Finding the Next Edison

EVERYDAY PEOPLE ARE RESPONSIBLE FOR A STRIKING NUMBER OF INVENTIONS AND INNOVATIONS. HOW CAN BUSINESS ENLIST MORE OF THEM?

By Derek Thompson

The inspiration for Rafael Hwang's million-dollar idea came, as inspiration sometimes does, from Jay Leno.

It was January 25, 2013, and Hwang, then a 22-year-old Arizona State senior, was watching *The Tonight Show* at his apartment in Glendale. One of the evening's guests was Ben Kaufman, the ebullient founder of Quirky, a manufacturing company that builds products dreamed up by a global throng of amateur inventors. Kaufman showed off his newest gosh-wow creations to the studio audience with a circus showman's flair (an egg-yolk extractor! a citrus spritzer you plug right into the lemon!). Home on the couch, Hwang thought, *Hey, I can make something better than that.*

Without experience in engineering or design, Hwang technically couldn't "make" anything—at least, not by himself. But he had an idea about how to answer a small, recurring question for millions of supermarket shoppers like himself: *Am I running low on eggs?*

Hwang drew up plans for the first-ever "smart" egg carton, which syncs with your phone to display the eggs still in the tray, and submitted his admittedly rough sketch ("It was horrible," he confided to me). The idea was a hit at Quirky, which refined and fully engineered the carton, modeled it

using a 3-D printer, and had it mass-manufactured in China. The Egg Minder, co-branded with GE, is now on shelves; Hwang is guaranteed about 13 percent of the product's sales.

This might sound like the apotheosis of crowd-sourcing, but Ben Kaufman can't hear the word without getting cross. "Do you like being in a *crowd*? Do you like *sourcing*? I hate both of those things," Kaufman told me. "Quirky isn't just pulling from our community, we're starting a conversation." At its vast converted-warehouse headquarters, in West Chelsea in New York City, the company refines the slapdash ingenuity of a nation of napkin-doodlers by combining it with the sophistication of a modern design, manufacturing, and distribution company.

Erik Brynjolfsson, a management professor at MIT and a co-author, with Andrew McAfee, of the new book *The Second Machine Age*, calls this new approach to problem-solving "combinatorial innovation." It's his belief that invention and scientific progress typically come not from entirely new ideas, but from the right combination of existing ideas. What science and engineering companies need, therefore, are smarter ways to collect and grade all these potential idea combinations—the way Quirky uses in-house experts to advise on, tweak, and build promising ideas, rather than trying to turn every doodle into a new product. "There are a ton of potential ideas out there, and the bottleneck is being able to evaluate and consider them all," Brynjolfsson told me. "The great thing about digital technology is that it's easier than ever to get lots of eyeballs looking at our biggest problems."

Opening up challenges to a diverse group of people is powerful, not only because it gives you more shots on goal, but also because it gives you different shots, from surprising angles. "Big companies can't invent that well. They know too

much," Kaufman said. "They lose touch with the average person. When you become infinitely educated in a category, you're your own worst enemy, because you can instantly say the 15 to 20 reasons something isn't needed, and you don't realize the one reason it is needed."

In other words, outsiders often present the most-interesting answers to complex problems, not *despite* their lack of expertise, but because of it.

The airplane that took off from Kitty Hawk in 1903, one of the most important inventions of the 20th century, was devised by famously unlikely inventors. Orville and Wilbur Wright ran a bicycle shop, and lacked the engineering chops of the many pilots whose dreams had crashed along with their gliders. But this background played to their advantage when Wilbur, chatting up a customer, casually twisted a rectangular bike-part box, turning its left and right sides in opposite directions. The concept he had absentmindedly modeled is now known as "wing warping," one of the breakthroughs that made the first flight possible. The twisting wing became part of the brothers' most important patent.

The romantic ideal of the everyman inventor, or the at-home eureka moment, sounds too mythically quaint to be real. But research into the mysterious origins of invention suggests that neither the Wright brothers nor Rafael Hwang were exceptions.

