



**Thought Leader**  
by Art Kleiner

**A**t a time of prevalent focus on short-term results, long-wave theories are quietly making a comeback. These theories are historically associated with the Russian theorist Nikolai Kondratiev (1892–1938), who posited that capitalism evolves through recurring 50-year cycles of boom and bust, and the Austrian-American economist Joseph Schumpeter (1883–1950), who identified the “creative destruction” of these cycles as necessary for long-term economic growth, no matter how harmful it might be to individuals in the short run. Today, the most significant proponent of long-wave theory is Carlota Perez, a visiting senior research fellow at the Cambridge Endowment for Research in Finance at Cambridge University in the United Kingdom.

Professor Perez, at 66, has the kind of eclectic background that one might expect from a theorist whose work combines analysis of financial, political, and technological trends. Raised in Venezuela, she studied architecture and the economic and social history of technology before becoming a forecaster studying the impact of high oil

Photograph by Julian Anderson

## Carlota Perez: The Thought Leader Interview

According to this influential long-wave theorist, the world is due for a technological and economic boom that truly lifts all boats. When? That’s up to us.

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prices for several Latin American governments in the 1970s. In the course of her research, she noticed that the most promising growth opportunities linked with the new, still-relatively-obscure device known as the microprocessor. Between 1980 and 1983, as the director of technological development in the Venezuelan Ministry of Industry, Professor Perez established one of the first government-sponsored venture capital agency: an effort to support local innovation using new digital technologies.

That experience, along with her further studies of the history of technology, led Professor Perez to a broader view of technological change: as a force that drove both modernization and upheaval in society's institutions and in the culture at large. Through the 1980s and 1990s, working in the development field and academia, she increasingly focused her attention on the link between technological and financial cycles. When a new set of technologies is ready to emerge into widespread use, it needs the force of freewheeling investment capital to give it momentum. This period, which Professor Perez calls Installation, might take 20 to 30

years to develop; then, there is another 20- to 30-year period called Deployment, when the potential of those technologies for improving quality of life comes to fruition. This recurring sequence is laid out in her 2002 book, *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages* (Edward Elgar). Based on 20 years of research (in collaboration with University of Sussex economist Christopher Freeman), the book happened to come out just as the world began to shift from one of these periods to the other.

Since the book appeared, it has gained a reputation as a counter-intuitive but prescient explanation for the mysterious economic oscillations of the past few years. It has received avid praise from, for example, Brian Arthur, the Santa Fe Institute economist known for his theory of "increasing returns," and from William Janeway, vice chairman of the private equity investment firm Warburg Pincus LLC. According to Professor Perez, the industrialized world is still in the middle of its painful transition from Installation to Deployment. Such a transition can last two years (as it did at the time of the Victorian railway panic)

or 15 (as it did from the 1929 U.S. stock market crash through the end of World War II). The duration depends on how seriously decision makers, great and small, take the challenge of building a robust alliance between business, government, and the public at large.

We met with Professor Perez at a London hotel to conduct this interview. Whether or not her theory is correct (and it has the advantage of compelling face validity), it raises one of the most critical issues for our moment in history: how to marshal business strategy and government policy together to create the global markets of the future.

**S+B:** On the airplane here, I read two articles about the future. One predicted economic clear sailing and the other foresaw crisis and collapse.

**PEREZ:** They're probably both right. We may well have a jolt or two in the near future, and then a great boom probably lies ahead. But the Nasdaq collapse of 2000 was not big enough to force the changes necessary to get there.

**S+B:** For people who lost their retirement savings, that's a difficult statement to hear.

**PEREZ:** I couldn't agree more, but that's the price we've historically paid for our ability to reach great booms. The collapse has to be disastrous enough to make it clear to everyone that the time when the stock market drives the growth of the economy is finished. Finance capital has done its job; it's brought forth the resources to pave the way for the next wave of technology. Along the way, it's created an environment in which companies like Microsoft, Intel, and Google could

# “Finance capital has done its job; the time when the stock market drives the growth of the economy is finished.”

emerge and flourish. Now we need to spread out the new paradigm of our era through all the economies of the world, just as in the past.

