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ENTREPRENEURSHIP

The Innovator's DNA

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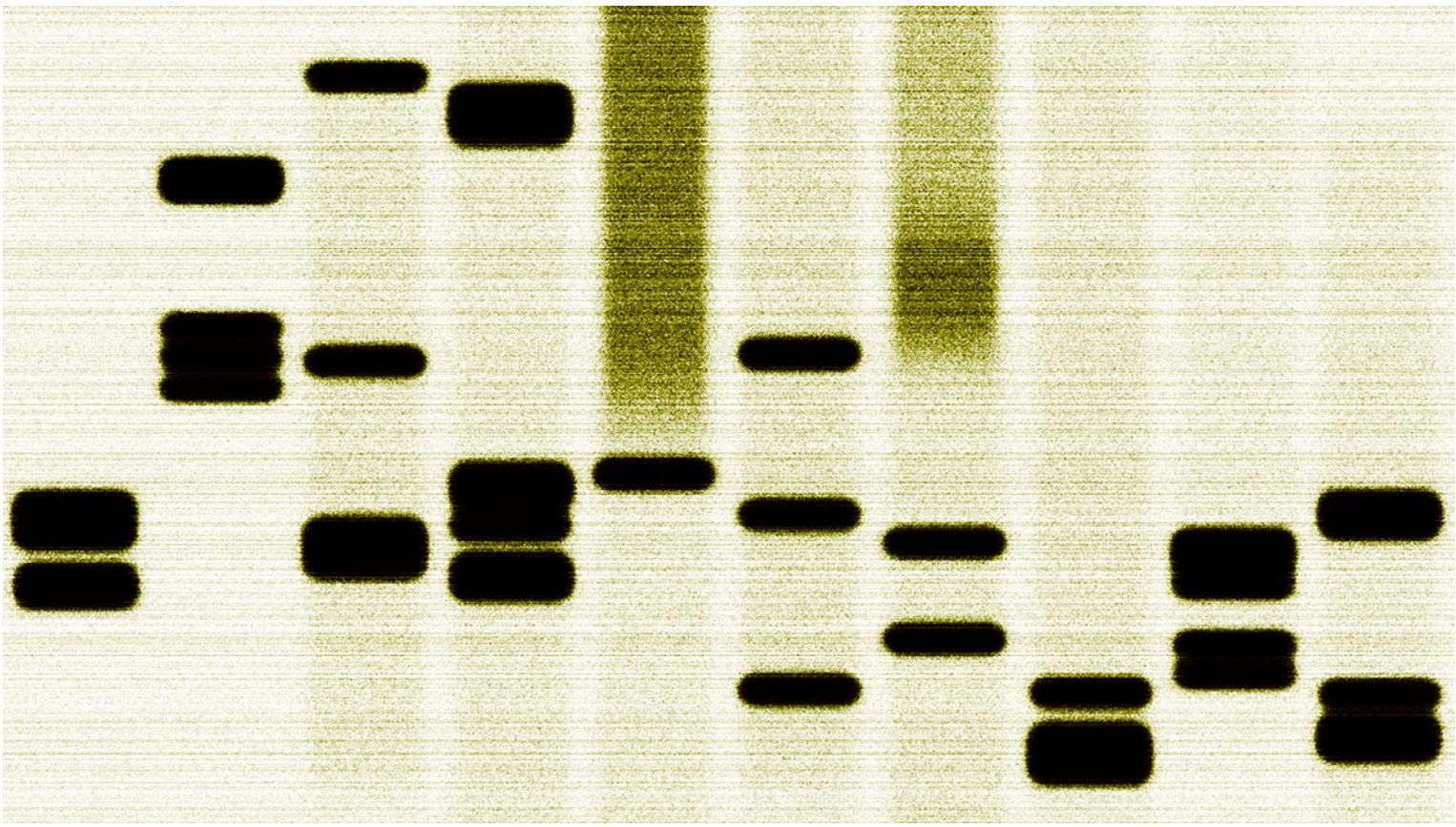


"How do I find innovative people for my organization? And how can I become more innovative myself?"

