Behind Pixar's string of hit movies, says the studio's president, is a peer-driven process for solving problems.

by Ed Catmull

How Pixar Fosters Collective Creativity

photos: Deborah Coleman; characters courtesy of Pixar

A few years ago, I had lunch with the head of a major motion picture studio, who declared that his central problem was not finding good people – it was finding good ideas. Since then, when giving talks, I've asked audiences whether they agree with him. Almost always there's a 50/50 split, which has astounded me because I couldn't disagree more with the studio executive. His belief is rooted in a misguided view of creativity that exaggerates the importance of the initial idea in creating an original product. And it reflects a profound misunderstanding of how to manage the large risks inherent in producing breakthroughs.

When it comes to producing breakthroughs, both technological and artistic, Pixar's track record is unique. In the early 1990s, we were known as the leading technological pioneer in the field of computer animation. Our years of R&D culminated in the release of *Toy Story* in 1995, the world's first computer-animated feature film. In the following 13 years, we have released eight other films (*A Bug's Life; Toy Story 2; Monsters, Inc.; Finding Nemo; The Incredibles; Cars; Ratatouille;*

and *WALL·E*), which also have been blockbusters. Unlike most other studios, we have never bought scripts or movie ideas from the outside. All of our stories, worlds, and characters were created internally by our community of artists. And in making these films, we have continued to push the technological boundaries of computer animation, securing dozens of patents in the process.

While I'm not foolish enough to predict that we will never have a flop, I don't think our success is largely luck. Rather, I believe our adherence to a set of principles and practices for managing creative talent and risk is responsible. Pixar is a community in the true sense of the word. We think that lasting relationships matter, and we share some basic beliefs: Talent is rare. Management's job is not to prevent risk but to build the capability to recover when failures occur. It must be safe to tell the truth. We must constantly challenge all of our assumptions and search for the flaws that could destroy our culture. In the last two years, we've had a chance to test whether our principles and practices are transferable. After Pixar's 2006 merger with the Walt Disney Company, its CEO, Bob Iger, asked me, chief creative officer John Lasseter, and other Pixar senior managers to help him revive Disney Animation Studios. The success of our efforts prompted me to share my thinking on how to build a sustainable creative organization.

>> hbr.org

Listen to Ed Catmull discuss the management of creativity at **pixar.hbr.org**.

What Is Creativity?

People tend to think of creativity as a mysterious solo act, and they typically reduce products to a single idea: This is a movie about toys, or dinosaurs, or love, they'll say. However, in filmmaking and many other kinds of complex product development, creativity involves a large number of people from different disciplines working effectively together to solve a great many problems. The initial idea for the movie – what people in the movie business call "the high concept" – is merely one step in a long, arduous process that takes four to five years.

A movie contains literally tens of thousands of ideas. They're in the form of every sentence; in the performance of each line; in the design of characters, sets, and backgrounds; in the locations of the camera; in the colors, the lighting, the pacing. The director and the other creative leaders of a production do not come up with all the ideas on their own; rather, every single member of the 200- to 250-person production group makes suggestions. Creativity must be present at every level of every artistic and technical part of the organization. The leaders sort through a mass of ideas to find the ones that fit into a coherent whole – that support the story – which is a very difficult task. It's like an archaeological dig where you don't know what you're looking for or whether you will even find anything. The process is downright scary.

Then again, if we aren't always at least a little scared, we're not doing our job. We're in a business whose customers want to see something new every time they go to the theater. This means we have to put ourselves at great risk. Our most recent film, *WALL·E,* is a robot love story set in a post-apocalyptic world full of trash. And our previous movie, *Ratatouille,* is about a French rat who aspires to be a chef. Talk about unexpected ideas! At the outset of making these movies, we simply didn't know if they would work. However, since we're supposed to offer something that isn't obvious, we bought into somebody's initial vision and took a chance.

To act in this fashion, we as executives have to resist our natural tendency to avoid or minimize risks, which, of course, is much easier said than done. In the movie business and plenty of others, this instinct leads executives to choose to copy successes rather than try to create something brand-new. That's why you see so many movies that are so much alike. It also explains why a lot of films aren't very good. If you want to be original, you have to accept the uncertainty, even when it's uncomfortable, and have the capability to recover when your organization takes a big risk and fails. What's the key to being able to recover? Talented people! Contrary to what the studio head asserted at lunch that day, such people are not so easy to find.

