



GEEK HERESY

RESCUING SOCIAL CHANGE
FROM THE CULT OF TECHNOLOGY

KENTARO TOYAMA

"Toyama's research reminds us that there are few one-size-fits-all solutions. If technology is going to improve the lives of the world's poorest, it must be grounded in a deep understanding of human behavior and an appreciation for cultural differences."

**—BILL GATES, COFOUNDER OF MICROSOFT AND COCHAIR OF
THE BILL AND MELINDA GATES FOUNDATION**

"High-tech insider Kentaro Toyama's compulsively readable manifesto will change minds about all those technological quick-fixes for poverty. From previous claims for radio and TV to today's claims for broadband, he convincingly shows that technological solutions are neither so new nor so quick. Technology does not solve problems; people do, Toyama reminds us. He balances his refreshing skepticism about technological utopias with inspiring faith in the motivation and creativity of human beings."

**—WILLIAM EASTERLY,
PROFESSOR OF ECONOMICS, NEW YORK UNIVERSITY,
AND AUTHOR OF *THE TYRANNY OF EXPERTS***

"Read this book! With engaging stories and penetrating insight, Toyama reveals that even the most powerful technologies can't cure our social ills, and he inspires us toward a more deeply human kind of progress."

**—BEN MEZRICH, AUTHOR OF
*THE ACCIDENTAL BILLIONAIRES***



AFTER A DECADE designing technologies meant to address education, health, and global poverty, award-winning computer scientist Kentaro Toyama came to a difficult conclusion: Even in an age of amazing technology, social progress depends on human changes that gadgets can't deliver.

Computers in Bangalore are locked away in dusty cabinets because teachers don't know what to do with them. Mobile phone apps meant to spread hygiene practices in Africa fail to improve health. Executives in Silicon Valley evangelize novel technologies at work even as they send their children to Waldorf schools that ban electronics. And four decades of incredible innovation in America have done nothing to turn the tide of rising poverty and inequality. Why then do we keep hoping that technology will solve our greatest social ills?

In this incisive book, Toyama cures us of the manic rhetoric of digital utopians and reinvigorates us with a deeply people-centric view of social change. Contrasting the outlandish claims of tech zealots with stories of people like Patrick Awuah, a Microsoft millionaire who left his engineering job to open Ghana's first liberal arts university, and Tara Sreenivasa, a graduate of a remarkable South Indian school that takes impoverished children into the high-tech offices of Goldman Sachs and Mercedes-Benz, *Geek Heresy* is a heartwarming reminder that it's human wisdom, not machines, that move our world forward.



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CONTENTS

Introduction	ix
<i>Part 1</i>	
CHAPTER 1: No Laptop Left Behind <i>Conflicting Results in Educational Technology</i>	3
CHAPTER 2: The Law of Amplification <i>A Simple but Powerful Theory of Technology's Social Impact</i>	17
CHAPTER 3: Geek Myths Debunked <i>Dispelling Misguided Beliefs About Technology</i>	38
CHAPTER 4: Shrink-Wrapped Quick Fixes <i>Technology as an Exemplar of the Packaged Intervention</i>	57
CHAPTER 5: Technocratic Orthodoxy <i>The Pervasive Biases of Modern Do-Gooding</i>	74
<i>Part 2</i>	
CHAPTER 6: Amplifying People <i>The Importance of Heart, Mind, and Will</i>	103
CHAPTER 7: A Different Kind of Upgrade <i>Human Development Before Technology Development</i>	122
CHAPTER 8: Hierarchy of Aspirations <i>The Evolution of Intrinsic Motivation</i>	151
CHAPTER 9: "Gross National Wisdom" <i>Societal Development and Mass Intrinsic Growth</i>	172
CHAPTER 10: Nurturing Change <i>Mentorship as a Social-Cause Paradigm</i>	192
Conclusion	211
Acknowledgments	219
Appendix: Highlighted Nonprofits	223
Notes	225
References	279
Index	315

INTRODUCTION

“Talent is universal; opportunity is not.” That’s how Megan Smith, chief technology officer of the United States and former vice president of Google.org, began her opening remarks at the University of California, Berkeley, in the spring of 2011. She and I were on a panel titled “Digital Divide or Digital Bridge: Can Information Technology Alleviate Poverty?”¹ The event was held in South Hall, the campus’s oldest building but home to its youngest school – the School of Information – where scholars study the interaction between digital technology and human society. The hall was packed. The panel drew not only students and faculty, but also Bay Area impact investors, non-profit leaders, and social entrepreneurs.

Google.org’s motto at the time was “tech-driven philanthropy,” and Smith embraced it.² She implicitly agreed that talent was universal. But, she said, “opportunity is becoming more universal” as well. According to Smith, opportunity was expanding along with “the network,” by which she meant the Internet, mobile phone systems, and presumably the Google technologies riding on them.

That more people are becoming connected is a fact. By the end of 2014, there were nearly 3 billion people on the Internet. Sometime in 2015 the total number of mobile phone accounts will exceed the world population.³ Both figures continue to grow. Smith suggested that these technologies bring people together, trigger revolutions, and make “all world knowledge . . . available online for free.” If she is

right, everyone everywhere will soon have plenty of opportunity: Talent is universal, and opportunity is the Internet.

The world's leading technologists thoroughly agree, and they're competing to speed things up. In 2009, Sir Tim Berners-Lee, the inventor of the key protocols that drive the Internet, founded the World Wide Web Foundation to spread the Web as "a global public good and a basic right." Its tagline: "Connecting People. Empowering Humanity."⁴ A couple years later, Smith's colleagues at Google began working to deliver WiFi through solar-powered balloons. CEO Larry Page says, "Two out of three people in the world don't have good Internet access now. We actually think [balloon-delivered Internet] can really help people."⁵ Not to be outdone, Facebook founder Mark Zuckerberg announced Internet.org in 2013. "We've been working on ways to beam internet to people from the sky," he posted.⁶ He wants to reach remote places with infrared lasers and high-altitude drones.

That tech giants are messianic about their creations is no surprise. But their outlook has possessed powerful people outside of Silicon Valley, too. US Secretary of Education Arne Duncan said that "technology is a game-changer in the field of education – a game-changer we desperately need to both improve achievement for all and increase equity for children and communities who have been historically underserved."⁷ Economist Jeffrey Sachs, author of *The End of Poverty* and the force behind the United Nations' Millennium Villages Project, believes that "mobile phones and wireless Internet end isolation, and will therefore prove to be the most transformative technology of economic development of our time."⁸ And in 2011, then-secretary of state Hillary Clinton announced a new foreign policy doctrine. She introduced "Internet freedom" by saying that information networks were a "great leveler" that we should use "to help lift people out of poverty and give them a freedom from want."⁹ World leaders are convinced that technology will make the world a better place.

But does technology really cause positive social change?

