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PRAISE FOR SMART MOBS

ALSO BY HOWARD RHEINGOLD

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INTRODUCTION:
How to Recognize the Future When It Lands on You

THE FIRST SIGNS OF THE NEXT SHIFT BEGAN TO REVEAL THEM SELVES TO me on a spring afternoon in the year 2000. That was when I began to notice people on the streets of Tokyo staring at their mobile phones instead of talking to them. The sight of this behavior, now commonplace in much of the world, triggered a sensation I had experienced a few times before—the instant recognition that a technology is going to change my life in ways I can scarcely imagine. Since then the practice of exchanging short text messages via mobile telephones has led to the eruption of subcultures in Europe and Asia. At least one government has fallen, in part because of the way people used text messaging. Adolescent mating rituals, political activism, and corporate management styles have mutated in unexpected ways.

I've learned that "texting," as it has come to be called, is only a small harbinger of more profound changes to come over the next ten years. My media moment at Shibuya Crossing was only my first encounter with a phenomenon I've come to call "smart mobs." When I learned to recognize the signs, I began to see them everywhere—from barcodes to electronic bridge tolls.

The other pieces of the puzzle are all around us now but haven't joined together yet. The radio chips designed to replace barcodes on manufactured objects are part of it. Wireless Internet nodes in cafes, hotels, and neighborhoods are part of it. Millions of people who lend their computers to the search for extraterrestrial intelligence are part of it. The way buyers and sellers rate each other on the Internet auction site eBay is part of it. At least one key global business question is part of it: Why is the Japanese company Do-CoMo profiting from enhanced wireless Internet services while U.S. and European mobile telephony operators struggle to avoid failure?

When you piece together these different technological, economic, and social components, the result is an infrastructure that makes certain kinds of human

actions possible that were never possible before. The "killer apps" of tomorrow's mobile infocom industry won't be hardware devices or software programs but social practices. The most far-reaching changes will come, as they often do, from the kinds of relationships, enterprises, communities, and markets that the infrastructure makes possible.

Smart mobs consist of people who are able to act in concert even if they don't know each other. The people who make up smart mobs cooperate in ways never before possible because they carry devices that possess both communication and computing capabilities. Their mobile devices connect them with other information devices in the environment as well as with other people's telephones. Dirt-cheap microprocessors are beginning to permeate furniture, buildings, and neighborhoods; products, including everything from box tops to shoes, are embedded with invisible intercommunicating smartifacts. When they connect the tangible objects and places of our daily lives with the Internet, handheld communication media mutate into wearable remote-control devices for the physical world.

Within a decade, the major population centers of the planet will be saturated with trillions of microchips, some of them tiny computers, many of them capable of communicating with each other. Some of these devices will be telephones, and they will also be supercomputers with the processing power that only the Department of Defense could muster a couple of decades ago. Some devices will read barcodes and send and receive messages to radio-frequency identity tags. Some will furnish wireless, always-on Internet connections and will contain global positioning devices. As a result, large numbers of people in industrial nations will have a device with them most of the time that will enable them to link objects, places, and people to online content and processes. Point your device at a street sign, announce where you want to go, and follow the animated map beamed to the box in your palm, or point at a book in a store and see what the *Times* and your neighborhood reading group have to say about it. Click on a restaurant and warn your friends that the service has deteriorated.

These devices will help people coordinate actions with others around the world—and, perhaps more importantly, with people nearby. Groups of people using these tools will gain new forms of social power, new ways to organize their interactions and exchanges just in time and just in place. Tomorrow's fortunes will be made by the businesses that find a way to profit from these changes, and

yesterday's fortunes are already being lost by businesses that don't understand them. As with the personal computer and the Internet, key breakthroughs won't come from established industry leaders but from the fringes, from skunkworks and startups and even associations of amateurs. *Especially* associations of amateurs.

Although it will take a decade to ramp up, mobile communications and pervasive computing technologies, together with social contracts that were never possible before, are already beginning to change the way people meet, mate, work, fight, buy, sell, govern, and create. Some of these changes are beneficial and empowering, and some amplify the capabilities of people whose intentions are malignant. Large numbers of small groups, using the new media to their individual benefit, will create emergent effects that will nourish some existing institutions and ways of life and dissolve others. Contradictory and simultaneous effects are likely: People might gain new powers at the same time we lose old freedoms. New public goods could become possible, and older public goods might disappear.

When I started looking into mobile telephone use in Tokyo, I discovered that Shibuya Crossing was the most mobile-phone-dense neighborhood in the world: 80 percent of the 1,500 people who traverse that madcap plaza at each light change carry a mobile phone.[1] I took that coincidence as evidence that I was on the right track, although I had only an inkling of how to define what I was tracking. It had not yet become clear to me that I was no longer looking for intriguing evidence about changing techno-social practices, but galloping off on a worldwide hunt for the shape of the future.

I learned that those teenagers and others in Japan who were staring at their mobile phones and twiddling the keyboards with their thumbs were sending words and simple graphics to each other—messages like short emails that were delivered instantly but could be read at any time. When I looked into the technical underpinnings of telephone texting, I found that those early texters were walking around with an always-on connection to the Internet in their hands. The tingling in my forebrain turned into a buzz. When you have a persistent connection to the Internet, you have access to a great deal more than a communication channel.

A puzzling problem troubles those who understand the possibilities inherent in a mobile Internet: The potential power of connecting mobile devices to the

Internet has been foreseen and hyped recently, but with the exception of DoCoMo, no company has yet created significant profits from wireless Internet services. The dotcom market collapse of 2001, accompanied by the even larger decline in value of global telecommunication companies, raised the question of whether any existing enterprises will have both the capital and the savvy to plug the Internet world into mobile telephony and make a successful business out of it.

Forecasting the technical potential of wireless Internet is the easy part. I knew that I should expect the unexpected when previously separate technologies meet. In the 1980s, television-like display screens plus miniaturized computers added up to a new technology with properties of its own: personal computers. PCs evolved dramatically over twenty years; today's handheld computer is thousands of times more powerful than the first Apple PC. Then PCs mated with telecommunications networks and multiplied in the 1990s to create the Internet, again spawning possibilities that neither of the parent technologies exhibited in isolation. Again, the new hybrid medium started evolving rapidly; my Internet connection today is thousands of times faster than my modem of the early 1980s. Then the Web in the late 1990s put a visual control panel on the Net and opened it to hundreds of millions of mainstream users. What's next in this self-accelerating spiral of technological, economic, and social change?

