WELCOME TO THE REVOLUTION

by Thomas A. Stewart

In a historic convergence, not one but four business revolutions are upon us. For your future, embrace them.

#1 MARKET GLOBALIZATION
Once it meant forays abroad...from a strongly defended home market. Now, as the boundaries to commerce open up, new rivals are coming after your home market just as hard as you're going after theirs.

#2 SPREAD OF INFORMATION TECHNOLOGY AND COMPUTER NETWORKS
Work and learning are transformed.

#3 DISMANTLING OF THE HIERARCHY
The fall of hierarchy frees the man in the gray flannel suit from his office, his boss, his boss's boss, his boss's boss's boss—not to mention the suite

#4 NEW INFORMATION-AGE ECONOMY
Commerce travels on the electronic highway. Wealth is the product of knowledge assets more than of natural resources.

LET US NOT use the word cheaply. Revolution, says Webster's, is "a sudden, radical, or complete change...a basic reorientation." To anyone in the world of business, that sounds about right. We all sense that the changes surrounding us are not mere trends but the workings of large, unruly forces: the globalization of markets; the spread of information technology and computer networks; the dismantling of hierarchy, the structure that has essentially organized work since the mid-19th century. Growing up around these is a new, information-age economy, whose fundamental sources of wealth are knowledge and communication rather than natural resources and physical labor.

Each of these transformations is a no-fooling business revolution. Yet all are happening at the same time—and fast. They cause one another and affect one another. As they feed on one another, they nourish a feeling that business and society are in the midst of a revolution comparable in scale and consequence to the Industrial Revolution. Asks George Bennett, chairman of the Symmetrix consulting firm: "If 2% of the population can grow all the food we eat, what if another Go can manufacture all the refrigerators and other things we need?"

Good question. The parking lot of General Electric's appliance factory in Louisville, Kentucky, was built in 1953 to hold 25,000 cars. Today's work force is 10,000. In 1985, 406,000 people worked for IBM, which made profits of $6.6 billion. A third of the people, and all of the profits, are gone now. Automaker Volkswagen says it needs just two-thirds of its present work force. Procter & Gamble, with sales rising, is dismissing 12% of its employees. Manufacturing is not alone in downsizing: Cigna Reinsurance, an arm of the Philadelphia giant, has trimmed its work force 25% since 1990.
Change means opportunity as well as danger, in the same way that the Industrial Revolution, while it wrought havoc in the countryside and in the swelling town, brought undreamed-of prosperity. No one can say for certain what new ways of working and prospering this revolution will create; in a revolution the only surety is surprise.

The transition may be difficult. As Neal Soss, chief economist for C.S. First Boston, puts it: "Adjustment is the dismal part of the dismal science." And, as Robespierre might have observed on his way to the guillotine, this time it's personal—for the inescapable tumult involves your company and your career. The paragraphs and stories that follow explain the causes and consequences of this era of radical change—and introduce some business leaders who are meeting the challenges it poses.

General Electric Lighting is an ancient business, begun in 1878. It is headquartered in Cleveland on a leafy campus of brick Georgian buildings separated by placid lawns. Like sin into Eden, the work burst through the gates in 1983, when traditional rival Westinghouse sold its lamp operations to Philips Electronics of Holland. To John Opie, GE Lighting's chief, the memory is so vivid that he describes it in the present tense: "Suddenly we have bigger, stronger competition. They're coming to our market, but we're not in theirs. So we're on the defensive."

Not long: GE's 1990 acquisition of Hungarian lighting company Tungsram was the first big move by a Western company in Eastern Europe. Now, after buying Thorn EMI in Britain in 1991, GE has 18% of Europe's lighting market and is moving into Asia via a joint venture with Hitachi. As recently as 1988, GE Lighting got less than 20% of its sales from outside the U.S. This year, Opie says, more than 40% of sales will come from abroad; y 1996, more than half will. In a few short years, Opie's world changed utterly.