Consider poverty in the United States. Its rate decreased steadily for decades until 1970. Around 1970, though, the decline stopped. Since then, the poverty rate has held steady at a stubborn 12 to

13 percent – embarrassingly high for the world’s richest country – only to rise since the 2007 recession.¹⁰ Over the past four decades, real incomes for poor and middle-class households stagnated. Inequality shot up to a level not seen for a century.¹¹

During the same four decades, though, the United States experienced an explosion of new technologies. America ushered in the Internet and the personal computer. Its companies invented mobile phones and social media. US firms such as Apple, Google, Microsoft, and Twitter dominate the global corporate landscape, churning out product after product used by billions of people. In 2014 there were more than 210 million Facebook accounts in the United States, outnumbering Americans aged fifteen to sixty-four. For a while now, the total US population has been eclipsed by the number of wireless subscriptions.¹²

So during a golden age of innovation in the world’s most technologically advanced country, there has been no dent in our rate of poverty.¹³ All of our amazing digital technologies, widely disseminated, didn’t alleviate our most glaring social ill.

A Tale of Two Approaches

When Smith said, “Talent is universal; opportunity is not,” she was quoting an epigraph from a memoir, *It Happened on the Way to War*, by former Marine captain Rye Barcott. Barcott was an officer-in-training in 2000 when he visited Kibera, the largest slum in Nairobi, and his eyes were opened to global poverty. Feeling compelled to do something about it, he worked with local residents Tabitha Atieno Festo and Salim Mohamed to found a nonprofit organization called Carolina for Kibera (CFK), which has since been honored for its work by *Time* magazine and the Bill & Melinda Gates Foundation. The organization runs health and education programs and trains youth leaders to solve community problems. Steve Juma, for example, joined a CFK youth soccer team and discovered he made a good referee and peer mentor. CFK granted him a medical school scholarship, and Juma now treats patients at its clinic.¹⁴ The founders believe that everyone comes into the world with potential, but not everyone has

the opportunity to develop it. Talent is universal, and opportunity is the nurturing of that talent.

This is very different from Smith's take. Whereas Smith is concerned with external provision, Barcott builds up internal strengths. The difference is profound, as even Smith – and every Google employee – knows well from another context. Google posts its job announcements on its website, so in theory, anyone with access to the Internet has the opportunity to apply. In practice, though, the jobs are closed to all but a small minority of people who have the education, experience, and personal contacts to pass extensive rounds of interviews and aptitude tests. I know many low-income people who would like nothing more than a well-paying job at a global technology company. But it doesn't matter whether they can browse engineering jobs on their phones. Online opportunity isn't always actual opportunity.

Of course, Smith herself wouldn't argue that a tenth-grade dropout from East Palo Alto and a Stanford computer science PhD have the same ability to hack software. Nevertheless, by equating the Internet with opportunity for underprivileged people, she has made a dubious assumption – an assumption that the Internet can make up for severe non-Internet deficiencies.

So – talent is universal; opportunity is not. The same six words capture what Smith and Barcott both believe. Yet their different interpretations lead to wildly divergent ways of trying to change the world. Smith wants to spread technology to every corner of the planet. Barcott focuses on cultivating individual talents. One builds technologies. The other fosters people.

I know very well where Smith was coming from. For twelve years I worked at Microsoft, where, like every other gizmo-happy technologist, I unconsciously embraced a peculiar paradox. It revealed itself in the most innocuous things that the company said. At corporate gatherings, executives would tell us, "You are our greatest asset!" But in their marketing, they would tell customers, "Our technology is your greatest asset!" In other words, what matters most to the company is capable people, but what should matter to the rest of the world is new

technology. Somehow what was best for us and what was best for others were two different things.¹⁵

This book is about this subtle contradiction and its outsized consequences. I explore how a misunderstanding about technology's role in society has infected us – not just the tech industry, but global civilization as a whole – and how it confuses our attempts to address the world's persistent social problems. The confusion expresses itself as Silicon Valley executives who evangelize cutting-edge technologies at work but send their children to Waldorf schools that ban electronics. Or as a government that spies on its citizens' emails while promoting the Internet abroad as a bulwark of human rights. Or as a country densely crisscrossed with interactive social media that is nevertheless more politically polarized than ever. *Geek Heresy* demystifies these contradictions and seeks to illuminate a more effective path to social change.

Technoholics Anonymous

I am a recovering technoholic. I was once addicted to a technological way of solving problems.

My parents were nerds at heart, possibly reflecting the stereotypical Japanese fascination with science and technology. On birthdays, they gave me Lego blocks and Erector sets. I have fond memories of playing with a clever Japanese toy called *Denshi Burokku*. It consisted of analog electronics embedded in plastic cubes that you could arrange and rearrange to build lie detectors and radios.¹⁶ By the seventh grade, I was programming an Apple II personal computer. My bookshelves were filled with biographies of Isaac Newton, Thomas Edison, and the Wright brothers as well as titles such as *How Things Work* and *Tell Me Why*.

One book that left a deep impression on me described Russian efforts to build a fusion reactor. When I was growing up in the 1970s, a series of energy crises caused long lines at gas stations and an adult obsession with turning off lights. These developments seemed connected to world events that caused furrows in President Jimmy Carter's brow every time he appeared on TV. Nuclear fusion – as a source of

unlimited energy – seemed like it could put an end to these problems once and for all. I thought I could help make it work.

So in college I majored in physics, but, as often happens, one thing led to another, and I changed fields. I did a PhD in computer science, and after that, I took a job at Microsoft Research – one of the world's largest computer science laboratories. What didn't change was my search for technological solutions.

At first I worked in an area called computer vision, which tries to give machines a skill that one-year-olds take for granted but that science still toils to explain: converting an array of color into meaning – a crib, a mother's smile, a looming bottle. Computers still can't recognize these objects reliably, but the field has made progress. For example, these days we don't think twice about the little squares that track a person's face on our mobile-phone cameras. That's a technology that a colleague of mine developed just fifteen years ago.¹⁷ In my own research, I worked on algorithms that allowed you to cut out objects in digital photographs and automatically fill in the hole with an appropriate background.¹⁸ Another project was a precursor to the software in Microsoft's Kinect system, which does away with joysticks for Xbox games by tracking players' physical movements with cameras.¹⁹

These advances were exciting. They proved the incredible power of technology. And they kept me engaged for seven years. But I began to feel a little dissatisfied with the kind of impact I was having. If I was overly ambitious as a child to think that I could solve big energy problems, now I didn't feel ambitious enough. I wanted to do more than serve the world's gadget lovers.

So in 2004, when my manager in Redmond asked me if I would join him to launch a research center in India – what would become Microsoft's only major lab in the developing world – I jumped at the chance.²⁰ I was excited by a new topic: How could electronic technologies contribute to social causes in the world's poorest communities? Within months, I moved to Bangalore, expecting to spend a few years applying my technical skills to a new set of problems. What I didn't foresee was that India would change my entire conception of technology.

