Chapter 1

The Power of Collaboration

On December 17, 1903, on a bitterly cold windswept beach in North Carolina, five men from the local lifeguard station stood in the sand and watched as Orville Wright took off in his handmade flyer into a twenty-seven-mile-per-hour wind. The twelve-horsepower engine kept him aloft for twelve seconds; he landed 100 feet away from the launch point. Orville and his brother, Wilbur, then took turns in making three more flights, the longest lasting fifty-nine seconds and covering 852 feet. No members of the press witnessed the event; Orville himself mounted his camera on a tripod and asked one of the lifeguards to snap the shutter. The resulting picture is the most famous image of innovation ever taken: The aircraft has just left its track and is 2 feet aloft; Wilbur, standing just off the wing, is leaning back as if astonished at their amazing feat.

How did these two bicycle mechanics from Dayton, Ohio, beat leading scientists, who had fortunes in funding, and win the international race to build the first airplane? The Wrights drew on the power of collaboration: They allowed their innovation to unfold from constant conversation and side-by-side work. Wilbur Wright later explained it this
way: “From the time we were little children my brother Orville and myself lived together, played together, worked together and, in fact, thought together. We usually owned all of our toys in common, talked over our thoughts and aspirations so that nearly everything that was done in our lives has been the result of conversations, suggestions and discussions between us.”

The Wrights kept detailed diaries of their transformative collaboration. These diaries show that the Wrights didn’t experience a single moment of insight; rather, their collaboration resulted in a string of successive ideas, each spark lighting the next. In 1900, after four years of closely studying everything written on bird flight and glider designs, they took their first trip down to Kitty Hawk. After each practice flight, they modified the glider, and by the end of that first season, they had flown it safely, with several flights of more than 300 feet.

On their second trip to North Carolina in 1901, they realized that the wings weren’t providing enough lift to carry the motor the craft would eventually need. Back in Dayton for the winter, they built a wind tunnel that was 6 feet long and, using a powerful fan hooked up to a gasoline engine, tested two hundred wing designs.

On their third trip to Kitty Hawk, in 1902, they were getting so good at flying their glider that they routinely made fifty or more flights each day. But they discovered an unexpected problem, known as “adverse yaw”: When warping the wings to steer right or left, the glider lost control and leaned over too far, crashing the wing’s tip into the ground (the Wrights called it “well digging”). Before they could fly safely, this problem had to be fixed. First, they added a vertical tail; this helped a bit, but the glider still crashed unpredictably. One day, Orville told Wilbur about a new idea: Modify the vertical tail so that it could be moved by the operator. Wilbur responded by suggesting that the new cable required to control the tail be tied into the wing-warping mechanism so that the operator could work both controls at once. This
collaborative insight proved to be the final piece of the puzzle: By combining wing warping and a movable tail, they had mastered controlled gliding. Now they were ready for powered flight.

In 1903, they designed and built their own gasoline engine and propellers, and then scaled up the aircraft to support the extra weight. They refined the design further by adding a second vertical tail for better control. They arrived in North Carolina for the fourth time in September and worked through October and November fixing tiny problems that kept cropping up. Everything finally came together on that cold day in late December.

Invisible Collaboration

The Wright brothers lived together, ate together, and discussed their project every day. Their collaboration was visible to everyone around them, and it speaks from every page of their journals. But many creative collaborations are almost invisible—and it’s these largely unseen and undocumented collaborations that hold the secrets of group genius.

The mountain bike provides a perfect example of what I call “invisible collaboration.” No one knows exactly when and where that innovation originated, but it probably dates to the early 1970s in Marin County, California. In the early 1970s, road cycling was making a comeback in America, and Marin County was a cycling hotbed. In the off-season, some of these bicyclists started riding just for fun on the dirt trails of Mount Tamalpais, or Mount Tam as locals call it, which rises 2,571 feet above San Francisco Bay. The roots and rocks would have trashed their expensive road-racing bikes, so they went to yard sales and scrounged up old balloon-tire bikes from the 1930s and 1940s. The fat tires provided a little extra give on the rough terrain. The cyclists found the rush hard to beat as they flew down the trail named Repack
Road at breakneck speed, dropping 1,300 vertical feet in two miles, surrounded by oak and redwood pine trees.