Next comes the mobile Net. Between 2000 and 2010, the social networking of mobile communications will join with the information-processing power of networked PCs. Critical mass will emerge some time after 2003, when more mobile devices than PCs will be connected to the Internet.[2] If the transition period we are entering in the first decade of the twenty-first century resembles the advent of PCs and the Internet, the new technology regime will turn out to be an entirely new medium, not simply a means of receiving stock quotes or email on the train or surfing the Web while walking down the street. Mobile Internet, when it really arrives, will not be just a way to do old things while moving. It will be a way to do things that couldn't be done before.

Anybody who remembers what mobile telephones looked like five years ago has a sense of the pace at which handheld technology is evolving. Today's mobile devices are not only smaller and lighter than the earliest cell phones, they have become tiny multimedia Internet terminals. I returned to Tokyo a year and a half after I first noticed people using telephones to send text between tiny black and

white screens. On my most recent visit in the fall of 2001, I conducted my own color videoconference conversations via the current version of high-speed, multimedia, "third-generation" mobile phones. Perhaps even more important than the evolution of color and video screens in telephone displays is the presence of "location awareness" in mobile telephones. Increasingly, handheld devices can detect, within a few yards, where they are located on a continent, within a neighborhood, or inside a room.

These separate upgrades in capabilities don't just add to each other; mobile, multimedia, location-sensitive characteristics multiply each other's usefulness. At the same time, their costs drop dramatically. As we will see in later chapters, the driving factors of the mobile, context-sensitive, Internet-connected devices are Moore's Law (computer chips gets cheaper as they grow more powerful), Metcalfe's Law (the useful power of a network multiplies rapidly as the number of nodes in the network increases), and Reed's Law (the power of a network, especially one that enhances social networks, multiplies even more rapidly as the number of different human groups that can use the network increases). Moore's Law drove the PC industry and the cultural changes that resulted, Metcalfe's Law drove the deployment of the Internet, and Reed's Law will drive the growth of the mobile and pervasive Net.

The personal handheld device market is poised to take the kind of jump that the desktop PC made between 1980 and 1990, from a useful toy adopted by a subculture to a disruptive technology that changes every aspect of society. The hardware upgrades that make such a jump possible are already in the product pipeline. The underlying connective infrastructure is moving toward completion.

After a pause to recover from the collapse of the telecommunications economic bubble of the 1990s, the infrastructure for global, wireless, Internet-based communication is entering the final stages of development. The pocket videophone I borrowed in Tokyo was proof that a high-speed wireless network could link wireless devices and deliver multimedia to the palm of my hand. The most important next step for the companies that would deploy this technology and profit from it has nothing to do with chips or network protocols but everything to do with business models, early adopters, communities of developers, and value chains. It's not just about building the tools anymore. Now it's about what people use the tools to do.

How will human behavior shift when the appliances we hold in our hands,

carry in our pockets, or wear in our clothing become supercomputers that talk to each other through a wireless mega-Internet? What can we reasonably expect people to do when they get their hands on the new gadgets? Can anyone foresee which companies will drive change and detect which businesses will be transformed or rendered obsolete by it? These questions first occurred to me on that spring day in Tokyo, but I didn't think about it again until another sight on a street halfway around the world from Shibuya Crossing caught my attention.

Sitting at an outdoor café in Helsinki a few months after I noticed the ways that people were using Japanese "i-mode" telephones, I watched five Finns meet and talk on the sidewalk. Three were in their early twenties. Two were old enough to be the younger people's parents. One of the younger persons looked down at his mobile phone while he was talking to one of the older people. The young man smiled and then showed the screen of his telephone to his peers, who looked at each other and smiled. However, the young man holding the device didn't show his mobile phone's screen to the older two. The sidewalk conversation among the five people flowed smoothly, apparently unperturbed by the activities I witnessed. Whatever the younger three were doing, it was clearly part of an accepted social code I knew nothing about. A new mode of social communication, enabled by a new technology, had already diffused into the norms of Finnish society.

At that moment I recalled the odd epiphany I had experienced at Shibuya Crossing the previous spring. Faint lines began to connect the dots. My internal future-detectors switched from a mild tingle to a persistent buzz.

Twice before in the past twenty years I've encountered something that convinced me in an instant that my life and the lives of millions of other people would change dramatically in coming years. On both occasions, I was drawn into a personal and intellectual quest to understand these possible changes. The first experience that propelled me on one of these intellectual expeditions was the sensation of using the graphical user interface that enabled non-programmers to operate computers by pointing and clicking. My 1985 book *Tools for Thought: The History and Future of Mind-Expanding Technology* presented my arguments that the PC could make possible an intellectual and creative expansion as influential as the changes triggered by the printing press.[3]

Within a few years of writing about them, the mind-amplifying gizmos I had futurized about had become part of my own life. My personal computer was a

magic typewriter. Then I plugged my PC into my telephone, and I entered into social cyberspace. I spent more and more time online, reading and writing messages to computer bulletin boards, in chat rooms and electronic mailing lists. My 1993 book, *The Virtual Community,* examined the social phenomena I saw emerging from the early days of the Internet era.[4] Because of these previous experiences, I was prepared to pay attention that day in March 2000, when I first watched people in Tokyo thumbing text messages on their mobile phone keypads.

We're only seeing the first-order ripple effects of mobile-phone behavior now —the legions of the oblivious, blabbing into their hands or the air as they walk, drive, or sit in a concert and the electronic tethers that turn everywhere into the workplace and all the time into working time. What if these are just foreshocks of a future upheaval? I've learned enough from past technology shifts to expect the second-order effects of mobile telecommunications to bring a social tsunami. Consider a few of the early warning signs:

- The "People Power II" smart mobs in Manila who overthrew the presidency of President Estrada in 2001 organized demonstrations by forwarding text messages via cell phones.[5]
- A Web site, http://www.upoc.com, enables fans to stalk their favorite celebrities in real time through Internet-organized mobile networks and provides similar channels for journalists to organize citizen-reporters on the fly. The site makes it easy for roving phone tribes to organize communities of interest.
- In Helsinki and Tokyo you can operate vending machines with your telephone and receive directions on your wireless organizer that show you how to get from where you are standing to where you want to go.[6]
- "Lovegety" users in Japan find potential dates when their devices recognize another Lovegety in the vicinity broadcasting the appropriate pattern of attributes. Location-based matchmaking is now available on some mobile phone services.[7]
- When I'm not using my computer, its processor searches for extraterrestrial intelligence. I'm one of millions of people around

the world who lend their computers to a cooperative effort—distributing parts of problems through the Internet, running the programs on our PCs while the machines are idle, and assembling the results via the Net. These computation collectives produce enough supercomputing power to crack codes, design medicines, or render digital films.[8]

Location-sensing wireless organizers, wireless networks, and community supercomputing collectives all have one thing in common: *They enable people to act together in new ways and in situations where collective action was not possible before.* An unanticipated convergence of technologies is suggesting new responses to civilization's founding question, How can competing individuals learn to work cooperatively?

