

Introduction: Why You Need Digital Know-How—Why We All Need It

The future of digital culture—yours, mine, and ours—depends on how well we learn to use the media that have infiltrated, amplified, distracted, enriched, and complicated our lives. How you employ a search engine, stream video from your phonecam, or update your Facebook status matters to you and everyone, because the ways people use new media in the first years of an emerging communication regime can influence the way those media end up being used and misused for decades to come.¹ Instead of confining my exploration to whether or not Google is making us stupid, Facebook is commoditizing our privacy, or Twitter is chopping our attention into microslices (all good questions), I've been asking myself and others how to use social media intelligently, humanely, and above all mindfully. This book is about what I've learned.

I believe that learning to live mindfully in cyberspace is as important to us as a civilization as it is vital to you and me as individuals. The multi-fold extension of human minds by chips and nets in the first decade of the twenty-first century has granted power to billions, but in these still-early years of multimedia production studios in your pocket and global information networks in the air, it is clear to even technology enthusiasts like me that our enhanced abilities to create and consume digital media will certainly mislead those who haven't learned how to exert mental control over our use of always-on communication channels.

The mindful use of digital media doesn't happen automatically. Thinking about what you are doing and why you are doing it instead of going through the motions is fundamental to the definition of mindful, whether you are deciding to follow someone on Twitter, shutting the lid of your laptop in class, looking up from your BlackBerry in a meeting, or consciously deciding which links *not* to click. Although educational institutions have been slow to incorporate digital literacies, practical know-how is available

to those who figure out how to find it. This know-how, from the art of growing social capital in virtual communities to the craft of cultivating wiki collaboration, might determine whether life online will drive us to distraction, or augment and broaden our minds.

For individuals, the issue of where digital culture may be heading is personal as well as philosophical: knowing how to make use of online tools without being overloaded with too much information is, like it or not, an essential ingredient to personal success in the twenty-first century. Just as learning to drive an automobile (or at least learning how to survive as a pedestrian) was crucial for citizens of the early twentieth century, learning how to deploy attention in relation to available media is key today for success in education, business, and social life. Similarly, those who understand the fundamentals of digital participation, online collaboration, informational credibility testing, and network awareness will be able to exert more control over their own fates than those who lack this lore.

I see a bigger social issue at work with digital literacy, in addition to personal empowerment: if we combine our individual efforts wisely, enough of the right know-how could add up to a more thoughtful society as well as enhance those individuals who master digital network skills. Web 2.0 impresario Tim O'Reilly claims that the secret sauce behind Google, Wikipedia, and the Web itself is the "architecture of participation," enabling countless small acts of self-interest like publishing a Web page or sharing a link to add up to a public good that enriches everybody. Examples of the social-media-enabled public goods that grow out of self-interested actions include the Web and free online search engines.²

I don't believe that technology itself, a fixed human nature, or the powers that be wholly determine who ends up in control and who ends up being controlled by others when a communication medium is adopted. But I do recognize that powers eventually emerge that try to close gates, meter resources, and lock down liberties. I'm enough of an optimist to persist in believing that this hasn't happened quite yet, despite real advances in the direction of control by governments and corporations around the world. Right now (and for a limited time), we who use the Web have an opportunity to wield the architecture of participation to defend our freedom to create and consume digital media according to our own agendas. Or by not acting in our own interests, we can let others shape our future.

If I am correct that informed actions might still influence the outcome, declaring that technology alone will solve social problems caused by the use of technology is dangerously naive; at the same time, it is dangerously nihilistic to dismiss all the mental and social tools that microchips make

possible as irredeemably destructive. People's actions influenced the ways print media shaped the cultural evolution of the past five hundred years.³ The early users of the telephone insisted on using it to socialize, not as the broadcast medium envisioned by the first telephone companies.⁴ Just as people in previous eras appropriated printing presses and telephones in ways that the inventors and vendors of the enabling technologies never imagined, the shape of the social, economic, political, and mental infosphere now emerging from the combination of inexpensive though powerful computers, mobile communication devices, and global digital networks is not yet fully hardened, and thus can still be influenced by the actions of literate populations. We're in a period where the cutting edge of change has moved from the technology to the literacies made possible by the technology.

Five hundred years ago, Gutenberg presses did not immediately enable people to overthrow monarchies, drive the Protestant Reformation, and invent science as a collective enterprise. The interval between the technological advance of print and the social revolutions it triggered was required for literacy to spread. Print, a technology that leverages the power of the human mind by making possible mass distribution of written documents, required decades for the intellectual skill of decoding those printed pages to spread through populations. The sheer scarcity of painstakingly crafted manuscripts (the word manuscript literally means "written by hand") had constrained literacy for thousands of years. Thirty thousand pen-and-ink books existed in all of Europe in Johannes Gutenberg's lifetime, but more than ten million printed books became available within fifty years of his invention.⁵ The sudden abundance of printed material meant that the mental know-how that had been reserved for elites for millennia abruptly became available to anybody who was able to put in the effort to learn to read. For decades and centuries after Gutenberg, newly literate populations began to learn what to do with the new media of their time, and then they started to foment the Reformation, institute political self-governance, and systematize the discovery of knowledge.

Digital literacies can leverage the Web's architecture of participation, just as the spread of reading skills amplified collective intelligence five centuries ago. Today's digital literacies can make the difference between being empowered or manipulated, serene or frenetic. Most important, as people who are trying to get along day to day in a hyperscale, warp-speed civilization that seems so often to be beyond anyone's control, digital literacy is something powerful we can learn as well as exercise for ourselves and each other.

Who Needs to Read This Book, and Why?

I know from my own thirty years online and quest to learn from people who are highly skilled in the new media that practical know-how does exist and can be useful (maybe even essential) to:

- Adults who are adept at using online tools and networks, but face challenges of time and attention management, and seek a balance between their physical and virtual environments
- Intelligent but perhaps less knowledgeable and fearful parents of young people who are going online for the first time, or spending more and more time online
- Young people who are immersed in the digital “hanging out, messing around, and geeking out” online that is such an important part of youth culture today, but are ready to learn deeper, broader ways of using social media productively and collaboratively⁶
- People who are old enough to remember the world before it was webbed, and are simultaneously puzzled, attracted, and fearful about new media
- Businesspeople who want their employees to be net smart with each other inside their enterprise as well as social media literate when dealing with customers—net smarts within enterprises are different from social marketing competencies
- Educators who want to help students connect old and new literacies, and think critically about their own media use

While we’re waiting for research to provide more definitive evidence about what our media practices are really doing to our minds and social relationships, I think we can all benefit from adopting some of the rules of thumb discovered by mindful digital media users. Literacy as I am using the term is definitely a skill. But solitary skills are not enough today. Literacy now means skill plus social competency in using that skill collaboratively. Learning how to ride a bike is a skill you have to learn alone, and even if you’re the only person in the world who can ride a bicycle, you could get from place to place faster because of your operational knowledge, along with a working bicycle. If you are the only person in the world who knows how to read, write, or hyperlink, however, your skill is far less useful than it could be. What matters the most with present-day new literacies are not just the encoding and decoding skills an individual needs to know to join the community of literates but also the ability to use those skills socially, in concert with others, in an effective way.