**S+B:** We've been here before?

**PEREZ:** Yes, and more than once. There are historical regularities in the way technological revolutions form and become assimilated into society. You and I both have seen the changes wrought by information technology, and we think it is uniquely momentous. Yet previous technological revolutions made equally momentous changes. When you go back and read contemporary accounts of life in the 1880s and '90s, you could replace the words *steamships* and *telegraph* with *computers* and *Internet* and the text would sound completely modern.

## Five Great Surges

**S+B:** Tell us more about these previous technological revolutions.

**PEREZ:** There have been five since the late 18th century. Each lasted 45 to 60 years. They each produced a great surge of development: growth, employment, new products, new industries, and — most important of all — new infrastructures for car-

rying goods, energy, people, and information farther, faster, and more cheaply. And while they were extremely different technologically, each revolution followed a similar pattern of phases and changing business climates.

**S+B:** And they were...?

**PEREZ:** The first surge was the classic Industrial Revolution that started in 1771. It brought mechanization, factories, and canals. The second, centered in Victorian England, began around 1829: the age of steam engines, coal, and iron railways. The third was the age of steel and heavy engineering. Civil, electrical, chemical, and naval engineering developed impetuously then.

**S+B:** When did that surge start?

**PEREZ:** Around the mid-1870s. That was when cheap Bessemer steel made possible transcontinental railways, major tunnels and bridges, and rapid steamship lines. Those, along with telegraphy, led to the first great globalization — which, by the way, was coordinated by the British Central Bank and the City of London. With those technologies, Argentina, Australia, and others in the Southern Hemisphere

could send grain and meat in refrigerated ships to the northern winter markets.

In the fourth surge, which started with Henry Ford's Model T in 1908, the center of gravity shifted to America. This was the age of oil, mass production, and the automobile. Our present, fifth, surge, the age of information technology and telecommunications, began in 1971 with Intel's microprocessor. If the historical pattern holds, this surge still has 20 to 30 years left to realize its potential.

I could guess that the next wave will involve biotechnology, bioelectronics, nanotechnology, and new materials. But those are still in gestation, just like the transistor of the 1950s represented the microprocessor in gestation.

**S+B:** How does our current semiconductor surge differ from the age of oil?

**PEREZ:** Last time, producers were all seeking homogeneous markets. Henry Ford said you could have any color car as long as it was black. Most products, from shirts to eggs, came in three sizes: small, medium, and large. The cost advantages of mass production depended on

high-volume standardization and economies of scale.

We are now in a different game. High productivity, diversified markets, and customization all coexist. There will still be high-volume production at the bottom end; China and India are increasingly handling that segment. But for every type of product now, there is so much market segmentation. People make profits now by catering to many different ways of life. Food, for example — from organic to exquisite gourmet foods, the choices are continually widening.

**S+B:** And organizations are different as well?

**PEREZ:** Yes, each surge brings with it a new organizational paradigm, new best practices, a new “common sense.” No one today would propose a centralized, rigid, top-down organizational structure, where you cannot communicate across functions except through your bosses, but that was precisely what Alfred Sloan set up at General Motors, to great advantage at his time. With today’s communications and flexible technologies, agile creative networks make more sense and lead to much more productivity.

## The Frenzy of Installation

**S+B:** Where are we, then, in 2005, in our particular surge?

**PEREZ:** Well, historically there have been two major periods in each surge, with a critical break between them. That’s where we seem to be now, in the break.

I call the first half Installation, because we’re installing the new technology in the economy, and the new paradigm in the business and culture. This period is led by invest-

ment capital in alliance with young technological entrepreneurs, and it begins by confronting the “dinosaurs,” the powerful established institutions from the previous paradigm, which are now obstacles to change.