But the old Schwinn frames weren’t built for such rugged terrain, and many of them collapsed when they ran into an especially big rock. One trailside tree was dubbed “Vendetti’s Face” after a local rider flew headfirst into the trunk. There were other problems, too. The old brakes, used constantly to control speed, would get so hot that the grease evaporated and left a trail of smoke behind each rider. Riders had to pack in new grease after almost every trip down the mountain (thus the trail name “Repack Road”). And because the old bikes didn’t have shifters or gears, riding uphill was almost impossible.

On December 1, 1974, three riders from Cupertino, seventy-five miles to the south, showed up in Marin for an off-road race. They called themselves the Morrow Dirt Club. They were riding old balloon-tire bikes, but these machines were different: They’d been rigged up with shifters and multiple gears, and the handlebars were modified into today’s familiar “longhorn” shape, providing better control. The Marin bikers had never seen anything like it before, and they quickly modified their own bikes with the new ideas. At about the same time, a third group of fat-tire riders had formed in Crested Butte, Colorado, a desirable location for scenic, rugged rides, such as the Pearl Pass road from Crested Butte to Aspen. A few years later, when five riders from Marin took their shifter-modified bikes to the Pearl Pass race, they not only left the local riders in the dust but also left behind their new ideas.

By the late 1970s, some of the more mechanically inclined riders were starting to make a living building custom mountain bikes, and business grew by word of mouth. When Gary Fisher and Charlie Kelly launched the first mountain bike company in 1979, they sold hand-made bikes costing $1,400. Even at that high price, buyers snatched them up. Within a few years, the big bike companies entered the business, and by 1986, mountain bike sales surpassed road bike sales. Ten
years earlier, only a few hundred people had even heard of mountain biking; ten years later, in 1996, mountain biking was an Olympic sport.

The early riders in California and Colorado weren’t trying to change biking forever and they weren’t trying to start a new industry; they were just having fun. But then unexpected events followed their initial innovations. The Morrow Dirt Club designed the gear-shifter and the new handlebars; the Marin County riders devised brakes that wouldn’t burn out; and several riders independently designed custom-made frames that wouldn’t break on the big bumps. After that, still others created manufacturing techniques and marketing strategies, and gradually they modified the bike to appeal to mainstream America. Soon, all of us—buyers, riders, and commuters—did the rest. The mountain bike was the result of a largely invisible long-term collaboration that stretched from Marin to Colorado.

Although the Wright brothers will always hold a special place in history, today’s airplanes also unfolded through invisible collaboration. The Wrights’ most significant idea, to steer using wing warping and a moving vertical tail, was soon replaced by other aviators with a better invention: the aileron, a separate surface on the trailing edge of the wing that pivoted up and down. By the beginning of World War I, most of the Wrights’ ideas had been replaced by better technologies.

We’re drawn to the image of the lone genius whose mystical moment of insight changes the world. But the lone genius is a myth; instead, it’s group genius that generates breakthrough innovation. When we collaborate, creativity unfolds across people; the sparks fly faster, and the whole is greater than the sum of its parts.

Collaboration drives creativity because innovation always emerges from a series of sparks—never a single flash of insight. The Wright brothers had lots of small ideas, each critical to the success of the first powered flight. The mountain bike wasn’t commercially viable until many distinct
ideas came together. These two stories show how the genius of the group emerges through the sanding and polishing of raw innovation.

Jazz Freddy

When scientists first began looking at creativity in the 1950s, they focused on the solitary creative person. Although this research provided important insights—for example, creative people are slightly above average in intelligence but aren’t necessarily geniuses, and creative people are good at generating lots of ideas—by the early 1990s, those of us studying creativity had reached the limits of this approach. We were beginning to see that even the best creativity tests couldn’t predict which children would become the most creative adults. Even the most enriched elementary school curricula seemed to have no significant impact on how creative students would be years later. My colleagues and I realized that we needed to find a new way to explain how innovation takes place and how to unleash each person's creative potential.