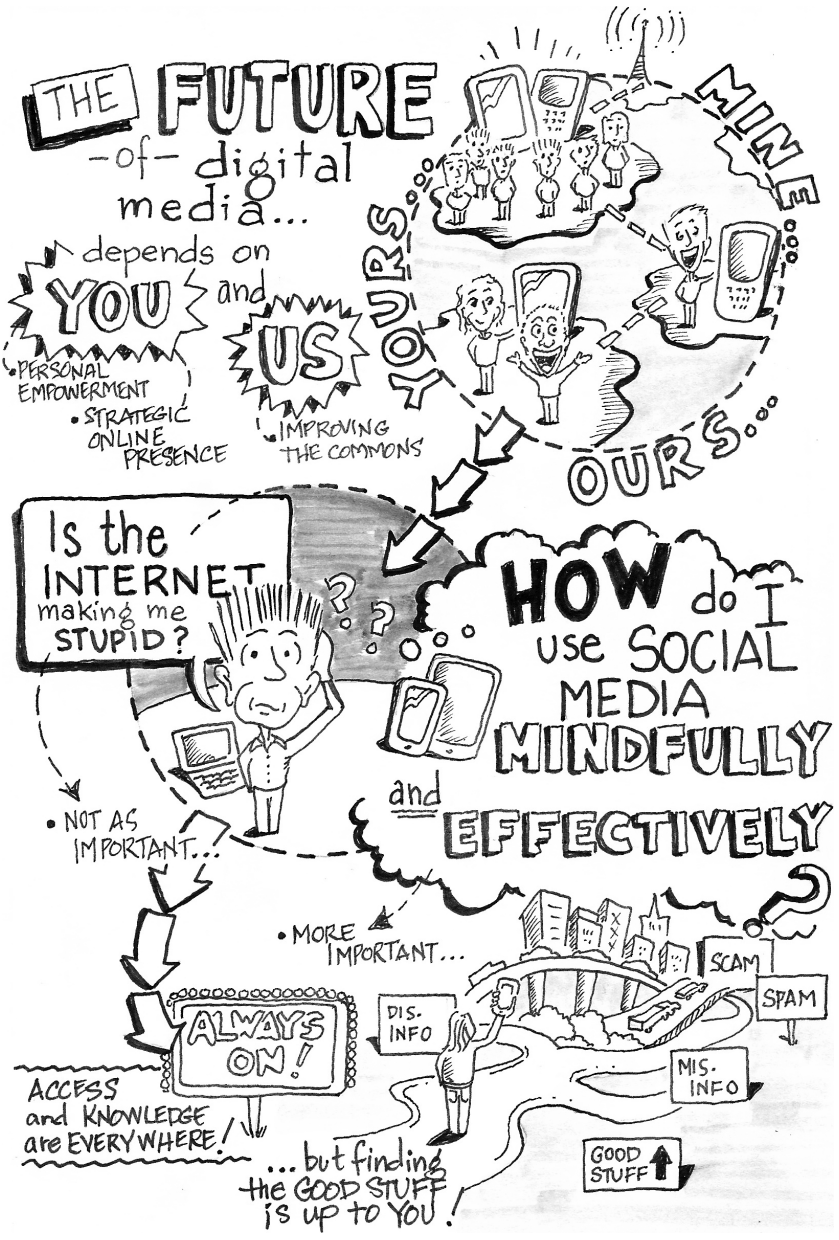
I want to introduce you to new know-how (and how to know in new ways) by sharing what I've learned about five literacies that are in the process of changing our world: attention, participation, collaboration, the critical consumption of information (aka "crap detection"), and network smarts. When enough people become proficient at these skills, then healthy new economies, politics, societies, and cultures can emerge. If these literacies do not spread through the population, we could end up drowning ourselves in torrents of misinformation, disinformation, advertising, spam, porn, noise, and trivia. Information overload only begins to describe the problem facing everyone with an email account. The free flows of information that digital technologies have made possible are enriching if used properly, but unhealthy for us as individuals, unproductive for businesses, and toxic for our societies if we don't know how to take them in (or selectively shut them out), evaluate and assimilate them, and contribute our own participation or collaboration—and perhaps most important, when and why to turn off the device, or tear ourselves away from it.

We need to handle the new flows of knowledge, media, and attention in a healthy, flexible, grounded manner, whether we are older and trying to cope with a world that has changed on us, or just starting out in an era in which the rules are still being written. The well-being of sixteen year olds, sixty year olds, start-up companies, and global corporations increasingly depends on the same know-how and how to know.

How Our Learning Journey Will Proceed

In the chapters that follow, I share specific advice about benefiting from and protecting yourself from today's always-and-everywhere media. I direct this advice to worried parents, anxious and enthused students, concerned teachers, curious managers, ambitious employees, thoughtful entrepreneurs, reflective online enthusiasts, puzzled policymakers, and technoskeptics who are just trying to cope. If you need to know what to tell your children about life online, need help surviving and thriving in your own online life, or are grappling with the changes that always-on media are bringing to your organization, I offer the following stories, advice, arguments, evidence, tools, and exercises for your use. I offer this book to people of any age who are willing to think for themselves about their part in digital culture.

I can't give you what you need, however, without some work on your part, precisely because you know better than I do about who you are and where you stand. I can only point out what I've learned and what others





have discovered, and leave it to you to make decisions according to your own values. Here, I strive for a balanced approach that is neither a technoutopian sales pitch nor a neo-Luddite moral panic; it is instead a pragmatic stance that takes into account the reality that the preferences and circumstances of each reader will differ.

As one of the earliest adopters of what I called “mind amplifiers” (in 1985)⁷ and the person who gave a name to “virtual communities” (in 1987),⁸ I have learned that the media I’ve been using with gusto for three decades also have their downsides. Although I’ve traveled across countries and disciplines to consult with a wide variety of media experts, much of what I convey here in terms of practical advice comes from my own experience. I’ve learned to be wary of trying to sell to others the generalizations about life online that I’ve found to be true through my own exploration—because one of the things I’ve learned about social media is that the same activity can be a lifeline for one person and a distracting compulsion to others. There is no single recipe for a mindful life in the digital mediasphere; reflection is required.

One tool that I do feel comfortable generalizing about is the importance of questioning my own communication practices—recognizing which media and mediated social activities I tend to avoid, which ones attract or distract me, and which lead and mislead me, and reflecting on *why* I react in these ways. I have found through years of trial and much error that the most enriching, least harmful way for me to live in my own computer-mediated world is to cultivate an occasional but ongoing inner inquiry into whether my own activity of the moment is really as significant as what is happening in the rest of my life at each moment. You can’t make microdecisions about how to deploy your attention in the moment unless you have made macrodecisions about how you want to spend your time. And while I’m asking questions, where is my body while my mind scurries through cyberspaces? It’s easy to ask oneself, What do I think I should be doing right now? Answering it usually takes work. The process of trying to address the question in your own context is the work of learning digital mindfulness.

Each of the five literacies I discuss is connected to and in many cases undergirds each other. It’s impossible to separate signal from noise without exercising attention, so mindfulness is a prerequisite to effective crap detection. Similarly, it’s difficult to instigate mass collaboration without network awareness, nor is it easy to participate online without also collaborating. Twitter is a recent example of a social medium that can be a waste of time or multiplier of effort for the person who uses it, depending on how knowledgeable the person is in the three related literacies of attentional

discipline, collaborative know-how, and net savvy. You need to know who to pay attention to when you “follow” other Twitter users, how to participate in the networks of trust and norms of reciprocity among Twitter users that make for social capital, and how to craft messages that others will propagate to their own networks. Attention is a literacy that can thread all the other literacies together and hence is fundamental to the others in several ways, so I’ll start there.

In the first chapter, I connect my own experience, the exercises recommended by others, and what I’ve learned about the underlying neuroscience of attention to the practical literacy of controlling attention. The learning journey here begins with an updated understanding of how attention works, why distraction and multitasking might or might not be the vehicle through which modern media are making us stupid as individuals and shallow as a culture, and then gets right into what to do about the dangers of distraction through examining mindfulness, ancient and modern. I’ll lay the foundations for discussions later in the book about the possibilities of the extended mind—the use of technology to go beyond remedies for attentional deficits to methods of enhancing intellectual performance. Most crucial for you and your power to wield the literacies introduced later, the first chapter will demonstrate how to begin to take control of your most important technological affordance—your attention.

