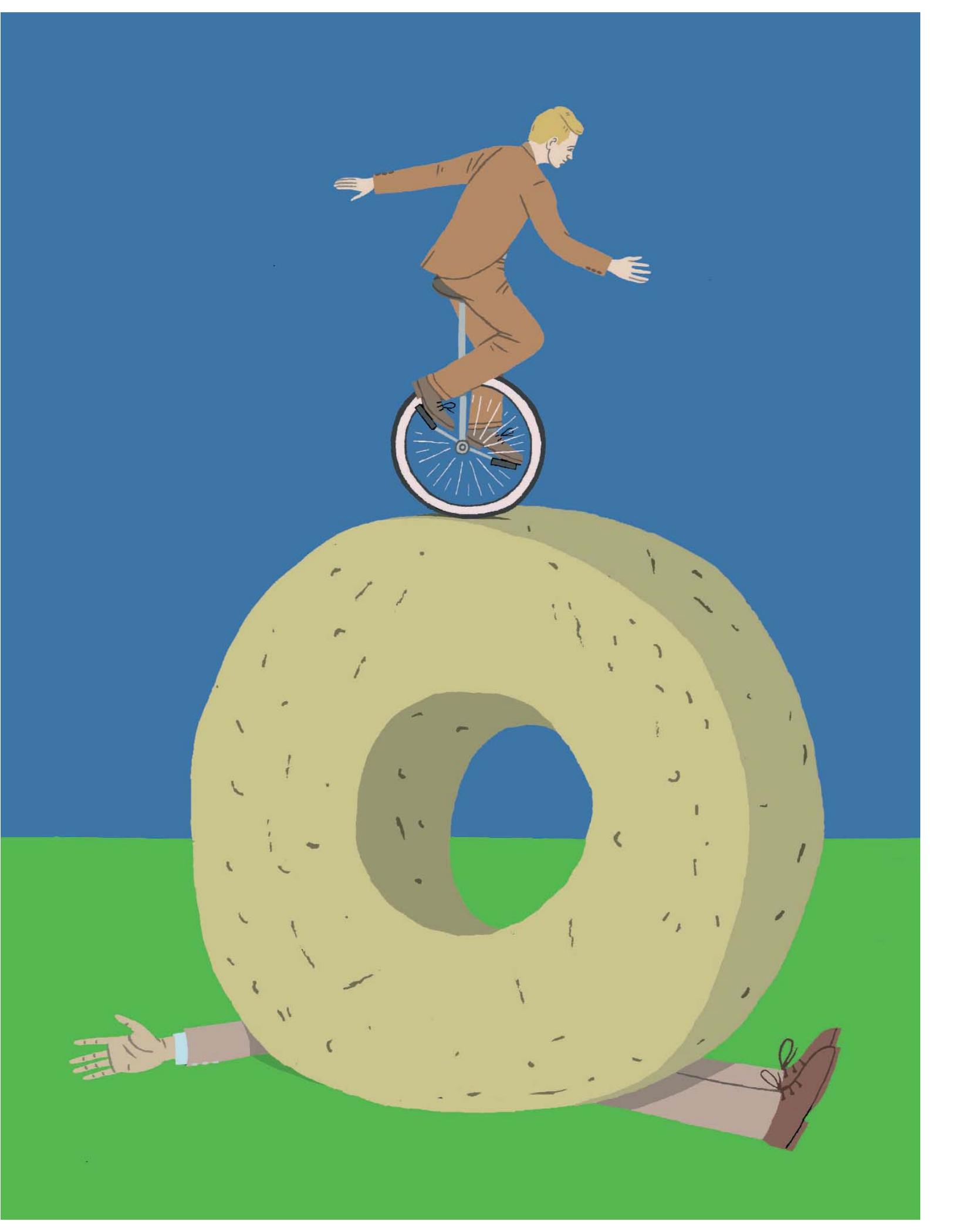


Why big companies can't invent

Technology analyst and leading venture capitalist **Howard Anderson** asks, Is the vaunted corporate research-and-development laboratory obsolete as a source of meaningful invention and innovation?

Illustration by Scott Menchin



IT'S OFTEN SAID that Thomas Edison's finest invention wasn't the light bulb or the record player; it was the concept of an ongoing industrial innovation and development process. Corporations from Edison's own General Electric to Ma Bell, Corning, and Kodak took his idea and ran with it, setting the stage for the modern R&D lab.

While independent inventors were once the main source of patents, since the 1930s, corporate labs have been the dominant wellspring of invention. For decades, these organizations drove corporate growth, and they developed many of the fundamental inventions that run modern life: Bell Labs and the transistor, RCA and color television, GE and MRI technology. In the process, R&D has become the ultimate corporate sacred cow. Until recently, corporate gospel has

been that sustained high investment in research will lead to a boatload of insanely great products that will carry a company to a new level, driving growth in profits and staking out vibrant emerging markets. But it's time to ask some hard questions: Does corporate research and development really work? And if it does, why are so many prestigious and supposedly well-run firms continually blindsided by competitors?