What's equally tough, of course, is getting talented people to work effectively with one another. That takes trust and respect, which we as managers can't mandate; they must be earned over time. What we can do is construct an environment that nurtures trusting and respectful relationships and unleashes everyone's creativity. If we get that right, the result is a vibrant community where talented people are loyal to one another and their collective work, everyone feels that they are

TAKING RISKS
Pixar's customers expect to see something new every time. That's downright scary. But if Pixar's executives aren't always a little scared, they're not doing their jobs.

The view that good ideas are rarer and more valuable than good people is rooted in a misconception of creativity.

part of something extraordinary, and their passion and accomplishments make the community a magnet for talented people coming out of schools or working at other places. I know what I'm describing is the antithesis of the free-agency practices that prevail in the movie industry, but that's the point: I believe that community matters.

The Roots of Our Culture

My conviction that smart people are more important than good ideas probably isn't surprising. I've had the good fortune to work alongside amazing people in places that pioneered computer graphics.

At the University of Utah, my fellow graduate students included Jim Clark, who cofounded Silicon Graphics and Netscape; John Warnock, who cofounded Adobe; and Alan Kay, who developed object-oriented programming. We had ample funding (thanks to the U.S. Defense Department's Advanced Research Projects Agency), the professors gave us free rein, and there was an exhilarating and creative exchange of ideas.

At the New York Institute of Technology, where I headed a new computer-animation laboratory, one of my first hires was Alvy Ray Smith, who made breakthroughs in computer painting. That made me realize that it's OK to hire people who are smarter than you are.

Then George Lucas, of *Star Wars* fame, hired me to head a major initiative at Lucasfilm to bring computer graphics and other digital technology into films and, later, games. It was thrilling to do research within a film company that was pushing the boundaries. George didn't try to lock up the technology for himself and allowed us to continue to publish and maintain strong academic contacts. This made it possible to attract some of the best people in the industry, including John Lasseter, then an animator from Disney, who was excited by the new possibilities of computer animation.

Last but not least, there's Pixar, which began its life as an independent company in 1986, when Steve Jobs bought the computer division from Lucasfilm, allowing us to pursue our dream of producing computer-animated movies. Steve gave backbone to our desire for excellence and helped us form a remarkable management team. I'd like to think that Pixar captures what's best about all the places I've worked. A number of us have stuck together for decades, pursuing the dream of making computer-animated films, and we still have the pleasure of working together today.

It was only when Pixar experienced a crisis during the production of *Toy Story 2* that my views on how to structure and operate a creative organization began to crystallize. In 1996, while we were working on *A Bug's Life,* our second movie, we started to make a sequel to *Toy Story.* We had enough technical leaders to start a second production, but all of our proven creative leaders – the people who had made *Toy Story,* including John, who was its director; writer Andrew Stanton; editor Lee Unkrich; and the late Joe Ranft, the movie's head of story – were working on *A Bug's Life.* So we had to form a new creative team of people who had never headed a movie production. We felt this was OK. After all, John, Andrew, Lee, and Joe had never led a full-length animated film production before *Toy Story.*

Disney, which at that time was distributing and cofinancing our films, initially encouraged us to make *Toy Story 2* as a "direct to video" – a movie that would be sold only as home videos and not shown first in theaters. This was Disney's model for keeping alive the characters of successful films, and the expectation was that both the cost and quality would be lower. We realized early on, however, that having two different standards of quality in the same studio was bad for our souls, and Disney readily agreed that the sequel should be a theatrical release. The creative leadership, though, remained the same, which turned out to be a problem.

In the early stage of making a movie, we draw storyboards (a comic-book version of the story) and then edit them together with dialogue and temporary music. These are called story reels. The first versions are very rough, but they give a sense of what the problems are, which in the beginning of all productions are many. We then iterate, and each version typically gets better and better. In the case of *Toy Story 2,* we had a good initial idea for a story, but the reels were not where they ought to have been by the time we started animation, and they were not improving. Making matters worse, the directors and producers were not pulling together to rise to the challenge.