These are questions that stump senior executives, who understand that the ability to innovate is the "secret sauce" of business success. Unfortunately, most of us know very little about what makes one person more creative than another. Perhaps for this reason, we stand in awe of visionary

entrepreneurs like Apple's Steve Jobs, Amazon's Jeff Bezos, eBay's Pierre Omidyar, and P&G's A.G. Lafley. How do these people come up with groundbreaking new ideas? If it were possible to discover the inner workings of the masters' minds, what could the rest of us learn about how innovation really happens?

In searching for answers, we undertook a six-year study to uncover the origins of creative—and often disruptive—business strategies in particularly innovative companies. Our goal was to put innovative entrepreneurs under the microscope, examining when and how they came up with the ideas on which their businesses were built. We especially wanted to examine how they differ from other executives and entrepreneurs: Someone who buys a McDonald's franchise may be an entrepreneur, but building an Amazon requires different skills altogether. We studied the habits of 25 innovative entrepreneurs and surveyed more than 3,000 executives and 500 individuals who had started innovative companies or invented new products.

We were intrigued to learn that at most companies, top executives do not feel personally responsible for coming up with strategic innovations. Rather, they feel responsible for facilitating the innovation process. In stark contrast, senior executives of the most innovative companies—a mere 15% in our study—don't delegate creative work. They do it themselves.

But *how* do they do it? Our research led us to identify five "discovery skills" that distinguish the most creative executives: associating, questioning, observing, experimenting, and networking. We found that innovative entrepreneurs (who are also CEOs) spend 50% more time on these discovery activities than do CEOs with no track record for innovation. Together, these skills make up what we call the innovator's DNA. And the good news is, if you're not born with it, you can cultivate it.

What Makes Innovators Different?

Innovative entrepreneurs have something called creative intelligence, which enables discovery yet differs from other types of intelligence (as suggested by Howard Gardner's theory of multiple intelligences). It is more than the cognitive skill of being right-brained. Innovators engage both sides of the brain as they leverage the five discovery skills to create new ideas.

In thinking about how these skills work together, we've found it useful to apply the metaphor of DNA. Associating is like the backbone structure of DNA's double helix; four patterns of action (questioning, observing, experimenting, and networking) wind around this backbone, helping to cultivate new insights. And just as each person's physical DNA is unique, each individual we studied had a unique innovator's DNA for generating breakthrough business ideas.

Imagine that you have an identical twin, endowed with the same brains and natural talents that you have. You're both given one week to come up with a creative new business-venture idea. During that week, you come up with ideas alone in your room. In contrast, your twin (1) talks with 10 people—including an engineer, a musician, a stay-at-home dad, and a designer—about the venture, (2) visits three innovative start-ups to observe what they do, (3) samples five "new to the market" products, (4) shows a prototype he's built to five people, and (5) asks the questions "What if I tried this?" and "Why do you do that?" at least 10 times each day during these networking, observing, and experimenting activities. Who do you bet will come up with the more innovative (and doable) idea?

Studies of identical twins separated at birth indicate that our ability to think creatively comes one-third from genetics; but two-thirds of the innovation skill set comes through learning—first understanding a given skill, then practicing it, experimenting, and ultimately gaining confidence in one's capacity to create. Innovative entrepreneurs in our study acquired and honed their innovation skills precisely this way.

Let's look at the skills in detail.

Discovery Skill 1: Associating

Associating, or the ability to successfully connect seemingly unrelated questions, problems, or ideas from different fields, is central to the innovator's DNA. Entrepreneur Frans Johansson described this phenomenon as the "Medici effect," referring to the creative explosion in Florence when the Medici family brought together people from a wide range of disciplines—sculptors, scientists, poets, philosophers, painters, and architects. As these individuals connected, new ideas blossomed at the intersections of their respective fields, thereby spawning the Renaissance, one of the most inventive eras in history.

