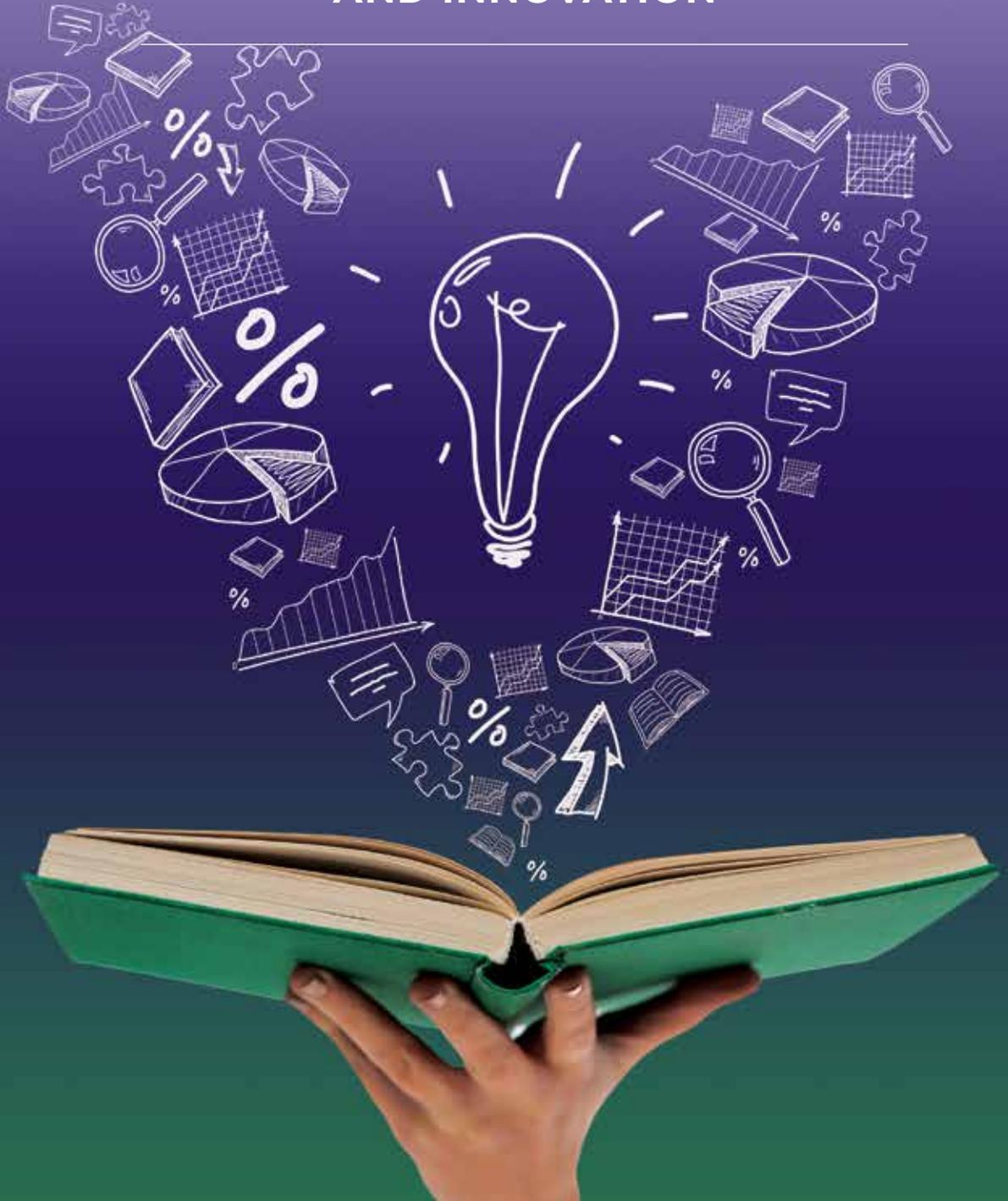


PROFESSIONAL READING LIST



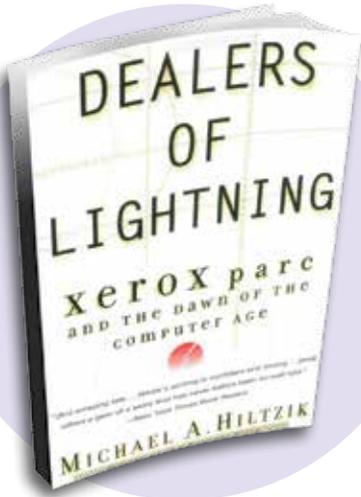
# INDUSTRIAL PRODUCTIVITY AND INNOVATION