In the second chapter, I’ll show how to use your attention and mine, individually and in concert, to filter out the noise and crap in order to concentrate on the tiny relevant portion of the moment-to-moment incoming tsunami of information. Intention added to attention, and mixed with knowledge of information-filtering tools, work together in a coordinated mind-machine process I call “infotention.” Critical thinking, information filtering, and Ernest Hemingway’s fundamental “internal crap detector” are all about how to use your attention to begin managing the inflow of media. Like the first chapter, my exploration of search and credibility skills as well as attitudes is about the meeting of mental capabilities with the technologies of keyboards, screens, and networks. Together, the first two internally focused chapters are about what my friend Cathy Davidson, educational technology pioneer, calls “your brain on the Internet.”⁹

Moving from the strictly individual mental aspects of life online to the coupling of individual personality with digital culture via social media, the third chapter is about the literacy of participation, or the know-how that empowers the best of bloggers and videobloggers, netizens, Twitterers, and online community participants—those who use digital media to express themselves, socialize, advocate, organize, educate, and grow collective

intelligence. Mirroring the inner-outer powers covered in other chapters, participation is about internal individual skills and strategies, and at the same time, the Webwide aggregation of participation—where the literacy of participation shades into the literacy of collaboration. A “participatory culture,” as media analysts Henry Jenkins and Mizuko Ito put it, is one in which the level of digital participation—from gaming to curating—creates a social setting in which citizens become active agents in cultural production.¹⁰ Conversely, if the level of participation literacy fails to maintain a certain (presently unknown) minimum, a social setting for media use in the future might hark back to the mediasphere of the broadcast age, in which a relatively small population of prosperous, empowered producers broadcast their versions of culture to a much larger, far more passive and less wealthy, less powerful population.

Chapter 4 moves from the personal and interpersonal to the cybersocial. The know-how at the core of this literacy is about the magic of several different flavors of collaboration made possible by networked media. The realms of collaboration are broad and deep, so this chapter offers both a high-altitude map of the territory of online collaboration and close-up conversations with the people who have created famously successful collaborative enterprises. Wikipedians, Flickr taggers, and social bookmarkers are contributing new knowledge in new ways by performing self-interested information practices within an architecture of participation that provides value to all. Virtual community organizers work at the border of media and interpersonal relationships, in a zone where technical knowledge will get you nowhere if you don’t understand online social norms—and can get you much that money can’t buy if you know how these emerging cybersocial forms work. As one of the earliest commentators on cybersociality, I can speak from experience about the benefits and pitfalls of mediated communities.

Collective activities and interpersonal capabilities that nobody dreamed possible have become part of everyday life for millions of people. In 1985, when I participated in an ad hoc online support group for a member of our virtual community whose son had a life-threatening disease, we did speculate that this kind of group might be used in the future by more than the early adopters of networked social communication. Until my “Virtual Communities” article in 1987, there really wasn’t a word or cultural category for strangers who lived in different places yet offered each other sympathy, medical advice, and even financial support.¹¹ Millions use services today such as Patientslikeme.com and mdjunction.com.¹²

Knowledge creation, political activism, and health support are far from the only ways people are working together with others they have not been able to work with before, in ways and places that were never before possible. Online collaboration may be evolving a third variety of economic production to supplement the market and firm, as scholars such as Harvard's Yochai Benkler contend: "Who could have predicted that volunteers, working with neither financial incentives as we know them or the management structure of the firm as we know it managed to co-create free, open source software that challenged Microsoft in both the operating system and web browser markets?"¹³ A coalition of volunteers who build and improve millions of articles in hundreds of languages as part of a free encyclopedia would have sounded preposterous even to enthusiasts when the Web first became widely known in the mid-1990s. Today, succeeding online—in business, personal life, and the public sphere—can entail knowing how to find, participate in, and grow your own virtual community.

"Collective intelligence" and "crowdsourcing" are other emergent terms to capture newfangled forms of collaboration. People who don't communicate directly as they do in virtual communities can nevertheless aggregate individual efforts to create useful public goods. By bookmarking and tagging Web sites that contain useful information, people are creating a kind of mass-curated knowledge that would have been impossible before the Web. The Library of Congress, lacking the funds to exhaustively describe its photographs of U.S. life, put them up on Flickr, where volunteers tagged millions of them—for no financial return.¹⁴ Future forecasters are beginning to use the voluntary, enthusiastic, communal efforts of online gamers to foresee and attempt to solve world-scale problems. New ways for people to collaborate are invented on an ad hoc basis every day. For example, when computer scientist Jim Gray went missing at sea, his friends obtained recent satellite images of that ocean region from NASA and Google; Microsoft and Amazon engineers divided the images into a half-million separate pictures; more than twelve thousand volunteers searched the photos. Gray was never found, but a new kind of crowdsourcing popped into public consciousness.¹⁵

Chapter 5 is about the multifaceted knowledge of networks that comes in handy so often today. Network savvy is exceptionally multidisciplinary. Becoming network aware has to include some basic knowledge gained by sociologists who have studied the way structural dynamics of networks influence how people relate via social networks; another bit of sociology, the famous "small-world network" that explains how every human being is connected to every other human, applies directly to online network

building. Now that more than half a billion people have their own Facebook pages and more than five billion carry mobile phones, sociologists have also been tracking a shift of central importance to digital citizens: the emerging phenomenon of “networked individualism.” Political scientists and sociologists alike have been the specialists who use the term “social capital” to describe the power of populations to get things done together outside formal laws and institutions, but now every knowledgeable Web user needs to understand how online behavior can grow or obstruct social capital. Small worlds, networked individuals, and social capitalists are all part of the emerging culture of digital publics. The politics and psychology of privacy—and why knowledge of privacy protection is critical in an era of transparency—is another case of an issue that small groups of specialists debated a decade ago, but now poses daily challenges for parents, students, and citizens. It’s hard to be much of anywhere in the twenty-first century and not recognize what University of Southern California professor Manuel Castells succinctly argues: that networks matter.¹⁶

The shapes of our connections and what we know about them are not only the subject matter of a developing new science of networks but also matter in the ways that technological networks amplify and extend human social networks. Technological architectures and the media practices of ordinary people suddenly matter very much in the personal realms of liberty, opportunity, and the possibility of justice.

By the end of chapter 5, you should have a set of mental and social tools to apply to your own advantage—and the benefit of others. You’ll have the knowledge to confront the bigger question of what social media mean cognitively and socially. The final chapter frames these practical literacies in relation to the broader issues of privacy, remix culture and copyright conflicts, and the role of today’s citizens in the digital public sphere. It also provides advice for parents and a bullet-point summary of our learning journey.

Attention! The Fundamental Literacy

Last month, I picked up my twenty-six-year-old daughter at work to take her dinner. Here is our conversation, verbatim:

Me: “Honey, is it necessary for you to spend our entire time together on your BlackBerry?”

She: “Daddy, if I don’t deal with today’s work emails before dinner, I’m going to fall behind.”

Me: “Welcome to my world. I think.”

That exchange started me pondering previously somewhat-separate issues that had been on my mind. On the day I met up with my daughter, my university students and I had been contending with the attention issues raised by their use of laptops in class. I can remember when “you’ve got mail” was, for most people, a cheery and inviting message. Now I was seeing how my daughter was already on a digital treadmill I know well, and I know that when I travel, I fear the hundreds of messages in my in-box when I return. At home, my wife frequently has to finish her online messaging before she turns away from her computer to greet me when I walk in the door. I know that I have been guilty of the same kind of social media delay in face-to-face sociability with the most important person in my life; I often have to finish my email, instant message, tweet, text, bookmark, tag, post, or comment before I greet my wife when she walks in the door. And long before our daily lives were colonized by pocket-size communication gadgets, I regularly wondered why my whole family jumped to answer a ringing telephone when we knew the caller would roll over into voice mail if we chose not to interrupt our dinner conversation.

These concerns are not unconnected, of course. And neither are they wholly new in a larger sense, although novel social media behavioral challenges seem to pop up every day. We’ve been reallocating our attention in response to new communication media for a long time.