To grasp how associating works, it is important to understand how the brain operates. The brain doesn't store information like a dictionary, where you can find the word "theater" under the letter "T." Instead, it associates the word "theater" with any number of experiences from our lives. Some of these are logical ("West End" or "intermission"), while others may be less obvious (perhaps "anxiety," from a botched performance in high school). The more diverse our experience and knowledge, the more connections the brain can make. Fresh inputs trigger new associations; for some, these lead to novel ideas. As Steve Jobs has frequently observed, "Creativity is connecting things."

The world's most innovative companies prosper by capitalizing on the divergent associations of their founders, executives, and employees. For example, Pierre Omidyar launched eBay in 1996 after linking three unconnected dots: (1) a fascination with creating more-efficient markets, after having been shut out from a hot internet company's IPO in the mid-1990s; (2) his fiancée's desire to locate hard-to-find collectible Pez dispensers; and (3) the ineffectiveness of local classified ads in locating such items. Likewise, Steve Jobs is able to generate idea after idea because he has spent a lifetime exploring new and unrelated things—the art of calligraphy, meditation practices in an Indian ashram, the fine details of a Mercedes-Benz.

Associating is like a mental muscle that can grow stronger by using the other discovery skills. As innovators engage in those behaviors, they build their ability to generate ideas that can be recombined in new ways. The more frequently people in our study attempted to understand, categorize, and store new knowledge, the more easily their brains could naturally and consistently make, store, and recombine associations.

Discovery Skill 2: Questioning

More than 50 years ago, Peter Drucker described the power of provocative questions. "The important and difficult job is never to find the right answers, it is to find the right question," he wrote. Innovators constantly ask questions that challenge common wisdom or, as Tata Group chairman Ratan Tata puts it, "question the unquestionable." Meg Whitman, former CEO of eBay, has worked directly with a number of innovative entrepreneurs, including the founders of eBay, PayPal, and Skype. "They get a kick out of screwing up the status quo," she told us. "They can't bear it. So they spend a tremendous amount of time thinking about how to change the world. And as they brainstorm, they like to ask: 'If we did this, what would happen?'"

Most of the innovative entrepreneurs we interviewed could remember the specific questions they were asking at the time they had the inspiration for a new venture. Michael Dell, for instance, told us that his idea for founding Dell Computer sprang from his asking why a computer cost five times as much as the sum of its parts. "I would take computers apart...and would observe that $600 worth of parts were sold for $3,000." In chewing over the question, he hit on his revolutionary business model.

Sample of Innovative Entrepreneurs from our Study

Sam Allen: ScanCafe.com

Marc Benioff: Salesforce.com

Jeff Bezos: Amazon.com

Mike Collins: Big Idea Group

Scott Cook: Intuit

Michael Dell: Dell Computer

Aaron Garrity: XanGo

Diane Green: VMWare

Eliot Jacobsen: RocketFuel

Josh James: Omniture

Chris Johnson: Terra Nova

Jeff Jones: NxLight; Campus Pipeline

Herb Kelleher: Southwest Airlines

Mike Lazaridis: Research In Motion

Spencer Moffat: Fast Arch of Utah

David Neeleman: JetBlue; Morris Air

Pierre Omidyar: eBay

John Pestana: Omniture

Peter Thiel: PayPal

Mark Wattles: Hollywood Video

Corey Wride: Movie Mouth

To question effectively, innovative entrepreneurs do the following:

Ask "Why?" and "Why not?" and "What if?"

Most managers focus on understanding how to make existing processes—the status quo—work a little better ("How can we improve widget sales in Taiwan?"). Innovative entrepreneurs, on the other hand, are much more likely to challenge assumptions ("If we cut the size or weight of the widget in half, how would that change the value proposition it offers?"). Marc Benioff, the founder of the online sales software provider Salesforce.com, was full of questions after witnessing the emergence of Amazon and eBay, two companies built on services delivered via the internet. "Why are we still loading and upgrading software the way we've been doing all this time when we can now do it over the internet?" he wondered. This fundamental question was the genesis of Salesforce.com.

Imagine opposites.