Psychologists are typically trained to focus on the individual, an approach firmly supported by our culture’s belief that the solitary individual is the source of creativity. But to our surprise, beginning in the 1990s, our research began to point in the opposite direction. We began to see that innovations once believed to be the creation of a genius actually emerged from invisible collaborations, and that collaboration was responsible for famous creations throughout history.

Sigmund Freud is credited with creating psychoanalysis, but in fact these ideas emerged from a vast network of colleagues. The French impressionist painting associated with Claude Monet and Auguste Renoir emerged from a closely connected group of Parisian painters. Albert Einstein’s contributions to modern physics were embedded in an international collaboration among many laboratories and many teams. Psychoanalysis, impressionism, and quantum physics emerged
over many years of interactions, trial and error, and false starts—not in a single burst of insight.

As we moved beyond historical observation to the laboratory and to the everyday world, a new science of creativity began to form. My contribution has been to map the architecture of collaboration in two uniquely creative groups: the improvising ensembles of jazz and theater. These are the purest form of group genius; their creative performances emerge from everyone’s equal participation.

In 1992, early in my research, I began to hear about an improvisational theater-group called Jazz Freddy, which was performing at the Live Bait Theater in Wrigleyville—an urban neighborhood on the North Side of Chicago named for its central feature, the Chicago Cubs’ Wrigley Field. The ten-member cast of Jazz Freddy chose the name to emphasize their links with jazz—their improvisations were free-flowing and unpredictable. I’d heard that the Live Bait had been sold out for every Jazz Freddy performance—pretty good for a type of theater that was off most people’s radar at that time.

What made Jazz Freddy unique? After all, Chicago was the birthplace of modern improv theater, the city where the Compass Players and the Second City Theater created improv in the 1950s. By the early 1960s, Chicago improv was nationally known; it produced stars such as Mike Nichols and Elaine May as well as the legendary television program Saturday Night Live, which revolutionized small-screen comedy.

Through the 1980s, Saturday Night Live kept going strong. But back in Chicago, the improv scene had fallen into a rut. The famous Second City Theater had stopped improvising on stage, preferring instead to stick with scripted sketch comedy. Improv was risky; scripts were better at drawing in the large paying audiences of tourists who basically just wanted to see Saturday Night Live, live. It was a well-known secret among Chicago actors that during the break the cast worked furiously to weave the audience suggestions into the scripted material they were developing for the next season’s show. Second City was undeniably
funny and successful, but it didn’t have the exciting edge that early im-
prov had enjoyed.

Jazz Freddy was bringing back the excitement by doing something
more radical, more free-form than Second City’s sketch comedy. Jazz
Freddy’s goal was riskier than anything that had been tried before:
Every night, they performed a fully improvised one-hour play in two
acts, separated by an intermission.

On a Saturday night in April 1993, I made the forty-minute drive to
Wrigleyville from my home at the University of Chicago. The rumors
that I’d heard were true—the Live Bait was packed. I sat in a folding
chair in the aisle about two feet from the stage, which was only a foot
high, and barren except for ten wooden chairs. Right on schedule, the
lights came up; the audience applauded as the cast members ran onto
the stage and stood in an informal group facing the audience. Two cast
members stepped to the front of the stage and asked the audience to
supply an event and a location. “The Olympics,” shouted one member
of the audience. “A convent,” yelled another.

