



The Beatles—Paul McCartney, John Lennon, Ringo Starr and George Harrison—on stage during rehearsals at Television House, Kingsway, London, 1963.

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CAREER FOCUS

# From Bad Ideas Come Good Ideas

Innovative ideas are often generated or refined by effective brainstorming.

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**S**tephen Fantone, the 2020 president of OSA (now Optica), said decades ago that even coherent laser light starts with a single spontaneous emission event. Similarly, potentially coherent ideas can be spontaneously emitted in a brainstorming event.

Ubiquitous in professional interactions and crucial to producing valuable ideas, brainstorming comes in many flavors. Your supervisor might convene formal brainstorming sessions to help create new ideas or refine existing ones. Or impromptu casual hallway chats might turn into spontaneous brainstorming discussions.

While most ideas suggested are put aside and eventually discarded, a few golden nuggets can be refined and “oscillate” in dialogues to produce a valuable, innovative approach.

Brainstorming should come naturally to creative, enthusiastic early-career professionals. Unfortunately, such people may be especially prone to fear proposing a “foolish” idea that might be shot down. Well, to quote a Stanford University, USA, commencement address by the late Steve Jobs: “Stay foolish.” From bad ideas can come good ideas. But from no ideas will come nothing.

By definition, persons in brainstorming sessions are expected to participate, both in offering new ideas and respectfully critiquing other people's ideas. Even the most junior person should feel comfortable and eager to engage. Indeed, this is a great opportunity since such a person's input during a brainstorming session can make them highly valuable to the team, sought after as a project member and considered a rising star.

Conversely, showing up to a brainstorming meeting yet not participating makes you "extra baggage," as brainstorming can be more effective with a smaller, highly engaged group. Therefore, don't be surprised if a silent attendee doesn't get invited to the next meeting.

### Build on ideas

The Beatles are perhaps the most successful and creative musical group in history. Recently, a documentary series called "Get Back" showed hours of actual footage from the group's January 1969 recording sessions. Although I have loved Beatles' music for decades, I was still deeply awed and fascinated watching the artists interact directly with each other. The give-and-take of musical brainstorming was on full display. Creative ideas were proposed, put aside, resurrected, critiqued and continually refined. Paul McCartney, who wrote numerous songs with John Lennon, has said that this brainstorming process made their sessions almost always productive.

Many wonderful technical advances in our field came from an iterative brainstorming process that involves two steps: First, proposing multiple new ideas, most of which are quickly eviscerated by probing questions. For example, decades ago, a student came day after day into my



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office to propose new ideas for his next project. Each day, I would ask some basic questions, and the new idea would not survive. After a few weeks, the student plopped down, tired and frustrated, into a chair and said, "Here's my 21<sup>st</sup> idea." Bingo! That idea was superb, and produced a coveted OFC Conference post-deadline paper and a journal article.

The second step is intellectually attacking the few ideas that survive to uncover limitations and propose solutions. Again, a personal experience illustrates this stage. Another student recently had an idea and gathered data. However, we realized when writing a paper that a fundamental flaw limited the original idea's usefulness. We went back to the drawing board, and the student

marshalled the collective wisdom of the group to rework the idea during numerous sessions. The modified idea ultimately emerged, with the flaw removed and the usefulness broadened, and his paper was published in *Nature Photonics*.

### "Don't be embarrassed."

Early-career professionals should imagine their mentors sitting behind them during brainstorming sessions chanting, "Don't be embarrassed." Will you propose bad ideas? Almost certainly yes. Hopefully, some ideas will be valuable, and it takes only one great idea to more than justify many bad ones. A wise mentor once told me that the best baseball home-run hitters also tend to lead in strikeouts. Her point was clear—you will likely have many bad ideas if you are taking risks and hoping for that home run.

Hillel, a Jewish scholar, is quoted in *Ethics of Our Fathers* as saying a shy person cannot learn and an impatient person cannot teach. Perhaps one can modify this sentence to read that a shy person cannot contribute ideas to brainstorming and an impatient person cannot accept constructive suggestions.

One purpose of brainstorming is to find holes in an idea early on, yet it can be devastating to a person early in their career to have their ideas criticized in a public setting. However, it is the group's job to intellectually push so that a person either defends the idea, drops the idea or works hard to overcome others' constructive criticisms. I try to challenge my students, hoping they push back intellectually and respectfully. Indeed, I can feel disappointed if a student prematurely abandons their idea in which they truly believe simply because someone else pointed out a potential flaw.





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Brainstorming is like an intellectual chess game or jousting match—but one in which everyone wants the same outcome and everyone can win credit. A person should enhance their idea using the insight of the probing questions and alternative suggested approaches. Ultimately, a person may need to drop the idea, but only after a careful and intellectually rigorous thought process—and not because of embarrassment.

### Avoid lazy ideas

Although bad ideas are expected, a person should avoid “lazy” new ideas by thoughtful preparation. A lazy new idea is one in which the person tasked with proposing a new idea did not do their basic homework to give the concept a preliminary vetting. For example, you might propose

an idea that was published two years ago; a little preparation might have avoided wasting the group’s time.

To prepare properly, a person should ask themselves several questions. Has the idea already been published? What is the problem that this idea is trying to solve? How do people address this problem today? What are potential technological limitations of the new approach—regarding, for example, speed, size, power and cost? If the idea succeeds, what might be gained, and would anybody care?

You don’t need all the answers, but you should have considered these rudimentary questions. Of course, don’t spend too much time in advance, since your idea may be discarded for other reasons, and more searching can be performed later if the idea survives.

## Sharing and caring

Here is some final advice for productive brainstorming sessions.

*Share credit.* Brainstorming is a two-way street between the person with the original idea and the person making constructive, refining comments. If credit is not shared, then trust can quickly be destroyed within your team. People will not want to discuss their new ideas for fear that someone in the room will stay quiet and run with their own improved approach without involving the original person. Conversely, people will not want to suggest a technical improvement, for fear that the original person will take their suggestion and leave them out of the project and publication. Sharing credit is paramount; otherwise competition and distrust ensue.

*Be gentle.* Anyone offering thoughts in a brainstorming meeting is exposing themselves to criticism. People can naturally feel a little insecure and experience bruised egos. When a person’s idea is harshly belittled, the life gets sucked out of the room. It is vital to praise and appreciate ideas with respect and gentleness. A constructive and comforting environment breeds intellectual freedom and risk-taking—just what you want to happen.

I can’t count the enormous number of foolish ideas that I have put forward to other people, and the constructive suggestions of others that I have incorporated into my work. I wish the same for all of you—with no fear of embarrassment. **OPN**

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