Finally *A Bug's Life* was finished, freeing up John, Andrew, Lee, and Joe to take over the creative leadership of *Toy Story 2.* Given where the production was at that point, 18 months would have been an aggressive schedule, but by then we had only eight left to deliver the film. Knowing that the company's future depended on them, crew members worked at an incredible rate. In the end, with the new leadership, they pulled it off.

How did John and his team save the movie? The problem was not the original core concept, which they retained. The main character, a cowboy doll named Woody, is kidnapped by a toy collector who intends to ship him to a toy museum in Japan. At a critical point in the story, Woody has to decide whether to go to Japan or try to escape and go back to Andy, the boy who owned him. Well, since the movie is coming from Pixar and Disney, you know he's going to end up back with Andy. And if you can easily predict what's going to happen, you don't have any drama. So the challenge was to get the audience to believe that Woody might make a different choice. The first team couldn't figure out how to do it.

John, Andrew, Lee, and Joe solved that problem by adding several elements to show the fears toys might have that people could relate to. One is a scene they created called "Jessie's story." Jessie is a cowgirl doll who is going to be shipped to Japan with Woody. She wants to go, and she explains why to Woody. The audience hears her story in the emotional song "When She Loved Me": She had been the darling of a little girl, but the girl grew up and discarded her. The reality is kids do grow up, life does change, and sometimes you have to move on. Since the audience members know the truth of this, they can see that Woody has a real choice, and this is what grabs them. It took our "A" team to add the elements that made the story work.

Toy Story 2 was great and became a critical and commercial success – and it was the defining moment for Pixar. It taught us an important lesson about the primacy of people over ideas: If you give a good idea to a mediocre team, they will screw it up; if you give a mediocre idea to a great team, they will either fix it or throw it away and come up with something that works.

Toy Story 2 also taught us another important lesson: There has to be one quality bar for every film we produce. Everyone working at the studio at the time made tremendous personal sacrifices to fix *Toy Story 2.* We shut down all the other productions. We asked our crew to work inhumane hours, and lots of people suffered repetitive stress injuries. But by rejecting mediocrity at great pain and personal sacrifice, we made a loud statement as a community that it was unacceptable to produce some good films and some mediocre films. As a result of *Toy Story 2,* it became deeply ingrained in our culture that everything we touch needs to be excellent. This goes beyond movies to the DVD production and extras, and to the toys and other consumer products associated with our characters.

Of course, most executives would at least pay lip service to the notion that they need to get good people and should set their standards high. But how many understand the importance of creating an environment that supports great people and encourages them to support one another so the whole is far greater than the sum of the parts? That's what we are striving to do. Let me share what we've learned so far about what works.

If you give a good idea to a mediocre team, they'll screw it up. But if you give a mediocre idea to a great team, they'll make it work.

Power to the Creatives

Creative power in a film has to reside with the film's creative leadership. As obvious as this might seem, it's not true of many companies in the movie industry and, I suspect, a lot of others. We believe the creative vision propelling each movie comes from one or two people and not from either corporate executives or a development department. Our philosophy is: You get great creative people, you bet big on them, you give them enormous leeway and support, and you provide them with an environment in which they can get honest feedback from everyone.

After *Toy Story 2* we changed the mission of our development department. Instead of coming up with new ideas for movies (its role at most studios), the department's job is to assemble small incubation teams to help directors refine their own ideas to a point where they can convince John and our other senior filmmakers that those ideas have the potential to be great films. Each team typically consists of a director, a writer, some artists, and some storyboard people. The development department's goal is to find individuals who will work effectively together. During this incubation stage, you can't judge teams by the material they're producing because it's so rough – there are many problems and open questions. But you can assess whether the teams' social dynamics are healthy and whether the teams are solving problems and making progress. Both the senior management and the development department are responsible for seeing to it that the teams function well.

To emphasize that the creative vision is what matters most, we say we are "filmmaker led." There are really two leaders: the director and the producer. They form a strong partnership. They not only strive to make a great movie but also operate within time, budget, and people constraints. (Good artists un-

derstand the value of limits.) During production, we leave the operating decisions to the film's leaders, and we don't second-guess or micromanage them.