The lights went down; in the dim glow cast by the aisle safety lights,
we could see the ten cast members walking to the sides of the stage to sit
in the wooden chairs. Two of the actors almost simultaneously decided
to walk to the center of the stage; one of them, noticing that the other
had started first, deferred and went back to his chair at stage left. The
first actor, John, pulled a chair to the center of the stage and sat down,
facing the audience, as the stage lights came up. He mimed working at
a desk—he took a cap off of a pen, opened a book, and started to make
underlining motions as he studied the page. He stopped to rub his eyes.
He then turned the page and underlined some more. The other actors
watched intently from the sides of the stage; the audience was com-
pletely quiet. After about twenty seconds, Mary stood up at the opposite
side of the stage, and walked over to John, miming the act of carrying
something in both hands held in front of her:
MARY: Here are those papers.
(Mimes putting down the “papers” and remains standing.
2 second pause.)

JOHN: Thanks.
(Looks up to face MARY. 2 second pause.)
I really appreciate your doing those copies for me.

(BILL approaches from stage left, also carrying “papers,” and stops
next to MARY.)

BILL: Here are those papers.
(Puts down the papers.)

JOHN: Thanks a lot,
(Still facing the two)
you guys have really been great.
(2 second pause)
I’m gonna stop booking for now.
(Closes book on desk.)

MARY: Okay.
BILL: Sure.
(I second pause)
I’m gonna go get some more papers.

JOHN: Alright.
(He stands up. 1 second pause)
Thanks a lot, I appreciate it.

BILL: You’re welcome.
(I second pause)
We mean it.
(As he says this, BILL touches MARY’s arm; MARY reaches
up her other hand to grasp his hand; they stand holding
hands.)

JOHN: Thanks for being in my corner.
BILL: We always will be.

Even these first thirty seconds of the one-hour performance demon-
strate the key characteristics of improvisation. It’s unpredictable; the
actors don’t even know who’s going to speak next, much less what
they’re going to say. Even an offstage actor can walk on and take the next turn, as Bill does when he carries in more papers. The actors leave unusually long pauses between their turns of dialogue because they’re just getting into the flow of the performance. And they choose ambiguous lines that open up possibilities.

After about ten minutes, the basic elements of the plot began to emerge, and the pace accelerated. By the intermission, Jazz Freddy had created two independent plotlines. The Olympics plot was about a baseball team training for the Olympics, and John has become an umpire who isn’t very good and probably needs glasses. In the convent plot, the nuns are playing cards and spray-painting graffiti on the religious murals. One of the nuns has discovered that she’s turned on by the janitor’s boot fetish. The final scene in the first act takes place in heaven. God confers with Jesus and Saint Peter as they try to decide the best way to right things at the convent.

In the second act, the actors managed to weave these two plots together. The baseball games get ugly as the team members become filled with hatred for their opponents. Hoping to return the nuns to the straight and narrow, God sends Saint Peter to the convent disguised as a young girl. The play ends with several of the female baseball players quitting the sport to join the convent.

How can ten people go on stage and create such a complex and entertaining performance when they have absolutely no idea about what’s going to happen? This is the question that I set out to answer. Armed with my video camera, I visited improv theaters all over Chicago; I ended up with a bookshelf full of videotapes—some of “long form” groups like Jazz Freddy, others of more traditional groups that did short skits and games. Then, back in the lab, I spent years analyzing the dialogues second by second; and I gradually began to understand how the performances emerged from the creative power of collaboration.
Inside the Black Box

It’s not news to anyone in the corporate world that collaboration is powerful. Businesses everywhere are moving to team organizations, distributed leadership, and collaboration. The trend is so strong that even office furniture companies have been rethinking the cubicle-and-desk paradigm. James P. Hackett, chief executive officer of Steelcase, is leading the company in designing a new kind of furniture that will support group collaboration. Robyn Waters, Target’s former vice president of trend, design, and product development, says that “collaboration is Target’s secret sauce.” Whole Foods Market attributes its success to its use of self-managed teams, which it calls the “Whole People” philosophy.

But the managers who have embraced the power of collaboration have largely taken a black-box approach: They look at overall team characteristics—such as members’ personality traits—instead of investigating what goes on inside the box. My research strongly suggests that the secret to understanding what makes a collaboration successful lies inside the box, in moment-to-moment interactional dynamics.

