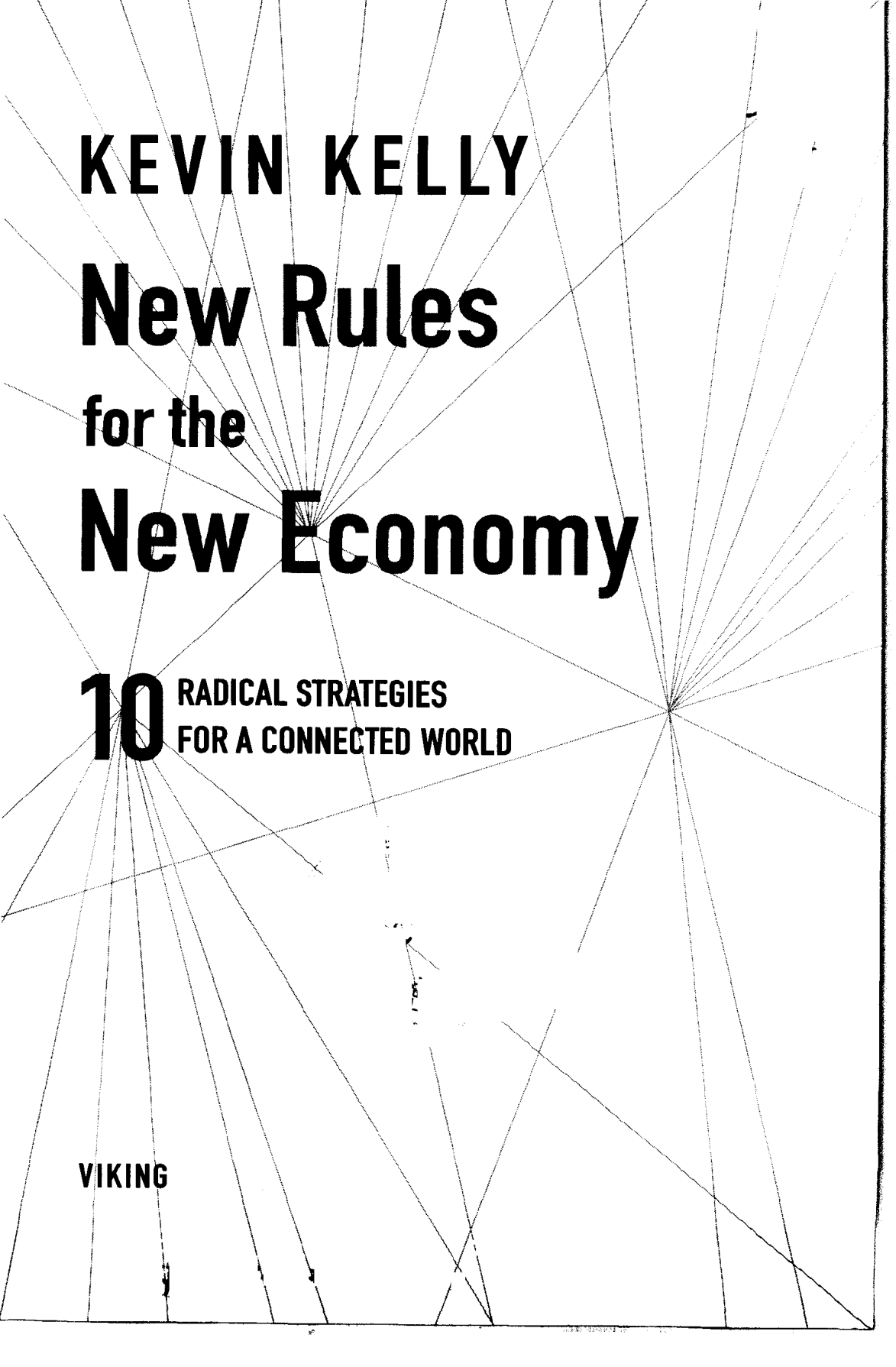
KEVIN KELLY

Executive Editor, *Wired* magazine
author of *Out of Control*

New Rules for the New Economy

10 Radical Strategies for a Connected World



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Published by the Penguin Group
Penguin Putnam Inc., 375 Hudson Street,
New York, New York 10014, U.S.A.
Penguin Books Ltd, 27 Wrights Lane,
London W8 5TZ, England
Penguin Books Australia Ltd, Ringwood,
Victoria, Australia
Penguin Books Canada Ltd, 10 Alcorn Avenue,
Toronto, Ontario, Canada M4V 3B2
Penguin Books (N.Z.) Ltd, 182–190 Wairau Road,
Auckland 10, New Zealand
Penguin India, 210 Chiranjiv Tower, 43 Nehru Place,
New Delhi 11009, India