In his book *The Opposable Mind,* Roger Martin writes that innovative thinkers have "the capacity to hold two diametrically opposing ideas in their

Niklas ZennstrÖm: Skype

heads." He explains, "Without panicking or simply settling for one alternative or the other, they're able to produce a synthesis that is superior to either opposing idea."

Innovative entrepreneurs like to play devil's advocate. "My learning process has always been about disagreeing with what I'm being told and taking the opposite position, and pushing others to really justify themselves," Pierre Omidyar told us. "I remember it was very frustrating for the other kids when I would do this." Asking oneself, or others, to imagine a completely different alternative can lead to truly original insights.

Embrace constraints.

Most of us impose constraints on our thinking only when forced to deal with real-world limitations, such as resource allocations or technology restrictions. Ironically, great questions actively impose constraints on our thinking and serve as a catalyst for out-of-the-box insights. (In fact, one of Google's nine innovation principles is "Creativity loves constraint.") To initiate a creative discussion about growth opportunities, one innovative executive in our study asked this question: "What if we were legally prohibited from selling to our current customers? How would we make money next year?" This led to an insightful exploration of ways the company could find and serve new customers. Another innovative CEO prods his managers to examine sunk-cost constraints by asking, "What if you had not already hired this person, installed this equipment, implemented this process, bought this business, or pursued this strategy? Would you do the same thing you are doing today?"

Discovery Skill 3: Observing

Discovery-driven executives produce uncommon business ideas by scrutinizing common phenomena, particularly the behavior of potential customers. In observing others, they act like anthropologists and social scientists.

Intuit founder Scott Cook hit on the idea for Quicken financial software after two key observations. First he watched his wife's frustration as she struggled to keep track of their finances. "Often the surprises that lead to new business ideas come from watching other people work and live their normal lives," Cook explained. "You see something and ask, 'Why do they do that? That doesn't make sense.'" Then a buddy got him a sneak peek at the Apple Lisa before it launched. Immediately

after leaving Apple headquarters, Cook drove to the nearest restaurant to write down everything he had noticed about the Lisa. His observations prompted insights such as building the graphical user interface to look just like its real-world counterpart (a checkbook, for example), making it easy for people to use it. So Cook set about solving his wife's problem and grabbed 50% of the market for financial software in the first year.

Innovators carefully, intentionally, and consistently look out for small behavioral details—in the activities of customers, suppliers, and other companies—in order to gain insights about new ways of doing things. Ratan Tata got the inspiration that led to the world's cheapest car by observing the plight of a family of four packed onto a single motorized scooter. After years of product development, Tata Group launched in 2009 the $2,500 Nano using a modular production method that may disrupt the entire automobile distribution system in India. Observers try all sorts of techniques to see the world in a different light. Akio Toyoda regularly practices Toyota's philosophy of *genchi genbutsu*—"going to the spot and seeing for yourself." Frequent direct observation is baked into the Toyota culture.

Discovery Skill 4: Experimenting

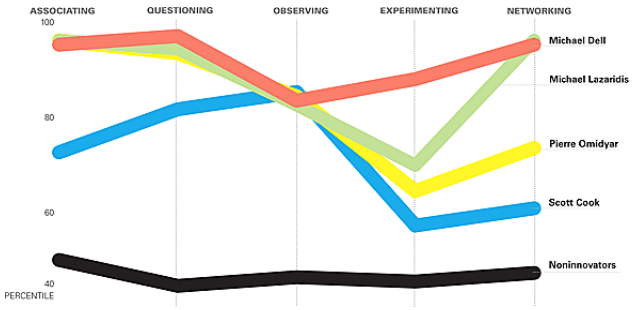
When we think of experiments, we think of scientists in white coats or of great inventors like Thomas Edison. Like scientists, innovative entrepreneurs actively try out new ideas by creating prototypes and launching pilots. (As Edison said, "I haven't failed. I've simply found 10,000 ways that do not work.") The world is their laboratory. Unlike observers, who intensely watch the world, experimenters construct interactive experiences and try to provoke unorthodox responses to see what insights emerge.