Since the early 1990s, my colleagues and I have been using a variety of approaches to open up the black box of collaboration, to discover what happens when collaboration translates each person’s creativity into group genius. My preferred approach is called interaction analysis, a time-consuming method of analyzing verbal gestures, body language, and conversation during collaboration. It requires about an hour of analysis for every minute of videotape to fully understand what’s going on. I performed with many jazz and theater groups in the early 1990s, and because I was one of the group, they didn’t mind when I set up my video camera and tripod. After two years of performing and collecting videotapes, I spent the next ten analyzing these collaborations, line by line and second by second. What I learned surprised me, and it changed the way I think about innovation.
In both an improv group and a successful work team, the members play off one another, each person's contributions providing the spark for the next. Together, the improvisational team creates a novel emergent product, one that's more responsive to the changing environment and better than what anyone could have developed alone. Improvisational teams are the building blocks of innovative organizations, and organizations that can successfully build improvisational teams will be more likely to innovate effectively.

On the basis of my research, I've identified seven key characteristics of effective creative teams.

1. Innovation Emerges over Time

No single actor comes up with the big picture, the whole plot. The play emerges bit by bit. Each actor, in each line of dialogue, contributes a small idea. In theater, we can see this process on stage; but with an innovative team, outsiders never see the long chain of small, incremental ideas that lead to the final innovation. Without scientific analysis, the collaboration remains invisible. Successful innovations happen when organizations combine just the right ideas in just the right structure.

2. Successful Collaborative Teams

   Practice Deep Listening

Trained improv actors listen for the new ideas that the other actors offer in their improvised lines, at the same time that they're coming up with their own ideas. This difficult balancing act is essential to group genius. Most people spend too much time planning their own actions and not enough time listening and observing others.
3. Team Members Build on Their Collaborators' Ideas

When teams practice deep listening, each new idea is an extension of the ideas that have come before. The Wright brothers couldn’t have thought of a moving vertical tail until after they discovered adverse yaw, and that discovery emerged from their experiments with wing warping.

Although a single person may get credit for a specific idea, it’s hard to imagine that person having that idea apart from the hard work, in close quarters, of a dedicated team of like-minded individuals. Russ Mahon—one of the Morrow Dirt Club bikers from Cupertino—usually gets credit for putting the first derailleur on a fat-tired bike, but all ten members of the club played a role.

4. Only Afterwards Does the Meaning of Each Idea Become Clear

Even a single idea can’t be attributed to one person because ideas don’t take on their full importance until they’re taken up, reinterpreted, and applied by others. At the beginning of Jazz Freddy’s performance, we don’t know what John is doing: Is he studying for a test? Is he balancing the books of a criminal organization? Although he was the first actor to think of “studying,” the others decided that he would be a struggling umpire, a man stubbornly refusing to admit that he needed glasses. Individual creative actions take on meaning only later, after they are woven into other ideas, created by other actors. In a creative collaboration, each person acts without knowing what his or her action means. Participants are willing to allow other people to give their action meaning by building on it later.
5. Surprising Questions Emerge

The most transformative creativity results when a group either thinks of a new way to frame a problem or finds a new problem that no one had noticed before. When teams work this way, ideas are often transformed into questions and problems. That’s critical, because creativity researchers have discovered that the most creative groups are good at finding new problems rather than simply solving old ones.

6. Innovation Is Inefficient

In improvisation, actors have no time to evaluate new ideas before they speak. But without evaluation, how can they make sure it’ll be good? Improvised innovation makes more mistakes, and has as many misses as hits. But the hits can be phenomenal; they’ll make up for the inefficiency and the failures.

After the full hourlong Jazz Freddy performance, we never do learn why Bill and Mary are making copies for John—that idea doesn’t go anywhere. In the second act, a brief subplot in which two actors are in the witness protection program also is never developed. Some ideas are just bad ideas; some of them are good in themselves, but the other ideas that would be necessary to turn them into an innovation just haven’t happened yet. In a sixty-minute improvisation, many ideas are proposed that are never used. When we look at an innovation after the fact, all we remember is the chain of good ideas that made it into the innovation; we don’t notice the many dead ends.