As indicated by their name, smart mobs are not always beneficial. Lynch mobs and mobocracies continue to engender atrocities. The same convergence of technologies that opens new vistas of cooperation also makes possible a universal surveillance economy and empowers the bloodthirsty as well as the altruistic. Like every previous leap in technological power, the new convergence of wireless computation and social communication will enable people to improve life and liberty in some ways and to degrade it in others. The same technology has the potential to be used as both a weapon of social control and a means of resistance. Even the beneficial effects will have side effects.

We are moving rapidly into a world in which the spying machinery is built into every object we encounter. Although we leave digital traces of our personal lives with our credit cards and Web browsers today, tomorrow's mobile devices will broadcast clouds of personal data to invisible monitors all around us as we move from place to place. We are living through the last years of the long era before sensors are built into the furniture. The scientific and economic underpinnings of pervasive computing have been building for decades, and the social side-effects are only beginning to erupt. The virtual, social, and physical worlds are colliding, merging, and coordinating.

Don't mistake my estimates of the power of the coming technology with unalloyed enthusiasm for its effects. I am not calling for an uncritical embrace of the new regime, but for an informed consideration of what we're getting ourselves into. We have an opportunity now to consider the social implications of this new

technological regime as it first emerges, before every aspect of life is reordered.

Online social networks are human activities that ride on technical communications infrastructures of wires and chips. When social communication via the Internet became widespread, people formed support groups and political coalitions online. The new social forms of the last decade of the twentieth century grew from the Internet's capability for many-to-many social communication. The new social forms of the early twenty-first century will greatly enhance the power of social networks.

Since my visits to Tokyo and Helsinki, I've investigated the convergence of portable, pervasive, location-sensitive, intercommunicating devices with social practices that make the technologies useful to groups as well as individuals. Foremost among these social practices are the "reputation systems" that are beginning to spring up online—computer-mediated trust brokers. The power of smart mobs comes in part from the way age-old social practices surrounding trust and cooperation are being mediated by new communication and computation technologies.

In this coming world, the acts of association and assembly, core rights of free societies, might change radically when each of us will be able to know who in our vicinity is likely to buy what we have to sell, sell what we want to buy, know what we need to know, want the kind of sexual or political encounter we also want. As online events are woven into the fabric of our physical world, governments and corporations will gain even more power over our behavior and beliefs than large institutions wield today. At the same time, citizens will discover new ways to band together to resist powerful institutions. A new kind of digital divide ten years from now will separate those who know how to use new media to band together from those who don't.

Knowing who to trust is going to become even more important. Banding together, from lynch mobs to democracies, taps the power of collective action. At the core of collective action is reputation—the histories each of us pull behind us that others routinely inspect to decide our value for everything from conversation partners to mortgage risks. Reputation systems have been fundamental to social life for a long time. In intimate societies, everyone knows everyone, and everyone's biography is an open, if not undisputed, book. Gossip keeps us up to date on who to trust, who other people trust, who is important, and who decides who is important.

Today's online reputation systems are computer-based technologies that make it possible to manipulate in new and powerful ways an old and essential human trait. Note the rise of Web sites like eBay (auctions), Epinions (consumer advice), Amazon (books, CDs, electronics), Slashdot (publishing and conversation) built around the contributions of millions of customers, enhanced by reputation systems that police the quality of the content and transactions exchanged through the sites.[9] In each of these businesses, the consumers are also the producers of what they consume, the value of the market increases as more people use it, and the aggregate opinions of the users provide the measure of trust necessary for transactions and markets to flourish in cyberspace.

Reputation reports on eBay give prospective auction bidders a sense of the track record of the otherwise anonymous people to whom they may trustingly mail a check. Ratings of experts on Epinions make visible the experience of others in trusting each expert's advice. Moderators on Slashdot award "karma points" that make highly knowledgeable, amusing, or useful posts in an online conversation more visible than those considered less insightful.

Wireless devices will take reputation systems into every cranny of the social world, far from the desktops to which these systems are currently anchored. As the costs of communication, coordination, and social accounting services drop, these devices make possible new ways for people to self-organize mutual aid. It is now technologically possible, for example, to create a service that would enable you to say to your handheld device: "I'm on my way to the office. Who is on my route and is looking for a ride in my direction right now—and who among them is recommended by my most trusted friends?"

Wireless communication technologies and the political regimes that regulate their use are a key component of smart mob infrastructure. One can sit in a restaurant in Stockholm or in the atrium of a business building in San Francisco and connect to unprotected or publicly available wireless networks with a laptop computer. Will ad hoc coalitions of wireless Internet enthusiasts create a grassroots network that can challenge the power of established infrastructure providers?

In Chapter 4, I'll consider how the placeless world of wireless communications is likely to interact with the place-specific networked computer chips that are beginning to infiltrate buildings, furniture, and even clothing. Although pervasive

and wearable computers have been predicted and developed for more than a decade, their enabling components are only beginning to become inexpensive enough to trigger a wave of change. After years of kludgey prototypes, wearable computers are on the threshold of becoming fashion items. The first "wearable computing communities" are emerging.

The following chapters chronicle my investigation into technology practices and social theories and my inquiry into what we need to know if we intend to influence the way technological capabilities are exercised. I discuss the likely evolution of mobile devices, the future of pervasive computing, the power of peer-to-peer resource sharing, the study of cooperation, and the science of reputation. I examine the wireless Internet business model, or lack of it, and untangle some of the geek/wonk jargon surround-**xx** ing regulatory battles over wireless Internet technologies. I explain why today's regulatory battles over the electromagnetic spectrum might be the most important collision of politics and communication technology since the King of England insisted on licensing printing presses.