Once I started looking for everyday behaviors where communication technology use affects attention, it didn’t take long to perceive the outlines of the large-scale shifts in attentional practices and norms that we all see happening around us in many ways. I understand my daughter’s fear of the overflowing email in-box, as do most white-collar adults in the industrialized world. I talk to my wife while she is texting (and vice versa). You don’t have to wear a white collar to have sent one of the trillions of text messages transmitted worldwide this year. My daughter had six instant messaging windows open while she chatted on the phone and worked on a school assignment (and I let her do it because she is an excellent student, so maybe I helped set the stage for her BlackBerry habit). I see how all eyes in my university classroom are not on me but rather on laptop screens. I started noticing myself at the same time I was observing the attentional behaviors of others; I began to think in new ways about how people deploy their attention when I started looking at the way my own thinking processes had changed since I turned my typewriter in for a personal computer (PC), and then plugged my PC into a modem and thus my first online network.

Although I originally started using digital tools in order to type more efficiently, I soon learned that the transition from electric typewriter to word

processor entailed more than just a change in office machinery. Not long after I began using computers and networks, I started writing about how it felt to use them. The ways in which our uses of social media affect our minds, relationships, and society have been the overarching theme of the books I've written for the past twenty-five years. I started to teach courses on social media five years ago because I recognized the importance of helping students examine their own psychological and social issues around digital media use. Teaching and learning with students in classrooms at Berkeley and Stanford brought me into direct contact with (and provided a living laboratory in) generational differences in attention patterns.

Probably the first advice I would give unequivocally, based on my own decades online, is that in a world where information is abundant and veracity is not guaranteed, while gatekeepers, authorities, and fact-checkers are scarce, each of us as individuals and all of us as a society have no choice but to learn how to think critically about what we pluck from the information flow, how much we are to believe what we find or are given, and whether we should even devote any mind share to it at all.

Although I hope to explain what is known about the cognitive effects of using digital networked media, including the research and controversy over multitasking, this is not a book on multitasking, pro or con, or how to manage your time better; there are plenty of those. Neither is this book going to deal with the issue of attention deficit disorder. Knowing when as well as when not to multitask is a key part of the digital literacy toolbox—and you don't need to have a disorder to be confused about how to react to rapid social and technological changes. If you aren't a little confused, maybe you aren't thinking deeply enough about the bigger picture. For the purpose of my inquiry into a broad range of literacies, concentrating too much on the important but not all-encompassing issue of multitasking risks missing larger issues about a broad range of attentional habits that are dying and aborning.

Most people in the world recognize, at some level, that a massive shift is taking place in the way we direct, fail to direct, fragment, or time-share our attention in conversations, classrooms, and while walking down the street. Many are uneasy about this transformation. Some, like Nicholas Carr in his article "Is Google Making Us Stupid?" and his book *The Shallows*, believe we are losing an essential ability to focus and dive deep.¹⁷ The sociotechnological questions Carr addresses may have been made possible by the digital devices a majority of the earth's population now carry, but the real changes driving this shift are occurring in human minds and between human beings, not in microchips. The way we communicate today is altering the

way people pay attention—which means we need to explore and understand how to train attention now, so that we, not our devices, control the shape of this alteration in the future.

It's not that multitasking is always bad (except when it is—like when you are driving a car), or continuous partial attention (such as surfing the Web while talking on the phone) is always rude and inefficient. It's that too few have learned and taught to others the skills we need to know if we are to master the use of our attention amid a myriad of choices designed to attract us. A significant part of the population has not yet learned to decide when it is appropriate to share multiple lines of attention and when single focal point is necessary (and I'm not just talking about etiquette here but rather about efficacy in business and personal lives), nor have many people studied how attention can be trained. Who can blame us? We've been busy trying to catch up with the way our uses of digital computers, worldwide webs, and mobile cameraphones have restructured our lives. (A 2010 survey found that one in six adults has physically bumped into someone or something while talking or texting on their mobile phone.)¹⁸

Fortunately, learning to gain control over attention is a skill that people have been perfecting for thousands of years, and it can start with something as simple as paying attention to your breathing. Eventually, twenty-first-century elaborations on older mind tools have to be learned, but the beginner in traditional meditation discipline and modern digital infotention training both start in the same place: elementary mindfulness exercise involving attention to the physical breath.

One of the most critical things to know about mindfulness training is that even the smallest amount of attention is immeasurably more useful than none at all. Step one in gaining control of attention is to simply notice it. Getting started in this kind of reflective thinking is the hardest part, and yet it's also easy to begin. After embarking on what should become at least occasional self-examination, it's time to turn the tool of attention control—however early you might be in your self-training—to the task of finding the information you need at the moment you need it, learning what you need to learn and forgetting what you don't need, and most important, learning how to filter out the bad info.

Calibrating Your Crap Detector: What You Pay Attention to After You Pay Attention to Attention

The answer to almost any question is available within seconds almost anywhere on earth, courtesy of the invention that has altered forever ancient

rules about how we discover, store, and classify knowledge: the search engine. People don't just use online search for homework or business intelligence. Search has penetrated to the quotidian details of daily life like finding a plumber or ordering a pizza. With location-aware devices, information is now available that takes into account where you are, what time it is, which direction you are pointing your device, and what your social network thinks about it. If you have a smart phone, you not only can find the nearest place to eat vegetarian cuisine but also find out what other people have to say about the food and service, get visual and vocal directions to your destination from where you are now standing, and view a photograph of what the block you seek looks like. When today's infants grow up, they will be amazed that their parents' generation could ever get lost, not be in touch with everyone they know at all times, and get answers out of the air for any question.

Materializing answers from the air just in time and just in place turns out to be the easy part—the part a machine (a really, really big machine like the Web) can do. The real difficulty kicks in when you click down into your search results. At that point, it's up to you, the human who is using the machine, to sort the accurate bits and the ones that have immediate relevance for you and your circumstances from the ignorantly or maliciously inaccurate information. While our public schools do a poor to fair job preparing students for life in the nineteenth and twentieth centuries, instruction in online search and credibility testing for our current milieu is not taught in most classrooms.

Unless a great many people learn the basics of online crap detection, and begin applying their critical faculties en masse and soon, I fear for the Internet's future as a useful source of credible news, medical advice, financial information, educational resources, and scholarly as well as scientific research. Some critics argue that a tsunami of hogwash has already rendered the Web useless. I disagree. We are indeed inundated by online noise pollution, but the problem is soluble. The good stuff is out there, if you know how to find and verify it. Basic information literacy, widely distributed, is the best protection for the knowledge commons; a sufficient portion of critical consumers among the online population can become a strong defense against the noise-death of the Internet.

The first thing we all need to know about information online is how to detect crap, by which I mean information tainted by ignorance, inept communication, or deliberate deception. Learning to be a critical consumer of Web info is not rocket science. It's not even algebra. Becoming acquainted with the fundamentals of Web credibility testing is easier than learning

the multiplication tables. The hard part, as always, is the exercise of flabby think-for-yourself muscles.

Learning how to make use of huge, unsorted, continually changing flows of information without becoming overwhelmed is partly an application of minimally trained attention skills to a simple question in relation to every assertion, factual claim, or opinion: How do I know I should trust this information as accurate? The specifics of examining the credibility of information effectively are as simple as looking for an author's name somewhere on the page in question and submitting it to a search engine, and as complicated as learning to use one's attention in conjunction with the variety of increasingly powerful automated filters that are becoming available. The specific combination of learned attentional skills and learned information technology know-how is an important new aspect of the digital literacy I call infotention.

In the second chapter I introduce an increasingly significant learning tool known as critical thinking that I certainly didn't invent but that has grown to be vitally essential in the many-to-many, anyone-can-publish era. I'll look at how people actually do assess the credibility of what they find online. I'll talk to experts in search and credibility, consider the utility of crowdsourcing your filters, and zoom way back to illustrate how the nature of knowledge, information gathering, and meaning making are changing.

When you're on your way to gaining control of your online attention and have begun to practice crap-detection skills, I turn from "this is your brain on the Internet" to "this is what the Internet enables people to do together." From the cognitive to the social, I'll shift our attention to the technology and sociality of participation and collaboration, focusing on the skills digital citizens need to master in order to take part in or instigate mass collaboration.