Indeed, even when a production runs into a problem, we do everything possible to provide support without undermining their authority. One way we do this is by making it possible for a director to solicit help from our "creative brain trust" of filmmakers. (This group is a pillar of our distinctive peer-based process for making movies – an important topic I'll return to in a moment.) If this advice doesn't suffice, we'll sometimes add reinforcements to the production – such as a writer or codirector – to provide specific skills or improve the creative dynamics of the film's creative leadership.

What does it take for a director to be a successful leader in this environment? Of course, our directors have to be masters at knowing how to tell a story that will translate into the medium of film. This means that they must have a unifying vision – one that will give coherence to the thousands of ideas that go into a movie – and they must be able to turn that vision into clear directives that the staff can implement. They must set people up for success by giving them all the information they need to do the job right without telling them how to do it. Each person on a film should be given creative ownership of even the smallest task.

Good directors not only possess strong analytical skills themselves but also can harness the analytical power and life experiences of their staff members. They are superb listeners and strive to understand the thinking behind every suggestion. They appreciate all contributions, regardless of where or from whom they originate, and use the best ones.

A Peer Culture

Of great importance – and something that sets us apart from other studios – is the way people at all levels support one another. Everyone is fully invested in helping everyone else turn out the best work. They really do feel that it's all for one and one for all. Nothing exemplifies this more than our creative brain trust and our daily review process.

The brain trust. This group consists of John and our eight directors (Andrew Stanton, Brad Bird, Pete Docter, Bob Peterson, Brenda Chapman, Lee Unkrich, Gary Rydstrom, and Brad Lewis). When a director and producer feel in need of assistance, they convene the group (and anyone else they think would be valuable) and show the current version of the work in progress. This is followed by a lively two-hour give-and-take discussion, which is all about making the movie better. There's no ego. Nobody pulls any punches to be polite. This works because all the participants have come to trust and respect one another. They know it's far better

GETTING REAL HELP Pixar's brain trust of directors offers advice on works in progress. But the production's leaders decide what to use and what to ignore.

to learn about problems from colleagues when there's still time to fix them than from the audience after it's too late. The problem-solving powers of this group are immense and inspirational to watch.

After a session, it's up to the director of the movie and his or her team to decide what to do with the advice; there are no mandatory notes, and the brain trust has no authority. This dynamic is crucial. It liberates the trust members, so they can give their unvarnished expert opinions, and it liberates the director to seek help and fully consider the advice. It took us a while to learn this. When we tried to export the brain trust model to our technical area, we found at first that it didn't work. Eventually, I realized why: We had given these other review groups some authority. As soon as we said, "This is purely peers giving feedback to each other," the dynamic changed, and the effectiveness of the review sessions dramatically improved.

The origin of the creative brain trust was *Toy Story.* During a crisis that occurred while making that film, a special relationship developed among John, Andrew, Lee, and Joe, who had remarkable and complementary skills. Since they trusted one another, they could have very intense and heated discussions; they always knew that the passion was about the story and wasn't personal. Over time, as other people from inside and outside joined our directors' ranks, the brain trust expanded to what it is today: a community of master filmmakers who come together when needed to help each other.

The dailies. This practice of working together as peers is core to our culture, and it's not limited to our directors and producers. One example is our daily reviews, or "dailies," a process for giving and getting constant feedback in a positive way that's based on practices John observed at Disney and Industrial Light & Magic (ILM), Lucasfilm's special-effects company.

At Disney, only a small senior group would look at daily animation work. Dennis Muren, ILM's legendary visual-effects supervisor, broadened the participation to include his whole special-effects crew. (John, who joined my computer group at Lucasfilm after leaving Disney, participated in these sessions while we were creating computer-animated effects for *Young Sherlock Holmes.*)

As we built up an animation crew for *Toy Story* in the early 1990s, John used what he had learned from Disney and ILM to develop our daily review process. People show work in an incomplete state to the whole animation crew, and although the director makes decisions, everyone is encouraged to comment.

