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"A passionate look at innovation by a proven innovator concerned about the level of short-sightedness surrounding us."

—Andy Grove,  
cofounder of Intel

# CLOSING THE INNOVATION GAP

REIGNITING THE SPARK OF  
CREATIVITY IN A GLOBAL ECONOMY

JUDY ESTRIN

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## CHAPTER 1

# THE CAPACITY FOR CHANGE

Say the word *Pixar* and what comes to mind? Kids of all ages think of *Toy Story*, *A Bug's Life*, *Monsters Inc*, *Finding Nemo*, *The Incredibles*, *Cars*, and *Ratatouille*. All of these films create magical worlds in which toys, bugs, monsters, fish, superheroes, and cars come to life, and a rat can become a gourmet chef. Even after my son was too old to want to go to the theater with me, I eagerly awaited the release of each new Pixar film—not only to watch what great story would unfold, but also to see how the company's brilliant animators pushed technology to make their onscreen characters even more engaging. At Pixar, the technology inspires the art and the art challenges the technology. It's a two-way street.

I remember my first visit to Pixar headquarters in Emeryville, California, when Disney was in the process of acquiring the company. The lobby opens into a giant atrium surrounded by conference rooms, gaming spaces, and a cafeteria, inviting employees to play, meet, eat, and create. Scooters and skateboards are used to zip around the building, encouraging people to get out of their offices and move around. The openness of the building immediately conveys the openness of the environment.

Walking through the door of the animation department is like entering a Pixar movie—or a bustling small town. The

workspace is decorated thematically for each new film. On the day I visited, there were rats everywhere (cute ones, of course) because the project in production was *Ratatouille*. Each animator creates his or her own unique workspace. One had built a little cottage out of a gardening shed; another, who prefers to work standing up, designed an office with no walls and no chairs. It was clear how much thought had been put into creating a physical environment that inspires individualism, creativity, and fun.

Behind Pixar's incredible creative and financial success is leadership that has a deep understanding of the importance and process of innovation. Launched with \$10 million by Ed Catmull and John Lasseter in 1986, the company was sold to Disney for over \$7 billion in 2006. Catmull is now the president of Disney and Pixar Animation Studios. Lasseter, who is the chief creative officer, is often referred to as the next Walt Disney.

The genesis of the company was an example of innovation at work. What is now Pixar began in 1979 when George Lucas, of *Star Wars* fame, set up a group to explore new techniques for digital printing and audio and video editing. He hired Catmull, a leading researcher in computer graphics, who has always had a passion for filmmaking. After several years, they agreed to set up the group as an independent company. Following months of discussions with venture capitalists (VCs) and corporate partners that led nowhere, they finally negotiated a deal with Apple founder Steve Jobs, who was attracted by the talent of the team. Their passion was to make full-length computer-generated animated films. But recognizing that neither the technology nor the market was ready, they sold advanced imaging systems to medical-imaging firms, government agencies, and other movie studios, including Disney. Never giving up on their long-term vision, a small group led by Lasseter developed animated short films that helped drive the technol-

ogists and incubated what would eventually become Pixar's main business.

From 1986 to 1991, Pixar went through several variations of its business strategy. "We were grasping for a workable model. We sold the hardware business and started to sell software. Then we started making TV commercials," Catmull recalls. "Throughout, we struggled. Steve stuck with us as we were losing money. Then Disney gave us the opportunity to do a feature film."

If the team had been less passionate and tenacious, there would be no *Toy Story* or *Cars*. If the company had been backed by typical venture capitalists instead of a visionary entrepreneur like Jobs, it would never have survived its various transitions. Although he is not usually thought of as a patient personality, Jobs provided patient capital for the company. He trusted the smart people on the team, recognizing that their attempts to create various business models were not fatal failures, but steps toward success. When Disney approached Pixar in 1991 to work together on a set of 3D computer-animated feature films, the company and its technology were ready.

How has the company managed to always stay out ahead of the competition, each film amazing audiences more than the one before? Part of the answer is that the technology organization is always working on three time horizons simultaneously. Pixar developers who are dedicated to the next film in the lineup work side by side with the directors, writers, and animators to apply and extend the current technology. Other developers work on the next generation of animation tools so that the characters and environments in future films are even more real—enabling water to flow, shiny cars to reflect light, and fur to look soft to the touch. Pixar also has a small applied research group that focuses on longer-term development. This group collaborates with the research community at large on new

algorithms that continually push the state of the art of graphics and animation.