What happened at GE Lighting illustrates the surprises and paradoxes of globalization. Surprise: Globalization isn't old hat. Global competition has accelerated sharply in just the past few years. The market value of U.S. direct investment abroad rose 35%, to $776 billion, from 1987 to 1992, while the value of foreign direct investment in America more than doubled, to $692 billion.

You ain't seen nothin' yet. The extraordinary rise in overseas telephone traffic (see chart) may best g g e how much more often people n different nations feel they h e something urgent to say to one another—a good deal of it coordinating business activity. First Boston's Neal Soss points out the in the past five years or so the commercial world has been swelled by the former Soviet empire, China, India, Indonesia, and much of Latin America—billions of people stepping out from behind political and economic walls. This is the most dramatic change in the geography of capitalism in history.

Paradox: Though it's hard to imagine a more macroeconomic subject, globalization is intensely parochial. Globalization's strongest effects are on companies. Says Anant Sundaram, professor at Dartmouth's Tuck School of business: "Statistics at the macro level grossly
underestimate globalization's presence and impact." For example, Chrysler got just Go of
sales from outside the U.S. and Canada in 1992, but in the 1980s global competition nearly
killed it.

Investment numbers also reveal too little, for they do not count minority ownership or
alliances—or the impact of competition originating abroad. Notes Frederick Kovac, vice
president for planning at Goodyear, whose products can be found on all seven continents and
the moon: "The major strategic decisions of our biggest competitors are made in France and
Japan." Sales by over seas subsidiaries of American corporations are about three times greater
than the value of all U.S. exports. Thus a lot of commerce that looks domestic to an
economist—such as the Stouffer's frozen dinner you bought last week—looks international to
a chief financial officer, in this case Nestle's.

This makes for a profound change, Mr. CFO, in your job. Some observers argue that it is
time you forget about the business cycle, or at least pay a lot less mind to it. Says Gail
Fosier, chief economist of the Conference Board: "It's every industry in its own. When I talk
to companies, it's very difficult to describe a business environment that's true for everybody." For example, she argues, as FORTUNE's economists also hold, that capital spending "is no
longer driven by business cycle considerations but by global competition." If the world is
your oyster, an oyster is your whole world.

Horace "Woody" Brock president, Strategic Economic Decisions, an advisory firm in
California, agrees. He says a nation's economy should be viewed as a portfolio of businesses
whose fates are less and less linked: "What happens in the U.S. copper industry may be
caused by shocks in Africa, and will have no effect on Silicon Valley. Silicon Valley may
drive events in Japan’s electronics industry, but these in turn will be uncorrelated with the
auto industry in either Japan or Detroit." Look at Seattle, Brock says, where two great
technology companies, Boeing and Microsoft, operate side-by-side, one sagging, one
booming—"utterly out of sync."

For a nation, the net effect should be more stability, with long odds against all sectors
booming or busting together. For individual businesses, however, it's a different story. Says
Brock: "If your competitor in Germany does something, you react immediately—you don't
wait for interest rates or recovery or anything else."

Fortunately, the revolution in information technology is creating tools that permit just
such agility.

Robert Immerman is the founder of InterDesign, a private company in Solon, Ohio, with
annual sales above $10 million. InterDesign sells plastic clocks, refrigerator magnets, soap
dishes, and the like. WalMart, Kmart, and Target are customers, as are hundreds of houseware
stores.
There's not a high-tech item among its products, but computers have changed the business. In the past 12 years, InterDesign's employment has tripled, total space has multiplied, and sales have occupied, but its megabytes of computer memory have gone up 30-fold. Seven years ago Immerman dug deep and found $10,000 to buy a used disk drive that had 288 megabytes of storage—capacity that costs about $350 today. Says Immerman: "In the Seventies we went to the Post Office to pick up our orders. In the early Eighties we put in an 800 number. Late Eighties, we got a fax machine. In 1991, pressured first by Target, we added electronic data interchange."