There are several benefits. First, once people get over the embarrassment of showing work still in progress, they become more creative. Second, the director or creative leads guiding the review process can communicate important points to the entire crew at the same time. Third, people learn from and inspire each other; a highly creative piece of animation will spark others to raise their game. Finally, there are no surprises at the end: When you're done, you're done. People's overwhelming desire to make sure their work is "good" before they show it to others increases the possibility that their finished version won't be what the director wants. The dailies process avoids such wasted efforts.

Technology + Art = Magic

Getting people in different disciplines to treat one another as peers is just as important as getting people within disciplines to do so. But it's much harder. Barriers include the natural class structures that arise in organizations: There always seems to be one function that considers itself and is perceived by others to be the one the organization values the most. Then there's the different languages spoken by different disciplines and even the physical distance between offices. In a creative business like ours, these barriers are impediments to producing great work, and therefore we must do everything we can to tear them down.

OVERCOMING INHIBITIONS
Showing unfinished work each day liberates people to take risks and try new things because it doesn't have to be perfect the first time.

Walt Disney understood this. He believed that when continual change, or reinvention, is the norm in an organization and technology and art are together, magical things happen. A lot of people look back at Disney's early days and say, "Look at the artists!" They don't pay attention to his technological innovations. But he did the first sound in animation, the first color, the first compositing of animation with live action, and the first applications of xerography in animation production. He was always excited by science and technology.

At Pixar, we believe in this swirling interplay between art and technology and constantly try to use better technology at

Pixar's Operating Principles

1 Everyone must have the freedom to communicate with anyone.

2 It must be safe for everyone to offer ideas.

3 We must stay close to innovations happening in the academic community.

every stage of production. John coined a saying that captures this dynamic: "Technology inspires art, and art challenges the technology." To us, those aren't just words; they are a way of life that had to be established and still has to be constantly reinforced. Although we are a director- and producer-led meritocracy, which recognizes that talent is not spread equally among all people, we adhere to the following principles:

Everyone must have the freedom to communicate with anyone. This means recognizing that the decision-making hierarchy and communication structure in organizations are two different things. Members of any department should be able to approach anyone in another department to solve problems without having to go through "proper" channels. It also means that managers need to learn that they don't always have to be the first to know about something going on in their realm, and it's OK to walk into a meeting and be surprised. The impulse to tightly control the process is understandable given the complex nature of moviemaking, but problems are almost by definition unforeseen. The most efficient way to deal with numerous problems is to trust people to work out the difficulties directly with each other without having to check for permission.

It must be safe for everyone to offer ideas. We're constantly showing works in progress internally. We try to stagger who goes to which viewing to ensure that there are always fresh eyes, and everyone in the company, regardless of discipline or position, gets to go at some point. We make a concerted effort to make it safe to criticize by inviting everyone attending these showings to e-mail notes to the creative leaders that detail what they liked and didn't like and explain why.

We must stay close to innovations happening in the academic community. We strongly encourage our technical artists to publish their research and participate in industry conferences. Publishing may give away ideas, but it keeps us connected with the academic community. This connection is worth far more than any ideas we may have revealed: It helps us attract exceptional talent and reinforces the belief throughout the company that people are more important than ideas.

We try to break down the walls between disciplines in other ways, as well. One is a collection of in-house courses we offer, which we call Pixar University. It is responsible for training and cross-training people as they develop in their careers. But it also offers an array of optional classes – many of which I've taken – that give people from different disciplines the opportunity to mix and appreciate what everyone does. Some (screenplay writing, drawing, and sculpting) are directly related to our business; some (Pilates and yoga) are not. In a sculpting class will be rank novices as well as world-class sculptors who want to refine their skills. Pixar University helps reinforce the mind-set that we're all learning and it's fun to learn together.

Our building, which is Steve Jobs's brainchild, is another way we try to get people from different departments to interact. Most buildings are designed for some functional purpose, but ours is structured to maximize inadvertent encounters. At its center is a large atrium, which contains the cafeteria, meeting rooms, bathrooms, and mailboxes. As a result, everyone has strong reasons to go there repeatedly during the course of the workday. It's hard to describe just how valuable the resulting chance encounters are.