Pixar's internal culture encourages creativity through questioning, openness, and a healthy attitude toward failure. Self-assessment is ongoing—not only when there's a problem, but also when things seem to be working well. Everyone is encouraged to comment on one another's work. "We have a group of filmmakers who don't take critiques personally. Here, it would be a serious error not to say what you thought," says Catmull. This level of honesty requires a working environment in which people trust management and feel safe.

Employees are encouraged to make their ideas available for feedback early. "People not only have to be willing to take risks, but others have to be willing to let them take the risk," Catmull observes. "Our first job is to get to the failure as soon as possible." Then they figure out why they failed and fix the things they couldn't foresee. Instead of viewing failures as negative, they recognize the initial missteps as necessary to getting the feedback needed to develop an important software tool or a brilliant film.

Pixar produces great entertainment by employing the best talent in research, development, and application of technology. The company has a shared vision and an unwavering commitment to the core values and process of innovation.

## THE BASIC INGREDIENTS

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Sustainable innovation does not happen in a vacuum. It is not just a flash of brilliance from a lone scientist, nor is it simply the result of a group going offsite to brainstorm and play team-building games. People often overestimate the *aha!* factor in the invention process. That process starts with creating the right kind of environment. "The rare thing is not coming up with ideas. It is creating that soup where lots of people are coming

up with ideas, and having a system that translates them into something effective,” says Danny Hillis, a former Disney Imagineer and cofounder of Applied Minds, an R&D consulting firm that calls itself the “little Big Idea company.” The soup starts with some common ingredients, a set of human attitudes and beliefs that are so critical that I call them the five core values of innovation: *questioning*, *risk taking*, *openness*, *patience*, and *trust*.

If pushed to an extreme, any one of these values can actually stifle innovation. Trust without questioning is blind. Too much patience can create an environment in which nothing happens. Risk taking must be tempered by questioning so that it does not become reckless. Questioning without trust can become merely judgmental. When all five values are in balance, they work together to create the capacity for change that enables innovation to thrive.

### Questioning

Innovators naturally ask why or how something works, or if something can be done in a new way. This curiosity is encouraged by giving them room to explore. “My folks would be at home working on technology whether I paid them or not,” says Miley Ainsworth, IT director for FedEx Labs. “They have a natural hunger for new stuff. Technology happens to be their job, but it’s also their hobby.” Author and consultant John Seely Brown, former chief scientist at Xerox, calls himself “Chief of Confusion, helping people ask the right questions.” This restless curiosity inspires innovators to uncover promise and potential that others have overlooked.

In the early days of the ARPANET—the predecessor of the Internet—the focus of development was on creating networks that would allow computers in disparate geographical locations

to communicate. But Bob Metcalfe, then at Xerox, became curious about the data being exchanged between computers in the same building, which had been nicknamed “incestuous traffic.” Out of this curiosity came the development of Ethernet, the foundation of local area networks that enable individuals to share information with their coworkers, friends, and family.

David Culler, a computer science professor at UC Berkeley, describes this kind of inquisitiveness as “stubbing my toe on the same spot often enough that I say, ‘What is this?’ Then I look down and find that what I’m tripping on is just the tip of a very big rock below the surface.” Innovation can also be driven by curiosity about things that *don’t* exist. “Once, when my three-year-old son was learning to read road signs,” says Culler, “he asked me, ‘Dad, why aren’t there any “go” signs?’ Kids see these things. What else are we not seeing?”

The only way to get beyond mere incremental improvements is to question the status quo. When Tesla Motors introduced its flashy red electric sports car in 2006, it made a big splash. People lined up to place orders for a car that hadn’t even been built yet. The Tesla was not the first electric car to hit the market, but its reception was different because the company’s cofounder, Martin Eberhard, was willing to take a new approach. All of the prior efforts to market electric cars had prioritized affordability to reach the broadest possible market. “They made horrible little cars that nobody wanted to drive,” says Eberhard. Instead, Tesla decided to launch with a high-end model that was outright cool to create desirability for the product concept; later it would figure out how to make a more affordable version. Whether the company is successful over the long term or not, Eberhard’s willingness to buck the trend has created positive, disruptive changes in the electric-car industry.

Entrepreneur Randy Scott launched a start-up called Incyte to sequence and catalog genes with the goal of discovering new