Innovation used to be easy. Imagine the caveman, forced to move a giant rock, discovering by accident that rolling it on a log made the job easier.

Luckily, the concept of intellectual property wasn't around then. Today, that same caveman would've filed a patent and demanded licensing payments from anyone else who wanted to roll things on logs or other cylindrical objects.

Fortunately, the knowledge-as-asset age has arisen at a time when most obvious inventions -- the wheel, hammer, processed-cheese spread -- are already invented. New innovations, sampling from patent applications published in recent months, have names like Parallel leading bit detection for Exp-Golomb decoding and Method and apparatus for s.i.p./h.323 interworking. They're probably not the sort of things you, too, would have come up with had you the spare time and an empty garage.

As everyday technology grows in complexity, tech firms are spending a lot more money on R&D. Research firm Booz Allen Hamilton reports that the pace of R&D spending among the top 1,000 corporate spenders is accelerating. As we continue to ship jobs in industries like manufacturing to places where people work for wages that make Wal-Mart pay scales seem exorbitant, a lot of economists say innovation is the new driver of the economy.

True, perhaps. But most of us lack the ability to recognize a promising innovator. Typically, we're seers only in hindsight, lamenting how we knew eight years ago that Google would revolutionize search and forgetting how we dismissed successful product introductions with cynical rejoinders like "Nobody's going to eat cheese
from a spray bottle."

Part of the reason is it's hard to recognize a promising innovation is that it's not necessarily linked to who spent the most money on it. Rather, the process of innovation itself is subject to reinvention.

Even academics and analysts who study innovation don't agree on what does fuel successful invention. But they do have some ideas about what works best.

**Admit that most things fail:**
This is not a bad thing. It is not even a surprising thing. It is just the way the world operates. And those who do not realize this are more doomed to failure than those who do.

That's the observation of Paul Ormerod, author *Why Most Things Fail*, and an advocate of continuous, aggressive innovation. In the history of industry, Ormerod says, most businesses eventually fail, even market leaders. Although they don't fall apart for the same reasons, certain patterns of behavior contribute to the likelihood of failure.

"What you should be looking for is not the amount of money they're spending on research and development themselves, but a company's willingness to be flexible and to adapt to what other people are doing well," Ormerod said.

Ormerod cites Detroit automakers as an example of an industry that got it wrong. In the face of competition from Japanese manufacturers making smaller, more reliable cars, U.S. automakers could have attempted to adopt the same strategy, but did not.

On the technology side, Ormerod sees Microsoft as a company that responds to competitive threats effectively, often by buying potentially dangerous rivals. (Of course, it helps that the company has $34 billion in cash to buy rivals.)

**Specialize, specialize, specialize:** Sir Isaac Newton once famously wrote, by way of explaining his extraordinary legacy of discoveries, that "If I have seen further, it is by standing upon the shoulders of giants."

The straightforward interpretation of Newton's quotation is if it weren't for the studying the works of those who preceded him, he would not have been able to unearth new findings.

But an alternate read suggests that making discoveries has become more difficult.

"If one is to stand on the shoulders of giants, one must first climb up their backs, and the greater the body of knowledge, the harder this climb becomes," writes Benjamin Jones, a professor at the Kellogg School of Management, in a paper that addresses the complexities of innovation. (.pdf)
Jones' analysis of R&D spending and lackluster gains in productivity, leads him to the conclusion that more effort is required to achieve breakthroughs than in the past.

"The individual R&D worker doesn't seem to produce as much as they used to," Jones said, adding that this will likely lead to two changes in the way people and institutions pursue innovation.

The first is a trend toward specialization. In order to improve existing technologies, Jones believes researchers must either pursue an increasingly extensive education or narrow their field of expertise.

Jones also envisions a trend toward teamwork gaining momentum, as companies need more people to complete projects.

"Whenever researchers look at innovation, they see this upward trend in collaboration," he said. "People are becoming more specialized over time and they need to work in bigger teams."

**The part is easier to change than the whole:** Some advances come from focusing on a small part of a technology, but more specialization does not necessarily mean more education. It's not necessary to complete six Ph.D.s in order to innovate.

That's the view of Eric von Hippel, a professor at MIT's Sloan School of Management, who says technologies can be developed in such a way that innovations are easier to make. The basic idea is to break complex systems into simpler "modules." A product can be improved upon by focusing not on the whole, but on a small part.

"Existing technology gets gradually shaped into large user-friendly chunks that you don't need to know the insides of to use," he said. "You can work with an operating system without knowing everything about how it works. And you can modify a car without necessarily understanding how the engine works."

The module concept doesn't only apply to technology. Von Hippel sees the same approach in areas like cooking and composing. People with relatively little expertise do sophisticated things using ready-made food products or music software that make complex tasks easy.

As for corporate R&D, von Hippel says companies are finding that more and more innovation is coming not from in-house developers, but from products users who do their own re-engineering.

"People are innovating for themselves," he said. "That's what has happened and economists are really puzzled about it because economists are focused on this IP-based system."

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