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INNOVATION



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**A LETTER FROM
DEAN GARTH SALONER**

How We Embrace Disruption to Push Boundaries

Strategy literature is replete with examples of industry giants who have lost their leadership positions as a result of a failure to innovate. Whether these companies are complacent, obsessively focused on perfecting legacy products, processes, or services; are trapped by routines that support the status quo; or rely too much on feedback from existing customers rather than prospective ones, these companies often succumb to the forces of creative destruction. Meanwhile, rivals, often new firms, unencumbered by legacy, propel themselves forward by embracing disruptive technologies or business approaches.

Mindful that too often “the cobbler’s children have no shoes,” even as we strive to study and teach innovation, at Stanford GSB we must aspire to embrace it in our programs and methods. It isn’t always easy to resist the temptation to focus excessively on defending positions in which we are already strong. It’s similarly challenging for a school that prides itself on doing everything well to take risks with new ventures that might fail. Yet we must take risks in order to lead.

The result is that we innovate constantly within our professional programs. In addition to periodic major curricular

changes, we also constantly reinvent elective courses. Almost half of those courses turn over every four years.

In executive education many of our most popular programs are those focused on innovation. In the minds of many, Stanford’s role as the engine of innovation for Silicon Valley, the prevalence of design thinking on campus, and our many faculty who do path-breaking work make us a natural destination for startups. Also, we attract established companies seeking to kick their internal innovation engines into higher gear.

In 2006, Stanford Ignite began as a four-week summer program on campus for graduate students in schools other than ours to learn the basics of general management and entrepreneurship. We focused on educating students who were destined to start their own companies or to be change-makers within larger ones by providing them with the business context to accompany their deep science, engineering, medical, or other specialized field knowledge. Stanford Ignite has now blossomed to nine programs, three on campus (including one for veterans of the armed forces) and six off campus (in Beijing, Bangalore, Santiago, São Paulo, London, and New York City). Delivering these programs has required that we innovate in synchronous distance-learning technology in which a significant fraction of this curriculum is delivered to these destinations from the Stanford GSB campus.

Our ground-breaking Stanford Institute for Innovation in Developing Economies (Seed) aimed at poverty alleviation helps companies with the potential to scale become the engines of growth for their economies. It is another example of innovation at work. Following the success

of the first regional hub in Accra, Ghana, the institute will open its second regional hub in Nairobi, Kenya, in May, with a third hub to follow within a year in South or Southeast Asia. Bolstered by a vibrant university-wide research effort focused on development, Seed has hit its stride with a successful, replicable model.

Last year, we created a new online certificate program, LEAD, which enables us to offer key insights in areas such as value creation, strategic leadership, and critical analytical thinking to executives in any location across the globe. LEAD enables us to leverage the expertise and content of our faculty, which increases our reach and impact.

Educational technology also provides us with an opportunity to push the boundaries within our on-campus degree programs. Our faculty have created a set of videos students can watch before class that summarize the core concepts from a prior case discussion and set up the framework for the forthcoming session, substantially increasing student engagement. An accounting faculty member figured out that after getting the same question from students a couple of times during office hours, he could push the question and answer on video to the whole class via email. Imagine having the answer to a question you haven’t even asked showing up in your inbox unbidden! These are just a couple of examples of numerous pedagogical technological innovations taking place every day.

This year two groups of faculty, teaching classes in finance and data and decisions, plan to produce new versions of our foundations courses in those areas. They will “flip” the classroom — providing the core concepts via video outside of class and freeing up class time for hands-on experiential learning. Only by trying such bold new approaches will we avoid becoming overly attached to our successful legacy methods and content.

I am constantly aware that our ability to innovate in these and other ways is a privilege we have being at a school like Stanford GSB where alumni such as yourselves provide us with the insights and resources to challenge complacency every day. Thank you for all that you do to make this possible. ▲

Garth Saloner is the Philip H. Knight Professor and Dean of Stanford Graduate School of Business. Follow him on Twitter @Saloner



Toni Bird

Garth Saloner

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“By analyzing
**Facebook
Likes**

of millions of users
we can reveal subtle patterns
that would be difficult
to identify using traditional surveys.”

— **Michal Kosinski**

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Stanford Business

INSIGHTS AND IDEAS
FROM STANFORD
GRADUATE SCHOOL OF
BUSINESS

SPRING 2016
VOLUME 84, NUMBER 1



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A few final words on our theme