Penguin Books Ltd. Registered Offices:
Harmondsworth, Middlesex, England

First published in 1998 by Viking Penguin,
a member of Penguin Putnam Inc.

10 9 8 7 6 5 4 3 2 1

A portion of this work first appeared in *Wired*, September 1997,
as "New Rules for the New Economy: Twelve Dependable
Principles for Thriving in a Turbulent World."

LIBRARY OF CONGRESS CATALOGING-IN-PUBLICATION DATA
Kelly, Kevin.
New rules for the new economy : 10 radical strategies for
a connected world / Kevin Kelly.
p. cm.
Includes bibliographical references and index.
ISBN 0–670–88111–2
1. Economic forecasting. 2. Business forecasting. I. Title
HC59 15.K45 1998
658—dc21 98–36917

This book is printed on acid-free paper.
♾

Printed in the United States of America
Set in Electra
Designed by Francesca Belanger

New Rules for the New Economy

Also by Kevin Kelly

OUT OF CONTROL:
The New Biology of Machines,
Social Systems, and the
Economic World

ABOUT THE AUTHOR

Kevin Kelly is executive editor of *Wired* magazine. In 1993 and 1996, under his co-editorship, *Wired* won its industry's Oscar—the National Magazine Award for General Excellence. Prior to the launch of *Wired*, Kelly was editor/publisher of the *Whole Earth Review*, a journal of unorthodox technical and cultural news. His previous book is *Out of Control: The New Biology of Machines, Social Systems and the Economic World*, a book about a new paradigm for technology. The text of *Out of Control* and other material can be found on his homepage: http://www.well.com/user/kk. The best way to reach him is via email: kk@well.com.

For Gia-Miin

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This New Economy

No one can escape the transforming fire of machines. Technology, which once progressed at the periphery of culture, now engulfs our minds as well as our lives. Is it any wonder that technology triggers such intense fascination, fear, and rage?

One by one, each of the things that we care about in life is touched by science and then altered. Human expression, thought, communication, and even human life have been infiltrated by high technology. As each realm is overtaken by complex techniques, the usual order is inverted, and new rules established. The mighty tumble, the once confident are left desperate for guidance, and the nimble are given a chance to prevail.

But while the fast-forward technological revolution gets all the headlines these days, something much larger is slowly turning beneath it. Steadily driving the gyrating cycles of cool technogadgets and gotta-haves is an emerging new economic order. The geography of wealth is being reshaped by our tools. We now live in a new economy created by shrinking computers and expanding communications.

This new economy represents a tectonic upheaval in our commonwealth, a far more turbulent reordering than mere digital hardware has produced. The new economic order has its own distinct opportunities and pitfalls. If past economic transformations are any guide, those who play by the new rules will prosper, while those who ignore them will not. We have seen only the beginnings of the anxiety, loss, excitement, and gains that many people will experience as our world shifts to a new highly technical planetary economy.

This new economy has three distinguishing characteristics: It is global. It favors intangible things—ideas, information, and relationships. And it is intensely interlinked. These three attributes produce a new type of marketplace and society, one that is rooted in ubiquitous electronic networks.

Networks have existed in every economy. What's different now is that networks, enhanced and multiplied by technology, penetrate our lives so deeply that "network" has become the central metaphor around which our thinking and our economy are organized. Unless we can understand the distinctive logic of networks, we can't profit from the economic transformation now under way.

New Rules for the New Economy lays out ten essential dynamics of this emerging financial order. These rules are fundamental principles that are hardwired into this new territory, and that apply to all businesses and industries, not just high-tech ones. Think of the principles outlined in this book as rules of thumb.