Prolegomenon

America is a bubble where everyone tunes into YouTube; Amazon delivers to every Kindle; and debates of fact are quickly settled by consulting our iPhones. As a result, it's hard to gain a true sense for technology's real effect on society. We're all breathing the same air. We have a perspective that some people call WEIRD – Western, Educated, Industrialized, Rich, and Democratic.²¹

Outside our bubble, there are places like India – an ocean of diversity presenting a Technicolor range of man-machine interaction. Nonliterate dollar-a-day rickshaw drivers, who are savvy users of Bluetooth file exchange on their multimedia phones, deliver undergraduate computer-science majors to campuses in which programming is taught entirely on paper. Inadequate theories of technology don't hold together in the rough waters of such contrasts.

In Part 1, I'll share what I learned in India and other places about digital technology and demonstrate that the lessons apply everywhere. I'll describe the Law of Amplification, which concisely explains technology's impact on society and shatters pervasive myths about social change. These myths are embedded deep in the modern technocratic psyche, and they mislead us toward mirages that vanish on closer inspection. Part 1 will provoke tech optimists, vindicate tech skeptics, and liberate others from the cult-like hold of technology.

Part 2 suggests the path forward. It will reveal rules for the best ways to apply technology, but move beyond machines to highlight the critical role of individual and societal intention, discernment, and self-control. I'll tell moving stories of extraordinary people, such as Patrick Awuah, a Microsoft millionaire who left his lucrative engineering job to open Ghana's first liberal arts university, and Tara Sreenivasa, a graduate of a remarkable South Indian school that takes children from dollar-a-day households into the high-tech offices of Goldman Sachs and Mercedes-Benz. Part 2 reanimates an ancient narrative for progress that is more relevant today than ever before: Even in a world of abundant technology, there is no social change without change in people.

Throughout, I use examples from global poverty to represent a range of societal afflictions. In part, this is because of my own focus over the past decade. But poverty is also linked to just about every social problem, either directly or by analogy. Being poor often means having lower levels of health, education, and political power. Resource scarcity and environmental destruction are everyday facts in impoverished communities. All forms of social inequality and prejudice echo the motifs of economic inequality and discrimination. By the end of this book, I hope you'll agree that the Law of Amplification and the case for certain human values apply not just to the alleviation of poverty, but to any kind of positive social change.

Greek Geek

In Greek mythology, Daedalus was a brilliant craftsman and engineer. He designed the labyrinth that contained the Minotaur. He devised new methods of carpentry and shipbuilding. His animated statues were the world's first robots.²² But Daedalus is perhaps best known for the invention of flight. Imprisoned in a tower with his son, Icarus, Daedalus fashioned wings out of feathers and wax. As they planned their escape, he warned Icarus not to fly too close to the sun for fear that the wax would melt. Once they were in the air, though, Icarus ignored his father's warnings. He soared exuberantly into the sky. His wings fell apart, and Icarus fell to his death.

This story is often interpreted with a moral for children: Obey your parents. Rein in hubris. But there is also a timeless lesson for the grown-ups: Brilliant technology is not enough to save us from ourselves. Tech proponents will insist that Daedalus needed wings to escape. Tech skeptics will say that Icarus would have been better off without them. But had Icarus exercised restraint, or had Daedalus taken more time with his son to convey the risks, they could have benefited from the technology without the tragedy. The real lesson, then, is not about technology at all – it's about the right kind of heart, mind, and will.

The Law of Amplification

A Simple but Powerful Theory of Technology's Social Impact

Nakkalbande is a small slum community in the southern part of Bangalore. Hidden within the upper-middle-class neighborhood of Jayanagar, it's formed around a single, straight alley that is covered by a canopy of grand old trees that have survived the city's aggressive road construction. The unpaved alley is strewn with plastic debris and the occasional dead rat. As slums go, though, it's doing all right. Instead of the improvised tarp-and-tree-branch shelter you might see elsewhere, most of the houses in Nakkalbande are one- or two-room cinder-block structures. Residents have lived there for decades.

Nakkalbande is where I spent my Saturdays soon after moving to India in late 2004. I volunteered for a nonprofit called Stree Jagruti Samiti, the Society for Women's Empowerment. Its leader was a middle-aged matriarch named Geeta Menon, who had a mischievous chuckle and a gleam in her eye that wouldn't be brought down by the tired droop in her shoulders. For over fifteen years, she had worked as an activist, organizing the women and girls of several slum communities. She was known to storm into police stations with groups of women. They would demand that the officers take action against, say, a

conception, this traditional calculus doesn't account for the possibility that an educated wife could bring in her own income, as happens more and more across India.)

I didn't think of the computer course as a formal research project, so I didn't keep detailed track of the outcomes. When I look back, though, I realize that the class foreshadowed what I'd soon find in my own research: the initial optimism that surrounds technology, the doubt as reality hits, the complexity of outcomes, and the unavoidable role of social forces.

The Ferocious Field of Technology and Society

Technology is powerful, but in India it became clear to me that throwing gadgets at social problems isn't effective. When I came back to the United States, I sought to understand why.

As a computer scientist, my education included a lot of math and technology but little of the history or philosophy of my own field. This is a great flaw of most science and engineering curricula. We're obsessed with what works today, and what might be tomorrow, but we learn little about what came before.

So at the University of California, Berkeley, I met with dozens of professors who had studied different aspects of technology and society. I spent hours tracking down dusty, bound volumes in the stacks of libraries across campus. And here is what I learned.

Theorists, despite many fine shades of distinction, fall roughly into four camps: technological utopians, technological skeptics, contextualists, and social determinists. These terms will be defined in a moment, but one thing that jumped out was that the scholars fought like Furies. For example, the economic historian Robert Heilbroner wrote, "That machines make history in some sense . . . is of course obvious."² This view is called technological determinism, because it implies that technology determines social outcomes. But if some find it obvious, it is nevertheless ridiculed by critics. Philosopher Andrew Feenberg responded with sarcastic sympathy, writing that "the implications of

determinism appear so obvious that it's surprising to discover that [its premises do not] withstand close scrutiny."³

Yet for all the debate, there is plenty of agreement, too. Utopians accept that there can be negative consequences of technology, and skeptics concede its benefits. What separates the four camps most is not facts but temperamental differences.

How to Spot a Utopian

In the *Star Trek* future, technological advances have liberated Earth from war, famine, illness, and conflict, at least among human beings. Thanks to matter replicators and dilithium crystals, food and energy are free. With nothing to fight over, peace and egalitarianism reign. (That's why the series needs an ample supply of aliens as plot devices.) As Captain Jean-Luc Picard explains in the movie *First Contact*, "the acquisition of wealth is no longer the driving force in our lives."⁴ That is to say, in a few more centuries, advanced technology makes economics itself obsolete. Instead, people are free to focus on greater ends: "We work to better ourselves and the rest of humanity."