By sampling strategies and understanding the benefits of many different kinds of online collaboration, I hope to help you try on collaborative mindsets and ways of using the media freely available to you. Wiki thinking is one form of distributed cognition that has only become possible in recent years. Scholars who indulge in social bookmarking contribute hints about the skill sets ordinary digital citizens ought to have when seeking and trying to make sense of information. Tens of millions of online game players are having fun, and in the opinion of some well-respected business leaders, some of them are honing the collaborative talents essential in knowledge-based enterprises. Huge corporations are crowdsourcing design by asking their customers to help create the products they want. From each of these different milieus, I draw practical lessons regarding the social competencies

we need to benefit from the Web's architecture of participation. The following two chapters, on participation and collaboration, introduce the individual and group aspects of collaboration literacy.

What It Takes to Participate in Participatory Culture—and What You Get Out of It

If print culture shaped the environment from which the Enlightenment blossomed and set the scene for the Industrial Revolution, participatory media might similarly forge the cognitive and social environments in which twenty-first-century life will take place. Knowing that you have a printing press, broadcasting station, community hall, marketplace, school, and library of all knowledge in your pocket—and knowing how to use it for your own benefit—is what makes the difference between a consumer of electronic gadgets and an empowered citizen.

Participatory media include every online service that enables individuals to create as well as consume content online. Media as distinctly different as YouTube and World of Warcraft share three characteristics:

- Many-to-many media now make it possible for every person connected to the network to broadcast as well as receive text, images, audio, video, software, data, discussions, transactions, computations, tags, or links to and from every other person. The asymmetry between broadcaster and audience that was dictated by the structure of predigital technologies has changed radically.
- Participatory media are social media whose value and power derives from the active participation of many people. This value derives not just from the size of the audience but also from people's power to link to each other, to form a public as well as a market.
- Social networks, when amplified by information and communication networks, allow for broader, faster, and lower-cost coordination of activities.

People who make even the most modest contributions such as correcting a spelling error on Wikipedia or tagging a photo think of themselves differently from those people who only passively consume the cultural material broadcast by others. A participant is active. A consumer isn't practicing, even in a small way, the skill that is at the foundation of building social capital online—for contributions are often signals to others that it would benefit them to pay attention to and share with you.

The eager adoption of Web-based media by millions of young people around the world demonstrates the strength of their desire—unprompted

by adults—to learn digital production and communication skills. According to a 2005 survey by the Pew Internet and American Life Project, “The number of teenagers using the internet has grown 24% in the past four years and 87% of those between the ages of 12 and 17 are online.”¹⁹ This interest by U.S. (and Brazilian, British, Chinese, Indian, Japanese, Persian, etc.) youths in media production practices might well be a function of adolescents’ needs to explore their identities and experiment with social interaction—and can be seen as a healthy active response to the hypermediated environment they’ve grown up in.

Whatever else might be said of teenage (and any age) bloggers, dorm-room video producers, or the millions who maintain pages on social network services like Myspace, Facebook, and Google+, it cannot be asserted that they are passive media consumers. They seek, adopt, appropriate, and invent ways to participate in cultural production. Another recent Pew study found that more than 50 percent of today’s teenagers have created as well as consumed digital media.²⁰ This introductory chapter, then, is for those avid young digital media makers (and their parents and teachers) as well as older Web surfers who want to know how to dive deeper (or at least less shallowly) into what the Web has to offer. I do this in the knowledge that addressing the needs of those who are not able to participate in cultural production—the other half of the digital divide—is still an important task. Although significant barriers remain in regard to economically marginal youth and adults, the knowledge and advice in this chapter is geared toward the educational needs and opportunities of the hundreds of millions of people around the world, of many nationalities and socioeconomic levels as well as all ages, who have access to digital media and networks.

Senator Trent Lott lost his position as majority leader of the U.S. Senate, George Allen lost his election to the Senate, and CBS news anchor Dan Rather was forced to retire, all because of the way informed participants used email, blogs, and other participatory media to organize.²¹ Participation is power, and any of the more than two billion people who have Internet accounts can learn to wield that power. This chapter looks at how and why to be an active, informed participant in digital culture, and sets you up for the next interconnected literacy—the art of online collaboration.

Clueing in to Collaboration: Making Virtual Communities, Collective Intelligence, and Knowledge Networks Work for You (and Us)

If I had to reduce the essence of *Homo sapiens* to one sentence, I’d propose: “People create new ways to communicate, then use their new media to do

complicated things together.” *Why* we act in concert is the big question. People do things together for a rich mixture of reasons, and Web-based collaboration tools are particularly important in this regard, because wikis and bulletin board systems (BBSs) enable people to collaborate in ways that challenge basic assumptions underlying modern economic theory and contradict older stereotypes regarding human motivations to cooperate.²² The current story that most people tell each other about how humans get things done focuses on the well-known flavors of self-interest that make for great drama—competitive struggles for survival, power, wealth, sex, or glory. I see the outlines of a new narrative emerging, however, in which competition is still central, but its place on our mental map shrinks a little to make room for new knowledge about cooperative arrangements and complex interdependencies.

Starting with the Web’s invention (which its creator refused to patent and insisted on giving to the public domain), and continuing with efforts such as the South-East Asia Earthquake and Tsunami Blog, some significant online social behavior suggests that in addition to financial compensation and other forms of naked self-interest, people do things together for fun, mutual enrichment, the love of a challenge, out of compassion, and because we sometimes enjoy working with others to make something beneficial to everybody.²³ This chapter explains how the Web’s architecture of participation makes new forms of collective action possible, asks some of the superstars of mass collaboration how they work their magic, and lays out what I’ve learned from twenty five years of participation in as well as observation of the online activities now called “social media.”

The power of sociality stems from human not technological attributes, but tools are created in order to leverage human attributes; any tool that can help humans overcome barriers to cooperation works because it augments an essentially human skill such as persuasion, education, or collaboration. Online social networks can be powerful amplifiers of collective action precisely because of the specific ways they extend the power of human sociality. This augmentation is often but not always healthy. Any tool that expands human capabilities also makes it possible for some of our nastiest predilections to operate on new scales as well. To be sure, gossip, conflict, slander, fraud, greed, and bigotry are part of human sociality, whether it takes place at the village well or in a virtual world, and those parts of human behavior can be amplified too. But altruism, fun, community, collective action, and curiosity are also parts of human sociality—and I propose that the Web is an existence proof that these capabilities can

be artificially extended. Indeed, I agree with those who contend that our species' social inventiveness is central to being human.

The parts of the human brain that evolved most recently, and are connected to what we consider to be our “higher” faculties of reason and forethought, are also essential to social life. This is no accident; it appears that human brains and human social behavior shaped each other's evolution. The neural information-processing required for recognizing people, remembering their reputations, and learning the rituals that remove boundaries of mistrust and bind groups together, from bands to communities to civilizations, may have been enabled by (and driven the rapid evolution of) the brain structure unique to mammals—the neocortex.²⁴ Humans in particular appear to have evolved brains that are optimized for social activity. Is it any wonder that we're now designing social technologies?

Our immediate primate ancestors left the relative safety of the forest to compete with megapredators and saber-toothed everything on the open savanna. *Homo erectus* couldn't run fast, fly, or emit a stream of stinky fluid. They didn't have claws, fangs, or armor. But a couple hundred thousand years ago, these creatures started to outsmart the merely instinctive pack animals by improving their ways of doing things in groups. They coordinated defense and food gathering, and those who were better at participating in or organizing this coordination—probably by learning some new code like spoken language—passed along more of their genes. *Homo sapiens* evolved to favor, along with the good looking and strong, the most able communicators, and those who could coordinate or at least abide by cooperative efforts. It pays to keep in mind the biological and historical roots of the human drive to cooperate—and how we've always invented ways to overcome hurdles to cooperation—when studying the modern arts of mass collaboration.