Now, just two years later, more than half of InterDesign's orders arrive via modem straight into company computers. Errors in order entry and shipping have all but disappeared. Immerman says: "We had 50 weeks perfect with a big chain. Then one week we missed part of the order for one item on a long list—and they're on the phone wondering what's wrong." Staffers who used to man phones taking orders now track sales by product, color, customer, region—valuable information that Immerman once couldn't afford to collect.

InterDesign's story is typical. In Alcoa's Davenport, Iowa, factory, which rolls aluminum foil, sheet, and plate, a computer stands at every work post to control machinery or communicate data about schedules and production. Practically every package deliverer, bank teller, retail clerk, telephone operator, and bill collector in America works with a computer. Microchips have invaded automobiles and clothes dryers. Three out of ten American homes have a PC.

The revolution begins when these computers hook up to one another. Already two out of five computers in the U.S. are part of a network—mostly intracompany nets, but more and more are crossing company lines, just as InterDesign's electronic data interchange does. Data traffic over phone wires is growing 30-0 a year, says Danielle Danese, a telecommunications analyst at Salomon Brothers. Traffic on the global Internet doubles every year.

The potential for information sharing is almost unimaginable. On the wall of every classroom, dorm room, and office at Case Western Reserve University is a box containing a phone jack, coaxial cable, and four fiber-optic lines. Through that box a student could suck down the entire contents of the Library of Congress in less than a minute, if the library were on-line and she had room to store it.

For years CEOs and economists lamented that billions invested in information technology had returned little to productivity. That dirge is done. Says William Wheeler, a consultant at Coopers & Lybrand: "For the first time the computer is an enabler of productivity improvement rather than a cause of lack of productivity."

Instantaneous, crossfunctional communication about orders and scheduling enabled M.A. Hanna, the $1.3 billion-in-annual-sales polymer maker, to speed production, reduce inventory, and cut waste so much that the company needs a third less working capital to get a dollar of sales than it did four years ago. CEO Martin D. Walker notes that this gain came entirely
within the four walls of the company; he estimates that an equal gain in working capital turnover is waiting to be found by networking with suppliers and customers.

Efficiency is a first-order effect of new technology: That's how you justify the capital expenditure. The second-order effects are more interesting, because unpredicted. One disorienting result of the spread of computer nets has been the transformation of sales, marketing, and distribution. To see the change, says Fred Wiersema, a consultant at CSC Index in Cambridge, Massachusetts, dig a ten-year-old marketing plan out of the file and compare it with a new rent "The distribution channel is a mess. Customers have much more power. There's 1 fragmentation in media and advertising. The activities of the sales force are completely different."

The next trend, says William Bluestein, director of computing strategy research for Forrester Research, a Massachusetts firm: "Companies that empower their customers." Soon, pursuing cost savings, suppliers and customers will be able to rummage around in each other's computers, entering orders directly, checking stock and shipping status. One vehicle manufacturer can already go into Goodyear's system. Says strategist Kovac: "There will be a day in the not-distant future when customers will get data on the tests of a new tire as soon as our engineers do. They'll see everything—warts and all."

From there it's a short step before customers start comparing notes—maybe on your network. Says Bluestein: "If I were Ralph Nader, I'd set up a consumer chat line so someone who was thinking of buying a Saturn could ask people who have one how they like it. If GM were smart, they'd do it themselves."

Like globalization, information technology vastly extends a company's reach—but has the paradoxical effect of rewarding intimacy. Computers enormously increase the amounts information a company can have about its market—but deliver premium returns less to careful planning than to quick responses to changing circumstances.

Both phenomena have powerful implications for the way work is organized.

In 1958 Harvard Business Review published an article called "Management in the 1980s" by Harold J. Leavitt and Thomas L. Whisler, professors at the Carnegie Institute of Technology and the University of Chicago. It predicted that the computer would do to middle management what the Black Death did to 14th century Europeans. So it has If you're middle management and still have a job, don't enter your boss's of lice alone. Says GE Lighting's John Opie: "There are just two people between me and a salesman—information technology replaced the rest."