The innovative entrepreneurs we interviewed all engaged in some form of active experimentation, whether it was intellectual exploration (Michael Lazaridis mulling over the theory of relativity in high school), physical tinkering (Jeff Bezos taking apart his crib as a toddler or Steve Jobs disassembling a Sony Walkman), or engagement in new surroundings (Starbucks founder Howard Shultz roaming Italy visiting coffee bars). As executives of innovative enterprises, they make experimentation central to everything they do. Bezos's online bookstore didn't stay where it was after its initial success; it morphed into an online discount retailer, selling a full line of products from toys to TVs to home appliances. The electronic reader Kindle is an experiment that is now transforming Amazon from an online retailer to an innovative electronics manufacturer. Bezos sees

experimentation as so critical to innovation that he has institutionalized it at Amazon. “I encourage our employees to go down blind alleys and experiment,” Bezos says. “If we can get processes decentralized so that we can do a lot of experiments without it being very costly, we’ll get a lot more innovation.”

How Innovators Stack Up

This chart shows how four well-known innovative entrepreneurs rank on each of the discovery skills. All our high-profile innovators scored above the 80th percentile on questioning, yet each combined the discovery skills uniquely to forge new insights.



Rankings are based on a survey of more than 3,000 executives and entrepreneurs.

Scott Cook, too, stresses the importance of creating a culture that fosters experimentation. “Our culture opens us to allowing lots of failures while harvesting the learning,” he told us. “It’s what separates an innovation culture from a normal corporate culture.”

One of the most powerful experiments innovators can engage in is living and working overseas. Our research revealed that the more countries a person has lived in, the more likely he or she is to leverage that experience to deliver innovative products, processes, or businesses. In fact, if managers try out even one international assignment before becoming CEO, their companies deliver stronger financial results than companies run by CEOs without such experience—roughly 7% higher market performance on average, according to research by Gregeren, Mason A. Carpenter, and Gerard W. Sanders. P&G’s A.G. Lafley, for example, spent time as a student studying history in France and running retail operations on U.S. military bases in Japan. He returned to Japan later to head all of P&G’s Asia operations before becoming CEO. His diverse international experience has served him well as the leader of one of the most innovative companies in the world.

Discovery Skill 5: Networking

Devoting time and energy to finding and testing ideas through a network of diverse individuals gives innovators a radically different perspective. Unlike most executives—who network to access resources, to sell themselves or their companies, or to boost their careers—innovative entrepreneurs

go out of their way to meet people with different kinds of ideas and perspectives to extend their own knowledge domains. To this end, they make a conscious effort to visit other countries and meet people from other walks of life.

They also attend idea conferences such as Technology, Entertainment, and Design (TED), Davos, and the Aspen Ideas Festival. Such conferences draw together artists, entrepreneurs, academics, politicians, adventurers, scientists, and thinkers from all over the world, who come to present their newest ideas, passions, and projects. Michael Lazaridis, the founder of Research In Motion, notes that the inspiration for the original BlackBerry occurred at a conference in 1987. A speaker was describing a wireless data system that had been designed for Coke; it allowed vending machines to send a signal when they needed refilling. "That's when it hit me," Lazaridis recalls. "I remembered what my teacher said in high school: 'Don't get too caught up with computers because the person that puts wireless technology and computers together is going to make a big difference.'" David Neeleman came up with key ideas for JetBlue—such as satellite TV at every seat and at-home reservationists—through networking at conferences and elsewhere.

Kent Bowen, the founding scientist of CPS technologies (maker of an innovative ceramic composite), hung the following credo in every office of his start-up: "The insights required to solve many of our most challenging problems come from outside our industry and scientific field. We must aggressively and proudly incorporate into our work findings and advances which were not invented here." Scientists from CPS have solved numerous complex problems by talking with people in other fields. One expert from Polaroid with in-depth knowledge of film technology knew how to make the ceramic composite stronger. Experts in sperm-freezing technology knew how to prevent ice crystal growth on cells during freezing, a technique that CPS applied to its manufacturing process with stunning success.