Like any rules of thumb they aren't infallible. Instead, they act as beacons charting out general directions. They are designed to illuminate deep-rooted forces that will persist into the first half of the next century. These ten laws attempt to capture the underlying principles that shape our new economic environment, rather than chase current short-term business trends.

The key premise of this book is that the principles governing the world of the soft—the world of intangibles, of media, of software, and of services—will soon command the world of the hard—the world of reality, of atoms, of objects, of steel and oil, and the hard work done by the sweat of brows. Iron and lumber will obey the laws of software, automobiles will follow the rules of networks, smokestacks will comply with the decrees of knowledge. If you want to envision where the future of your industry will be, imagine it as a business built entirely around the soft, even if at this point you see it based in the hard.

Of course, all the mouse clicks in the world can't move atoms in real space without tapping real energy, so there are limits to how far the soft will infiltrate the hard. But the evidence everywhere indicates that the hard world is irreversibly softening. Therefore one can gain a huge advantage simply by riding this conversion. To stay ahead, you chiefly need to understand how the soft world works—how networks prosper and

grow, how interfaces control attention, how plentitude drives value—and then apply those principles to the hard world of now.

The tricks of the intangible trade will become the tricks of your trade.

The new economy deals in wispy entities such as information, relationships, copyright, entertainment, securities, and derivatives. The U.S. economy is already demassifying, drifting toward these intangibles. The creations most in demand from the United States (those exported) lost 50% of their physical weight per dollar of value in only six years. The disembodied world of computers, entertainment, and telecommunications is now an industry larger than any of the old giants of yore, such as construction, food products, or automobile manufacturing. This new information-based sector already occupies 15% of the total U.S. economy.

Yet digital bits, stock options, copyright, and brands have no measurable economic shape. What is the unit of software: Floppy disks? Lines of code? Number of programs? Number of features? Economists are baffled. Walter Wriston, former chairman of Citicorp, likes to grumble that federal economists can tell us exactly how many left-handed cowboys are employed each year, yet have no idea how many software programs are in use. The dials on our economic dashboard have started spinning wildly, blinking and twittering as we head into new territory. It's possible the gauges are all broken, but it is much more likely the world is turning upside down.

Remember GM? In the 1950s business reporters were infatuated with General Motors. GM was the paragon of industrial progress. It not only made cars, it made America. GM was the richest company on earth. To many intelligent observers, GM was the future of business in general. It was huge, and bigger was better. It was stable and paternal, providing lifetime employment. It controlled all parts of its vast empire, ensuring quality and high profits. GM was the best, and when the pundits looked ahead 40 years they imagined all successful companies would be like GM.

How ironic that ever since the future has arrived, GM is now the counter example. Today, if your company is like GM, it's in deep trouble.

Instead, pundits point to Microsoft. Microsoft is the role model. It is the highest-valued company on Earth. It produces intangibles. It rides the logic of standards. Its sky-high stock valuation reflects the new productivity. So we look ahead and say: In 40 years all companies will be like Microsoft.

History would suggest this is a bad bet. The obvious lesson is that we tend to project the future from what's fashionable at present. Right now software and entertainment companies are very profitable, so we assume they are role models. Brad DeLong, an economist at UC Berkeley, has a handy theory of economic history. He says that various sectors of economy wax and wane in prominence like movie stars. The history of the American economy can be seen as a parade of "heroic" industries that first appear on the scene as unknowns, then heroically "save" the economy by doing economic miracles, and for a time are treated as economic stars. In the 1900s, the automobile industry was heroic: There was incredible innovation, many, many car company upstarts, incredible productivity. It was a wild and exciting time. But then the heroism died away and the auto industry became big, monolithic, boring, and hugely profitable. In DeLong's view, the latest heroic savior is the information, communication, and entertainment complex. Businesses in the realm of software and communications are now valorous: They pull successes out of a hat, stack up unending innovation, and perform economic miracles. Long live computers!

There is a lot of common sense to DeLong's view of heroic industry. Just because Microsoft is heroic now, doesn't mean all companies will follow their lead and replicate intellectual property on floppy disks with a profit margin of 90%. No doubt many, many companies in the future will not resemble Microsoft at all. Somebody has to fix the plugged toilets of the world, somebody has to build houses, somebody has to drive the trucks hauling our milk.

