Introduction

When human beings acquired language, we learned not just how to listen but how to speak. When we gained literacy, we learned not just how to read but how to write. And as we move into an increasingly digital reality, we must learn not just how to use programs but how to *make* them.

In the emerging, highly programmed landscape ahead, you will either create the software or you will be the software. It's really that simple: Program, or be programmed. Choose the former, and you gain access to the control panel of civilization.

Choose the latter, and it could be the last real choice you get to make.

For while digital technologies are in many ways a natural outgrowth of what went before, they are also markedly different. Computers and networks are more than mere tools: They are like living things, themselves. Unlike a rake, a pen, or even a jackhammer, a digital technology is programmed. This means it comes with instructions not just for its use, but also for itself. And as such technologies come to characterize the future of the way we live and work, the people programming them take on an increasingly important role in shaping our world and how it works. After that, it's the digital technologies themselves that will be shaping our world, both with and without our explicit cooperation.

That's why this moment matters. We are creating a blueprint together—a design for our collective future. The possibilities for social, economic, practical, artistic, and even spiritual progress are tremendous. Just as words gave people the ability to pass on knowledge for what we now call civilization, networked activity could soon offer us access to shared thinking—an extension of consciousness still inconceivable to most of us today. The operating principles of commerce and culture—from supply and demand to command and control—could conceivably give way to an entirely more engaged, connected, and collaborative mode of participation.

But so far, anyway, too many of us are finding our digital networks responding unpredictably or even opposed to our intentions.

Retailers migrate online only to find their prices undercut by automatic shopping aggregators. Culture creators seize interactive distribution channels only to grow incapable of finding people willing to pay for content they were happy to purchase before. Educators who looked forward to accessing the world's bounty of information for their lessons are faced with students who believe that finding an answer on Wikipedia is the satisfactory fulfillment of an inquiry. Parents who believed their kids would intuitively multitask their way to professional success are now concerned those same kids are losing the ability to focus on any one thing.

Political organizers who believed the Internet would consolidate their constituencies find that net petitions and self-referential blogging now serve as substitutes for action. Young people who saw in social networks a way to redefine themselves and their allegiances across formerly sacrosanct boundaries are now conforming to the logic of social networking profiles and finding themselves the victims of marketers and character assassination. Bankers who believed that digital entrepreneurship would revive a sagging industrial age economy are instead finding it impossible to generate new value through capital investment. A news media that saw in information networks new opportunities

for citizen journalism and responsive, twenty-four-hour news gathering has grown sensationalist, unprofitable, and devoid of useful facts.

Educated laypeople who saw in the net a new opportunity for amateur participation in previously cordoned-off sectors of media and society instead see the indiscriminate mashing and mixing up of pretty much everything, in an environment where the loud and lewd drown out anything that takes more than a few moments to understand. Social and community organizers who saw in social media a new, safe way for people to gather, voice their opinions, and effect bottom-up change are often recoiling at the way networked anonymity breeds mob behavior, merciless attack, and thoughtless responses.

A society that looked at the Internet as a path toward highly articulated connections and new methods of creating meaning is instead finding itself disconnected, denied deep thinking, and drained of enduring values.

It doesn't have to turn out this way. And it won't if we simply learn the biases of the technologies we are using and become conscious participants in the ways they are deployed.

Faced with a networked future that seems to favor the distracted over the focused, the automatic over the considered, and the contrary over the compassionate, it's time to press the pause button and ask what all this means to the future of our work, our lives, and even our species. And while the questions

may be similar in shape to those facing humans passing through other great technological shifts, they are even more significant this time around—and they can be more directly and purposely addressed.

The big, unrecognized news here is about a whole lot more than multitasking, pirated MP3s, or superfast computers at the investment houses shortcutting our stock trades. It is that thinking itself is no longer—at least no longer exclusively—a personal activity. It's something happening in a new, networked fashion. But the cybernetic organism, so far, is more like a cybernetic mob than new collective human brain. People are being reduced to externally configurable nervous systems, while computers are free to network and think in more advanced ways than we ever will.

The human response, if humanity is going to make this leap along with our networked machines, must be a wholesale reorganization of the way we operate our work, our schools, our lives, and ultimately our nervous systems in this new environment. "Interior life," such as it is, began in the Axial Age and was then only truly recognized as late as the Renaissance. It is a construction that has served its role in getting us this far, but must be loosened to include entirely new forms of collective and extra-human activity. This is uncomfortable for many, but the refusal to adopt a new style of engagement dooms us to a behavior and psychology that is increasingly vulnerable to the biases and agendas of

our networks—many of which we are utterly unaware we programmed into them in the first place.

Resistance is futile, but so is the abandonment of personal experience scaled to the individual human organism. We are not just a hive mind operating on a plane entirely divorced from individual experience. There is a place for humanity—for you and me—in the new cybernetic order.

The good news is we have undergone such profound shifts before. The bad news is that each time, we have failed to exploit them effectively.