When I examine the potential of new technologies, I have tried to avoid the dangers of "the rhetoric of the technological sublime," in which the miraculous properties of new tools are extolled to the exclusion of critical examination of their shadow sides.[10] I seek to shine light and also to look into the shadows.

Loss of privacy is perhaps the most obvious shadow side of technological cooperation systems. In order to cooperate with more people, I need to know more about them, and that means that they will know more about me. The tools that enable cooperation also transmit to a large number of others a constellation of intimate data about each of us. In the recent past, it was said that digital information technology, such as the magnetic strips on credit cards, leaves a "trail of electronic breadcrumbs" that can be used to track individuals. In the future, the trail will become a moving cloud as individuals broadcast information about themselves to devices within ten yards, a city block, or the entire world. Although there is room for speculation about how quickly the new tools will be adopted, certainly over the next several decades inexpensive wireless devices will penetrate into every part of the social world, bringing efficiencies to the production of snooping power. The surveillance state that Orwell feared was puny in its power in comparison to the panoptic web we have woven around us. Detailed information about the minute-by-minute behaviors of entire populations

will become cost-effective and increasingly accurate. Both powerfully beneficial and powerfully dangerous potentials of this new tracking capability will be literally embedded in the environment.

Cooperative effort sounds nice, and at its best, it is the foundation of the finest creations of human civilizations, but it can also be nasty if the people who cooperate share pernicious goals. Terrorists and organized criminals have been malevolently successful in their use of smart mob tactics. A technological infrastructure that increases surveillance on citizens and empowers terrorists is hardly utopian. Intrusions on individual privacy and liberty by the state and its political enemies are not the only possible negative effects of enhanced technology-assisted cooperation. In addition, profound questions about the quality and meaning of life are raised by the prospect of millions of people possessing communication devices that are "always on" at home and work. How will mobile communications affect family and societal life?

There are opportunities as well as dangers, however, and a major reason I've written this book is my growing belief that what we understand about the future of smart mobs, and how we talk about that future, holds the power to influence that future—at least within a short window of opportunity. The possibilities for the use of smart mob infrastructure do not consist exclusively of dark scenarios. Indeed, cooperation is integral to the highest expressions of human civilization. In counterpoint to the dystopian possibilities I've noted, I introduce sociologists and economists who argue that wireless technologies could make it easier to create public goods, thus affording an unprecedented opportunity for enhancing social capital that can enrich everyone's life.

Just as existing notions of community were challenged by the emergence of social networks in cyberspace, traditional ideas about the nature of place are being challenged as computing and communication devices begin to saturate the environment. As more people on city streets and on public transportation spend more time speaking to other people who are not physically co-present, the nature of public spaces and other aspects of social geography are changing before our eyes and ears; some of these changes will benefit the public good and others will erode it.

Before people who hold stakes in tomorrow's technological civilization can hope to address the social challenges posed by smart mob technologies, we have to know what the issues are, what they imply, and useful ways to think about

them. I conclude this book with a strategic briefing for the future, highlighting the strengths, weaknesses, opportunities, and dangers of mobile and pervasive technologies. I believe that our destiny is not (yet) determined by technology, that our freedom and quality of life do not (yet) have to be sacrificed to make us into more efficient components of a global wealth-generating machine.

I also know that beneficial uses of technologies will not automatically emerge just because people hope they will. Those who wish to have some influence on the outcome must first know what the dangers and opportunities are and how to act on them. Such knowledge does not guarantee that the new tools will be used to create a humane, sustainable world. Without such knowledge, however, we will be ill equipped to influence the world our grandchildren will inhabit.

1
Shibuya Epiphany

The telegraph, like the Internet . . . transformed social and business practices, but it could be used only by skilled operators. Its benefits became available to the public at large only when the telegraph evolved into the telephone—initially known as the "speaking telegraph." The Internet is still in a telegraphic stage of development, in the sense that the complexity and expense of PCs prevent many people from using it.The mobile phone thus promises to do for the Internet what the telephone did for the telegraph: to make it a truly mainstream technology.

Because it used the same wires, the telephone was originally seen as merely a speaking telegraph, but it turned out to be something entirely new. The same mistake is already being repeated with the Internet. Many people expect the mobile Internet to be the same as the wired version, only mobile, but they are wrong . . . . Instead, the mobile Internet, although it is based on the same technology as the fixed-line Internet, will be something different and will be used in new and unexpected ways.

—Tom Standage, "The Internet Untethered"

Thumb Tribes

If you want to experience virtual reality without putting your head in a computer, take the subway to Shibuya station and follow the signs to "Hachiko." Pause near the statue outside the station. This bronze monument to a faithful dog is one of Tokyo's favorite meeting places. In the 1920s, Hachiko accompanied Professor

Eisaboru Ueno to this station every morning and waited for Ueno's return. Ueno failed to make his appointment the day he died in 1925, but his pet continued to show up at the station until he died **1** there in 1934. People still hold a festival at the statue every year on the seventh of March.[1] Like other meeting places such as the clock in Grand Central Station in New York City, the statue of Hachiko is an informal coordination point for urban populations—a social focus identified by sociologist Thomas Schelling as an essential element of every city's life.[2]

Hundreds of people mill around Hachiko. Cliques and flocks assemble and diffuse. Couples and octets coalesce, synchronize, and move on. In many ways, Shibuya station resembles every other Schelling point since the Athenian agora. Unlike gathering places of antiquity, however, some of the people milling around Hachiko are invisibly coordinated by flows of electronically mediated messages.

A growing number of people at Shibuya Crossing now divide their attention among three places at the same time. There's the physical world where pedestrians are expected to avoid walking into each other. Surrounding the crowd is an artificial but concrete world, the city as the all-enclosing environment of commercial propaganda described more than thirty years ago as The Society of the Spectacle.[3] Less garish but no less influential than the neon and video of the twenty-first-century metropolis are the private channels of the texting tribes, a third sphere in which bursts of terse communications link people in real time and physical space.

If you turn your back to Hachiko and look across the street at the right time, you will see yourself displayed on one of three gargantuan television screens that loom over the intersection. The giant high-definition screens are, in virtual reality parlance, "immersive." That is, when you are at Shibuya Crossing, not only are you perceiving an ever-changing audio-video advertisement, but you are also inside it.