Star Trek is fiction, but its technological utopianism is very real. MIT Media Lab founder Nicholas Negroponte clearly shares it. So does Google chairman Eric Schmidt. In *The New Digital Age*, he and coauthor Jared Cohen wrote, "The best thing anyone can do to improve the quality of life around the world is to drive connectivity and technological opportunity."⁵ And then there are technology cheerleaders like Clay Shirky, who shakes pom-poms for Team Digital in a book subtitled *How Technology Makes Consumers into Collaborators*.⁶ Many engineers and computer scientists also hold this view. A generation ago, when young people said they wanted to "change the world" or "make an impact," they joined the Peace Corps. Now they move to Silicon Valley. They envision laying a foundation for Captain Picard's greedless future.

Utopians believe that technology is inherently a positive force, that technology shapes civilization, and that more of it is a good thing. And they have what seems like irrefutable evidence. Thanks to advances such

as modern medicine, air conditioning, cheap transport, and real-time communication, middle-class people today enjoy a quality of life that kings and queens didn't have a century ago. There's a reason, utopians argue, why historical epochs are named after technologies – the Bronze Age, the Iron Age, the Industrial Age, the Information Age – and why human culture flourished after the invention of the printing press.



But whatever they say and write, what most unites utopians is how they feel about technology. They love it, and they want more. Many believe that *every* kind of problem can be solved by some invention, often one that is right around the corner. Whether the issue is poverty, bad governance, or climate change, they say things like, "[There] is no limit to human ingenuity," and "When seen through the lens of technology, few resources are truly scarce."⁷ Besotted with gadgets, technological utopians scoff at social institutions like governments, civil society, and traditional firms, which they pity as slow, costly, behind the times, or all of the above.

I sympathize with the utopians because I was one myself. When I started the computer class in Nakkalbade, it was in the hopes that exposure to the technology would improve lives. And my research looked for ways to use technology to alleviate poverty.

A Curmudgeonly Skepticism

But time after time, I realized that technology alone never did the trick. Whether it was MultiPoint in India or laptops in America, inventing and spreading new devices didn't necessarily cause social progress.

Technology skeptics would harrumph and point out that aspects of the *Star Trek* future are already with us. Thanks to agricultural technologies, America produces more than enough food to feed everyone in the country, and the food is cheap. Yet, almost 5 million children in the United States suffer from food insecurity in any given year.⁸ Indeed, there is enough food to feed the whole world, but hunger persists. About one in eight people is malnourished; that's 840 million people eating less than they need.⁹ Evidently, technological plenty doesn't mean plenty for everyone.

Skeptics believe that technology is overhyped and often destructive.  Nicholas Carr, author of *The Shallows*, suggests that the fast-twitch, hyperlinked Internet not only erodes our ability to think deeply, but also traps us like a Siren: "We may be wary of what our devices are doing to us, but we're using them more than ever." His book is ominously subtitled *What the Internet Is Doing to Our Brains*. In *The Net Delusion: The Dark Side of Internet Freedom*, Evgeny Morozov catalogs the myriad ways in which the Internet boosts, rather than contains, the power of repressive regimes: in China, social media is a tool for disseminating Communist Party propaganda; in Azerbaijan, webcams installed at election stations frightened citizens into voting for state-sponsored incumbents;¹⁰ in Iran, the chief of national police acknowledged a chilling fact of their anti-protest efforts: "The new technologies allow us to identify conspirators."¹¹ 

Technology skeptics like to point out unintended consequences. Jacques Ellul, for example, warned of the dangers of information overload back in 1965. "It is a fact that excessive data do not enlighten the reader or the listener," he wrote. "They drown him."¹² Neil Postman suggested that broadcast media have created a culture that is "amusing itself to death,"¹³ like mythological lotus-eaters, or the soma-sedated characters of Aldous Huxley's *Brave New World*. And Harvard professor Sheila Jasanoff has voiced the concerns of many in calling out climate change as a by-product of fossil-fuel-driven technologies.¹⁴ Incidentally, digital technologies play a shockingly large part in carbon emissions. One study estimated that in 2007, electronics accounted for 3 percent of carbon emissions globally and 7.2 percent of all electricity usage.¹⁵ In the United States in 2013, the data centers that store and distribute online content accounted, on their own, for about 2 percent of total electricity use.¹⁶ All of these figures are projected to grow.¹⁷

If skeptics are pessimistic, though, many of them share the utopians' belief that technologies embody moral and political values. But where utopians see the promise of greater freedom and prosperity, skeptics see weakness, folly, and corruption. The economic efficiency of factories and assembly lines leads to a dehumanized society. High-tech entertainment prompts us to judge everything by its marketability. Social media turns us into zombies of "continual partial attention."¹⁸

As for practical action, skeptics are less united than their utopian counterparts. They span a spectrum from neo-Luddites who would destroy technology to those who can't quite give up their smartphones. At one extreme is author and activist Derrick Jensen, who wrote, "Every morning when I wake up I ask myself whether I should write or blow up a dam."¹⁹ Carr invoked a poet's call for resistance, hoping that "we won't go gently into the future our computer engineers and software programmers are scripting for us."²⁰ And some just throw up their hands. Ellul could see no easy solution: "It is not a matter of getting rid of it, but, by an act of freedom, of transcending it. How is this to be done? I do not yet know."²¹

Not Good, Not Bad, Not Neutral

← Contextualist

Utopians and skeptics have catchy rhetoric, but most reasonable people can see that the truth is neither *Star Trek* nor *Brave New World*. It's probably a mixture of both. Melvin Kranzberg, a historian of technology, embraced technology's apparent contradictions. "Technology," he wrote in 1986, "is neither good nor bad; nor is it neutral."²² This enigmatic statement captures what is probably the most common view among scholars of technology today: Its outcomes are context-dependent. Technology has both positive and negative impacts because technology and people interact in complex ways.

But contextualist explanations are also unedifying. To stop at context dependency is to say very little altogether. The lessons tend to follow the lines of "more research is needed"; "it's case by case"; or "it's nuanced" – ivory-tower code for "it's so complicated, there couldn't possibly be any worthwhile generalizations." As a proponent of one contextualist theory claimed, "explanation does not follow from description."²³

The Human Factor

Utopians, skeptics, and contextualists are each right in limited ways. The fifty-odd technology projects I oversaw in India produced a range of outcomes. A few improved people's lives. The utopians would have

cheered. A few wasted time and resources. The skeptics would have said, "I told you so." The majority fell into a middle ground where they succeeded as research projects, but benefits beyond that were limited. The contextualists would have nodded in sympathy.

But was there some other way to interpret these outcomes? As I looked for some structure to our findings, three factors emerged as necessary for real impact.

