

# **RIDE THE WAVE**

## **How 12 Technologies Will Change the World and Make You Rich**

by Fred Rogers and Richard Lalich

**A tsunami of new technologies is about to wash away  
the world we've known.  
Are you ready?**

Whenever the skies turn black and hurricane sirens shriek, most people board up their windows, hunker down in their basements, and wait nervously for the storm to pass. But there are always a few brave souls who scan the skies and see an opportunity. Those are the mavericks you'll see on TV, surfing skyscraper-sized waves and exulting in the thrill of a lifetime.

Today, the world is about to be hit by a massive wave of game-changing technologies. You still have time to choose: Will you be *swept away* by the wave . . . or will you *ride the wave* to a new era of prosperity?

Throughout history, technologies have triggered economic revolutions that led to new golden ages of wealth and higher standards of living. In *Ride the Wave*, you'll learn about the 12 key technologies of the coming golden age and how you can profit from them.

Drawing from three decades of research for their elite group of influential clients at *Trends Magazine*, Fred Rogers and Richard Lalich now explain the coming revolution for a wider audience . . . along with the insightful forecasts that tens of thousands of executives, investors, and venture capitalists at the world's leading corporations and government agencies rely upon.

*Ride the Wave* tells the story of the new technology-driven era of affluence we're entering. Clear, well-documented patterns and relationships in history and economics indicate that 12 revolutionary technologies — all dependent on the maturing power of digital technology — are transforming nearly every aspect of life and business. Investors and executives who are ready and able to ride this wave of progress will thrive. Those who ignore it, or fight it, will be devastated as their companies and industries are swept away.

*Ride the Wave* not only identifies the 12 most promising areas within infotech, biotech, and nanotech, but also maps their evolution and explains some of the developing investment opportunities. More importantly, it outlines a methodology that you can put to work immediately to take control of *your* future. The great business opportunities of the next two decades will rely almost entirely on disrupting

existing industries with technology-enabled business models. That's as true for retailing and hospitality as for healthcare and manufacturing. In *Ride the Wave*, you'll learn how to successfully identify competitive opportunities and define disruptive solutions, before your competitors.

## The Golden Age of Affluence, just ahead

We are at the critical “inflection point,” or “flash point” of the Digital Revolution. *Ride the Wave* examines how we got here, where we go from here, and why this just may be the most important economic turning point in the history of mankind.

Until now, civilization has lived in a world ruled by a “culture of scarcity.” Even today, many voices in government and academia (even some in business) say “we'll all have to live with *less*.” But, as *Ride the Wave* explains, these voices are being led astray by the same failure to understand the transformational power of technology that fooled earlier “visionaries” like Thomas Malthus, Karl Marx, and Paul Ehrlich.

<i>Technological revolution</i>	<i>Popular name for the period</i>	<i>Core country or countries</i>	<i>Big-bang initiating the revolution</i>	<i>Year</i>
FIRST	The 'Industrial Revolution'	Britain	Arkwright's mill opens in Cromford	1771
SECOND	Age of Steam and Railways	Britain (spreading to Continent and USA)	Test of the 'Rocket' steam engine for the Liverpool-Manchester railway	1829
THIRD	Age of Steel, Electricity and Heavy Engineering	USA and Germany forging ahead and overtaking Britain	The Carnegie Bessemer steel plant opens in Pittsburgh, Pennsylvania	1875
FOURTH	Age of Oil, the Automobile and Mass Production	USA (with Germany at first vying for world leadership), later spreading to Europe	First Model-T comes out of the Ford plant in Detroit, Michigan	1908
FIFTH	Age of Information and Telecommunications	USA (spreading to Europe and Asia)	The Intel microprocessor is announced in Santa Clara, California	1971