7. Innovation Emerges from the Bottom Up

Improvisational performances are self-organizing. With no director and no script, the performance emerges from the joint actions of the actors.
In the same way, the most innovative teams are those that can restructure themselves in response to unexpected shifts in the environment; they don't need a strong leader to tell them what to do. Moreover, they tend to form spontaneously; when like-minded people find each other, a group emerges.

The improvisational collaboration of the entire group translates moments of individual creativity into group innovation. Allowing the space for this self-organizing emergence to occur is difficult for many managers because the outcome is not controlled by the management team's agenda and is therefore less predictable. Most business executives like to start with the big picture and then work out the details. In improvisational innovation, teams start with the details and then work up to the big picture. It's riskier and less efficient, but when a successful innovation emerges, it's often so surprising and imaginative that no single individual could have thought of it.

Elixir

Today's most innovative companies are the ones that have successfully implemented the improvisational approach—from the award-winning Silicon Valley design firm IDEO to the manufacturing company W. L. Gore & Associates, tucked away in the countryside along the Delaware-Maryland border.

IDEO has contributed to more than three thousand products in at least forty industries, including Crest toothpaste tubes, toothbrushes, the original Apple computer mouse, an electric guitar, bike helmets, telephones, furniture, fishing equipment, and Nike sunglasses. IDEO succeeds because it has mastered improvisation—beginning with the classic collaboration technique known as brainstorming, which is designed so that each person's sparks of insight can be immediately built
on by others. IDEO uses rapid prototyping so that shared ideas can prompt later ones. The company creates multiple teams to work on the same project independently so that different insights can cross-fertilize and blend; this strategy results in inefficient redundancies, and team members expect frequent failures. Employees aren’t assigned to teams; each team forms spontaneously and then splits up when its task is done.

But a company doesn’t have to be a trendy design firm to benefit from improvisational collaboration. In December 2004, *Fast Company* magazine went searching for the most innovative company in America—and they found W. L. Gore & Associates, maker of the famous GORE-TEX waterproof material. Most people don’t know that Gore has created more than a thousand products—from Elixir, the top-selling acoustic guitar string, to Glide dental floss, to medical products such as heart patches and synthetic blood vessels.

Gore has succeeded by tapping into the power of collaboration. Bill Gore, the founder, created the company with hardly any hierarchy, few ranks and titles, and a minimum of structure, aside from such necessary support functions as human resources and IT. He organized the company into small task forces that constantly self-organize and regroup in response to changing needs. These self-managed teams don’t have clear-cut roles and responsibilities: "Your team is your boss, because you don’t want to let them down," one employee said. "Everyone’s your boss, and no one’s your boss." Teams form and manage themselves improvisationally, and employees define their own roles in the company improvisationally.

All employees reserve 10 percent of their time to pursue speculative new ideas (a practice also followed at innovation powerhouses such as 3M and Google). Ad-hoc teams form around these off-the-record ideas and operate for years before a new product is revealed to top management. The Elixir guitar strings started with a group of three employees who realized that the technology used in Gore’s brand of Ride-On bike
cables could be transferred to guitar strings. The Ride-On cables were coated with a thin film of plastic so that they'd slide through the cable housing with less friction; these engineers realized that by putting a similar coating on guitar strings they could prevent the dulling of sound that occurs when natural oils from the fingers corrode the strings. These three worked on the idea for 10 percent of their hours each week; once the idea had taken shape from this initial collaboration, they gradually persuaded six other colleagues to contribute their expertise. After three years of working without permission or oversight, the team was ready to start working on the project full-time, and they sought out the official support of the company. Soon after its release in 1997, Elixir quickly became the top-selling acoustic guitar string—a success that emerged from improvised innovation.

What do successful collaborations look like? Where do the most innovative ideas come from? Gore isn't unique; it turns out that the most innovative ideas emerge spontaneously, from the bottom up. To learn why, let's turn to the next chapter, where we'll examine the many different faces of improvised innovation.