**S+B:** Why did the dinosaurs need to be confronted in the first place?

**PEREZ:** There are two types of dinosaurs inherited from the previous paradigm: the institutional framework (basically the rules of the game that governments establish for business in each age) and the mature industrial giant corporations. All of these will eventually be transformed and modernized. The industrial giants have reached limits to growth and innovation, but most of them still can’t give up their old practices, even when they see the need to. The electric refrigerator and the vacuum cleaner had been truly fantastic innovations, but by the 1970s innovation had devolved down to the electric knife and electric toothbrush. The appliance companies were still producing a lot of money, but they didn’t know how to invest in or design the new types of appliances that semiconductors would make possible.

**S+B:** In other words, what people call a “mature market” is more like a failure to develop new types of products when the old paradigm has run its course.

**PEREZ:** Yes. These companies are like J.P. Morgan at the dawn of the age of the automobile. He refused to invest in the Ford Motor Company because, he said, “That’s just a toy for rich people.” Trains and horses were good enough.

**S+B:** So who *does* put up the money during Installation?

**PEREZ:** It’s a new wave of bold financiers with entrepreneurial drive; in our surge, it was the new venture capitalists of the 1970s and ’80s. They looked around and saw a bunch of technologists, building and using little microprocessor chips. Suddenly these technologists were promising candidates for investment. After the first few financiers make money, many more flock to the feast.

By the 1980s, we had two economies side by side. The old economy was in decline; it was the economy of stagflation, high unemployment and high inflation. The New Economy was getting incredible returns — 30 to 60 percent profit, 60 to 80 percent growth. This was like a “strange attractor” in chaos theory: It drew money rapidly out of the old industries into the new technologies, which were reshaping the economy, and, as successes multiplied, all available money was absorbed into the game. Soon we had a casino atmosphere that encompassed all investment. Or, you might say, Installation culminates in a time of “frenzy” (in our own time, the high-tech bubble of the roaring 1990s). There was excess investment in dot-coms and especially in telecommunications. And that was a good thing.

**S+B:** Why was that important?

**PEREZ:** For each technological revolution to flourish, you need a lot of new investment in infrastructure. If you don’t have railroads, who can build locomotives? If you don’t have roads or electricity, how can you sell cars or refrigerators? But if you don’t have enough cars or refrigerators, you can’t justify the roads or power plants. The solution comes through asset inflation. As money flows into

new technological stocks, investors make capital gains by reselling them. It doesn't matter if there are no profits or dividends yet — the money keeps coming. Many of the canals and railways of the manias in the 18th and 19th centuries were completed years after their stock market boom ended, and many of the dot-com and telecom companies never realized any benefit from their investment. But the frenzy left enough infrastructure in place for everyone to benefit.

Of course, there is also an incredible amount of fraud at this point. So much wealth is running around, and decisions are made at such high speeds, that questionable ethics are commonplace. There are speakeasies and numbers runners in the 1920s, drugs and illegal weapons dealers in the 1990s. Work, entrepreneurship, and imagination are no longer seen as the source of wealth. Instead, wealth accrues to the cunning, the people who were smart (or lucky) enough to put their money in the right place. Meanwhile, the euphoric atmosphere and the extreme pressure for high profits every quarter push companies to doctor the books “just this once”...and we know how that ends.

**S+B:** Has such a pattern of frenzy appeared in every surge?

**PEREZ:** Every time. And it serves its purpose. By the time the bubble collapses, the old ideas are gone; the new networks become “normal.” The Internet, mobile phones, and computers are already taken for granted, just as railroads, electricity, and highways were after previous periods of frenzy. Bill Gates's Microsoft is no longer a Harvard dorm room; Intel is far from being a

bunch of innovators in Silicon Valley, IBM is rejuvenated, Google is a huge company. These and other information and communications technology, or ICT, giants are ready to serve as engines of growth for globalization.

If General Motors CEO “Engine Charlie” Wilson could say in the 1950s that “what's good for the country is good for GM and vice versa,” we could say today that “what's good for the world is good for ICT and vice versa.”

### The Euphoria of Deployment

**S+B:** What happens next?

**PEREZ:** Well, in an ideal world, we would smoothly enter a golden age of expansion and growth in the global economy — a time when the amazing, wealth-creating information technology paradigm lifts all boats and produces global welfare. Instead, as in every previous surge, there is a difficult interim period: a time of uncertainty, instability, and economic recessions or even depression. In my book, I called this interim period the Turning Point. Maybe the Turning would have been a better name, because it can last years.