---

## ***Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age***

---

**Author(s):**

Michael A. Hiltzik

**Publisher:**

HarperCollins

**Copyright Date:**

2000

**ISBN:**

978-0887309892

**Hard/Softcover:**

Softcover, 480 pages

**Reviewed by:**Dr. Stephanie Young  
RAND Corporation**Publisher Summary**

In the bestselling tradition of *The Soul of a New Machine*, *Dealers of Lightning* is a fascinating journey of intellectual creation. In the 1970s and '80s, Xerox Corporation brought together a brain-trust of engineering geniuses, a group of computer eccentrics dubbed PARC. This brilliant group created several monumental innovations that triggered a technological revolution, including the first personal computer, the laser printer, and the graphical interface (one of the main precursors of the Internet), only to see these breakthroughs rejected by the corporation. Yet, instead of giving up, these determined inventors turned their ideas into empires that radically altered contemporary life and changed the world.

Based on extensive interviews with the scientists, engineers, administrators, and executives who lived the story, this riveting chronicle details PARC's humble beginnings through its triumph as a hothouse for ideas, and shows why Xerox was never able to grasp, and ultimately exploit, the cutting-edge innovations PARC delivered. *Dealers of Lightning* offers an unprecedented look at the ideas, the inventions, and the individuals that propelled Xerox PARC to the frontier of technohistory—and at the corporate machinations that almost prevented it from achieving greatness.

## Review

“Xerox could have owned the entire computer industry,” reflected Apple CEO Steve Jobs in 1996. While the giant of the copier industry was responsible for fundamental technological advancements in personal computing in the 1970s and 1980s, Jobs noted, it failed to bring those innovations to market. Compared to Xerox, Jobs’ company (Apple), and other vanguards of the burgeoning industry, proved much more successful at identifying potential and leveraging new technology.

Journalist Michael Hiltzik’s *Dealers of Lightning* takes readers inside the organization responsible for Xerox’s remarkable story during this period: the Xerox Palo Alto Research Center (PARC). He explores factors associated with its success and considers the dynamics of decision making within Xerox that, in hindsight, led to so many missed opportunities. Hiltzik associates PARC’s success with robust financial support from the headquarters at Xerox, a historical moment of dynamic change in computer technology, an economy conducive to recruiting the best talent in engineering and computer science, and leadership at PARC that knew how to get the most out of its human capital. In this environment, Xerox PARC was responsible for what would prove to be some of the most influential developments for personal computing: the graphical user interface with mouse, icons, overlapping windows, the laser printer, the Ethernet, and the personal computer.

How, business theorists have asked, could Xerox develop such technology, and botch the opportunity to leverage it for commercial gain? Indeed, PARC’s transformative innovations were exploited time and again by companies other than Xerox. Even the laser printer, a technology that would prove to be a huge commercial success for Xerox, experienced frustrating delays coming to market.

In part, Hiltzik’s telling seeks to complicate this dim vision of Xerox’s decision making. He first notes that the rapid rate of change in the industry during this period makes it exceptionally difficult to fault Xerox for not better anticipating opportunities. Second, he pushes back against the assumption that the sheer size and sophistication of Xerox’s marketing capability should have facilitated exploitation of new technology. Xerox’s size, he argues, may have served as an impediment to commercializing PARC’s innovations, and conversely, Apple’s success at marketing the PC may have occurred “not in spite of its small size, but *because* of it” (p. 392). Hiltzik notes that for Xerox, a copier company, fully leveraging revolutionary technology in an entirely different industry would have required a fundamental shift in its corporate investments and customer base. Seldom has a

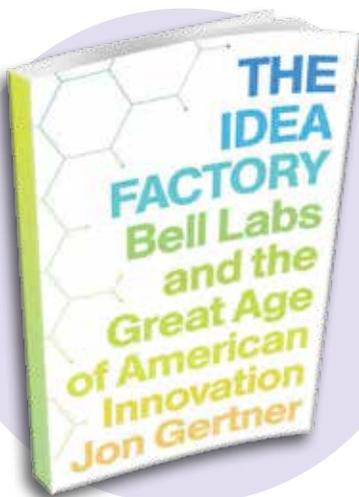
corporation proved able to so fundamentally remake itself. Finally, Hiltzik questions the assumption that the value of a research organization should be judged by the number of its innovations that are monetized alone. Rather, in an effective research program, not all ideas should be expected to prove immediately useful—and that is okay. Indeed, the willingness of an organization to take such risks might be the only way to transform, and even apparently useless developments might have benefits beyond what could have been originally imagined.