The first is the dedication of the researcher, not to research outcomes but to concrete social impact. Of all the projects I oversaw, the one that continues to affect the most lives is called Digital Green. It uses how-to videos featuring local farmers as a teaching aid to help instruct other farmers about better agriculture. Today the Indian Ministry of Rural Development is taking Digital Green to 10,000 villages, and the Ethiopian government has begun experimenting with it as well. None of this would be happening without Rikin Gandhi, who led the project. Gandhi has many talents, but what stands out is his single-minded focus on supporting smallholder farmers. Instead of designing the electronic version of a Rube Goldberg machine – which is what feature-happy technologists tend to do – he stuck with simple, off-the-shelf devices. Then, after we established Digital Green's effectiveness, he left his research job to start a nonprofit organization. Without Gandhi's devotion to social impact, Digital Green wouldn't be much more than a research paper.

The second factor is the commitment and capacity of the partner organization. In my research group, we looked for capable, well-intentioned partners who had rapport with the communities we wanted to work with. Sometimes, though, we'd misjudge an organization and find ourselves stymied by its dysfunctions. In one project, we partnered with a sugarcane cooperative in a rural district three hours away from Bombay. We upgraded its communication infrastructure by replacing a creaky network of old personal computers with low-cost mobile phones. The new system worked, and farmers loved it. Had the cooperative rolled it out to all of its villages, it would have saved them tens of thousands of dollars every year.²⁴ Yet an internal rivalry kept us from expanding beyond the pilot. (And as researchers, we lacked the patience

and charm to iron out the discord.) The technology worked perfectly, but institutional politics hampered deployment. Good partners were important, even with good technology.

The third factor lies with intended beneficiaries. They must have the desire and the ability to take advantage of the technology provided. Sometimes they don't. In India, we worked with poor people who lacked basic health care and hygiene, so we thought it would be useful to offer the right information at the right time. But would-be beneficiaries hesitated to follow even the simplest advice. Women wouldn't take iron pills because of the bitter taste. Households wouldn't boil water because of the extra effort. Fathers would lose infants to minor illnesses because they balked at hospital charges of as little as 50 rupees (about \$1, potentially a day's wages). In other words, they were like any of us who fail to exercise and eat well despite knowing that we should. It didn't matter whether we delivered the information via text messages, automated voice calls, entertaining videos, or interactive apps. Technology by itself didn't budge social and psychological inertia.

These factors suggest that the contextualists are right. Context definitely matters. All three factors, though, point to *human context* as what matters most. Or, to put it another way, the technology isn't the deciding factor even in a technology project. Of course, good design trumps poor design, but beyond some level of functionality, technical design matters much less than the human elements.²⁵ The right people can work around a bad technology, but the wrong people will mess up even a good one.

This is consistent with a fourth camp of technology-and-society scholarship sometimes called social determinism.²⁶ Versions of it are known as "the social construction of technology" and the "instrumental view" of technology. These and related theories emphasize that technology is molded and wielded by people. People decide the form of technologies, the purposes of their use, and the outcomes they generate. Social determinism rests on the plain fact that it is people who act and make decisions – technologies do not.²⁷

But if social determinism is commonsense, it's not quite enough. It says little about how much change follows in the wake of invention. So while I felt close kinship with social determinists, something was still missing.

It's All Geek to Me

If you've ever landed on a webpage in a language you can't read, you have an idea of what it means to be illiterate in a digital world. You can see that there's a whole universe bursting with possibility, but none of it makes sense. You might recognize a few photos here and there, but your curiosity is piqued only to bang into a wall of indecipherable gibberish.

That was the experience of those we worked with who couldn't read. It was true of the mothers of the students I taught in Nakkalbande, some of whom would pop into an occasional class to see what their children were up to. So one agenda for our research was digital interfaces for nonliterate users. In 2005 I hired Indrani Medhi, a designer who threw herself into the research and emerged within a few years as the world's expert on what we called "text-free user interfaces."

Medhi conducted much of her research in Nakkalbande. She got along well with Menon and shared her combination of toughness and empathy. Medhi was quick to befriend her research subjects – mostly women from poor families who earned \$20 to \$40 a month doing informal household work. Through them, Medhi found that illiteracy didn't always mean innumeracy, at least in those communities. Many of the women could read numbers, even if they sometimes confused "2" and "5." With a colleague, Archana Prasad, she also found that respondents understood cartoon drawings best, finding them less confusing than either simplified icons or photographs.²⁸ These and other discoveries fed directly into Medhi's designs.

Medhi and I had frequent discussions about her work, and some themes came up repeatedly. One was that illiteracy wasn't black and white – it was a spectrum. Some people couldn't read at all, others knew the alphabet, and still others could sound out words but couldn't read a

Geek Myths Debunked

Dispelling Misguided Beliefs About Technology

In 1981 when I turned twelve, my parents gave me a Sony Walkman as a birthday present. The casing, made of brushed aluminum and a deep maroon hard plastic, glimmered as I took it out of the packaging. It was a second-generation model – light, sleek, and not much bigger than the cassette tapes it played. The headphone earbuds fit snugly in my ears, and the grooved teeth on the volume control massaged my fingertips.

That day, like hundreds of thousands of other Walkman owners, I discovered that I couldn't be without music. My biggest life concern became rationing a stash of batteries. I wanted nothing more than to spend every minute of every waking hour listening to Journey and Olivia Newton John – I still blame that Walkman for my unrehabilitated love of 1980s top-40 hits.

The Walkman poses a potential challenge to the Law of Amplification. It seems at first to be a technology that gave birth to a new human desire. Few people imagined before 1979 that they would want to live in their very own cocoons of music. Today, personal music seems to be a permanent feature of civilization. Cassette tapes have become obsolete, but headphones – and the devices they plug into – have proliferated. Didn't the Walkman change global culture? Didn't it create

"In some ways, it's the same in America," King continued. Indeed, large technology companies in the United States are legally required to monitor and censor illegal content such as child pornography. And we know from recent revelations about the National Security Agency that our government is willing to strong-arm firms for the purposes of digital surveillance. "Functionally, that's the same as what happens in China, though I won't say it's morally the same," King said. In both countries, technology acts like a lens, magnifying and amplifying how governments act on their gravest concerns. By examining large-scale technology, you can ferret out hidden motivations.

Predicting Is Believing

The Law of Amplification enables us to make certain types of predictions. Under some conditions, it's possible to gauge the future of a technology that doesn't even exist yet. For example, imagine that scientists come up with the following inventions. In each pair, which one do you think would be more popular?

- a) A robot that cleans up after you, washes your dishes, and does all of your laundry.
- b) A robot that follows you around and verbally points out each of your personal flaws.

- a) A holographic device that projects the realistic illusion that your house is bigger than it is, outfitted with expensive furniture, and decorated by a professional interior decorator.
- b) A holographic device that projects the realistic illusion that your house is smaller than it is, outfitted with used furniture, and decorated by a college student.

- a) A novel device you wear on your belt buckle that guarantees a slim, fit figure, regardless of what you eat or how much you exercise.