As every surge is unique, so every “turning” is different. It can be very short. It took less than two years after the railway panic in England in the mid-18th century for the Victorian boom to take off. But it can also be very long, as after the crash of 1929. It might have happened sooner if American business had embraced Franklin Delano Roosevelt's New Deal, but they resisted it as “Communism.” Instead, the industrial momentum went to Adolf Hitler's Germany, where a mass-production economy flourished after 1933, with auto-

bahns, automobiles, tanks, weapons — and later, mass extermination. In his own horrible way, Hitler engineered economic expansion through government-business cooperation. Fortunately, he was defeated. In the West, the postwar golden age of mass production — with its Keynesian policies and its welfare state plus international stabilizers such as the Marshall Plan and the Bretton Woods international framework — only took off after the experience of World War II showed the benefits of government intervention to boost demand in the economy.

The last golden age lasted from the 1950s until the early 1970s. I call it Deployment, because technology is finally deployed to its full benefit, with profits from customers, not speculation, providing the bulk of new investment capital. A wave of regulation comes in that addresses the excesses of Installation and frenzy. Giant companies and governments redesign themselves, and the new sectors (in our case, the information technology industries) serve as engines of growth for the entire economy. It is like going from turbulent adolescence to young and strong adulthood. There are new institutions in place — some public and some private — and space for them to act in new ways. It is the Victorian boom, the Belle Époque, post-WWII America — the golden age. . . . But we're not there yet.

**S+B:** Our current model could be thought of, then, as akin to 1946.

**PEREZ:** Not yet. Still more like the late 1930s, although the real pain is not so visible to people who are well off. We must remember that this current surge is global. In fact, that is why China and India have been

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able to serve as a “miracle cure” to avoid recession. They have opened vast horizons of investment and rapidly growing markets, while much of their surplus comes back to support U.S. investment and consumption. Such a huge lifesaver is quite unprecedented. But no one can be sure of its sustainability. The bursting of housing bubbles or of hedge fund mountains in America or a collapse in China could bring the whole world economy down.

## Riding the Global Wave

**S+B:** What indicators would tell you that the Deployment period is near?

**PEREZ:** People would stop thinking that the Dow Jones is the barometer of the economy and would pay more attention to growth, employment, productivity, improving income distribution and increasing well-being. When you read accounts of these Deployment phases, it's like reading about a big feast where everyone gets to participate. Six million people came in 1851 to the Great Exhibition at the Crystal Palace in London. In the 19 acres covered by that amazing glass structure, there were more than 13,000 exhibits, among which were the

latest industrial products from machine tools, steam engines, looms, and reapers, to the new styles of household items such as china, cutlery, toilets, and cookers. Queen Victoria and her husband, Prince Albert, were the heads of the aristocracy, but they were the conveners of a celebration of industrialization, which the aristocrats had resisted in the past. There was this feeling of construction, of general growth, well-being. The same was true of the 1950s. Most people were happy. They were sure they'd have a place to live, and a job, sure their children would be better off than they were. Instead of the euphoria being limited to the few who invest, there was widespread social euphoria.

**S+B:** But how does that come about?

**PEREZ:** First, finance needs to be adequately regulated. Every time some forward-looking CEO tries to implement a three-year plan, he gets ousted in three quarters. The finance world still expects the easy profits of the bubble, but what is needed now is long-term investment. If capital gains were taxed more stringently when assets were sold before five years, for example, then more investors would “marry”

the companies they own and focus on maximizing longer-term returns. Similar measures for all assets would discourage the current massive deviation of investment money toward housing bubbles and derivatives. And, obviously, regulation of global finance must be enforceable at the *global* level. Quite a tall order!

Second, prices have to come into line. During Installation, there is always strong asset inflation (both in equity and in real estate) while incomes and consumption products do not keep pace. This creates a growing imbalance in which the asset-rich get richer and the asset-poor get poorer. When salaries can buy houses again, we will be closer to the golden age.