The crosswalk works on the scramble system. Every time the lights turn green, 1,500 people cross from eight directions at once, performing a complex, collective, ad hoc choreography that accomplishes the opposite of flocking; people cooperate with immediate neighbors in order to go in different directions. In addition to negotiating split-second coordination with moving strangers, many in this crowd carry on simultaneous conversations with people located elsewhere. When I revisited this place a year and a half after my first encounter with texting, I

paused in the center of the intersection during a dozen scramble cycles in order to taste attunement with the hyper-coordinated throngs.

I knew that every technological regime involves people who invent a new tool, people who manufacture and sell it (and their stockholders, and the politicians those stockholders influence), and finally, people who use the technology in ways often unimagined by inventors, vendors, or regulators. Each of these groups owns a different stake and sees the tool from a different perspective. I started my research by interviewing an anthropologist and then met with one of the strategists responsible for "i-mode," Japan's singularly successful wireless Internet service. I also talked with scientists, engineers, marketers, entrepreneurs, journalists, and people on the street.

Two graduate students from Showa Women's University, Tomoko Kawa-mura and Haruna Kamide, and I were joined on the streets of Tokyo by my friend Justin Hall, a twenty-five-year-old American whose cheery willingness to engage strangers compensated for his rudimentary understanding of the Japanese language. Over a number of days, the four of us directly engaged dozens of keitai (mobile telephone) users in an unscientific but illuminating street survey. We started with fourteen-to-twenty-year-olds and then moved on to college-age youth.

A short walk from Harajuku station, La Forêt is a vertical mall catering to young urbanites. The small public space in front of the La Forêt is the informal nexus of the techno-adept, fashion-saturated, identity-constructing, mobile-texting culture. One of the first interviewees we encountered kept her keitai tucked into the rear pocket of her pants. (I noticed a proliferation of tiny pockets in shirts and pants specifically for keitai in Tokyo.) Her hair pointed in forty directions, spliced into carefully composed anarchy by fluorescent-colored baby hair clips. She wore a bow tie. Fashions had flashed through Harajuku like epidemics for decades before texting accelerated the pace of social networking. Our bow-tied informant said that she exchanged around eighty text messages a day, mostly with her three best girlfriends, sometimes with guys. Like many of her friends, she could compose a message with her thumb without looking at it.

We talked with an eighteen-year-old male in baggy purple pants. His hair was casual but immobile in a way that suggested a dab of gel. He wore a camouflage pattern t-shirt and a New York Yankees cap. He messaged guys in his band, "but mostly, my girlfriend." He sent and received a few dozen messages each day.

Sometimes, he and his friends sent each other ringtone versions of pop music.

Some girls wore school uniforms but decorated their keitai with iridescent stickers and phrases written in nail polish. Brands were prominent on clothing and accoutrements, but often in an altered form; logos and team insignia were mixed together, adorned with stickers and patches, toys, and charms.

Some call Tokyo texters oyayubisoku—"the thumb tribe." Kyodo News service reported a story in the summer of 2001 that revealed an unpleasant side to e-tribalism: Police arrested five teenage members of "Mad Wing Angels," a virtual motorcycle gang that met via texting, included members who didn't own motorcycles, and had never gathered in one place at the same time. The leader had never met the four Tokyo girls she ordered to beat and torture a fifth gang member who asked permission to leave the group in order to study abroad.[4] Clearly, the social ripples of texting were getting into rich ethnographic territory. It was my great good fortune to know an ethnographer who had been exploring it from the beginning— Kawamura's and Kamide's mentor, my old friend Mizuko Ito.

Anthropologist Mizuko Ito has been observing the ways that Tokyo youth use keitai. Stanford graduate Ito, now an associate professor at Keio University, studies "how identity and place are produced through and within digital media infrastructures." I had known her for a decade; Ito's brother, Joichi, was the first person to show me how to create a Web site, circa 1993, and Ito's husband, Scott Fisher, had been a NASA researcher I had interviewed in 1990.[5] I think of the Ito-Fishers as the Tokyo branch of the tribe that lives in the future.

By the time she and I and Kawamura and Kamide conversed in the dining room of Ito's Tokyo residence in 2001, Ito had been interviewing Tokyo teenagers—arguably the most technology-adept cultural experimenters on the planet—for two years. Ito believes that mobile phones triggered an intergenerational power shift in Japan because they freed youth from "the tyranny of the landline shared by inquisitive family members, creating a space for private communication and an agency that alters possibilities for social action."[6] In Japan, adding wired telephone lines to homes is expensive, but it is less expensive for teens to have their own personal mobile numbers.

"The space of the home," Ito noted, "dominated by parents, accommodates their identity as child, but not as friend. It is too small, crowded, and saturated with family interests to be an appropriate place for gathering face to face. The

home phone once was a means for parents to monitor and regulate their children's relationships with their peers."[7] Texting made it possible for young people to conduct conversations that can't be overheard. Ito observed teens using this new communication freedom to "construct a localized and portable place of intimacy, an open channel of contact with generally three to five others."[8] Ito and Kawamura, her research assistant, had interviewed high school and college students, seeking to understand how "keitai refashions the politics of how we view place and time."[9] Explaining that the life of Tokyo high school students is tightly controlled by family and school, Ito elaborated: "Getting a mobile phone grants teenagers a degree of privacy and right of assembly previously unavailable, which they use to construct a networked alternative space that is available from anywhere they are."[10]

Keitai-equipped youth use the parts of the city between their schools and homes as the stage for their alternative social space, staying in touch with friends while traveling from home to school, conducting group communications while shopping, flocking to fast-food restaurants or coffeehouses at fluidly negotiated intervals.