Staying on the Rails

Observing the rise and fall of computer companies during my career has affected me deeply. Many companies put together a phenomenal group of people who produced great products. They had the best engineers, exposure to the needs of customers, access to changing technology, and experienced management. Yet many made decisions at the height of their powers that were stunningly wrongheaded, and they faded into irrelevance. How could really smart people completely miss something so crucial to their survival? I remember asking myself more than once: "If we are ever successful, will we be equally blind?"

Many of the people I knew in those companies that failed were not very introspective. When Pixar became an independent company, I vowed we would be different. I realized that it's extremely difficult for an organization to analyze itself. It is uncomfortable and hard to be objective. Systematically fighting complacency and uncovering problems when your company is successful have got to be two of the toughest management challenges there are. Clear values, constant communication, routine postmortems, and the regular injection of

outsiders who will challenge the status quo aren't enough. Strong leadership is also essential – to make sure people don't pay lip service to the values, tune out the communications, game the processes, and automatically discount newcomers' observations and suggestions. Here's a sampling of what we do:

Postmortems. The first we performed – at the end of *A Bug's Life* – was successful. But the success of those that followed varied enormously. This caused me to reflect on how to get more out of them. One thing I observed was that although people learn from the postmortems, they don't like to do them. Leaders naturally want to use the occasion to give kudos to their team members. People in general would rather talk about what went right than what went wrong. And after spending years on a film, everybody just wants to move on. Left to their own devices, people will game the system to avoid confronting the unpleasant.

There are some simple techniques for overcoming these problems. One is to try to vary the way you do the postmortems. By definition, they're supposed to be about lessons learned, so if you repeat the same format, you tend to find the same lessons, which isn't productive. Another is to ask each group to list the top five things they would do again and the top five things they wouldn't do. The balance between the positive and the negative helps make it a safer environment. In any event, employ lots of data in the review. Because we're a creative organization, people tend to assume that much of what we do can't be measured or analyzed. That's wrong. Most of our processes involve activities and deliverables that can be quantified. We keep track of the rates at which things happen, how often something has to be reworked, whether a piece of work was completely finished or not when it was sent to another department, and so on. Data can show things in a neutral way, which can stimulate discussion and challenge assumptions arising from personal impressions.

Fresh blood. Successful organizations face two challenges when bringing in new people with fresh perspectives. One is well-known – the not-invented-here syndrome. The other – the awe-of-the-institution syndrome (an issue with young new hires) – is often overlooked.

The former has not been a problem for us, thank goodness, because we have an open culture: Continually embracing change the way we do makes newcomers less threatening. Several prominent outsiders who have had a big impact on us (in terms of the exciting ideas they introduced and the strong people they attracted) were readily accepted. They include Brad Bird, who directed *The Incredibles* and *Ratatouille;* Jim Morris, who headed Industrial Light & Magic for years before joining Pixar as the producer of *WALL·E* and executive vice president of production; and Richard Hollander, a former executive of the special-effects studio Rhythm & Hues, who is leading an effort to improve our production processes.

The bigger issue for us has been getting young new hires to have the confidence to speak up. To try to remedy this, I make it a practice to speak at the orientation sessions for new hires, where I talk about the mistakes we've made and the lessons we've learned. My intent is to persuade them that we haven't gotten it all figured out and that we want everyone to question why we're doing something that doesn't seem to make sense to them. We do not want people to assume that because we are successful, everything we do is right.

Managers need to learn that it's OK to walk into a meeting and be surprised.

• • •

For 20 years, I pursued a dream of making the first computer-animated film. To be honest, after that goal was realized – when we finished *Toy Story* – I was a bit lost. But then I realized the most exciting thing I had ever done was to help create the unique environment that allowed that film to be made. My new goal became, with John, to build a studio that had the depth, robustness, and will to keep searching for the hard truths that preserve the confluence of forces necessary to create magic. In the two years since Pixar's merger with Disney, we've had the good fortune to expand that goal to include the revival of Disney Animation Studios. It has been extremely gratifying to see the principles and approaches we developed at Pixar transform this studio. But the ultimate test of whether John and I have achieved our goals is if Pixar and Disney are still producing animated films that touch world culture in a positive way long after we two, and our friends who founded and built Pixar with us, are gone.

Ed Catmull *is a cofounder of Pixar and the president of Pixar and Disney Animation Studios.*

Reprint R0809D To order, see page 139.