instance. For your story, create characters, a setting, and a plot with a beginning, middle, and end. Try your best to make the episode come to life through your writing and to convey the particular frustrations caused by the errant texter/phoner. You might end by appending a moral to the story.

HOWARD RHEINGOLD

How to Recognize the Future When It Lands on You

The article that follows is the first chapter of Howard Rheingold's influential book, Smart Mobs, *which was published in 2002. In it, Rheingold considers the ways in which pervasive wireless technology will "makes certain kinds of human actions possible that were never possible before." In the hordes of people talking and texting on their cell phones and in the increasing saturation of our environment with wireless connections to the Internet, Rheingold sees a key convergence of technologies that will enable people to act together and cooperate in new ways. While he acknowledges "dark scenarios" that might eventuate if technology-equipped smart mobs have nefarious intentions, Rheingold is mostly upbeat and excited about the possibilities of mobile computing, and here he makes interesting predictions about how humans might adapt to the technology and change some of their behavior as a result. Given that Rheingold was writing before texting really took off in the United States and before Facebook, MySpace, or Twitter, it's interesting to read this article and see how his predictions have played out.*

The first signs of the next shift began to reveal themselves 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 cafés, 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 DoCoMo 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. 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?

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.[4]
- 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.[5]

- "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.[6]
- 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.[7]

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.[8] 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?

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.[9] 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.

NOTES

1. The Shibuya Crossing in Tokyo, Japan, has the highest mobile phone density in the world. On weekdays an average of 190,000 people and on weekends an average of 250,000 people pass this crossing per day (Source: CCC, Tsutaya), around 1,500 people traverse at each light change, and 80 percent of them carry a mobile phone. <http://nooper.co.jp/showcase/gallery.php?s=4&l=en> (24 January 2002).

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3. Howard Rheingold, *Tools for Thought: The History and Future of Mind-Expanding Technology* (New York: Simon & Schuster, 1985.)
4. Arturo Bariuad, "Text Messaging Becomes a Menace in the Philippines," *Straits Times,* 3 March 2001.
5. Lisa Takeuchi Cullen, "Dialing for Dollars," *Time Magazine* 157 (22), 4 June 2001, <http://www.timeinc.net/time/interactive/business/money_np.html> (4 February 2002). See also: Kevin Werbach, "Location-Based Computing: Wherever You Go, There You Are," *Release* 1.0 18 (6), June 2000, <http://release1.edventure.com/abstracts.cfm?Counter=8096700> (4 February 2002).
6. "Japan's Lonely Hearts Find Each Other with 'Lovegety,'" *CNN.com,* 7 June 1998, <http://www.cnn.com/WORLD/asiapcf/9806/07/fringe/japan.lovegety/> (26 January 2002).
7. Howard Rheingold, "You Got the Power," *Wired* 8.08, August 2000, <http://www.wired.com/wired/archive/8.08/comcomp.html> (29 March 2002).
8. See: eBay, <http://www.ebay.com>; Epinions, <http://www.epinions.com>; Slashdot, <http://www.slashdot.org>; and Plastic, <http://www.plastic.com>.
9. J. Carey, "Space, Time and Communications: A Tribute to Harold Innis," in *Communication as Culture* (New York: Routledge, 1989), 12.

SUGGESTIONS FOR WRITING

1. Rheingold claims that mobile technologies and pervasive computing are changing the way that people "meet, mate, work, fight, buy, sell, govern, and create." Choose one of these verbs (or use one of your own), and make a list of the various technologies (in addition to cell phones and mobile Internet) that shape human behavior in this realm. Then write an explanatory essay in which you discuss the impact of technology on the particular activity you chose. Perhaps you could conclude your essay by identifying the one technology that currently exerts the strongest influence in this area.
2. Rheingold offers a number of concepts to help us understand the new technological developments he discusses: for example, smart mob, convergence, and reputation system. Choose one of these terms—or another key term that you find in the article—and read through the article again to see how Rheingold defines the terms and what examples he provides to illustrate this definition. Then, in an essay of

PENGUIN ACADEMICS

READING POPULAR CULTURE

Edited by

Michael Petracca
University of California at Santa Barbara

Madeleine Sorapure
University of California at Santa Barbara

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