Shrink-Wrapped Quick Fixes

Technology as an Exemplar of the Packaged Intervention

Over the years, I've given a lot of talks about digital technology's limited impact on social causes, and I've heard a range of reactions. Tech champions respond with hostility or begrudging resignation. Those tired of the hype offer commiseration. And another group of people say they agree, but not with respect to electronics. They say they've had similar experiences in nontechnology projects.

Amplification, it turns out, applies more broadly. Digital technologies are just an extreme example of what could be called the *packaged intervention* – any technology, idea, policy, or other easily replicable partial solution meant to address a social problem.¹ Like technologies, they're expected to cause large-scale social change in and of themselves. But they don't, and understanding why provides further insight into the Law of Amplification.

The Technology of Microcredit

A good example of a packaged intervention is microcredit. Small-scale lending to poor borrowers, also called microlending or microfinance,

Technocratic Orthodoxy

The Pervasive Biases of Modern Do-Gooding

In 1987 I moved to Cambridge, Massachusetts, to enroll as a freshman at Harvard. Bacchanalian parties weren't really my thing, so I had a lot of time on weekend evenings. It felt a little lonely in my dorm room while loud music thumped its ways through the walls, so I took walks around the city and found that it catered to a vice of my own: books.

At the time there were as many as thirty booksellers in the few blocks that made up Harvard Square. Local tour guides boasted that there were more bookstores per square mile than anywhere else on earth. I remember marinating in the musty smell of McIntyre & Moore, seeking enlightenment at the Thomas More Bookshop, skimming leatherbound copies of Plato at Mandrake, indulging guilty pleasures at Science Fantasy Books, and bottom-feeding at Buck-a-Book. My favorite was WordsWorth on Brattle Street. I spent hours upon hours in its two floor-to-ceiling stories of glorious inventory, all sold at discount.

Today those shops are gone. With no more than seven or eight bookstores left, Harvard Square has lost its bibliophilic bragging rights. Or, possibly worse, with those seven or eight shops, it might still be the Bookstore Capital of the World. Everywhere you look, brick-and-mortar bookstores are being steamrolled under an online juggernaut.

but even then, much will remain unmeasured. As the saying goes, "Not everything that can be counted counts, and not everything that counts can be counted."⁵⁵

If so, it's important that we acknowledge here and now that important but numberless qualities will always exist, and that we account explicitly for that fact in our decision-making. Unfortunately, in our world of big data, we are losing sight of bigger wisdom. As more kinds of numeric data become available, we focus only on the numbers and neglect qualities that don't come with measurable outcomes.

Technocrats like to say that "if it can't be measured, it can't be managed," but this is simply not true. Most of us manage our relationships with friends and family without measurement. (And you'd worry about anyone who needed metrics to manage relationships.) Many countries have experienced dramatic economic growth well before they have had a system of national accounts.⁵⁶ Surely, Homer thought of his *Iliad* as much more than 15,693 lines of dactylic hexameter. The important thing is to establish meaningful goals first, whether or not they can be measured. Where direct metrics don't exist, there might be indirect proxies. And where there aren't proxies, there should be a judicious weighing of measurable and unmeasurable factors. It's foolish to neglect metrics where they're available – but to think that only what's measurable is meaningful is pure sophistry.

The Tech Commandments

The problem with measurement obsession is the obsession, not the measurement. The drive for lower-cost books squeezes out all but best sellers. A mania for RCTs crowds out complementary approaches. Social enterprises distract from other paths to charitable action. Near-term happiness diverts us from long-term foundations. A tunnel vision on technology steals attention from nontechnological essentials.

In the hype surrounding these technocratic approaches, certain biases appear and reappear constantly. They are the distortions of our technological and technocratic age – what could be called the Tech Commandments:

- **Measurement over meaning:** Value only that which can be counted.
- **Quantity over quality:** Do only those things that affect millions of people.
- **Ultimate goals over root causes:** Focus narrowly on the end goal to ensure success.
- **Destinationism over path dependency:** Ignore history and context, and take a single hop to the destination.
- **External over internal:** Do not expect people to change; instead, focus exclusively on their external circumstances.
- **Innovation over tried-and-true:** Never do anything that has been done before, at least not without new branding.
- **Intelligence over wisdom:** Maximize cleverness and creativity, not mundane effort. Use intelligence and talent to justify arrogance, selfishness, immaturity, and rankism. (Rankism is abuse, humiliation, exploitation, or subjugation based on any kind of social rank.⁵⁷)
- **Value neutrality over value engagement:** Bypass values and ethics by pretending to value neutrality.
- **Individualism over collectivism:** Let competition lead to efficiency; avoid cooperation, which breeds complacency and corruption. Any inhibition of individual expression, including compromise to support the common good, is the same as oppression.
- **Freedom over responsibility:** Encourage more choices; discourage discernment in choosing. Any temperance of liberty, including encouragement of responsibility, is tantamount to tyranny.

This is an exaggeration, I'll admit, but not an extreme one. I've been in hundreds of discussions about global poverty with academics, entrepreneurs, nonprofit staff, program officers, and government ministers. With striking regularity, someone will invoke some version of these points to justify their pet intervention with smug certainty of its power. Technocratic zealots aren't satisfied by seeing their point of view

Amplifying People

The Importance of Heart, Mind, and Will

I first met Rikin Gandhi in 2006. He was a software engineer at the time, and Digital Green was still in our future.

Gandhi was a dreamer whose chiseled facial features belied a methodical intensity. He had always wanted to be an astronaut, so he studied the biographies of men and women who'd gone to space. He could recount the intricate details of every Apollo mission. And he knew that one of the best ways to be selected by NASA was to have an engineering degree and to be an Air Force pilot. When we met, he had just completed a master's in aeronautical engineering at MIT and was working at Oracle while waiting to be admitted to the US Air Force Officer Training School.

But the wait was long, and while he waited, he also noticed a theme in those space-traveler bios. "Astronauts get a chance to see our world as the small blue marble that it is," he told me, "and they come back with new love for humankind and for the earth itself." A friend of Neil Armstrong's once explained, "You understand that you're a short-term phenomenon, like the mosquitoes that come in the spring and the fall. You get a perspective on yourself. You're getting back to the fundamentals of

and enabling more of them at once. They allow a partial substitution of experts with nonexpert facilitators. They leave a stronger impression on farmers.¹¹

The Three Habits of Highly Effective Technology Use

Digital Green shows us that the best use of packaged interventions is selective and targeted. Its lessons can be condensed to three rules:

Rule 1 – Identify or build human forces that are aligned with your goals. Even without digital technology, Green Foundation was committed to farmers and capable of supporting them. For packaged interventions to have positive impact, they need a positive human force to amplify.

Rule 2 – Use packaged interventions to amplify the right human forces. Gandhi observed what Green Foundation was already doing and used technology to amplify its work. It's also possible to amplify the impact of unorganized social trends. In Kenya, for example, a mobile money transfer system called M-PESA famously increased the flow of money from urban to rural areas because there was already an underlying culture of urban migrants sending cash back home.¹²

Rule 3 – Avoid indiscriminate dissemination of packaged interventions. Digital Green doesn't work without a strong partner that has rapport with farmers. And Digital Green didn't branch out into, say, children's education, because its partner organization had no expertise in that area. Seeking mass dissemination of technology for its own sake is a waste of resources and often counterproductive.

