'll have some really great concepts that you can further refine into expressive mockups.

Space

The space where you work is also really important and affects how you work. Our brains work themselves into routines (and ruts!) based largely on our physical location. We condition ourselves to work when certain factors are present, many of them being physical: the chair, the window, the position of your desk, even your position in relationship to other people. Part of your challenge might be to find a different physical space where you can go. If you want to create something different, you'll need to go somewhere different. A new space can inspire

thoughts and ideas that you wouldn't normally have. New spaces have new sounds, new visuals, and unexpected stimulations all around you that contribute to your sense of creativity.

I personally find it difficult to get work done if I'm not at my desk, but because I occasionally travel, I've taken to listening to music almost constantly while I design. As a result, I usually can't get any serious design work done unless I'm listening to music piped through headphones. I've learned that this is the way I work now. So if I want to do something out of my normal routine, I have to go somewhere other than my office: a different room in my house, a local bookstore, or a park. The exact location doesn't matter as much as the change of routine. If you expect to create something that isn't routine, you must change your current routine. Go find a new, perhaps unexpected, place to let your brain percolate thoughts and come up with better ideas. You'll need to learn what works for you, but the process of searching for new, interesting places to create will yield better discipline and a different way of designing.

Activity

Sometimes, the best way to come up with better ideas and create better designs is to actually not do any designing at all. That is, change your activity to give your brain an opportunity to relax and wander. Do something that would wholly prevent you from even accessing a computer or any of your usual tools. For example, rather than sit with your laptop at a coffee shop, go for a walk in the woods, hike in the mountains, do yoga, pull weeds in the garden, go jogging, sit on the beach, watch the sunrise—do something that will allow your mind to be still, listening and thinking to what the future could be.

When I get stuck trying to figure out how something should work, I go run. Fresh air, no screens, my brain is free, and my mind wanders. I usually don't even pay attention to what I'm thinking. I'm not explicitly trying to solve problems, but it's during these moments of thinking of nothing that the solution presents itself without me even trying. Not always, but often. And even if I come back to my desk without having come up with the best idea ever, I am usually better prepared to tackle my work again.

Your brain's ability to solve problems while doing a different activity is a common yet remarkable phenomenon. Remember that great idea you had in the shower? Or that thing you fixed while sitting in traffic? It turns out that we all have better ideas when we're relaxed: doing a simple task and letting our minds wander.¹ Anything that you can do that is relaxing and pleasurable will allow your brain to also relax and come up with ideas or solve problems you never thought possible.

You won't be able to actually create something tangible from a change of activity like this, but it will force yourself to be unencumbered and think freely about how to solve some of the difficult problems you face. When you're out in the woods, you don't have your computer. You're forced to just *think* about all the hard problems. When you return, write down your thoughts, sketch out your ideas. Make a record of what you learned in the hopes that it can turn into something worth communicating to others on your team. A change of activity yields a change of ideas.

Materials

Lastly, I recommend changing up the kinds of materials and tools you use to force you into new habits and new ways of approaching your work. The simplest method is to bring along a pad of paper and a pencil, even if you're not the type to draw or sketch. Often we design based on what we already know we can do with our tools. Our ideas are limited to the tools we have in front of us. When something is a little more time-consuming to express with existing tools, we become stuck, waste time, or avoid that idea altogether. Changing the materials you use is a great way to discover new approaches because you're not limited by your typical toolset.

Once I was designing a UI that needed some specific icons, but I was tired of reusing similar icons over and over. I had developed a habit of just searching common icon libraries and grabbing something I liked. I needed to find something with a more unique personality, so I went outside with sidewalk chalk and drew my icons on the driveway. I then took photos of each of them, imported and traced them, and placed them in the project. There was nothing artistically innovative about

¹ Widrich, Leo. "Why We Have Our Best Ideas in the Shower: The Science of Creativity," February 28, 2013, <http://bit.ly/1JfExHs>

the resulting icons, but I accomplished my goal of creating something unique that communicated the style and tone of my project. Changing materials gave me more opportunities to create a better vision.

I would also highly recommend removing Internet access from the equation when you're trying to find new ideas. It's too easy to search and copy other ideas. Although there's nothing wrong with that, in terms of generating new ideas for your own product (taking someone else's idea and expressing it in your own context), I personally find it more helpful when I'm untethered from the online world and forced to use my own brain capacity for all of my thinking. It's about reducing my dependence on screens or tools for finding solutions to problems. I have access to too much information. Often, my access to infinite amounts of knowledge hinders my own ability to truly be creative and solve problems with good, old-fashioned thought. When I intentionally put myself in situations in which I can't access those screens, I have no choice: I'm all on my own.