Collective knowledge gathering was one of the capabilities that most excited me when I first wrote about virtual communities in 1987: “If, in my wanderings through information space, I come across items that don't interest me but which I know one of my group of online friends appreciate, I send the appropriate friend a pointer to the key datum or discussion.”²⁵ Now, entire communities exist for the purposes of knowledge sharing and organization, from social bookmarking services such as Diigo.com and Delicious.com, to question-answering forums such as Quora (which calls itself “a continually improving collection of questions and answers created, edited, and organized by everyone who uses it”) and Formspring.²⁶ When I recall the days I used an acoustic modem at 110 bits per second to download glorified library catalog entries, the notion of free search engines,

free collaboration tools, and voluntary knowledge-building collectives still seems as science-fictional magical as the hyperspace drive in movies and television shows. They are now indispensable everyday tools for billions of people. Those who know how it's done, as always, gain an edge.

Meet Jane McGonigal, for one, who creates massive multiplayer “alternate reality games” that take place in the physical world as well as cyberspace, involve thousands of people worldwide, and tackle real global-scale problems through playful collective intelligence. Or Wikipedia cofounder Jimmy Wales, who spends most of his time traveling to the physical hubs of Wikipedia communities, getting to know the people who have used an ultrasimple online tool to create a free encyclopedia with millions of entries. Every programmer also knows about Linus Torvalds, who sparked the effort globally to create free and open-source software. Tim Berners-Lee didn't ask permission of any central authority, nor did he require any technology provider to rewire the Internet, when he passed around the code for hyperlinks and Web servers that led to the explosive growth of the World Wide Web—just as Ken Thompson freely spread the UNIX operating system that made the Internet possible by sending out the code (then in the form of big reels of magnetic tape) with the appended note, “Love, Ken.”²⁷ Douglas Engelbart envisioned, invented, and persuaded others to invent what we know as the PC, multimedia, and hypertext because he felt it was his duty to improve people's power to cooperate.²⁸

All these superheroes of cybercollaboration knew a few simple things that the rest of us can benefit from learning about, such as how to:

- Create a variety of ways to contribute and give volunteers attractive roles
- Enable self-election where people choose what it is they want to work on
- Give participants platforms to work on together for mutual interest
- Acknowledge contributors
- Make decision making transparent (if not necessarily democratic)

In the chapters to come, I'll share these and other examples of collaboration lore that I've picked up from these virtuosos.

It's possible to master the art of controlling attention while you sit alone in a room, but it isn't possible to participate, collaborate, or crap detect without taking advantage of both social and technological networks. Understanding how networks work is one of the key survival skills of the twenty-first century. The next chapter pulls together network science, sociology, practical Facebooking, and the art of online self-presentation to provide both a framework for thinking about and tools for acting effectively in a networked world.

What You Need to Know about Network Smarts—from Small Worlds to Privacy Settings, from Weak Ties to Social Capital

New knowledge about the nature of networks is essential for getting around in this century because digital data and human communication networks erase barriers and multiply possibilities for one of our most powerful capabilities; our sociality. The science of networks emerged in the 1990s when large amounts of data about all kinds of phenomena, together with computer tools to make sense of this information, enabled scientists of different stripes to recognize common characteristics of networks that shape societies, ecosystems, languages, or online social media. This chapter flies over the wildly interdisciplinary landscape of network studies, zooming in on those features that can inform the behavior of digital citizens.

Some of the new knowledge comes from sociologists who were looking at social networks before the Internet was created. The idea of “six degrees of separation,” for example, was popularized through a widely reported sociology experiment by Stanley Milgram that used paper letters in the U.S. mail to demonstrate how each human being is connected to every other human being by a surprisingly small number of steps.²⁹ Decades later, physicists and sociologists noted that small-world networks manifest in widely separated disciplines. The networks of relations in ecosystems, the relationships between words in a language, and the human networks that people create together wherever they congregate all exhibit similar structural characteristics.³⁰ More recently, social network analysts have presented evidence for “contagion” in social networks: we appear to be influenced by the behavior of people we don’t know directly, but who know someone we do know directly.³¹

Electronic engineers and computer scientists have made major contributions: Sarnoff’s, Metcalfe’s, and Reed’s laws of networks explain the extraordinarily rapid rise in value of business enterprises such as eBay and Facebook—and point to entrepreneurial opportunities for anyone who can come up with a new platform for human group formation.³² When you learn how to look at them, you’ll see how discoveries emerging from this new interdisciplinary science point to real-world knowledge that can be useful to mindful digital citizens.

Manuel Castells, a scholar who studies social aspects of networked media worldwide, argues that networks matter now because new technical networks dramatically multiply the power of age-old human cultural tools of sociality, politics, and economics.³³ Castells’s insight is worthy of close

attention because one key to the successful use of online social networks lies in understanding how online capabilities can be used to enhance social behavior. The shapes of our interpersonal connections matter, Castells maintains, because of the ways technological networks enable the human social networks that enmesh each and every one of us to work more rapidly, in more settings, across more boundaries, than ever before. When you read about the irate airline passenger who organized a protest on Facebook and prompted Congress to consider a “passenger’s bill of rights,” or the Iranian government using the Internet to track down and arrest protesters, you are hearing about how the politics of networks affects the lives of ordinary people.³⁴ Technological architectures and people’s networked media practices suddenly matter very much in the personal realms of liberty, opportunity, and the possibility of justice.

I didn’t let my child loose on the streets without teaching her about traffic and looking both ways. Similarly, I don’t like to see otherwise well-educated people loose in digital culture without knowing something about what makes a small-world network work or why a portfolio of weak ties is important. Networks particularly affect privacy and reputation—the places where our private lives intersect or collide with public knowledge, whether or not we know what to do about it. In previous eras, it may have been true that “it’s not what you know but who you know.” Today, *how you know who you know* matters as much as who you know, and one of the most valuable traits a person could have in a twenty-first-century organization is a knack for knowing “who knows who knows what.”

Net smarts are not just vital to getting ahead; you need this knowledge to keep from falling behind. This caveat may well be an argument that our use of technology has grown way beyond our control, but it seems to be a fact of life whether or not we particularly like the idea. And whether or not we do anything about it, the webbed world is full of information about us that is provided by other people, including their opinions about us—the fact of life we know as reputation. To an individual, reputation is a powerful influence on how well one gets on in life, and it’s not wholly controllable by the person it impacts. Human sociality has always been thus; indeed, some social scientists suspect that gossip may have been involved in the transition from primate social grooming to human language.³⁵ Now, however, instead of whispering at the watering hole or scrawling your name on a bathroom wall, reputation assassins can leave indelible and searchable smears on the Web. It turns out that digital networks can also amplify some of human beings’ less laudable social behaviors. The art of “presentation of self” becomes all-important when you are trying to wrest control of your

reputation from others. As Microsoft Research digital anthropologist danah boyd put it in a conversation with me: “Today people need to frame their own stories, creating a positive living presence on the Web” as the most effective way to put a positive spin on what search engines turn up around your name.³⁶

To groups, social capital is the name for the social agreements and communication networks that allow people to get things done together informally, without state or strictly economic institutions. Social scientists such as Harvard University professor Robert Putnam claim that social capital—the mesh of traditional agreements that enable cooperation, and the networks that carry reputation information and thus lubricate transactions—is a key factor that influences the way one society thrives and another struggles.³⁷ Now that new kinds of human networks emerge online around mutual interests as well as the traditional community catalysts of physical proximity or sectarian allegiances, and social activities are mediated through Facebook, Twitter, YouTube, and Flickr, new ways to cultivate social capital become available. Ask the people who raised \$250,000 from Twitter users in two weeks in 2009 to sponsor clean-water projects in impoverished villages.³⁸

Network knowledge derives from a variety of disciplines that had previously not been connected (digital networks and human social behavior), and the skills based on this knowledge include a wide variety of situations. I’ll restrict my focus here to knowledge, wherever it is derived, that can be applied directly to mindful life online today. When you grasp the basics of social network analysis, you’ll know that growing a diverse personal learning network (PLN, as the enthusiasts call it) often is more useful than having a large, homogeneous social network. If you know how others seek to use your digital footprint to market or track, you have the power to protect your privacy and reputation. If you work in an organization, knowledge of the power of “structural holes” that connect networks can help you position yourself as a profitable conduit for good ideas.