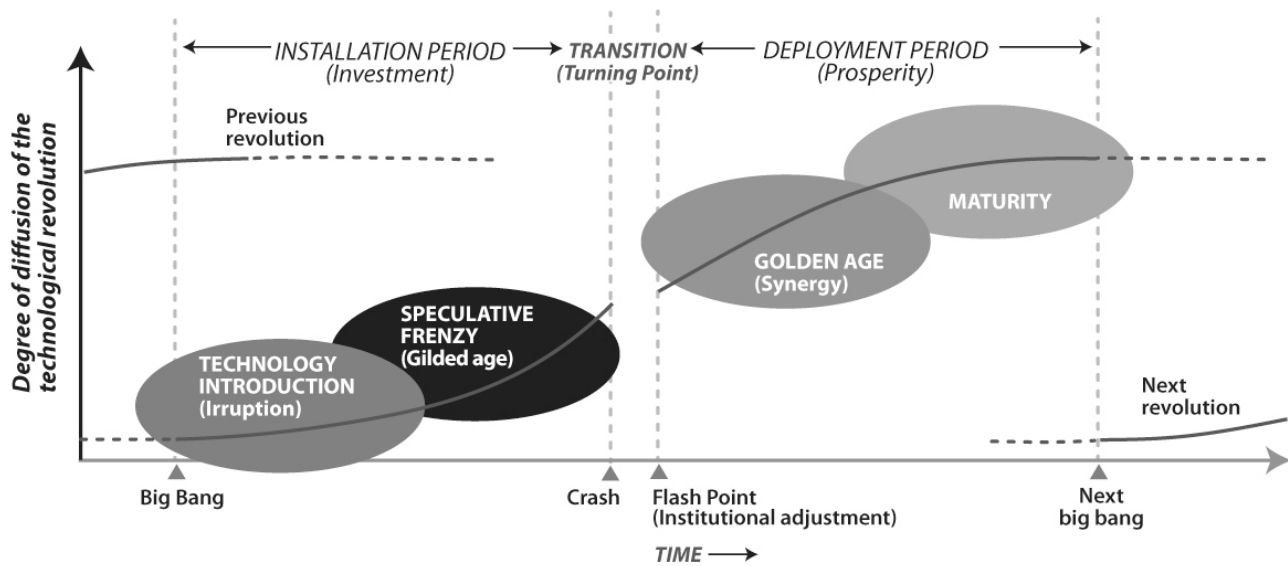
The Digital Revolution is not the first such revolution. Since 1771, the world has experienced a transformational technology revolution every 50 to 70 years. This pattern of so-called “techno-economic revolutions” has been studied extensively by economists and historians; most notable is the work by Professor Carlota Perez at Cambridge University. Each transformation has more than doubled worldwide per capita GDP and left the world qualitatively different from anything known before.

Each revolution started with a “technological big bang,” the first was James Watt's steam engine in 1771 and the most recent was the Intel 4004 microprocessor in 1971. Each “big bang” kicks off a speculative phase revolving around the technologies themselves; this is as true for railroads as for PCs and the Internet. And inevitably, this phase ends in a crash, like the “1929 crash” or the “dot-com crash” of 2000.

The crash occurs for several reasons, including an excessive focus on financial speculation and the inability of the new technological paradigm to fully realize its potential while relying on the “conventional wisdom” of the *prior* technological revolution. For example, PCs and the Internet could not truly re-make industries as long as those industries operated under the conventional wisdom of the Mass Production Revolution. To understand this, think back to the peak of the dot-com bubble: IPOs with billion-dollar capitalizations often had tiny revenues and no earnings, because they were sold based on the promise of being able to change behaviors or tap demand that never materialized; this failure occurred because entrepreneurs armed with the conventional wisdom of the Mass Production era could not see beyond the hype and identify the new business models that would be in demand.

## The life and times of a technology revolution

Recurring phases of each revolution



Source: Based on AudioTech's summary of *Technological Revolutions and Financial Capital* by Carlota Perez (Edward Elgar, 2002)