Kawamura and Kamide agreed with Ito that although many Japanese youth have more than one hundred addresses in their keitai's built-in address book, most send the majority of their messages to a small group of three to five peers. The three researchers also noted that many of these messages are of the intimacy-maintaining "thinking of you" variety. The young women they observed casually use text messages to say "good night," "good morning," or even "I'm bored." Similar research, not yet published at the time Ito reached her conclusions, was uncovering similar changes in family power structures in Scandinavia, a distinctly different culture half a world away from Japan.[11]

Kawamura documented communications exchanged by a group of thirty who were organizing a party at a karaoke bar. "As the date grew nearer, the frequency of messages increased. But only four people showed up on time at the agreed place," Kawamura told me. However, dozens of others stayed in touch through voice and text messages while they trickled in. "Kids have become loose about time and place. If you have a phone, you can be late," added Kawamura. Kamide, the other graduate student, agreed that it is no longer taboo to show up late: "Today's taboo," Kamide conjectured, is "to forget your keitai or let your battery

die." I later discovered that this "softening of time" was noted for the same age group in Norway.[12] "The opportunity to make decisions on the spot has made young people reluctant to divide their lives into time slots, as older generations are used to doing," agreed another Norwegian researcher.[13]

Has the definition of "presence" become uncoupled from physical places and reassigned to a social network that extends beyond any single lo- cation? According to Ito, "As long as people participated in the shared communications of the group, they seemed to be considered by others to be present."[14] In Norway, Rich Ling and Birgette Yttri observed that mobile telephone users in the same age group "were still available to their social network even when participating in another social event."[15]

It is commonly accepted among i-mode watchers that widespread youth adoption accelerated the spread of mobile Internet services throughout Japanese society (by spring 2001, 90 percent of Tokyo-area high school students possessed a mobile telephone—a technology diffusion that exceeded the adoption of the PC in Japan in both rate and scope).[16] Teenagers shared two key characteristics with the wider market of business people and housewives: Most were not already Internet users through desktop PCs, and most viewed keitai as fashion as well as technology. Our informants liked to download new ringtones or query an i-mode site to find out if the boy they just met was astrologically compatible—but none thought of what they were doing as "using the Internet."

Although major global manufacturers like Sony take their cues from the young early adopters in Shibuya and sell their own cultural pastiches back to them, the street kids already take the capabilities of smart mob technologies far beyond the safe boundaries provided by popular brands. Dmitri Ragano reported from Shibuya on this trend six months after my last visit there:

> As the balance of power falls in favor of the Shibuya kids, the technology companies may be increasingly at their mercy. In Japan, young people are beginning to turn away from sites and applications that are officially endorsed by mobile operators and going underground. One dark and strange example of this trend is an independent site called Zavn.net that has gained a

sizeable audience and offline momentum with no promotion. The site features a series of original novels about the Japanese phenomenon of enjo kosai in which some teenage girls in metro areas like Tokyo have affairs with middle-aged salary men in exchange for money. The stories of Zavn.net are written in punchy, card-size chapters that are intended to be read on a cell phone.[17]

According to Ragano, a café in Shibuya and a film have spun off physical world events based on this underground phenomenon—not entirely what the brand makers planned.

Michael Lewis referred to the "child-centric model of economic development" in Next: The Future Just Happened, in describing how the fastest-growing parts of the otherwise ailing Japanese economy derive from teen-centric products and services, from MP3 players and pocket-sized keitai to i-mode mobile Internet services.[18] Although today's 30 million i-mode subscribers come from every age group, Mari Matsunaga, the creative genius who launched this radical service from a staid engineering company, had Tokyo teenagers in mind. I was advised to meet Takeshi Natsuno, the Internet-seasoned marketing executive Matsunaga had hired to help launch the service.

i-mode Uber Alles

In the fall of 2001, NTT DoCoMo's regal modernist reception room on the twenty-seventh floor of Tokyo's Sanno Park Tower felt like the capital of a world, the way dotcom deal making at Buck's restaurant in Woodside, California, felt in 1999 or the way Sony Headquarters felt in 1989. Silent, marble- floored elevators the size of most companies' waiting rooms disgorge cohorts of prospective partners, contractors, and subcontractors into an enormous antechamber with panoramic views of Tokyo. In the center of the room, three banks of receptionists in identical fuchsia outfits take names and gesture toward the ranks of low, square, black leather benches where polyglot hordes wait on all four sides of each bench.

I came to Sanno Park Tower in search of clues about why this company was

succeeding while so many others were failing. The telecommunications giants of Europe watched their stock prices crash at the same time they owed $100 billion for the third-generation wireless license fees they paid governments in the 1990s. Portable analog telephones were the first generation of mobile technology. Digital telephones that made use of Internet-like services like short text messages were the second generation. The coming "3G" generation, which required the purchase of government-regulated licenses to use specific chunks of radio spectrum, was thought to be the breakthrough that would usher in the era of the mobile Internet. Although Sweden and Finland granted licenses in "beauty contests" among competitors, other nations conducted auctions. In anticipation of a wireless Internet business explosion, some European companies had staked unprecedented amounts of capital on securing their rights to a piece of the 3G spectrum. Converting those rights into profits, however, was proving to be thorny.

The first 3G trials of wireless networks fast enough for video data to travel in real time to mobile devices was postponed in Europe as telecom infrastructure industries struggled to leap from terrestrial wired networks to wireless media. The hype about the wireless Internet business was beginning to look as empty as the hype about the dotcom industry. There was one notable exception to the failures of wireless Internet schemes. While telecommunications companies faced radical declines in demand after a decade of expansion, one company attracted 28 million users within two years of launching a totally new kind of service. Each of those users pay an average of U.S.$20 monthly for i-mode services—DoCoMo's version of wireless Internet. I sat with the other hopefuls on the big square leather benches in Sanno Park Tower while I waited to meet the director of i-mode strategy. DoCoMo had launched the world's first successful 3G trial three weeks prior to my visit.

Nippon Telephone and Telegraph, DoCoMo's parent company, like AT&T and other telecommunication companies around the world, used to be a monopoly and has always been driven by engineers and bureaucrats. For most of the twentieth century, NTT sold telephone services, licensed headset technologies, and dreamed of delivering services utterly unlike voice telephony. NTT management did realize that the Internet business would be essentially different from the business that had made NTT the largest telco in the world with more than 200,000 employees.[19]

which are essentially a collection of ads. However, in the case of mobile phones, users don't use them for the purpose of acquiring specific information. If we could get the information onto mobile phones, people would start looking at it as a natural extension of using the phone."[22]

Matsunaga insisted that the telephone weigh less than 100 grams and that the basic service should cost less than 300 yen (less than three U.S. dollars) per month. Knowing that "something only comes to life when it's given a name," she came up with the name "i-mode."[23] She remembered that Enoki had said that they weren't designing a service for NTT executives, but for their children. "I got the first positive sign from my family," Enoki recalled. "At that time, the pager was at the peak of its popularity. My daughter used the number pad as a form of data communications. My son could play a new computer game without reading the instructions. Their ability to adapt to new information and use it with ease left a strong impression on me. I was convinced that young people would accept a new data service that would give them the same kind of enjoyment."[24]