When the business scholars Karim Lakhani and Lars Bo Jeppesen studied Innocentive, an online clearinghouse for unanswered questions in science and other fields, they discovered that the people most likely to solve the most-complex problems weren't professionals in the discipline in question. In fact, being an expert in an area distinct from the field of the challenge was a "statistically significant

predictor" of success. The secret ingredient was what Lakhani, a professor at Harvard, calls "interdisciplinary expertise"—the ability to draw connections between one subject and another. Hwang, for example, was not a kitchen-appliance engineer. But he understood mobile technology, gadgets, and his own shopping habits well enough to envision a product connecting our phones to our refrigerators.

At Innocentive, as at Quirky, the best answers typically come from neither professionals in a given field nor novices, but rather from that borderline expert who approaches the answer from an unusual angle. "Ninety to 95 percent of the time, the individual who comes up with the awarded solution does not have the background and résumé" of someone you would hire to solve the problem, Alph Bingham, Innocentive's founder and former CEO, told me. He recalled the eclectic crew of past winners: a retired telecom engineer who helped NASA predict solar-particle events, a crystallographer who solved a liver-toxicology problem, and an astrophysicist who won a challenge in edible plastics.

"It's not like we have lit majors solving space-medicine problems," he said. Instead the winning answers to the questions posed on Innocentive's Web site come from professionals at an "optimal distance" from the challenge. "You have to be close enough to comprehend the technical aspects, but not so close that you are biased by the way those immersed in the problem tend to think."

Only recently have we begun to learn how to enlist outsiders widely, effectively, and efficiently in the quest to solve problems large and small. Information technology has played a role, but so too has a new appreciation for the power of prize-based challenges. The 2007 DARPA Urban Challenge, for instance, was the most complex robot-car

competition in history—a 60-mile gantlet through a fabricated suburbia built around an abandoned Air Force base in Victorville, California. The government-sponsored race drew a diverse group of participants, produced a $2 million winner, and paved the way for Google's self-driving car. Not in attendance was Tom Kalil, a senior adviser with the Clinton administration, who had helped DARPA establish this sort of prize-based challenge. Today, he's working with the White House to expand the scope of such challenges, which he thinks will help solve some of the country's most significant problems.

In the past decade, the federal government has embraced ideas generated by open prize-based challenges to block illegal robocalls, improve local air-pollution measurements, adapt public-transport systems to self-driving buses, map the universe's dark matter, design a better astronaut glove, mop up oil spills, and design more-fuel-efficient cars. Kalil thinks the government has barely tapped the potential of challenges. "Prizes," he said, "are great public policy," with several benefits. They increase both the number and diversity of potential solutions, fostering the sort of combinatorial innovation that can produce radically new ideas. And they're cost-effective, since they reward only the winning solutions.

Karim Lakhani, the Harvard professor, agrees, but notes that designing a good challenge isn't as simple as posting a question and waiting on the crowd. There are three key elements: asking the right question, offering the right prize, and having the right team of experts evaluate the proposed solutions. Vague questions are ignored, good questions go unanswered without sufficient rewards, and if you don't have proper oversight to evaluate the answers, crowd-sourcing is just one big, useless guessing game. Still, it has never been easier to inspire and capture moments of lone genius, and

that bodes well for the future of scientific discovery, public policy, and—of course—kitchen appliances.

In September, eight months after his first appearance on Leno, Ben Kaufman was back to show off Quirky's latest whiz-bang inventions, like a stand-up rake and a strawberry-stem remover. The camera panned right, and there it was: Rafael Hwang's Egg Minder. "Looks like an egg tray," Leno observed dryly. "The world's smartest egg tray," Kaufman responded, before showing off the iPhone app to a smattering of laughter and audible *ooh*s. Back home in Glendale, on the same couch in the same apartment where he first learned about Quirky, Hwang was watching. "It was surreal to me," he told me. "That's what I call making invention accessible."