In the long run, each media revolution offers people an entirely new perspective through which to relate to their world. Language led to shared learning, cumulative experience, and the possibility for progress. The alphabet led to accountability, abstract thinking, monotheism, and contractual law. The printing press and private reading led to a new experience of individuality, a personal relationship to God, the Protestant Reformation, human rights, and the Enlightenment. With the advent of a new medium, the status quo not only comes under scrutiny; it is revised and rewritten by those who have gained new access to the tools of its creation.

Unfortunately, such access is usually limited to small elite. The Axial Age invention of the twenty-two-letter alphabet did not lead to a society of literate Israelite readers, but a society of hearers, who would gather in the town square to listen to the Torah scroll read to them by a rabbi. Yes, it was

better than being ignorant slaves, but it was a result far short of the medium's real potential.

Likewise, the invention of the printing press in the Renaissance led not to a society of writers but one of readers; except for a few cases, access to the presses was reserved, by force, for the use of those already in power. Broadcast radio and television were really just extensions of the printing press: expensive, one-to-many media that promote the mass distribution of the stories and ideas of a small elite at the center. We don't make TV; we watch it.

Computers and networks finally offer us the ability to write. And we do write with them on our websites, blogs, and social networks. But the underlying capability of the computer era is actually programming—which almost none of us knows how to do. We simply use the programs that have been made for us, and enter our text in the appropriate box on the screen. We teach kids how to use software to write, but not how to write software. This means they have access to the capabilities given to them by others, but not the power to determine the value-creating capabilities of these technologies for themselves.

Like the participants of media revolutions before our own, we have embraced the new technologies and literacies of our age without actually learning how they work and work on us. And so we, too, remain one step behind the capability actually being offered us. Only an elite—sometimes a new

elite, but an elite nonetheless—gains the ability to fully exploit the new medium on offer. The rest learn to be satisfied with gaining the ability offered by the last new medium. The people hear while the rabbis read; the people read while those with access to the printing press write; today we write, while our techno-elite programs. As a result, most of society remains one full dimensional leap of awareness and capability behind the few who manage to monopolize access to the real power of any media age.

And this time, the stakes are actually even higher. Before, failing meant surrendering our agency to a new elite. In a digital age, failure could mean relinquishing our nascent collective agency to the machines themselves. The process appears to have already begun.

After all, who or what is really the focus of the digital revolution? Instead of marveling at a person or group who have gained the ability to communicate in a new way, we tend to marvel at the tools through which all this is happening. We don't celebrate the human stars of this medium, the way we marveled at the stars of radio, film, or television; we are mesmerized instead by the screens and touchpads themselves. Likewise, we aspire less to the connectivity enjoyed by our peers than to the simple possession of the shiny new touchpad devices in their laps. Instead of pursuing new abilities, we fetishize new toys.

Meanwhile, we tend to think less about how to integrate

new tools into our lives than about how simply to keep up. Businesses throw money at social networks because they think that's the way to market in a digital age. Newspapers go online less because they want to than because they think they have to—and with largely disastrous results. Likewise, elementary school boards adopt "laptop" curriculums less because they believe that they'll teach better than because they fear their students will miss out on something if they don't. We feel proud that we're willing to do or spend whatever it takes to use this stuff—with little regard to how it actually impacts our lives. Who has time to think about it, anyway?

As a result, instead of optimizing our machines for humanity—or even the benefit of some particular group—we are optimizing humans for machinery. And that's why the choices we make (or don't make) right now really do matter as much or more than they did for our ancestors contending with language, text, and printing.

The difference is in the nature of the capability on offer—namely, programming. We are not just extending human agency through a new linguistic or communications system. We are replicating the very function of cognition through external, extra-human mechanisms. These tools are not mere extensions of the will of some individual or group, but tools that have the ability to think and operate other components in the neural network—namely, us. If we want to participate

in this activity, we need to engage in a renaissance of human capacity nothing short of (actually more significant than) the assumption by the Israelites of a new human code of conduct capable of organizing what had been preliterate tribes into a full-fledged civilization. The Torah was not merely a by-product of text, but a code of ethics for dealing with the highly abstracted, text-based society that was to characterize the next two millennia.

Only this time, instead of an enduring myth to elevate these ideas to laws, we need to rely on a purpose and on values as real and powerful as the science and logic our machines are using in their own evolutionary ascent.

The strategies we have developed to cope with new mediating technologies in the past will no longer serve us—however similar in shape the computing revolution may appear to previous reckonings with future shock.

For instance, the unease pondering what it might mean to have some of our thinking done out of body by an external device is arguably just a computer-era version of the challenges to self-image or "proprioception" posed by industrial machinery. The industrial age challenged us to rethink the limits of the human body: Where does my body end and the tool begin? The digital age challenges us to rethink the limits of the human mind: What are the boundaries of my cognition? And while machines once replaced and usurped the value of human labor, computers and networks do more

than usurp the value of human thought. They not only copy our intellectual processes—our repeatable programs—but they also discourage our more complex processes—our higher order cognition, contemplation, innovation, and meaning making that should be the reward of "outsourcing" our arithmetic to silicon chips in the first place.