The DoCoMo staff in their twenties who had joined the i-mode team convinced the rest of the team of the importance of text communication between mobile telephone users—an abbreviated form of instant email for the small keitai screens. "The young staff members were constantly coming up with new ideas," Matsunaga acknowledged. "One new idea was the addition of symbolic characters. It emerged as an answer to the problem of how to condense meaning and convey feelings in a short email. There had previously been a pager that had sold particularly well. Upon examining the reason for its success, it was discovered that only this particular model offered the symbol of a heart. Just the addition of a heart made a tremendous difference in sales."[25]

Eventually, one of the receptionists directed me to enter another elevator, where I joined those chosen to ascend to chambers on the thirty-third floor. There were crystal decanters and glasses, more views of Tokyo, and a whiteboard at the end of the table. Natsuno entered the room with an energy that didn't flag for the hour and a half we—mostly he—talked. He wore a tailored suit and perfectly dimpled tie. At thirty-six, Natsuno is the youngest of all NTT's top management. His English is perfect, and he makes it clear that he believes what he's selling. He grins often and seems to be authentically happy. Why shouldn't he be? It took AOL more than a decade to acquire 30 million subscribers, but i-mode reached that

Risto Linturi carried his mobile phone in his hand when he entered the room. Before he sat down, he put the device on the table. At times, Linturi picked up his telephone and gestured with it. Whereas keitai in Shibuya are often tucked away in special pockets or clipped onto belts, they seem to be an extension of the hand in Finland. Indeed, känny, the word Finns use to describe their mobile devices, is a diminutive form of "hand."[30] If Tokyo and DoCoMo are the first capitals of the wireless Internet industry, Helsinki and Nokia have been the wellsprings of mobile telephony. Finland leads the world in both Internet connections and mobile phones per capita.[31] Even before the launch of i-mode, Finnish adolescent courtship rituals and the social norms of Finnish business managers had been transformed by the use of short messages known as "SMS."

Helsinki is the color of granite, not neon, and giant televisions don't dominate street crossings, but Finnish citizens have lived the longest with the effects of mobile telephone usage. A few Finnish visionaries, Risto Linturi foremost among them, have been thinking about mobile and pervasive information technologies for some time. Like my Tokyo friends, Linturi is a member of the transnational tribe that lives in the future. As a teenager, he was one of Finland's first PC enthusiasts. Since then, he's been director of technology for Helsinki Telephone and "helped Nokia see the mobile telephone as a general purpose remote control device."[32] Slim, soft-spoken, and deliberate in his choice of words, Linturi is an enthusiast for the technologies he envisions. Like Natsuno and Hirschhorn, he is convinced that mobile telephones are evolving into control devices for the physical world.

Linturi set up a network of sensors in his home outside Helsinki. He monitors the temperature and lighting, locks and unlocks doors, and controls the kitchen appliances and the VCR from wherever he happens to be, using his mobile telephone as a remote control. "People who ring my door- bell when I am away from home can talk to me through my mobile."[33] Linturi's blend of personal enthusiasm and professional optimism reminded me of Mr. Irukuyama, the DoCoMo engineering manager who made his official NTT "vision" presentation with formal aplomb and then proudly showed me how his 3G phone connects to his infant son's webcam.

Linturi, the father of teenage daughters, was one of the first observers of the way young people use text messaging to coordinate their actions: "There are

at Digia, a company that was helping design HVV. By 2010, Innamaa claimed, HVV will link 12,000 residents, 700 enterprises with 8,000 employees, via fiber optic cables in their homes and 3G location-sensitive mobile devices.[40] If HVV succeeds, its sponsors plan to roll it out to neighborhoods and suburbs of other cities around the world. All there was to see of it in 2000, however, was a demo video.

"It's too top-down," was Linturi's opinion of HVV. "Open standards should enable people to link devices and services almost automatically." If citizens have the freedom to set up ad hoc wireless networks or to network their houses the way he had, Linturi thinks they will create digital pathways on their own, the way people automatically create pathways between buildings. One school of community design suggests looking for ways to enable people to use resources at hand to create different pathways, instead of trying to predesign their paths through the community.[41] Virtual villages, in this view, create themselves. In Chapter 4 I look more closely at "digital cities" pervaded by sensors, beacons, computers, and communicators. Arena 2000 and HVV might be the earliest representatives of two opposite schools of virtual urban planning: the "grassroots, open system, emergent use" school and the "centrally planned, proprietary system, planned use" school.

Finnish innovators have made significant contributions to Internet technology. Internet Relay Chat, the online social channel connecting countless real-time tribes, was invented in 1988 by Jarkko Oikarinen, a computer science student. The open source software movement's Linus Torvalds started Linux, the community-developed software operating system that is challenging Microsoft, on a server at the University of Helsinki.[42]

Finland's Nokia Oy started as a paper mill on the Nokia River in 1865.[43] By 1999, with $15.7 billion in sales, Nokia had become the world's leading vendor of mobile telephone handsets and infrastructure.[44] Nokia's CEO bet on what was still a distant future technology in 1987, when European technocrats agreed on a mobile telephony technical standard known as Global System for Mobile Communications (GSM). In 1991, Finland's Radiolinja launched the world's first GSM network; within a few years, the penetration of mobile telephones, most of them made by Nokia, had reached 60 percent of the Finnish population.[45]

Built into the GSM standard was the capability of instantly sending short text messages of 160 characters from one telephone to another, using the telephone

keyboard to input messages and the small display screen to read them—the Short Message Service (SMS). The first text message was sent in December 1992 in the United Kingdom.[46] By mid-2001, tens of billions of messages were being exchanged worldwide each month.[47] By 2002, 100 billion text messages were being sent on the world's GSM networks each month.[48] Considering that the telephone operators collect a few cents on each message, that's a tidy windfall for what was almost an afterthought in the GSM standard.