Leavitt and Whisler, knowing only mainframes, foresaw an Orwellian workplace in which the surviving middle managers were tightly controlled from on high, little different from the employees they bossed. In a world of expensive, centralized computing, it might have happened that way. But distributed computing redistributes power. Says Goodyear's Kokvac:
"It used to be, if you wanted information, you had to go up, over, and down through the organization. Now you just tap in. Everybody can know as much about the company as the chairman of the board. That’s what broke down the hierarchy. It’s not why we bought computers, but it’s what they did."

The management revolution has many fathers, some more venerable than the computer; self-managed teams and total quality management have intellectual roots reaching back half a century. Why, then, does it seem as if the mores and structures of management are undergoing discontinuous change? Is this really new? Or are we deluding ourselves, the way each generation of teenagers thinks it discovered sex?

The evidence suggests a basic shift in the organization of work. Look first at the ubiquity of change. No longer is the management revolution confined to the same dozen trendsetting companies, the GEs, Motorolas, and Xeroxes. Says Stephen Gage, president of the Cleveland Advanced Manufacturing Program, a federally subsidized organization that helps small business apply new technology: "I doubt if there’s a company around here that isn’t experimenting with something having to do with dismantling Taylorism."

Equally striking, leading companies now envision an endlessly changing organizational design. Kovac says: "The key term is 'reconfigurable.' We want an organization that’s reconfigurable on an annual, monthly, weekly, daily, even hourly basis. Immutable systems are dinosaurs." To make this sort of agility possible, leaders are honing such techniques as rapid product development, flexible production systems, and team-based incentives.

At bottom, the management revolution triumphs because the underlying economics of communication and control have changed, and those changes favor small, flexible organizations, not big ones. The argument, developed by microeconomists influenced by Berkeley’s Oliver Williamson (and here oversimplified), goes like this:

A transaction can be accomplished in one of two basic ways: You can go out and buy something from someone else, or you can produce it yourself. (Yes, there are hybrid forms, but remember that we’re oversimplifying.) Call the first system a market and the second a hierarchy. Vertically integrated businesses, in which transactions take place between divisions, each with its own organizational ziggurat, are hierarchies. Each system has its advantages. Markets generally deliver the lowest price, because of competition. But hierarchies usually have lower coordinating costs—such as for salesmen, advertising, or debt collection. Depending on how those costs and benefits line up, a given industry will tend to be more or less vertically integrated, feature larger or smaller companies, and display a bureaucratic or entrepreneurial management style.

Now buy a computer. The costs change. In particular, hierarchies begin to lose their comparative advantage in coordinating costs. Invoicing is automated, decimating armies of clerks. Electronic order-entry cuts selling costs. Says Thomas W. Malone, professor at the Sloan School of Management at MIT: "Coordinating activities are information-intensive, and
computers make coordinating better and cheaper." The result, Malone argues, is to increase the range of transactions in which markets are more desirable. Result: More companies decide to buy what once produced in-house.

The nice thing about this argument is that it checks out. Big companies are breaking up; outsourcing is on the rise. According to Roy Smith, vice president of Microelectronics & Computer Technology Corp., three out of ten large U.S. industrial companies outsource more than half their manufacturing.

Businesses are more tightly focused: Conference Board figures show that between 1979 and 1991 the number of three-digit standard industrial classifications (SIC codes) in which an average U.S. manufacturer does business dropped from 4.35 to 2.12. Companies are also smaller Census data show that the number of employees at the average U.S. workplace is 8% lower than it was in 1980. Combining those figures with data on spending for information technology, MIT’s Malone and several colleagues found the shrinkage is greatest in industries where IT spending is highest. Smaller payrolls are not simply the result of automation, for gross shipments and value-added also decline. The strong implication: In an information-age business, small is beautiful.