The answer is, at best it's not working well, and perhaps it just doesn't work at all anymore. Corporations need to take a closer look at their devotion to internal research. We're entering a new era of invention, and big companies must adapt and begin practicing invention triage—keeping only what works, fixing what can be fixed, and throwing out the rest.

IBM, for instance, employs 3,000 full-time researchers yet has rarely been a market innovator. It spent \$5.1 billion on R&D last year—6 percent of its revenue and \$16,000 per employee. Yes, Big Blue does make \$1 billion each year licensing the technology these inventors create to other firms. But look at the companies that are whopping IBM: Cisco, EMC, Oracle, and Sun, among others. These companies spend far less on research than IBM. Oracle, which long dominated the relational-database market, took the idea right out of a paper by an IBM researcher! In external computer storage, EMC, a relative newcomer, has 19 percent of today's \$13 billion market to IBM's 15 percent. Fifteen years ago IBM had 80 percent. And IBM is not alone in its R&D failures.

Look at Apple. It invented the personal-computer industry with the Apple II in 1977, popularized the graphical user interface, and pioneered intuitive software—and became the first personal-computer company to reach \$1 billion in annual sales. But once Apple made it big, it stalled. Today the company has only 2 percent of the \$180 billion personal-computer market. Apple spends \$471 million a year on R&D, a full 7.6 percent of its revenue. I defy you to name me another company so innovative with so little to show for it.

How about Xerox? Okay, you win. Xerox makes Apple look like a stellar success story. Picture a corporate meeting back in 1970. Xerox is getting filthy rich. It wouldn't even sell you a copier: you rented the damn things and paid for every copy you made. Research leaders convinced management that it had to plow back millions into research—without offering any guarantee that anything worthwhile would come of it. They hired the smartest people and built Xerox Palo Alto Research Center.

PARC researchers invented the Ethernet, windowed computer applications, screen icons, and laser printers. Of the 10 most important developments in computing, Xerox PARC birthed at least half of them.

And how did Xerox management handle this windfall? They blew it. Choked. Perhaps the biggest screw-up in technology history. Almost every other company in Silicon Valley benefited from PARC's innovations, but the only one Xerox managed to cash in on is the laser printer. And though printers now form a serious chunk of the company's business, even in that space, Hewlett-Packard is the clear winner. Xerox still spends almost \$900 million in R&D annually, almost 6 percent of its revenue. And do they have any knock-your-socks-off products to show for it? Nope. Can you think of a worse-run company over the last 20 years than Xerox—a company that did everything it was supposed to do to build internal innovation and has still failed spectacularly?

So what should the criteria be for seeing if R&D dollars are well spent? Number of patents? Patents per research dollar? Market share? Or market share of technology developed in-house? It's kind of like a major-league baseball team seeing what percentage of its starting lineups has come from its farm teams. One winning metric: revenue growth of 15 percent to 20 percent a year, driven by internally developed products.

But few companies can claim such success. We have been evolving over the last few decades toward an age in which corporate R&D just doesn't work. There are three reasons why.

Clayton Christensen delineated the first brilliantly in *The Innovator's Dilemma*. Any new technology threatens to cut the profit margins of the bigfoot products that carry the market leader. Why would RCA or GE push solid-state technology

For decades, R&D labs drove the fundamental inventions of still works, why are so many

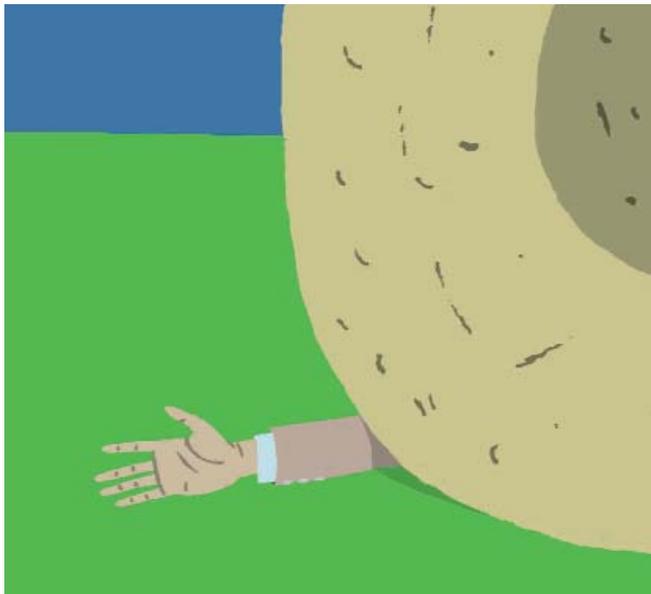
when the profits from vacuum tubes were so high? Why would Kodak push for digital cameras when its real money was made in film? All eventually entered these markets, of course, but late, and only when change was inevitable. Major corporations much prefer “just-in-time” innovation—innovation that peaks just as older products are on the back half of their life cycle. But innovation does not choreograph so simply; it comes in fits and starts, defeats mixed with occasional breakthroughs.