## The twelve transformational technologies

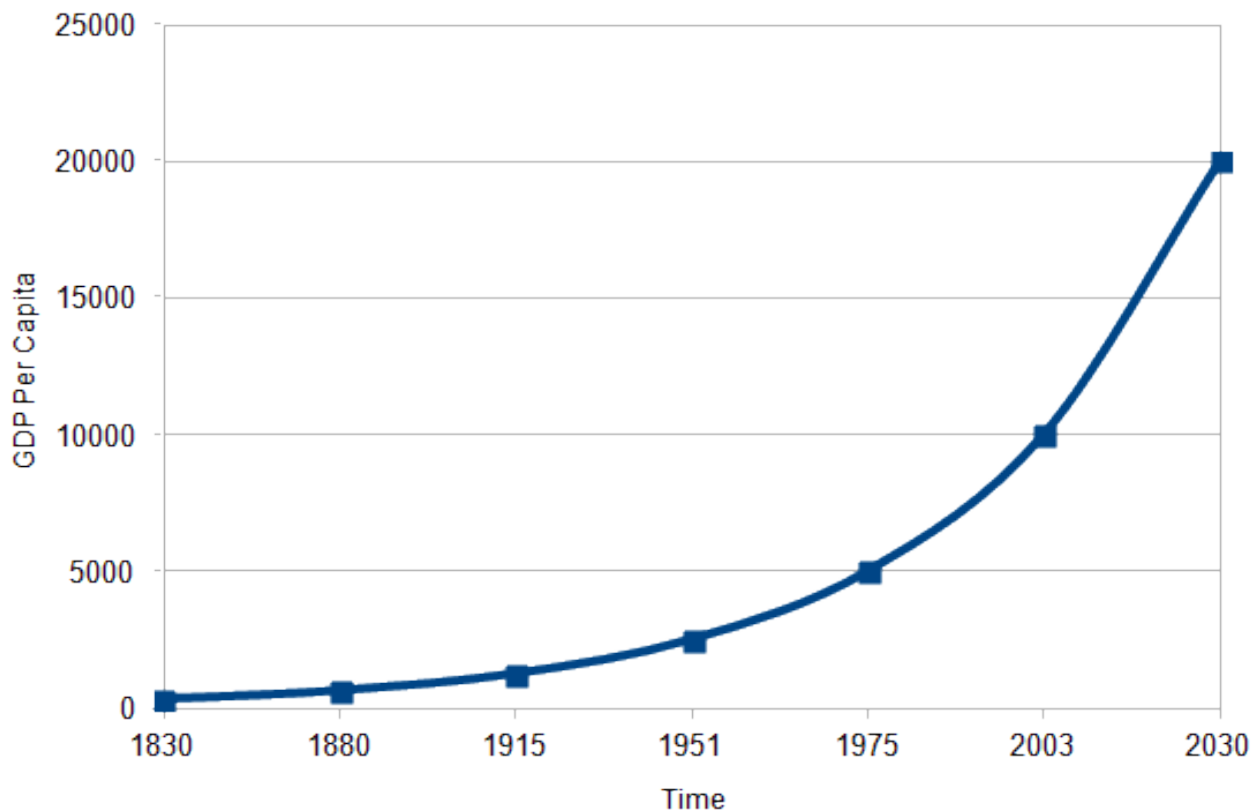
The Great Depression was the Transition Phase of the Mass Production era, and we are now 12+ years into the analogous Transition Era of the Digital Revolution. As proven again and again, it's during the so-called “Transition Phase” following each crash that the *new* “conventional wisdom” takes roots. Why? That's when the forces of “creative destruction” act with Darwinian ruthlessness to weed out all but the fittest business models and competitors.

These transitions are tumultuous and wrenching; and they don't have a finite timetable. They can be quick-and-brutal as in the Railroad Revolution, or long-and-grinding, as in the Great Depression. So

far, the current transition has played out as “a kinder, gentler version” of the Great Depression.

Fortunately, every transition phase ends with the dawning of what Perez has called a “Golden Age.” In the case of the Great Depression, the Golden Age that followed was enabled by the events of World War II. That Golden Age and the subsequent period of reduced growth continued into the 1970s. During this time, humanity experienced the greatest increase in affluence ever recorded. And now, it's about to happen again!

## Technology-Driven Affluence



The Golden Age of the Digital Revolution will involve transforming virtually every industry to take *full* advantage of digital technology, changing its underlying economics. This differs fundamentally from the earlier stage of the revolution, when the focus was on financial speculation in the companies creating the fundamental technologies: microprocessors, PCs, cell phones, telecoms, networks, software, and search engines. There is still money to be made in these fundamental technologies, but the *big* money will be made by those that can identify and implement new business models leveraging the 12 technologies that you'll learn about in this book.

Some, like “digital infrastructure” (Chapter 1) and “mobile and embedded computing” (Chapter 2) are

already big industries that face threats both from physical constraints (like quantum mechanics) and fundamental economic forces (like commoditization). In those cases, we focus on the technology roadmap and how it's likely to affect these and dependent industries.

As you'll see, the other ten technologies rely on those two technology categories to provide a secure foundation. A key task for strategists in industries as diverse as hospitality, healthcare and bio-tech is to anticipate the cost and availability of the information technology that will support their evolving business models, both in terms of infrastructure and enabling applications (Chapters 3 and 4).

As you “ride the wave,” you'll go on to explore less mature technologies, like quantum computing and synthetic life (in Chapters 6 to 10), which are still mostly in the realm of university research or speculative start-ups. You'll also learn (in Chapters 11 and 12) how these technologies are converging to put an end to the culture of scarcity.

Along the way, you'll learn — and discover how to profit from — the answers to these 13 critical questions:

1. What lies beyond Moore's Law and why does it make so much difference?
2. How will trillions of networked computers improve every life on the planet?
3. How will “smart machines” impact your career, life, and investments?
4. What are service robots and how will they change our lives, our cities, and our businesses?
5. Why do we care about quantum computing?
6. What will the amazing potential of bioinformatics mean for you?
7. Why will “personalized medicine” become the dominant 21<sup>st</sup> century healthcare paradigm?
8. How could bio-reengineering save our world?
9. How will synthetic life forms impact our economy and our lives?
10. What happens when we begin to understand how the brain works?
11. How will nanomaterials, microelectromechanical systems, and digital fabrication End the “Age of Scarcity”?
12. How will the American energy revolution unleash the wave that changes the world?
13. How will you harness the 12 trends to make better decisions?