None of this knowledge is especially difficult to understand or put into practice. It’s just that until now, those of us who want to use network smarts to thrive in digital culture without losing our humanity have had to put the puzzle pieces of theory, practice, and lore together for ourselves. This book is an early attempt to bring these connected but disparate pieces of knowledge together, and surely (I hope) won’t be the last. In the future, basic network literacy ought to be a part of school curriculum.

When I started thinking about the relationship between my personal networked media practices and my own thinking and attention, I realized

that I've been thinking about thinking tools—how they work, what they mean, and how do I get my hands on them—for decades now. Understanding how present-day PCs and networked media originated in the mid-twentieth century establishes a good foundation for twenty-first-century skills; besides, it's a fascinating story. The tools I used to write this book, and possibly the medium by which you heard about it, grew out of the dreams of people who specifically wanted to use computers to “augment human intellect” and link personal mind amplifiers into an “intergalactic network.”³⁹ These dreamers weren't in the mainstream of the computer industry or computer science. They were people who wanted digital thinking tools for their own use as well as the common good, and set out to create them, even though conventional wisdom held that digital computers were for scientific calculation and business data processing—payrolls and the like.⁴⁰ My own career as a writer and teacher was powerfully affected by encounters with some of the people who created the first PC and computer-mediated communication network.

Before I ask you to take my word about what I've learned, I think you'll benefit from hearing how I learned what I propose to teach you.

Dreaming of Mind Amplifiers: A Personal Journey

By the time the first PCs came along, I had been spending my days facing a typewriter and blank page for nearly a decade. I knew little about computers, but I was always interested in the future of media. And it didn't seem too far-fetched to think about using electronics within my lifetime for what Peter Drucker later called “knowledge work.”⁴¹

Since the 1970s, I had been intrigued by the idea that computers—most of which were still programmed through punched paper cards—could be accessed through telephones. What if I could go back to the library multiple times a day, I mused, by plugging my telephone into the library's computerized database—a feat that wasn't possible for me then? I had been tracking the “videotext” experiments that big publishers along with broadcasters like Knight-Ridder and Warner were experimenting with: a soon-to-come way of delivering customized information to people in their homes by using telephones as input devices and televisions as output devices. The whole system was centrally controlled, with users punching buttons on their telephone keypads in order to navigate through menus of preprepared information. Billions of dollars were spent on videotext experiments, but none of them included ways for the medium's users to communicate with—much less create content for—each other.

There was a sense of something in the air when the microprocessor was invented in 1971, but the acceleration rate of the cultural change to come wasn't visible yet to nonengineers like me. The first home computer kit, the fabled Altair, wouldn't be available until 1975 (inspiring Bill Gates to drop out of Harvard to write software for it). It's hard to convey to people who didn't live through it how impossible the first decades of the PC would have seemed if a time traveler had tried to tell us what was ahead. Ordinary humans did not take front-page news photographs with phones they carried in their pockets, or make their own brand of electronic entertainment and send it out on their own accord to people all over the world. That's what big newspapers and television networks, book publishers, and record labels were for.

In 1974, I came across Ted Nelson's self-published book *Computer Lib*, a talismanic object for the *Whole Earth Catalog* predecessors of cyberculture; like the *Whole Earth Catalog*, which had been published six years prior, in 1968, *Computer Lib* was oversized, full of illustrations, sidebars, and non-linear text, and looked like it was pasted together on a kitchen table.⁴² Nelson foresaw a future of personal empowerment as soon as everybody could afford to own a microcomputer; he also envisioned a vast network of documents and media, all connected with hyperlinks. I didn't interview Nelson until a decade after I stumbled on his book, when the revolution he foretold was well under way. That's the aspect of exponential growth that can sneak up on you—progress in the 1980s was much faster than the development of personal computing in the 1970s, and by the late 1990s, computing devices in toys were becoming literally billions of times more powerful than the Department of Defense behemoths of the 1960s.

In 1974, a company called the New York Information Bank also appeared on my radar (which in those days consisted mostly of trips to the library and telephone calls to sources).⁴³ I went to the Information Bank's office—a two-room suite in one of the first high-rise apartment-office buildings in San Francisco. I wasn't one of the institutional customers the company was seeking, but the man who ran the office found my enthusiasm convincing. He directed me to a desk, where I was able to place one of those big Ma Bell landline handsets that could be used as a hammer if necessary into a rubber coupling device atop a large box full of, presumably, electronics. My modem sent a coded series of beeps and boops to a computer in New York that was listening on a long-distance phone line, and that responded with the characteristic shrieks, static, and electronic whooping noises that old-time modem users will recall. What I gained for all that work was access to a slightly amplified card catalog. I could find article references and their

summaries. The speed of data transmission was around 110 bits per second, so downloading even a relatively short ten- or twenty-page article took long enough for me to go out for coffee while I was waiting. But I was able to print out references on whatever topic I was pursuing at that time as a freelance writer, and then bring the printout with me to the library. I felt like a man from tomorrow when I thumbed the paper card catalog at the public library, printout in hand.

In the late 1970s, two small companies—Apple and Microsoft—and their new category—PCs—began to attract press attention, along with scores of enterprises that few remember (I recall wondering whether to get the Apple II or Exidy Sorcerer, for example). I went to one of the first PC conferences, the legendary Computer Faire, convened in San Francisco’s Civic Center by founder Jim Warren, who rode around the vast convention hall floor on roller skates, weaving through the hundreds of nerds (before the word was vaguely complimentary). I understood little of what was going on, and was not that strongly attracted to it. There wasn’t much you could do with the first PCs except play games and program in the BASIC language—Gates’s first product. But I picked up a flyer about using PCs to write with, and that *did* attract my interest.

In the mid-1970s I was using the state-of-the-art correcting electric typewriter. By pushing the right button, I could make my typewriter magically type backward over the last line I had entered with a white ribbon that overwrote my previous typing. The notion that I could move my cursor around and manipulate entire blocks of text was extremely appealing in a brute-force labor way. At that time, I typed out a page of draft, corrected it with pen, and sometimes physically cut and retaped different parts of the page. Then I had to retype the page. To me, not retyping a page was enough in itself to pursue my investigation of the flyer I had picked up. I was far too unschooled to understand much of what I read in the enthusiasts’ publications, and nobody else was interested in paying me to do a story on using PCs to write with. Yet I drove from my home in San Francisco to Cupertino, about forty-five minutes away, to talk with a fellow named Jef Raskin, an employee of an Apple Computer Company, which was still small enough to occupy two buildings. Raskin later initiated the project that became the first consumer PC with a point-and-click interface: the Macintosh.

Indeed, Raskin had written his own program for using one of Apple’s first PCs as what I learned to call a “text editor.” Computer programmers knew about screen-based text editors because that was what they used in the post-punch-card days to edit programs on television-like screens before

submitting them to the computer. Unfortunately, as Raskin told me, the visionary founders of Apple were convinced that their users would mostly use the machine to play games and program in BASIC. So the hardware only supported uppercase letters.

Toward the end of 1977, one of the magazines I scanned (in the old-fashioned sense) at the public library, *Scientific American*, published an article by Alan Kay titled “Microelectronics and the Personal Computer.” When I came across the article a couple years after it was published, the first paragraphs of Kay’s piece jumped out at me. As Kay famously noted, “The best way to predict the future is to invent it,” which apparently he and his colleagues were doing at a facility within an hour’s drive of my office.⁴⁴

The article included photographs of a place where people actually moved paragraphs around by pointing to them on a screen, using a device called a mouse. The Xerox Palo Alto Research Center (PARC), designed in a style I later characterized as “Aztec modern,” seemed like Wonderland, Atlantis, and Shangri-la rolled into one. Kay zoomed me back to a much-larger vision than the current popular fascination with the boy wonders and their jillion dollar start-ups—a vision of personal digital media as tools for powerful new means of creating, communicating, teaching, and learning. “The future increase in capacity and decrease in cost of microelectronic devices will not only give rise to compact and powerful hardware but also bring qualitative changes in the way human beings and computers interact,” Kay observed. “In the 1980’s both adults and children will be able to have as a personal possession a computer about the size of a large notebook with the power to handle virtually all their information-related needs.”⁴⁵

Although I had been unaware of it, Kay and others had been working on a highly visual, networked PC system since the early 1970s. By that time I was juggling jobs as a freelance writer. Before I got my hands on a point-and-click computer, one of my freelance jobs was as a part-time staff writer at the Institute of Noetic Sciences, a think tank devoted to the study of consciousness. It was at IONS, as we called it, that I started using a primitive screen-based PC program known as Wordstar. I initiated a campaign to land a writing job at PARC. I found the telephone number of PARC’s public affairs director. She has since passed away, but I kept in touch with her for years because she gave me an important break. I called her every Friday and asked if she had any freelance writing work. On the third or fourth Friday, she said that they needed someone to work all weekend on scripting a slide show for a new product demonstration. After that, she started hiring me to help their wizards compose something about the technologies they were too busy inventing to write about.