Even *Wired* magazine, mouthpiece of the digital revolution—where I serve as one of the editors—does not approach the ideal of an intangible company. *Wired* is located smack in the middle of an old-fashioned downtown city, and in one year turns 8 million pounds (or 48 railway cars) of dried tree pulp, and 330,000 pounds of bright colored ink into hard copies of the magazine. A lot of atoms are involved.

So how can we make the claim that *all* businesses in the world

will be reshaped by advances in chips and glass fibers and spectrum? What makes this particular technological advance so special? Why is the business hero of this moment so much more important than its recent predecessors?

Because communication—which in the end is what the digital technology and media are all about—is not just a sector of the economy. Communication *is* the economy.

This vanguard is not about computers. Computers are over. Most of the consequences that we can expect from computers as stand-alone machines have already happened. They have sped up our lives, and made managing words, numbers, and pixels quite extraordinary, but they have not had much more effect beyond that.

The new economy is about *communication,* deep and wide. All the transformations suggested in this book stem from the fundamental way we are revolutionizing communications. Communication is the foundation of society, of our culture, of our humanity, of our own individual identity, and of all economic systems. This is why networks are such a big deal. Communication is so close to culture and society itself that the effects of technologizing it are beyond the scale of a mere industrial-sector cycle. Communication, and its ally computers, is a special case in economic history. Not because it happens to be the fashionable leading business sector of our day, but because its cultural, technological, and conceptual impacts reverberate at the root of our lives.

Certain technologies (such as the integrated circuit chip) spur innovation and novelty in other technologies; these catalysts are called "enabling technologies." Occasionally an economic sector will leverage power and accelerate the advance of other sectors in an economy. These can be thought of as "enabling sectors." Computer chips and communication networks have produced a sector of an economy that is transforming all the other sectors.

Only a relatively small number of people have ever been directly employed in the world of finance. Yet ever since the days of the Venetian bankers, financial innovations such as mortgages, insurance, venture funding, stocks, checks, credit cards, mutual funds, to name only a few, have completely reshaped our economy. They have enabled the rise of

corporations, of market capitalism, of the industrial age, and much more. Unlike many previous heroic industries such as the electrical power industry or the chemical industry, this small sector has influenced how all business is done, and how we structure our lives.

As tremendous as the influence of financial inventions have been, the influence of network inventions will be as great, or greater.

It took several billion years on Earth for unicellular life to evolve. And it took another billion years or so for that single-celled life to evolve multicellular arrangements—each cell touching a few cells near it to make a living spherical organism. At first, the sphere was the only form multicellular life could take because its cells had to be near one another to coordinate their functions. After another billion years, life eventually evolved the first cellular neuron—a thin strand of tissue—which enabled two cells to communicate over a distance. With that single enabling innovation, the variety of life boomed. With neurons, life no longer had to remain bounded in a blob. It was possible to arrange cells into almost any shape, size, and function. Butterflies, orchids, and kangaroos all became possible. Life quickly exploded in a million different unexpected ways, into fantastic awesome varieties, until wonderful life was everywhere.

Silicon chips linked into high-bandwidth channels are the neurons of our culture. Until this moment, our economy has been in the multicellular stage. Our industrial age has required each customer or company to almost physically touch one another. Our firms and organizations resemble blobs. Now, by the enabling invention of silicon and glass neurons, a million new forms are possible. Boom! An infinite variety of new shapes and sizes of social organizations are suddenly possible. Unimaginable forms of commerce can now coalesce in this new economy. We are about to witness an explosion of entities built on relationships and technology that will rival the early days of life on Earth in their variety.

In the future very few companies will look like Microsoft, or even *Wired*. Even ancient forms will be bent. Farming, and trucking, plumbing, and other traditional occupations will continue, just as unicellular life continues. But the economics of farmers and friends, in their own way, will obey the logic of networks, just as Microsoft does now.