Cover illustration by Oli-B

INTRODUCTION

INNOVATION

Failure is probably not the first thought that comes to mind when you hear the word “innovation.” And yet, it is one of the first topics we discuss in this issue of *Stanford Business*. ▶ That is because failure has its place in the creative process, says Baba Shiv, a marketing professor at Stanford GSB. We learn from our mistakes even if accepting them is not always easy. ▶ Criticism is another unsung hero of invention. How else can fledgling companies with limited funding and impatience to go to market halt a bad idea before it snakes too far along the production pipeline? Jonathan Bendor, a professor of political economy, recommends a rubric for delivering criticism without stifling creativity, while Lindred Greer, a professor of organizational behavior, sings the praises of people who voice those critiques. ▶ OK, so perhaps our tongue-in-cheek reference later in this magazine to *Downton Abbey*’s Dowager Countess of Grantham is not the role model Greer had in mind for delivering a contrarian viewpoint that challenges the consensus of a team. ▶ Nurturing a culture that invites innovation is also crucial, notes Charles Holloway, professor emeritus of operations, information and technology. Indeed, the makeup of a founding team, says finance Professor



"Phase Transition" by Michael Bartalos, a 2014 installation at the Thomas Welton Stanford Art Gallery

Shai Bernstein, is a key factor investors consider during early-stage funding. ▶ Success, however, has a downside, explains James March, professor emeritus of organizational behavior. He suggests ways for mature companies to reduce the drag that growth puts on breakthrough ideas. Tom Staggs, COO of Disney and a 1987 MBA alumnus, details how innovation is built into the DNA at his entertainment kingdom. ▶ Luckily for those who are bored with their jobs, retaining a cutting-edge approach depends a lot on keeping employees happy, says Justin Berg, a professor of organizational behavior, who has developed a system to make an old job feel new again. ▶ That's one problem I don't have. Since I just started as editorial director in January, my job is feeling very new. I look forward to getting to know you and hearing from you at StanfordBusiness@stanford.edu Visit us anytime at *Insights* by Stanford Business at www.gsb.stanford.edu/insights.

STANFORD BUSINESS

ONLINE



Jim Yong Kim

YOUTUBE

“If you want to change a system, setting an ambitious target is a great way to do it.”
World Bank President Jim Yong Kim on how his organization plans to eradicate poverty by 2030

Watch More: <http://stanford.io/Ambition>

YOUTUBE

Capturing the Power of Empathy

Professor Jennifer Aaker explains why product designers should put themselves in the shoes of consumers.

Watch More: <http://stanford.io/Empathy>

WEB

Hack Your Anxiety
Get nervous before a big speech? A Stanford GSB lecturer offers tips to manage those nerves.

Read More: <http://stanford.io/Anxiety>

WEB

Who Runs Silicon Valley?

A new study by Professor David Larcker shows boards are still predominantly male and white, but with a few surprises.

Read More: <http://stanford.io/Boards>

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Prepress, Inc.

Allen Press

We also acknowledge and thank our contributors, including colleagues at Stanford GSB, writers, photographers, illustrators, and class secretaries.

Stanford Business magazine (ISSN 1094-5423) is published three times annually by Stanford Graduate School of Business.

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Lives

“It’s very difficult for a company
**to stay
innovative**

if everyone’s job stays the same.”

—Justin Berg PAGE 14



EXPERIMENTATION

Why Failure Matters for Success

Learning from flawed attempts can bring long-term gains.

BY EILENE ZIMMERMAN

Invention has another mother: failure. It may seem counterintuitive, but repeated failures can, and often do, lead to success. Every time we try something new and fail, it provides valuable information about what went wrong and, just as important, what went right. From that, we can make small changes and try again, continually learning and innovating. “If you’re trying to solve a problem, there are potentially hundreds of possible pathways to take, but only a few are going to lead to the appropriate solution. And the only way to discover that is to try and fail and try again,” says Baba Shiv, a professor at Stanford Graduate School of Business whose research focuses on innovation in the workplace.

Baba Shiv is the Sanwa Bank, Ltd., Professor of Marketing at Stanford GSB. He studies the brain’s powerful role in shaping decisions and experiences.

Photograph by David Elliott



BABA SHIV Failing provides the data that informs triumph.

Experimentation and failure are essential to innovation because, by its nature, an innovation is an unknown that can be discovered only through trial and error. Still, for all the startups that follow the mantra of “fail fast,” there are many corporate leaders who see failure as something to be avoided, not embraced. Shiv has categorized this fear-of-failure mindset as type 1. An innovative point of view, one that perceives failure as exciting because of the opportunities it presents, he labels a type 2 mindset. “For type 2 people, the challenge is to keep experimenting and learning until they get to what works,” says Shiv.

In corporate hierarchies there is a tendency to give greater weight to the opinions of leaders rather than their subordinates. However, those opinions are usually based on instinct rather than information. The one thing that can trump a higher-up’s opinion is data, and repeated experimentation and failure lead to a lot of it, says Shiv.

Data can also win over the opposition. Those with a risk-averse mindset generally oppose innovating through experimentation, like rapid prototyping or continual iteration. “They are constantly looking for ways to mitigate risk, because that gives them comfort and reassurance,” says Shiv. “Those are things you can also get from data.”