The way to get on top of all this, of course, would be to have some inkling of how these "thinking" devices and systems are programmed—or even to have some input into the way it is being done, and for what reasons.

Back in the earliest days of personal computing, we may not have understood how our calculators worked, but we understood exactly what they were doing for us: adding one number to another, finding a square root, and so on. With computers and networks, unlike our calculators, we don't even know what we are asking our machines to do, much less how they are going to go about doing it. Every Google search is—at least for most of us—a Hail Mary pass into the datasphere, requesting something from an opaque black box. How does it know what is relevant? How is it making its decisions? Why can't the corporation in charge tell us? And we have too little time to consider the consequences of not knowing everything we might like to about our machines. As our own obsolescence looms, we continue to accept new technologies into our lives with little or no understanding of how these devices work and work on us.

We do not know how to program our computers, nor do we care. We spend much more time and energy trying to figure out how to use them to program one another instead. And this is potentially a grave mistake.

As one who once extolled the virtues of the digital to the uninitiated, I can't help but look back and wonder if we adopted certain systems too rapidly and unthinkingly. Or even irreversibly. But those of us cheering for humanity also get unsettled a bit too easily, ourselves. We are drawn into obsessing over the disconnecting possibilities of technology, serving as little more than an equal and opposite force to those techno-libertarians celebrating the Darwinian wisdom of hive economics. Both extremes of thought and prediction are a symptom of thinking too little rather than too much about all this. They are artifacts of thinking machines that force digital, yes or no, true or false reconciliation of ideas and paradoxes that could formerly be sustained in a less deterministic fashion. Contemplation itself is devalued.

The sustained thought required now is the sort of real reflection that happens inside a human brain thinking alone or relating to others in small self-selecting groups, however elitist that may sound to the techno-mob. Freedom—even in a digital age—means freedom to choose how and with whom you do your reflection, and not everything needs to be posted for the entire world with "comments on" and "copyright off." In fact, it's the inability to draw these boundaries and distinctions—or

the political incorrectness of suggesting the possibility—that paints us into corners, and prevents meaningful, ongoing, open-ended discussion. And I believe it's this meaning we are most in danger of losing. No matter the breadth of its capabilities, the net will not bestow upon humans the fuel or space we need to wrestle with its implications and their meaning.

We are aware of the many problems engendered by the digital era. What is called for now is a human response to the evolution of these technologies all around us. We are living in a different world than the one we grew up in—one even more profoundly different than the world of the alphabet was from the oral society that existed for millennia before it. That changing society codified what was happening to it through the Torah and eventually the Talmud, preparing people to live in a textual age. Like they did, we need to codify the changes we are undergoing, and develop a new ethical, behavioral, and business template through which to guide us. Only this time it must actually work.

We are living through a real shift—one that has already crashed our economy twice, changed the way we educate and entertain ourselves, and altered the very fabric of human relationships. Yet, so far, we have very little understanding of what is happening to us and how to cope. Most of the smart folks who could help us are too busy consulting to corporations—teaching them how to maintain their faltering

monopolies in the face of the digital tsunami. Who has time to consider much else, and who is going to pay for it?

But it's a conversation that needs to be started now. So please accept this first effort at a "poetics" of digital media in the humble spirit in which it is offered: ten simple commands that might help us forge a path through the digital realm. Each command is based on one of the tendencies or "biases" of digital media, and suggests how to balance that bias with the needs of real people living and working in both physical and virtual spaces—sometimes at the very same time.

A bias is simply a leaning—a tendency to promote one set of behaviors over another. All media and all technologies have biases. It may be true that "guns don't kill people, people kill people"; but guns are a technology more biased to killing than, say, clock radios. Televisions are biased toward people sitting still in couches and watching. Automobiles are biased toward motion, individuality, and living in the suburbs. Oral culture is biased toward communicating in person, while written culture is biased toward communication that doesn't happen between people in the same time and place. Film photography and its expensive processes were biased toward scarcity, while digital photography is biased toward immediate and widespread distribution. Some cameras even upload photos to websites automatically, turning the click of the shutter into an act of global publishing.

To most of us, though, that "click" still feels the same,

even though the results are very different. We can't quite feel the biases shifting as we move from technology to technology, or task to task. Writing an email is not the same as writing a letter, and sending a message through a social networking service is not the same as writing an email. Each of the acts not only yields different results, but demands different mindsets and approaches from us. Just as we think and behave differently in different settings, we think and behave differently when operating different technology.

Only by understanding the biases of the media through which we engage with the world can we differentiate between what we intend, and what the machines we're using intend for us—whether they or their programmers even know it.