So, set aside your computer, phone, and tablet for the time being. Grab some paper and a pencil and start scribbling down things that will help you create the next version of your product. Write words, draw boxes, and generate ideas that can contribute to your vision of what the future can look like.



For one project, I designed a set of icons using sidewalk chalk, took photos, and then traced them on the computer. The result was something that was truly unique and refreshing to work on.



Another time, I tried designing icons in the snow. This didn't yield a real icon set for a project but it was an excellent exercise in expressing an idea with a very limited toolset.

Making Stuff Up

When it comes down to it, designing for vision is really just about making stuff up. There is no magic, except in your design's ability to inspire people. Other than that, it's just a collection of visionary vaporware that has no basis in anything real. You are just making things up, expressing them in a tangible way, and then using imagery to create an excitement and urgency about the future.

If we take that a step further, I'd suggest it's as important to create a fake product with your designs and mockups as it is to create the version 2.0 of your current project. You probably have a pretty good idea about what version 2.0 is going to be like, but what are the products, opportunities, or niches that no one is even thinking about? What would the 4.0 version look like? We are too encumbered by the limits of our bosses and developers. What would you design if you had unlimited resources? What's the right thing to build? Is your current product even the thing you should be working on? We need to be designing more 4.0 versions of our products and 1.0 versions of things that don't even exist yet.

It's a good practice to create a product that doesn't exist yet. Look for opportunities within your organization and express them as best as you can. Don't wait for someone else to come along and pitch the next big thing. Take ownership of your skills, create something from nothing, and give people a reason to get excited.

Don't limit yourself.

Forget all the business requirements, legacy ideas, or engineering questions. Just create something that makes sense to you.

Start from scratch.

Don't reuse anything from an existing project or copy and paste from a template. Design this thing from the ground up, with only raw materials.

Don't obsess over the details.

It doesn't have to be perfect; the purpose is more about communicating a concept than it is about what's realistic and final.

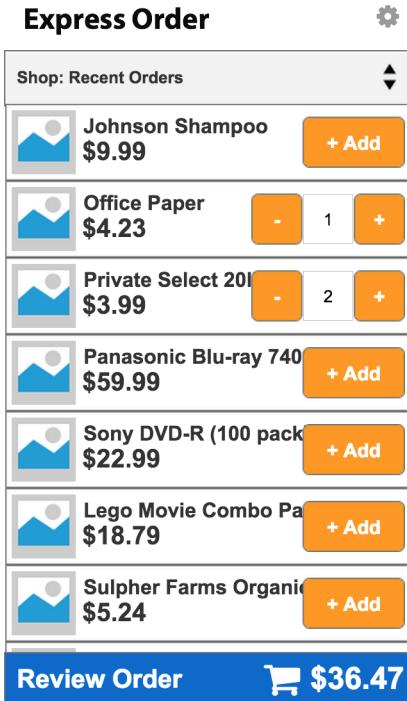
Make lots of different versions.

The more different ways you can approach the problem, the better. When you think you've finished, try it again. It's a good habit to force yourself to make just one more iteration.

This extends, too, to new designers who are looking to build their portfolios. Often, entry-level designers have nothing to show for their skill and are looking for opportunities just to gain experience. This is a great opportunity to find something that you think needs to exist, and make it happen. You don't need an internship or a school project to help you create something; just go create it and build the case for it yourself. Make up a business, design an app for a new product, or imagine what interfaces will be like in the future. Don't wait for other people to give you something to do; go create something for yourself and demonstrate your skill.

When I worked in the electronic-payment services industry, I had an idea for a new kind of loyalty card that our company could use and resell as a value-added service. It had nothing to do with my job. It was just an idea. But I spent some time (not a lot of time) creating mockups and designs that demonstrated what this new service might be like. I shared my ideas with my boss, who then sent it to the CEO and a few other executives. During my tenure, that idea never saw the light of day and I have no idea if it was ever even pursued as a product. However, it *did* create a conversation around our current thinking on loyalty cards, established my name with the CEO, and circulated a document that other people would later tell me they appreciated.

More recently, one of my retail clients had mentioned the need for their customers to easily reorder items that they had ordered in the past. During one of my purposeful creative pursuits, I created some designs for a standalone app aimed at power-users specifically for this purpose. I made some mockups and a simple demo showing how this system would work and shared it with the stakeholders on the project. Unknown to me, another team at the company was already working on something very similar. Although my own expression of that idea didn't cause them to stop what they were doing, it did create a "great minds think alike" conversation during which our combined efforts were validated. I gave them something tangible and sharable that they could use to influence the thinking on their own initiative. It may not have been completely original, but it did demonstrate that I was willing to think beyond their immediate needs and contribute long-term value. My role was more than delivering the day-to-day designs they expected. I also contributed ideas and designs to another project that was outside my current scope. It gave me another platform on which to communicate with them about design.