We see evidence for that already. A farmer in America—the hero of the agricultural economy—rides in a portable office on his tractor. It's air conditioned, has a phone, a satellite-driven GPS location device, and sophisticated sensors near the ground. At home his computer is connected to the never-ending stream of weather data, the worldwide grain markets, his bank, moisture detectors in the soil, digitized maps, and his own spreadsheets of cash flow. Yes, he gets dirt under his fingernails, but his manual labor takes place in the context of a network economy.

Much the same can be said about truck drivers. While the experience of sitting behind a wheel remains unchanged, the new tools of trucking—bar codes, radios, dispatch algorithms, route hubs, and even roads themselves—all follow the logic of networks. Thus, the very sweat of truckers as they manually load and unload heavy boxes becomes incorporated into the network economy.

Our economy is an amalgamation of diverse styles of trade, commerce, and social exchanges. New economic functions develop around the operating old. Barter, one of the earliest forms of commerce, has not gone away. The barter economy ran through the agricultural age, the industrial age, and continues today. Indeed most of what happens on the World Wide Web is barter. Even many years from now a significant portion of what the economy does will be done by the industrial layers—machines churning out goods and moving materials. The old economies will continue to operate profitably within the deep cortex of the new economy.

Yet the inertia of the industrial age continues to mesmerize us. Between 1990 and 1996 the number of people making tangible things—stuff you can drop on your toe—decreased by 1%, while the number of people employed in providing "services" (intangibles) grew 15%. Presently a mere 18% of U.S. employment is in manufacturing. But three quarters of those 18% actually perform network economy jobs while working for a manufacturing company. Instead of pushing atoms they push bits around: accountants, researchers, designers, marketing, sales, lawyers, and all the rest who sit at a desk. Only a minuscule percentage of the workforce performs industrial age tasks, yet our politics, our media, our funding, and our education continue the grand fantasy that industrial jobs need to be created. Within a generation, two at the most, the number of people working in honest-to-goodness manufacturing jobs will

be no more than the number of farmers in the land—less than a few percent. Far more than we realize it, the network economy is pulling in everyone.

As the world of chips and glass fibers and wireless waves goes, so goes the rest of the world.

In the face of history this bold assertion may seem naive. But every once in a while something big and new does happen. It must have felt that way to the home-craft Luddites who sensed that the industrial age was not just about newfangled looms, but foreshadowed deep, systemic changes with life-changing ramifications. Were they naive to think that machines would ultimately transform the ancient and holy act of planting seeds and harvesting the grain? Of breeding cows? Of the structure of communities?

"Listen to the technology," advises Carver Mead, one of the inventors of the modern computer chip. "Find out what it is telling you." Following that lead, I have assembled these rules of thumb by asking these questions: How do our tools shape our destiny? What kind of an economy is our new technology suggesting?

Steel ingots and rivers of oil, smokestacks and factory lines, and even tiny seeds and cud-chewing cows are all becoming enmeshed in the world of smart chips and fast bandwidth, and sooner or later they will begin to fully obey the new rules of the new economy, as everything will. I've listened to the technology, and as best as I can determine, the technology repeats ten distinct refrains, as premiered in the following ten chapters.

1 EMBRACE THE SWARM
The Power of Decentralization

The atom is the icon of the 20th century. The atom whirls alone. It is the metaphor for individuality. But the atom is the past. The symbol for the next century is the net. The net has no center, no orbits, no certainty. It is an indefinite web of causes. The net is the archetype displayed to represent all circuits, all intelligence, all interdependence, all things economic, social, or ecological, all communications, all democracy, all families, all large systems, almost all that we find interesting and important. Whereas the atom represents clean simplicity, the net channels messy complexity.

The net is our future.

Of all the endeavors we humans are now engaged in, perhaps the grandest of them all is the steady weaving together of our lives, minds, and artifacts into a global scale network. This great work has been going on for decades, but recently our ability to connect has accelerated. Two brand-new technological achievements—the silicon chip and the silicate glass fiber—have rammed together with incredible speed. Like nuclear particles crashing together in a cyclotron, the intersection of these two innovations has unleashed a never-before-seen force: the power of a pervasive net. As this grand net spreads, an animated swarm is reticulating the surface of the planet. We are clothing the globe with a network society.

The dynamic of our society, and particularly our new economy, will increasingly obey the logic of networks. Understanding how