Put a Ding in the Universe

Why do innovators question, observe, experiment, and network more than typical executives? As we examined what motivates them, we discovered two common themes: (1) They actively desire to change the status quo, and (2) they regularly take risks to make that change

Practice, Practice, Practice

As innovators actively engage in the discovery skills, they become defined by them. They grow increasingly confident of their creative abilities. For A.G. Lafley, innovation is the central job of every leader, regardless of the place he or she

happen. Throughout our research, we were struck by the consistency of language that innovators use to describe their motives. Jeff Bezos wants to "make history," Steve Jobs to "put a ding in the universe," Skype cofounder Niklas Zennström to "be disruptive, but in the cause of making the world a better place." These innovators steer entirely clear of a common cognitive bias called the status quo bias—the tendency to prefer an existing state of affairs to alternative ones.

Embracing a mission for change makes it much easier to take risks and make mistakes. For most of the innovative entrepreneurs we studied, mistakes are nothing to be ashamed of; in fact, they are expected as a cost of doing business. "If the people running Amazon.com don't make some significant mistakes," explained Bezos, "then we won't be doing a good job for our shareholders because we won't be swinging for the fences." In short, innovators rely on their "courage to innovate"—an active bias against the status quo and an unflinching willingness to take risks—to transform ideas into powerful impact.

occupies on the organizational chart. But what if you—like most executives—don't see yourself or those on your team as particularly innovative?

Though innovative thinking may be innate to some, it can also be developed and strengthened through practice. We cannot emphasize enough the importance of rehearsing over and over the behaviors described above, to the point that they become automatic. This requires putting aside time for you and your team to actively cultivate more creative ideas.

The most important skill to practice is questioning. Asking "Why" and "Why not" can help turbocharge the other discovery skills. Ask questions that both impose and eliminate constraints; this will help you see a problem or opportunity from a different angle. Try spending 15 to 30 minutes each day writing down 10 new questions that challenge the status quo in your company or industry. "If I had a favorite question to ask, everyone would anticipate it," Michael Dell told us. "Instead I like to ask things people don't think I'm going to ask. This is a little cruel, but I kind of delight in coming up with questions that nobody has the answer to quite yet."

To sharpen your own observational skills, watch how certain customers experience a product or service in their natural environment. Spend an entire day carefully observing the "jobs" that customers are trying to get done. Try not to make judgments about what you see: Simply pretend you're a fly on the wall, and observe as neutrally as possible. Scott Cook advises Intuit's observers to

ask, “What’s different than you expected?” Follow Richard Branson’s example and get in the habit of note taking wherever you go. Or follow Jeff Bezos’s: “I take pictures of really bad innovations,” he told us, “of which there are a number.”

To strengthen experimentation, at both the individual and organizational levels, consciously approach work and life with a hypothesis-testing mind-set. Attend seminars or executive education courses on topics outside your area of expertise; take apart a product or process that interests you; read books that purport to identify emerging trends. When you travel, don’t squander the opportunity to learn about different lifestyles and local behavior. Develop new hypotheses from the knowledge you’ve acquired and test them in the search for new products or processes. Find ways to institutionalize frequent, small experiments at all levels of the organization. Openly acknowledging that learning through failure is valuable goes a long way toward building an innovative culture.

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To improve your networking skills, contact the five most creative people you know and ask them to share what they do to stimulate creative thinking. You might also ask if they’d be willing to act as your creative mentors. We suggest holding regular idea lunches at which you meet a few new people from diverse functions, companies, industries, or countries. Get them to tell you about their innovative ideas and ask for feedback on yours.• • •

Innovative entrepreneurship is not a genetic predisposition, it is an active endeavor. Apple’s slogan “Think Different” is inspiring but incomplete. We found that innovators must consistently act different to think different. By understanding, reinforcing, and modeling the innovator’s DNA, companies can find ways to more successfully develop the creative spark in everyone.

A version of this article appeared in the December 2009 issue of *Harvard Business Review*.

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