I created a very basic prototype of a reordering app to express a vision for this opportunity. Then, I recorded a two-minute screen-capture video presentation of the idea. Even though my client was already working on a similar concept, it created a conversation that added value to the relationship.

You see, even when our ideas fall flat or aren't entirely useful, they still create value for us as far as learning to communicate about design and build the kind of momentum we need to be successful. When we make things up, we show that we're thinking, we're invested in the success of the organization, and we're smart enough to communicate our ideas to people in a way that's compelling. This sort of commitment is invaluable to organizations.

Taking Your Ideas to the Right People

Relationships are everything. Who you know will greatly influence the opportunities that are available to you. Working with and communicating with people will determine how likely they are to help you and connect you with those opportunities. It's one thing to have great ideas and to even be able to express them in meaningful ways, but it's another

thing entirely to have an audience of people who are there to support, encourage, and help you on your journey. Even if you're capturing that vision of a preferred future, it's not going to help you if there aren't people with whom you can share that vision.

The good news is that our skill in design can help us establish a connection with the people that make decisions. Like I've said before, everyone wants a designer on their team. Everyone needs something designed. You need to find opportunities to get in with the right people who have the power to make your vision a reality. You can take advantage of your success in articulating design decisions to influence these decision-makers.

This isn't about selfishly pursuing one-way relationships. It's about finding the opportunities to create your own success with people who can (and want to) support you. Usually, this is your boss: your direct report. Often, it's a peer or other colleague who recognizes your talent and makes a personal connection with you. Sometimes, it's an executive who periodically needs your help, which gives you access to them on a regular basis. Be on the lookout for people who have influence, build into those relationships, share your ideas with passion, and allow them to help you.

How can you do that? The best opportunities to build these connections are when someone needs a "favor" from you. When your boss asks you for help putting together a presentation, do it. If there's a critical bug that needs to be addressed, be the kind of person who sees the urgency and pitches in without complaining. When the product owner comes to the team with a last-minute missing requirement, step up and support her by making it happen. The more often you can help other people, the more likely you are to get help when you need it. These kinds of situations are major deposits in the bank account of trust. The way to get what you want is to help other people get what they want.

In these relationships, keep your ideas, designs, and vision handy. Eventually, you'll have an opportunity to share your ideas with someone who can make your vision a reality. They'll be surprised, delighted, and impressed that you can create that level of vision and communicate it so tangibly. Having an audience of people who can help you execute your ideas is a necessary part of designing for vision.

More Than Pixels

The things we create convey a message to our audience. These pictures possess a quality that gives them a voice and breathes life into what is otherwise just a collection of pixels. Our brains perceive them as having more qualities than they actually have: intelligence, purpose, even a soul. That's because our designs reflect who we are. They are a mirror of our own existence, a reflection of our ability to create and to be the created. As much as we try to design toward the personas of our users or the brand of the organization, our work is still a reflection of us: our style, tone, and personal touch is everywhere. Just as we are drawn to people who are like us, so too we design interfaces that reflect our own shape and personality. This is perhaps why it's so difficult to talk about design: because we are so intimately knit up in all that we create that we cannot stand back far enough to see what it really is. It's difficult to know if what we're reflecting in our designs is what we ever intended in the first place.

Our skill at creating an experience for users that is both delightful and accomplishes business goals is something that few people can do. And even though we do our best to evaluate it, measure it, and improve it, I'm not sure we can ever have a complete picture of what we've created. No matter how much information we have, our ability to understand and talk about our designs is limited to our own unique perspective as the designer. When you hear your own voice on a recording, it sounds strange, "That's not what I sound like, is it?" When you see a photo of yourself, you might think, "That's not how I really look from that angle, is it?" Likewise, when we watch our designs operate in the world with a life of their own, we might react, "That's not how I really meant for it to be used, is it?" We can't always see ourselves (and our designs) for who we really are.

In this book, I've written a lot about how we should communicate to our stakeholders. The whole thrust of this content is to convey how critical it is to be able to explain yourself to someone who might not understand UX design. You cannot and will not be able to really succeed as a designer unless you learn to talk to people in a way that makes sense to them because *your designs do not speak for themselves*. But more than that, product design is bigger than any one person's skill at communication. Our ability to create incredible user experiences is influenced by the constantly changing world around us: other people are involved, external factors are beyond our control, and our life and relationships make us who we are.

Design is volatile and changing, but being a better communicator is something that we can always have. Our designs may get discarded, but we can still talk about them and learn from them. That website will eventually shut down, but we understand the problem that it solved at the time. We may take another job, but we still carry these skills with us. No matter where life and work takes us, we can always rest in the knowledge that in any situation, in any role, and with all people, we are prepared to bring our ideas to life through the power of articulating design decisions.