The second reason: us venture capitalists. We have about \$100 billion just sitting on the sidelines. We often will pick out the best research teams and set them up as independent companies—something a big firm is loath to do. And we can make company founders rich beyond belief (at least that's what we tell them). We will steal the best researchers—those with a sense of urgency and a track record—and beat the big guns to market. That is our job, and we do it well.

The third reason we're heading for a new model of corporate invention is execution. Every company likes to innovate; very few companies want to execute the plan to take a development and productize it. That's hard work. Part of the problem is the internal barriers that corporations put up, but that isn't the real

key. Show me the internal compensation system for a company's general managers, and I will show you why its execution is just plain awful. Companies reward managers for making their numbers, not for building new businesses. Who wants to risk her bonus for an upstart technology that threatens the cash cows?

Corporate R&D spends 80 percent of its time and talent on “product improvements” and 20 percent on really new stuff. Last year my friend Kenan Sahin, a former vice president of software technology at Lucent Technologies' Bell Labs, addressed this issue a different way (see “Our Innovation Backlog,” *TR December 2003/January 2004*). Kenan bemoaned the shrinking amount of



corporate growth and developed modern life. But if corporate R&D firms blindsided by competitors?

research—and more importantly, commercialization of research—done by our largest companies and suggested that we reverse this trend. Let's look at it another way: since corporate R&D departments do so little with all the money they get now, shouldn't corporations spend less on research?

CEOs ride a perpetual roller coaster. Outsource R&D or bring it back in-house? Invest in venture capital funds to get a “window on technology” or suck up to the major research universities? Obtain technology by acquiring upstarts or make strategic investments in younger firms? Sign a codevelopment contract or build a distribution agreement? All are efforts to make this damn thing called R&D work. When did financial engineering replace real engineering?

One way to look at the research and development universe is to divide the world into two groups: attackers and defenders. The defenders are all the companies you know—AT&T, IBM, Wal-Mart. Once these giants were young and aggressive attackers—when the defenders were Western Union, National Cash Register, and Woolworth. But now they are the kings of the mountain. The defenders have markets and customers and capital and hired expertise. They believe in an orderly R&D

process, and they're generally driven by financial concerns. In any market, every defender must protect its best products and customers and also attack the adjacent markets. It can either take its existing products and retool them for new markets or take its existing customers and find other products or services to sell to them. Or both.

What innovators from the defender side want to do is to keep the status quo—although they firmly deny that. But if they can keep their margins and their market share relatively steady, the results are fine. The stock will appreciate 10 percent or 15 percent per year, and senior management's stock options will make them wealthy by retirement time. Yes, they talk about “attacking”; they use every war and football analogy known. But when all is said and done...they want to sleep well at night.

The attackers are companies you've probably never heard of—Alkermes and A123Systems and Kubi Software. [Anderson's YankeeTek Ventures has invested in A123Systems. Ed.] The best way to describe them is as true samurai, aggressive warriors. The attackers have no market share, no customers, and sometimes no clue. What they do have is an open field. Innovators from the attacker side want to topple the big boys and become defenders themselves—or at least to attain a version of success by selling out to defenders. And they throw all their energy into inventing new technologies to realize those goals.

The defenders, meanwhile, see these new technologies and go through a few predictable phases—not unlike those popularly associated with grieving.

Denial. “This new technology won't work (or is dangerous or doesn't conform to standards), and our customers don't want it!”

Anger. “How dare our good customers (friends, fellow members of the club) give even a little of their business to these interlopers! Don't they appreciate the great service and support we've been giving them?”

Reluctant acceptance. “Okay, there is some merit to the technology. So let's make it available—but only to those customers who want it and whom we might lose anyway. And let's tell them why they really don't want it, even though they think they do—and keep trying to sell as much of the older, more profitable product as possible.”

Capitulation. “Look—the market is moving away from us faster than we thought! Our own R&D is horribly late again; when they finally get the product ready it will be so hobbled as to be worthless. So let's invest in (or buy) the damn competition now, before they get too big.”

Which brings me back to Edison. His model is expensive and probably did the job as long as companies had virtual monopolies in their areas. But with the advent of venture capital, the model began to change. Now “the competition” is rarely a bigger company but a smaller, focused one. Companies such as Motorola and Kodak and Boeing are finding themselves whipped by upstarts with specialized technology and faster feet.

The old model of the corporate R&D lab as the engine for invention lasted 70 years. What every company needs now, regardless of size, is the single-mindedness and sense of urgency of entrepreneurial firms.

The old model is dead. Time to build a new one. ■

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