Of the four horsemen of revolutionary change, the hardest to grasp is the invention of an information-age economy. How can a whole economy be based on intangible knowledge and communication? Yet intellectual capital -- knowledge that can be captured and deployed to create advantage over competitors -- is as vital a business concern as capital of the familiar monetary sort. Intellectual labor, too, is where the action is, a fact demonstrated by the widening gap between the pay of college-educated workers and those less schooled.

Though knowledge assets and outputs are intangible, they are no less real for being so. It is possible to track the "intellectual content" of the economy. In 1991, business investment in computers and telecommunications equipment-- tools of the new economy that create, sort, store, and ship knowledge--for the first time exceeded capital spending for industrial, construction, and other "old economy" equipment. The figures, while impressive, understate investment in knowledge machines because they do not show the growing intellectual ability of industrial gear. For example, more than half of machine-tool spending in the U.S. is for equipment with built-in computer numerical controls that, often, can be connected to networks. Says Jodie Glore, vice president of the automation group at industrial-controls powerhouse Allen-Bradley: "The electromechanical boxes we used to sell had a macho feel. You could ted that they cost a lot. Now it's, 'You see this disk . . . ?'"

The new economy will transform the old and reduce its relative importance, but will not kill it. The Industrial Revolution did not end agriculture, because we still have to eat, and the Information Revolution will not end industry, because we still need cars to hold beer. Microsoft Chairman Bill Gates, up to now the preeminent capitalist of the knowledge age, spends his money on a big house and fancy cars, tangible stuff indeed.
The first effect of intellectual capital and knowledge work is to alter the economics of familiar goods and services—a process well under way. For example, in the now misnamed "industrialized" world, the amount of energy needed to produce a given amount of GDP has fallen. To a year, compounded, for more than 20 years. Factory labor is less physically demanding: Gone the heroic workman, a WPA mural in living flesh, ruddy in the glow of the blast furnace; now she's likely to be a middle-aged mom, sitting in front of a screen, who attends night school to study statistical process control. Many auto repairs will soon be made not by a grease monkey with a wrench but by a technician who fixes an engine knock by reprogramming a microchip.

As the usefulness of information, information technology, and information work grows, businesses find more ways to substitute them for expensive investments in physical assets, such as factories, warehouses, and inventories. By using high-speed data communications networks to track production, stock, and orders, GE Lighting has closed 26 of 34 U.S. warehouses since 1987 and replaced 25 customer service centers with one new, high-tech center. In effect, those buildings and stockpiles—physical assets—have been replaced by networks and databases—intellectual assets.

Similarly, the cost of establishing a retail bank branch has shrunk: You can find one inside the door of the supermarket, next to the Coke machine. Especially in the Christmas shopping season, each day's mail brings you a stack of department stores. For the right products, catalogue retailers will migrate to computer or television networks. Rent in cyberspace is even cheaper than catalogue space, and much lower than rent at the mall.

THE SHIFT TO the information economy, like globalization, computerization, and the management revolution, appears first as a way of doing old Lobs more cheaply. For those on efficiency's receiving end, it is a threat. But the drive for efficiency has also paid to string 12 million miles of optical fiber in the U.S., and, long before any couch potato has ordered up video-on-demand, efficiency will pay for a lot more construction of the electronic superhighway, the infrastructure of the information economy.

That endeavor, says Paul Saffo, an analyst at the Institute for the Future in Menlo Park, California, "is a full-employment act for entrepreneurs." Compared with trade in traditional goods and services, commerce in knowledge is startup heaven. Entry barriers are low. Distribution and marketing of information need little capital; they don't even require access to a printing press anymore. Many products and services can be distributed electronically.

THE SECOND-ORDER effect of change, opportunity, is the unpredictable one. Gottlieb Daimler, Ransom Olds, and their pals thought they had invented an improvement on the horse. They did not know that the automobile would fill the countryside with suburbs—which, in turn, created thousands of jobs building houses, making lawnmowers, and delivering pizza. The knowledge economy is still so young that we have few hints of its second-order effects in the view of Richard Collin, who studies the subject as director of Neurope Lab, a think tank in Archamps, France, near Geneva. Says Collin: "Today we are