It didn't take me long to find my way to Bob Taylor, who was then still the director of PARC's Computer Systems Laboratory, where the legendary Alto (acknowledged to be the first PC), the Ethernet network, and the laser printer had all been invented, and the graphical user interface was developed, extending Engelbart's ideas. I drove for forty minutes each way from my home in San Francisco to PARC in order to use an Alto to write as well as talk with people like Taylor. And they paid me for it. It was heaven.

Taylor had been a twenty-six-year-old research director at the Department of Defense's Advanced Research Project Agency (ARPA) in the 1960s, when interactive computing (meaning a programmer could enter commands and receive output from computers without submitting decks of punched cards to operators), computer graphics (an outgrowth of the air defense system), and Engelbart's Augmentation Research Center were just getting off the ground. In the Vietnam War era, when Congress forced ARPA to crack down on research that wasn't directly related to weaponry, Taylor recruited all the young talent he had previously funded for ARPA to join a new research laboratory that Xerox Corporation was starting in California. C. Peter McColough, the visionary Xerox CEO at that time, bankrolled a research center that would turn his company from a copier manufacturer to "the architect of information" for the office; infamously, the company wasn't able to seize the advantage from the market it had invented before Apple and Microsoft stole its thunder.⁴⁶

By 1984, when the Macintosh launched, Taylor was tired of hearing about Steve Jobs and Gates. Apple and Microsoft had created toys compared to the handcrafted workstations at PARC, and the expensive office versions Xerox was trying and failing to sell. Taylor wanted to talk about even more interesting people than the teenage millionaires in the news—people who weren't featured in national magazines but who had made PCs possible, such as Engelbart. At Taylor's suggestion, I read Engelbart's 1962 paper "Augmenting Human Intellect," and was electrified by it.⁴⁷ In this paper, twenty years old by the time I read it, Engelbart detailed exactly how and why a computer could be used as a mind amplifier. More excitingly, Taylor told me that Engelbart had built his dream machine—Taylor had funded it when he was at ARPA—and was still actively developing his original vision. I made a pilgrimage to Engelbart's Augmentation Research Center, which had been sold by Stanford Research Institute after ARPA monies dried up, to Tymshare, a company that no longer exists. Engelbart's office was ironically in a building surrounded by the growing Apple campus. I drove down to interview him—an encounter that changed my life.

Engelbart couldn't help trying to recruit others to assist him realizing the idea that came into his head in the 1950s as he drove to work in the fruit orchards that were to become Silicon Valley. Making it happen turned out to be more difficult than he had imagined. After a decade of trying to convince computer scientists and the computer industry that their technology could amplify human cognitive abilities, Engelbart wrote his paper because he realized that nobody even had a conceptual framework or mental model of computers that would enable them to see their potential. He certainly succeeded in convincing me of his vision, just as he had previously attracted engineers to build his first prototypes and had changed the way computer designers thought about what they were doing when he pulled off the famous "mother of all demos" in 1968: at an assembly gathering most of the computer designers in the world, he showed off the point-and-click hypermedia system his Augmentation Research Center had developed.⁴⁸ I remember driving home from my first meeting with Engelbart, all fired up to write about someone who had offered an idea that was changing the world, and had done so out of a conviction that he had a duty to use his knowledge to facilitate ways for people to work together to solve the world's ever more complex problems.

One aspect of Engelbart's vision, though, hasn't quite yet come to pass in the way that his first prototypes of graphical user interfaces, hypertext, multimedia, and online knowledge communities have developed into global media in his lifetime. In his original paper, Engelbart described a system of "humans using language, artifacts, methodology, and training."⁴⁹ I recall Engelbart remarking to me on several occasions recently that the artifacts' development had far outstripped the cognitive and social aspects of an augmentation system as he saw it—the language, methodology, and training had not spread through the population the way home computers with mice, icons, and hyperlinked networks had caught on. The books I have written since I met Engelbart, culminating in this one, have attempted, in my own humble way, to help remedy that deficit.

Reading Kay, and meeting Taylor and Engelbart, led me to write a book about "the history and future of mind-amplifying technology," as my *Tools for Thought* was subtitled. In the process of researching that book, I bought a twelve hundred bit-per-second modem (today's broadband speeds are millions of times faster) for five hundred dollars in 1983, started exploring amateur computer BBSs, and joined the Whole Earth 'Lectronic Link (WELL) when it was a few months old, in summer 1985. Two years later, I wrote my article on virtual communities for *Whole Earth Review* that apparently put the term into the public vocabulary, as noted earlier.⁵⁰

I started writing about my life online in part because the small subculture of enthusiasts for computer-mediated communication that existed in 1985 was certain that what we were doing would become important in the future, and in part to justify to my wife all the fun I was having hanging out online. I admit that I was and remain an enthusiast for social media of all kinds. I maintain and participate to this day in blogs, vlogs, wikis, social network services, and BBSs. My outlook, however, has grown more critical over the years. The online culture has changed. I've changed. And how I think about the significance of online socializing has changed. While still a devotee, I'm now aware and wary of the rat holes, hidden biases, unwholesome interchanges, and delusions of grandeur that can plague online culture. It is possible, I have long believed, to temper one's ardor with critical thinking, and that it is not healthy to have to choose only between being a complete supporter and a total skeptic. I want the reader to keep in mind that the advice I'm giving about how to participate productively in digital culture grows out of my enthusiastic, if not uncritical, use of these media.

I admit that I'm immersed. I understand that this immersion works for me in my particular situation, sitting in my garden as I tap out these words under the plum tree, in ways that it doesn't work for many others, and I believe that this rate of mediated communication should be regarded with a critical eye for multiple reasons. Yet compared to thirty years ago, in my typewriter and library stacks days, I guarantee you that as a thinker, writer, learner, and teacher, both my ability to know and communicate have been immensely empowered—from the self-correcting typewriter to the iPhone, from the local library to all the knowledge in the world floating in the air, from the card catalog to Google. Now, if I can only figure out how to stay off-line for a few weeks without having to deal with ten thousand messages, how to better detect texting drivers, or the best strategy for trying to teach thirty students while they surf the Web.

As laptop-carrying, smart-phone-using members of the digitally connected infosphere, we need to start by learning a new discipline: the literacy of attention. As citizens and cocreators of the cultures that shape us, we need participatory media skills. As collaborators in the collective intelligence that faces massive problems from global warming to water-sharing conflicts, we need to learn literacies of cooperation, mass collaboration, and collective action. As dwellers in the network society, we must understand and master the nature along with use of social networks, technical and human—and grasp the way both mediated and face-to-face social practices can increase or drain social capital. And in a world where nobody can trust the authority of any text they find online, the ability to quickly

evaluate the validity or bogosity of information is no longer an intellectual nicety. Critical thinking about media practices has become an essential, learnable mental skill.

My attention—the symbols, sounds, and images I personally experience—is the thread that weaves these dimensions into an integral whole. What use to me are fiber optics and network protocols without my attention as well as thought processes to make sense of all the bits flying around the networks? Attention connects the events that occur simultaneously in the mind, between people, and among technologies. Human thought processes are themselves no more than a part—a kind of focusing lens—of a system that includes neurons, symbols, search engines, social systems, and computational clouds.