The case of Xerox PARC offers valuable insights for the defense acquisition community. At its core, the Xerox story is about how organizations innovate: how they promote creativity and take advantage of the fruits of invention. These are fundamental questions for a community increasingly focused on improving acquisition outcomes by fostering innovation. Indeed, the breadth of PARC's contributions suggests the potential of a research organization empowered with the right resources, expertise, and leadership. Yet, at the same time, the challenges Xerox faced in taking full advantage of these innovations should also chasten defense decision-makers. The unique mission and organization of the Department of Defense will likely make innovation throughout the department fundamentally different from companies like Apple that proved so effective at recognizing and realizing the potential of technology developed at PARC.

---

## ***The Idea Factory: Bell Labs and the Great Age of American Innovation***

---



**Author(s):**

Jon Gertner

**Publisher:**

Penguin Books

**Copyright Date:**

2013

**ISBN:**

978-0143122791

**Hard/Softcover:**

Softcover, 432 pages

**Reviewed by:**

Dr. Michael Pennotti  
Stevens Institute of Technology  
(and Bell Labs, 1969–1992)

## **Publisher Summary**

From its beginnings in the 1920s until its demise in the 1980s, Bell Labs—officially, the research and development wing of AT&T—was the biggest, and arguably the best, laboratory for new ideas in the world. From the transistor to the laser, from digital communications to cellular telephony, it's hard to find an aspect of modern life that hasn't been touched by Bell Labs. In *The Idea Factory*, Jon Gertner traces the origins of some of the twentieth century's most important inventions and delivers a riveting and heretofore untold chapter of American history. At its heart this is a story about the life and work of a small group of brilliant and eccentric men—Mervin Kelly, Bill Shockley, Claude Shannon, John Pierce, and Bill Baker—who spent their careers at Bell Labs. Today, when the drive to invent has become a mantra, Bell Labs offers us a way to enrich our understanding of the challenges and solutions to technological innovation. Here, after all, was where the foundational ideas on the management of innovation were born.

## **Review**

Readers of a certain age will recall a time when Bell Labs was widely regarded as the foremost research and development organization in the world. Those of a later generation will be amazed to learn how many of the technologies that make up today's digital world were invented at, or further developed by, Bell Laboratories.

Jon Gertner tells the story of this remarkable organization, from its formation in 1925 through its partitioning in the Bell System break-up of 1984. It is a story about people: Mervin Kelly, the legendary Bell Labs President, the architect of the organization; Bill Baker, who succeeded him; William Shockley, John Bardeen, and Walter Brattain, inventors of the transistor; Claude Shannon, the father of information theory; and John Pierce, an early champion of the first communication satellites. It is a story of inventions, most notably of the transistor, the linchpin of the digital revolution, but also of undersea cable, fiber optics, charge coupled devices, solar cells, cellular telephony, and many others. And it is the story of thousands of others—men and women, engineers and technicians—who worked tirelessly to transform the inventions of research into technological products and systems to satisfy practical needs.

The book is first and foremost a history. It chronicles the rise and fall of an organization that no longer exists, at least not in the form it once did. It was born in a time and place to which we cannot return, housed within a regulated monopoly and funded by what was essentially a private tax on

every phone call made in America. And yet, there is much we can learn from understanding the culture of creativity and innovation that it fostered. For in the end, it was culture that drove the “Idea Factory.”

Central to this culture was attracting a critical mass of exceptional talent. In the postdepression era, Bell Labs became a magnet for young scientists and engineers from across the country and it remained so throughout its existence. Each addition increased its draw on the next. Once they were on board, the Labs provided four things that were essential to their development and success: a sense of mission, real problems, a big picture view, and freedom to follow their inquiries wherever they led.

From its inception, Bell Labs’ role was to provide the products and systems that would enable AT&T to achieve its goal of “universal service.” This vision, in the words of an early Bell Labs vice president, required that “any two people in the world be able to talk to each other as if they were face to face,” and it led to the building of what Shannon called “the most complex machine that man has ever attempted.” The challenge of building this machine created what one Bell Labs researcher referred to as “a problem-rich environment” that assured scientists and engineers a never-ending stream of practical problems against which to test their skills. These problems were always set in a holistic context within which whatever piece a particular person was working on fit. There was also an understanding that innovation was unpredictable. Researchers were given considerable flexibility in what they worked on and for how long.

The lessons for defense acquisition are found in this culture. Morry Tanenbaum, AT&T executive vice president at the time of divestiture and the inventor of the silicon transistor much earlier at Bell Labs, saw the roots of the Labs’ demise in the very technology that it had invented. By the time of divestiture, this technology had diffused widely throughout the electronics industry and it came back to haunt its creators in the form of competition. In the years since, that technology has further diffused globally, to friend and foe alike. The resulting challenge its ubiquity poses for national security will not be overcome by simply doing what we have always done, only better. It will require innovation, not only in technology, but also in the people that acquire it and the processes they use to do so. This innovation will demand a new culture across the defense acquisition community.