Tech-centric social projects most often violate the last rule. It's tempting to think of Digital Green as an all-purpose tool for knowledge dissemination. Some donors and partners see this potential in Digital Green just as they previously did with telecenters and currently do with mobile phone platforms. It's an understandable impulse – why not use the full potential of the technology to address health care, home economics, governance, nonfarming vocational training, and everything else in a single stroke?

A Different Kind of Upgrade

Human Development Before Technology Development

Think back to the Hole-in-the-Wall project. Children in poor neighborhoods were given free access to computers, and they figured out how to use them without any adult help. But they tended to do little other than play video games.

Those were kids, though. Maybe adults would be different. Such was the hope of my colleagues Sean Blagstedt, Udai Pawar, and Aishwarya Ratan who ran a project, inspired by the Hole-in-the-Wall, which they called Kelsa+. ("Kelsa" is the Kannada word for "work.") They wanted to see what adults who normally didn't work with computers would do if one was made available to them at no cost.

The team installed a PC in the basement of our office in Bangalore and connected it to the Internet. Then they held a meeting with our housekeeping staff, security guards, and technicians. The forty or so staff members were told that the PC was theirs to use as they wished as long as they abided by all laws and office policies. They were also told that the software would log any activity.

The PC got a lot of use, and after a few months the hard drive was stuffed with data. The researchers analyzed it, and what they saw

nonprofits proliferate like casinos in Las Vegas. We both happened to have other meetings there. On the day of our appointment, I waited for him in the warm, dark air of an outdoor restaurant. A sturdy pickup truck – the kind favored by United Nations officials – drove up. When the passenger door opened, out came a pair of crutches followed by none other than Isaac Tuggun. He told the driver to wait for about an hour while we talked.

It turned out that Tuggun had worked his way up the ladder of an advocacy organization called the Ghana Federation of the Disabled. “I started as administrative secretary and rose to the position of administrator,” he told me, “and then to national advocacy officer of the disability movement in Ghana.” When I met him in Tamale, he was managing a joint project with DANIDA, a Danish aid organization.

Three Pillars of Wisdom

How did Tuggun go from itinerant interpreter to being chauffeured in the limousines of the foreign aid world? He displays several characteristics that many self-starters take for granted, but that are much rarer among involuntarily impoverished people. Some of these qualities come with a good education, which is an express advantage. But there’s a tendency to think of education as being simply the ability to read, write, and do arithmetic, when an effective education involves so much more than academics. Conversely, many people lead satisfying lives because of their social skills, entrepreneurial drive, or force of personality without knowing a lot of science or history. In other words, even if education is one means to acquire the relevant traits, it’s often less about the textbook content than something else that happens to come with formal learning.

What allowed Tuggun to succeed were the same heart, mind, and will that make packaged interventions work. Tuggun has good intention, discernment, and self-control – qualities similar to what Rikin Gandhi had in leading Digital Green, and that Digital Green sought in its partners.

Heart, or Intention

First and foremost, Tuggun had the firm *intention* to make life better for someone: his future self. Everyone wants a better life, but excessive hardship of a kind that is all too common leaves many individuals resigned to lives of poverty and powerlessness. Learned helplessness squashes aspirations, leading people in poor or oppressed circumstances to focus narrowly on the present to the detriment of their futures.⁸ Tuggun, though, was not like this. "My parents never made it in life," he told me. "I was very determined to break that cycle of poverty." He had a strong intention to rise above the circumstances in which he found himself. He did what he needed to survive, but he also kept one eye on the hope of a better life. He avoided people who were likely to get him into trouble. And he kept looking for opportunities to climb out of his circumstances.

Taking care of one's future self is just one level of positive intention, though. Tuggun now fights for the rights of other disabled people in his country. Social causes are better served as individuals with a narrow present-orientation expand to a future-orientation; and as people extend their concern from themselves to others in what philosopher Peter Singer has called "expanding circles."⁹ It's good to care for oneself, better to care for family and community, even better to care for country, and best to care for humanity as a whole.¹⁰ The "evil" of tyrants and criminals often lies in their tiny circles of concern – they may have positive intentions for their present selves, and possibly for their future selves, but the concern doesn't extend to others. At the other extreme, saints have consistent positive intention for a large radius of sentient beings. The rest of us fall somewhere in between.

Changing intentions is hard to do, but it's the heart of social progress. The world's most meaningful social shifts – from slavery toward emancipation, from racism toward equality, from routine warfare toward routine peace, and from women-as-property toward gender parity – reflect ongoing mass changes in human intention.

Mind, or Discernment

Another aspect of Tuggun's rise is a canny *discernment*. Knowledge is one requirement for discernment, and I won't belabor its value. But discernment also requires the ability to make shrewd judgments about people and opportunities that go beyond bookish erudition.

Tuggun assessed his own situation lucidly, and he made choices that were appropriate for each moment. He realized that a good education had value. "My decision to accept the partial scholarship to study at Ashesi University was the best decision I have ever made," he said. He could tell which people would help him and which would bring trouble. He also exhibited social skills appropriate for interacting with the urban middle class, a kind of "cultural capital" that he'd picked up in part through observation.¹¹ And even without the rigors of modern psychology, Tuggun intuited that viewing situations as opportunities to learn was more worthwhile than dwelling on outcomes: "Unpleasant and undesirable consequences can be encountered but it is part of learning. Life is continued schooling."¹²

Most readers will take such sensibilities for granted, but they aren't always learned by people raised in less privileged communities, if only because of lack of exposure and practice.¹³ Of the three pillars, discernment is perhaps the hardest to pin down, because it depends so much on context. We can never know whether a decision is optimal without knowing all of its downstream consequences. Was Tuggun right to have abandoned his college education? It worked out well for him, but it might not for another person in another context. Discernment – or prudence, judgment, practical wisdom, Greek *phronesis* – is not easy to teach or specify, yet we all know people who are sagacious decision-makers.¹⁴

Will, or Self-Control

Finally, Tuggun showed an incredible degree of self-control. I thought he was a determined student, but I only learned later just how

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determined. Tuggun revealed that he had been homeless while studying at Ashesi. "I slept on a bench under a tent at a public lorry park. The tent was not completely covered. There was no door. I had access to the bench only when the station closed for work at 11:00 p.m.," he said. "I had my bath at a public bath meant for passengers. I walked most of the time to and from campus, covering a distance of eight kilometers a day, and studying mostly on an empty stomach." He managed on a very tight budget, and he avoided temptations that could threaten his survival. Doors closed in his face, but he persevered. He worked hard to learn the math in my class, and if his emails over the years are any indication, he has also put effort into his writing. His story is an extended marathon of self-control.