Third, as Deployment gets closer, you will see increasingly stable industry structures. Look at the mad price wars of the airline industry; it has a lot of restructuring to do to segment its markets and develop a sustainable set of practices.

Fourth, there need to be innumerable investments and business innovations to complete the fabric of the new economy. Here's one small example: Millions of self-employed entrepreneurs work from home with uneven sources of

income. Where are the financial instruments to smooth out their money flow so they can work and live without anxiety? For them, that innovation could be the equivalent to installment credit in the 1950s, which made possible the consumer base needed for mass production.

Finally, I'm not sure we've understood the causes of fraudulence at companies like Enron, nor how to avoid them by means other than excessive bureaucratic controls. The key decision makers, in government and business, do not seem ready to make the changes that could get a golden age under way.

**S+B:** What role does the government play in this?

**PEREZ:** A big role. I think that market fundamentalism today is as much of an obstacle to world economic growth in the next decades as state fundamentalism was in the 1970s and '80s. Government needs to be reinvented, using as much imagination as it took to design the welfare state in the first place. It all seems impossible now, but things always seem impossible at this point in the surge. Between 1934 and 1946, a lot of economists believed that high unemployment was inevitable, because both industry and agriculture were shedding labor. But just after that, with an adequate institutional framework for mass production and consumption, the U.S. entered its biggest full-employment period in history.

**S+B:** What kinds of companies will ride the next half of the surge most effectively?

**PEREZ:** Those that recognize the kaleidoscopic market segmentation that characterizes the process of globalization. If you are in the U.S.

or Europe, it makes no sense to insist on trying to produce something that can obviously be provided less expensively from Asia.

**S+B:** You mean specialization by country.

**PEREZ:** By country or by region. China, with its masses of low-cost labor, is becoming the center of standardized commodity fabrication; India, the center for mass-produced services. Resource-rich areas like Latin America and Russia will probably become centers for chemical, metallurgy, agricultural, and forestry products. Eastern Europe may become a source of heavy industry for Western Europe; maybe Mexico will be the same for the United States.

The U.S., Europe, and Japan will then concentrate on the upper edge of each industry, producing the most differentiated, complex, and high-priced goods and services, the kinds that determine a high quality of life. Have you noticed how good taste has suddenly become fashionable and is moving right down the income scale? That's what happens when a Deployment period is dawning. The industrialized countries will also coordinate the global networks, which is a much more complex management task than that of the past giants. In addition, they will organize the enormous movement of goods across the planet. I can assure you that DHL, FedEx, UPS, and the others will not be enough. Education will also take on incredible importance. Many of the unemployed in industrialized nations will make a good living selling their skill base to people elsewhere. In fact, I see a thriving global education industry emerging. There will also be a huge environmental

industry, dedicated to overcoming the polluting and health consequences both of the mass-production inheritance and of the current globalization — assuming there is strong and stable regulation to allow this industry to flourish.

**S+B:** Do you have the sense that decision makers are ready to talk about this?

**PEREZ:** Not yet. It may be that the experiences of the Indian Ocean tsunami, Hurricane Katrina, and the Pakistan earthquake create some degree of awareness. But even that may not suffice to start the necessary kinds of conversations — the equivalents to what took place to set up the welfare state and the Bretton Woods agreements.

A lot of people in the developing world are very much against globalization. They're looking only at the trade globalization that destroyed their industries. Or they see the mess that financial globalization made of many economies (many saw their life savings completely wiped out by collapses such as Argentina's). But there's a third kind of globalization — the globalization of production that is increasingly happening now. And that's the kind that, sooner or later, will probably bring prosperity to large numbers of people across the planet.

**S+B:** Then why not simply wait for it to emerge?

**PEREZ:** Because left to itself, it might not happen. Historical regularities are not a blueprint; they only indicate likelihood. We are at the crossroads right now. It is our responsibility to make sure that the enormous growth potential of the next golden age will not be lost. +

Reprint No. 05410