***Ride the Wave*** devotes one chapter to each of those 13 questions.

The first 12 chapters focus on the technologies that will transform the world.

Chapter 1 analyzes digital infrastructure, ranging from CPUs and memory to mass data storage to communications bandwidth to systems software. These technologies dominated the Investment Phase of the revolution. They will continue to advance as specified by Moore's Law, overcoming fundamental barriers and enabling an array of wondrous new technologies. This chapter lays out the road map that will determine the path for so many threats and opportunities in the coming decades.

Chapter 2 examines the implications of having networked computers (sometimes called “The Internet of Everything”) in everything, everywhere, all the time. Today's six billion cell phones represent the tip of the iceberg. Combined with practically free RFID tags and embedded processors, the opportunities are endless.

Chapter 3 explains what it means when artificial intelligence multiplies human capabilities via applications ranging from language translation to business decision making to medical diagnosis. It explores not only the economic and social potential of these machines, but assesses their realistic limitations.

Chapter 4 explores the wide range of potential robotic applications that exist beyond the factory floor; these include driverless automobiles and automated homes optimized for eldercare. The U.S. military and the Japanese healthcare industry are just two well-funded sources of unexpected breakthroughs, finally making this branch of technology viable. Combining the power of the cloud with enormous progress in sensor technology, service robotics is likely far closer to commercialization than you think.

Chapter 5 examines the world of exotic quantum computers designed to solve problems that are literally “impossible” to solve using conventional computing technology. Both the hardware and software are difficult to build, but the potential implications for scientific research, pharmaceuticals, and cyber-security are well worth the effort

Chapter 6 explains the technology of bioinformatics that lets us quickly and cheaply read, interpret, and even rewrite a genome. No area of research is likely to bear more fruit for more industries than this one.

Chapter 7 evaluates the challenges and implications of a new medical paradigm that improves outcomes and dramatically reduces costs, while eliminating side effects. Countless lives and billions of dollars will be saved annually when these new tools are used routinely.

Chapter 8 explores the application and implications of molecular biology. This includes conventional gene-splicing, as well as stem cell technology. The focus is on how our exponentially expanding understanding of cellular programming will enable us to prevent disease, extend absolute lifespans, and even grow or repair human organs. Beyond healthcare, it will also enable us to eliminate hunger, thirst, and poverty in ways never before possible.

Chapter 9 focuses on how entirely *new* living organisms can safely and cheaply produce food, fuels, and drugs, as well as clean up the environment. These totally synthetic life forms can now be tailored to do our bidding — and the opportunities are almost unlimited.

Chapter 10 evaluates the commercial implications of “brain-science.” Within the next two decades, what we've learned about the brain will not only enable us to become more effective marketers and managers, it will also enable us to treat Alzheimer's, Parkinson's, chronic depression, and stroke far

more effectively. It will also open the door to direct brain-machine interfaces and total-immersion virtual reality entertainment.

Chapter 11 describes how enormous value can be created from the most common elements. By integrating nanotech with biotech and infotech, we're about to unlock the secret of economic growth and be freed from material constraints. As a result, GDP per unit of matter or energy will continue to soar on a global basis, enabling even the world's poorest people to improve their standards of living.

Chapter 12 reveals how cheap fossil fuel will serve as the catalyst that unleashes the new Golden Age. In the process, it will enable the world's crucial transition from today's economy to a clean, highly affluent world fueled almost entirely by new nuclear fission and fusion technologies.

Finally, Chapter 13 spells out a proven process that enables any company to consistently answer key questions and integrate the answers into its planning process. In doing so, you'll close the notorious "knowing-doing gap".

As Harvard's Clayton Christensen has shown, every industry increasingly faces "disruption." The products, business models, and customer segments that were once reliably stable are subject to changing abruptly overnight. That's why your success depends on *harnessing* industry disruption rather than becoming a victim of it.

So, when it comes to technology, every investor and executive needs to ask the right questions, like:

1. Could this technology be relevant to my business?
2. Will it make my business obsolete?
3. How could it impact my customers, my suppliers, or my employees?
4. Does it create a "new job to be done" for my customers?
5. Could it make one of my core competencies, like personal service or a proprietary manufacturing process, more or less valuable?
6. Could a competitor use it to launch a different business model that would have a genuine performance or cost advantage, especially with a market category we're not now serving?
7. How could a competitor, substitute, or new entrant use it to disrupt my business?

Most people don't ask these questions until it's too late. With the knowledge you'll gain from *Ride the Wave*, you'll be prepared to answer each of these questions with supreme confidence, while ensuring that you are among the winners of the Digital Revolution.