Self-control allows us to follow through on what we intend or what we discern to be the best course of action.¹⁵ It's one thing to yearn for the security of savings; it's another to muster the will to save. It's one thing to recognize the need for a vocational skill; it's another to expend time and effort to obtain it. It's one thing to know that collective action can overcome repression; it's another thing to risk imprisonment to organize.

How did Tuggun develop self-control? Commonsense notions about willpower are probably not far off – use it, or lose it; no pain, no gain. Psychologist Roy Baumeister finds self-control to be like a muscle. In the short term, it can be exhausted by intensive use, but with regular exercise, capacity can be increased in the long term. Tuggun might have gained self-control by practicing the childhood habits ingrained in him by his parents, by raising his younger siblings after the death of his parents, by managing the obstacles his physical disability presented him with, and by going through the academic hoops at Ashesi.

Reviving Dead Sages

Combined, the capacity for intention, discernment, and self-control – or again, heart, mind, and will – might be called virtue, character, maturity, emotional intelligence, *sophia*, or wisdom.¹⁶ Unfortunately, these

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Hierarchy of Aspirations

The Evolution of Intrinsic Motivation

March 1, 2012, began like any other day for Regina Agyare, a software engineer at Fidelity Bank in Ghana. She woke up, got dressed, and had breakfast. She drove to work. She logged onto her computer and checked her emails. But that day wasn't like any other day. That day, she quit.

She had tried to quit once before. The company wanted to keep her, though, and "they countered with a promotion, a raise, and other incentives," she told me. That first time, Agyare decided to stay.

But not on March 1. "That day, too, the bank tried to convince me to stay," Agyare said. "My manager suggested that I stay at least until the end of the month when the bank gave out employee bonuses." It was tempting, and, again, she reconsidered. But not for long. Something in her just knew it was time to go. By the afternoon, "I packed up my office and left for good."

"I didn't have another job lined up, and I didn't have any grand plans," Agyare said. But she had a rough idea what she wanted to do. Two weeks later, she started Soronko. Soronko means "unique" in the Ghanaian language of Twi, and it lives up to its name. It's actually a pair of entities: a for-profit business called Soronko Solutions and the

“Gross National Wisdom”

Societal Development and Mass Intrinsic Growth

Progress can be a dangerous idea. It can mean labeling people with scores, and people read a lot into them. Labels discourage or insult low scorers, induce arrogance and complacency in high scorers, and cause society as a whole to warp with prejudices, none of which is helpful.¹ What's worse, the claim that progress is dependent on personal qualities such as heart, mind, and will begins to sound a lot like blaming the victims of poverty, oppression, and prejudice, as if lack of intrinsic growth were their fault.

This is an incendiary issue, and I believe we have put off for too long an intelligent conversation about it. One way to tease out the tough ethical issues is through the story of a high school student I once tutored. David was born into a poor, dysfunctional family and became the foster child of wealthy parents. They provided a stable home and enrolled him in an expensive private school, where he was respected as a star athlete. But he was behind in all of his classes. Working with him on geometry, I found he was able to do the math if he put his mind to it, but, without adult prodding, he wouldn't. He didn't have much motivation to study (intention), didn't seem to think it worthwhile

Nurturing Change

Mentorship as a Social-Cause Paradigm

My parents were relaxed about academic achievement, but the "tiger mother" in them roared when it came to my learning the piano. They started me on lessons when I was five and didn't let me quit until I left home for college. I hated to practice, but my mother forced me to spend an hour a day at the piano – more in the days leading up to recitals or competitions.¹ She would accompany me to piano lessons. At home, she'd sit next to me, repeating my teacher's instructions.

"You may never become a professional pianist," my father said, "but you will learn useful things." At the time, it sounded to me like adult mumbo-jumbo, but looking back, I realize he was right. Today I'm at best a clumsy pianist, but I gained much sitting at the keyboard. I learned how to practice complex skills, memorize pages of information, find pleasure even in tedious tasks (like scales), find a place for creativity in repetition, work alone and work with others, handle the anxiety of public performance, interweave intellect and emotion for aesthetic goals, and so on. And I learned perhaps the most valuable lesson of any good education: that so much of life is rooted in both skill and habit, and that almost everything can be learned with sufficient practice. Music, of course, is hardly the only way to learn these things. Others learn

Conclusion

When I was fifteen years old, I won the egg-drop contest at my high school, the American School in Japan. The goal was to design the smallest, lightest contraption that would protect an egg in a fall from the school's water tower. My device nested the egg in a cardboard tube attached to a tissue-paper parachute. It would, I hoped, be my first taste of geek stardom.

My physics teacher, Mr. O'Leary, offered a hearty congratulations, and my classmates teased me out of envy. What I remember most, though, was that my victory went unmentioned in the next morning's public announcements. Our principal regularly played up sports team triumphs and drama club events, so why didn't a feat of engineering merit acknowledgment? It stung.

That night I thought about why I cared, and the sting gave way to curiosity. I had enjoyed designing the parachute and testing it off my eighth-floor balcony. My egg survived, and I could take pride in that. My self-image as a science whiz was preserved. So what did it matter if others knew? It seemed silly and vain to want more recognition.

I still think of that day as the dawn of my adulthood because I realized then that I was driven by powerful subconscious aspirations:

APPENDIX: HIGHLIGHTED NONPROFITS

For readers who might be moved to support any of the inspiring nonprofits that I mentioned in this book, I provide the list below. All of them are exceptional in their respective areas, and each works to build heart, mind, and will. I receive no material compensation from any of them, but for full disclosure, an asterisk marks those on whose boards I sit. Of course, the list reflects my limited knowledge; it is not meant to exclude other worthy organizations.

- **Ashesi University** (www.ashesi.org) is a world-class, nonprofit, four-year university in Ghana focused on educating ethical, entrepreneurial African leaders.
- **Digital Green*** (www.digitalgreen.org) uses a unique video-based teaching methodology to improve agriculture, health, and nutrition in South Asia and Africa.
- **Innovations for Poverty Action*** (www.poverty-action.org) applies evidence gathered from randomized controlled trials to develop and scale up solutions for the developing world.
- **Pradan** (www.pradan.net) assists self-help groups to form, organize, and improve livelihoods of poor families in rural India.
- **Seva Mandir** (www.sevamandir.org) supports communities in southern Rajasthan in their effort to improve their lives via democratic, participatory development.

Appendix: Highlighted Nonprofits

- **Shanti Bhavan** (www.shantibhavanonline.org) provides India's most disadvantaged children with a world-class education that emphasizes globally shared values and high career aspirations.
- **Technology Access Foundation** (www.techaccess.org) equips Washington State students of color for success in college and life through the power of a STEM education.
- **Village Health Works*** (www.villagehealthworks.org) delivers world-class, community-driven medical care and local development initiatives in the rural community of Kigatu, Burundi.