The unexpected success of texting was also a sign that people were once again appropriating a communication technology for social purposes, as they had done with voice telephony and with the Minitel in France, where the chat tool was literally stolen from operators by the users, and with email, where it was the driving force behind the growth of the landlocked Internet.[49]

A technical and economic advantage of text messaging is that it is "packet-switched" rather than "circuit-switched." This technical distinction divides the telegraph-telephone era analog network from the Internet and mobile era digital network. Circuit-switched telephone connections require a series of physical switches to link a continuous wired circuit between both parties—think of early twentieth-century films of operators who closed those circuits by plugging jacks into a switchboard. Like data on the Internet, text messages are sent in electronic bursts of data, "packets," that find their own way through the network via "routers" that read the addresses on the packets and forward them. Packets are tiny and are reassembled at the destination, so they can fit in between other messages instead of preempting them the way analog circuits do. This means that far more information can be sent economically from any point on the network to any other because the transport medium efficiently allocates network resources on a bottom-up basis (the packets find their way like autos) rather than an inefficient, centrally planned basis where each conversation requires a devoted circuit (like railroads). This technical advantage makes it less expensive to support massive text-messaging traffic than to support circuit-switched voice traffic. The source of the power of this new medium is the combination of the economic advantages of texting with the way tex- ting supports and is propagated by social networks. The economic leverage that comes from interleaving digital information in this way will come into play again when I look at new wireless Internet technologies that challenge the way the electromagnetic spectrum is

regulated.

Texting—referred to by young Finnish enthusiasts with the verb form "tekstata"—surfaced in Finland in 1995 and was discovered by teenagers in 1998.[50] By 2000, Finns were exchanging more than a billion SMS messages annually.[51] Eija-Liisa Kasasniemi, a Finnish folklorist, focused her dissertation research on the text message culture of Finnish teenagers. She and colleague Pirjo Rautianen started collecting data about SMS messaging in the lives of Finnish adolescents. They reported some interesting findings:

> Through SMS teens hate, gossip, mediate, and express longing, even when the writer lacks the courage for a call or in situations where other communication channels are inappropriate. The text message is the backdoor of communication.
>
> The SMS phenomenon has generated its own terminology, customs, and social norms . . . . Perhaps the most surprising feature in the text messaging of Finnish teenagers is the extent to which it incorporates collective behavior . . . . Text messages are circulated among friends, composed together, read together, and fitting expressions or entire messages are borrowed from others.
>
> Teens use the messages to test their limits and step outside the role of a child. Text messaging is a way to share relationships.[52]

In 1997, Pasi Mäenpää and Timo Kopomaa conducted research funded by Nokia and Telecom Finland (which later became Sonera). Their report included observations that resonated with Ito's findings in Japan:

> The mobile phone creates its own user-culture, which in turn produces new urban culture and new ways of life . . .
>
> Spontaneous contacts, which especially the younger interviewees make "ex tempore," tend to be these

been proposed, but spam technology seems to be keeping a step ahead of countermeasures. The irony would be painful if the advanced cooperation machinery of many-to-many media is rendered unusable by chronic noncooperation.

The most profound category of threat posed by smart mobs is the threat to human dignity. Our marvelous information technology, claim a number of thoughtful critics, externalizes only one part of human nature, the part that grasps and exploits, the part that harvests efficiency by treating humans like components. Another school of critics warns that the enthusiastic embrace of our muscle-multiplying, brain-extending artificial creations could lead to an abandonment of the biological body—the "posthuman" era.

Symbiosis or Abomination?

Jacques Ellul wrote his bleak and prescient book, The Technological Society, in 1954, when there were no more than a dozen computers in the world. Ellul addressed the seductive danger he perceived in a way of thinking and doing. This way of thinking is necessary for what most of us think of as technology, but it is invisible and not always connected to physical machines. Technique applies to governments as well as artifacts: "the ensemble of practices by which one uses available resources in order to achieve certain valued ends."[43] Slavery is technique. The alphabet is technique. Government is technique. Steam power is technique. Ellul claims the key characteristics of technique are rationality, artificiality, automatism of technical choice, self-augmentation, monism, universalism, and autonomy. A community of computer-wearers who cooperate through a computerized reputation system would seem to fit those criteria.

To Ellul, technique is in the process of rearranging the world and the way humans act in the world. He warned that "human life as a whole is not inundated by technique. It has room for activities that are not rationally or systematically ordered. But the collision between technique and spontaneous activities that are not rationally or systematically ordered is catastrophic for the spontaneous activities."[44] Ellul could have been describing the hyper-coordinated teens of Scandinavia or the hyper-informated households of Silicon Valley—except he

biochemistry of thought and emotion, and the creation of artificial life-forms totally divorced from the realm of flesh. Technique has enabled humans to attain powers we attributed only to the gods a few generations ago. The question is whether we have the wisdom to use our power-tools without amputating something vital.

In 1967, Lewis Mumford, in The Myth of the Machine, proposed that the most powerful and dehumanizing invention was not a visible machine but a social machine in which humans were treated as components in a massive hierarchical system for building pyramids and skyscrapers, empires and civilizations.[46] Mumford conjectured origins for what he sometimes called "the megamachine" in a prehistoric arrangement that maps perfectly onto Foucault. Mumford proposed that leaders of the people with muscle, the hunter-kings who had conquered the other local bands of armed men, teamed up with the leaders of the people who had tamed the magic of symbols. The astrologer-priest would anoint the guy with the most loyal spear-carriers as a god, and the god-king would elevate the priest to the leadership of a cult that ordered the lives of their subjects— power/knowledge put in action.

By organizing workforces and military forces hierarchically and breaking their tasks into component parts, entire populations could organize into social machines to build pyramids and conquer empires. By freeing a priestly elite for intellectual training, the administration of empire became possible, and the tools of imperial administrators—numbers and alphabets—set the stage for more efficient organization (what Foucault would call discipline) and the power/knowledge that literacy enabled. Are networked thumb tribes playing with a form of counter-power to hierarchical megamachines? We've considered what tyrannies smart mobs might enable. And we've seen that the alphabetic weapon of Mesopotamian despots became the foundations of democracies. What liberties might the intelligent use of mobile and pervasive media make possible?

One of the first pioneers of artificial intelligence research, an MIT researcher named Joseph Weizenbaum, applied the arguments posed by Ellul and Mumford directly to the future of computing, a field he knew well. In Computer Power and Human Reason, published in 1976, Weizen-baum emphasized that the aspect of human nature that computers externalize is our most machine-like aspect.[47] He called this "the tyranny of instrumental reasoning," building on Heidegger's view

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