Yet repeated failure can be tough to justify to management because of the money and time — yours, your team members’, your manager’s — involved. Experimentation often takes resources away from other areas of the organization

“For type 2 people, the challenge is to keep experimenting and learning until they get to what works.”

that need them, which is why managers feel obliged to see results, although there may be nothing to show yet for the work. “Employees have to justify the investment being made now, even though they don’t know if they will have anything to show for it and if they do, it will be in the future,” says Shiv.

Organizations also tend to reward big breakthrough successes rather than smaller ones, but those game-changing innovations generally happen after, or in tandem with, the incremental ones. Shiv uses the example of Toyota, a company that encourages experimentation across its organization. “Most of those experiments result in incremental changes like improvements in production and manufacturing,” he says. “At the same time, however, the company invested in hybrid technology.”

Shiv says this two-pronged approach relies on exploitation and exploration. Both, he says, are essential for real success. Exploitation for Toyota means honing competencies it already has to reduce costs and improve the value for customers — incremental innovations. At the same time Toyota invests in exploration, which enables breakthrough innovations. “If you don’t invest in exploration, someone else

will, and then you’ll just be licensing or acquiring their know-how,” says Shiv. The process of exploration also builds a large knowledge base for a company, information that couldn’t be gained through an acquisition. Yet many companies are hard-pressed to justify a focus on exploration in a world of increasing short-term pressures, especially on public companies with stock prices to worry about and dividends to pay. Those pressures cause businesses to be more oriented toward exploitation and the small innovations that come with that, rather than exploration and its bigger risks and rewards.

When companies do support experimentation, Shiv recommends they test products or services on the average customer, not highly knowledgeable customers or early adopters. “The average customer is far less forgiving,” he says. One thing all companies can and should do is encourage a culture of innovation at all levels, the way Google has. “Small teams within Google run 3,000 to 5,000 experiments a year,” says Shiv. “A manager there might say, ‘We should use this course of action,’ and a new hire might say, ‘I think this way of doing it will be better.’ That manager’s first reaction isn’t resistance, it’s ‘OK, let’s test it.’ That’s the great thing about Google. There are no egos when it comes to opinions,” he says.

“There’s data.” ▲



DATA

The Power of Measurement in a Fitbit World

Scoreboards work better than ever in this wired world, but be careful.

BY JOEL C. PETERSON

Several months ago, a wellness expert strapped a Fitbit accelerometer to my wrist and told me she wanted me to walk 10,000 steps a day. I had no idea how many steps I usually walked, so I ignored the gizmo. A few weeks later, my smartphone buzzed with an unexpected email congratulating me on being only 2,318 steps shy of “my” goal.

Surprised that someone was silently tracking my (lack of) progress, I gave little thought to my near miss until a few days later when I received another email. This time, my anonymous Fitbit friend awarded me a sneaker emoji. Finding my increase in activity had been noticed somewhere, somehow, I decided to keep it up, at least a little longer. It wasn’t until I learned that my virtual cheerleader was keeping a permanent record of not only my daily steps but also my stair climbing, resting heart rate, and sleep patterns that I began to care about the traces I was leaving for posterity.

Soon I was walking everywhere, even grabbing a flashlight to go out at night to complete my 10,000-step minimum before the midnight witching hour. When the Fitbit gods pinged with the notice that I’d walked the 990-mile length of New Zealand in five months, I began taking dietary supplements and working at getting more sleep so I could conquer entire continents.

The effect on my behavior of these stealth, no-fuss measurements has been dramatic. That so few simple data points had altered my daily activity should have been no surprise to me. I’ve experienced the power of sales quotas, worked with consultants to design key performance indicators (KPIs), and been a C-suite executive personally turning data into at-a-glance information to solve for desired business results.

Joel C. Peterson, the Robert L. Joss Consulting Professor of Management at Stanford GSB, founded Peterson Partners, a Salt Lake City-based investment firm, and is chairman of JetBlue.

Illustration by John Ritter

Scoreboards work. They are used extensively — and never more effectively than in today’s wired world, where one can pull up information on a smartphone for real-time feedback. In some companies, turning data into information with immediate feedback metrics has been dubbed “gamification.” When routine tasks and measures can be turned into games to help employees either learn new material or become more engaged with meeting goals, it can have the same effect as my Fitbit feedback had on me.

But it didn’t take Fitbit to convince me of the power of scoreboards and the natural love people have of winning. Indeed, I’ve implemented compensation systems that reward employees for scoring points against standards. I’ve developed team awards for collaborating on achieving goals. And I’ve long observed that the power of scorecards rests on the maxim “You get what you measure.”

The real trick has always been to figure out *what* to measure. Measure the wrong thing and you get the wrong outcomes. Measure too much and you get nothing. Measure not enough and you suboptimize. Finding the Goldilocks zone of measurement represents the best of feedback loops.

Employing a Fitbit-like elegance, Fred Reichheld, former partner at management consulting firm Bain, developed what he dubbed the net promoter score (NPS) as the key measure of a business’s staying power and future profitability. Reichheld has customers rank their satisfaction on a scale from 1 to 10. Then he ignores the middle scores and subtracts the low scores from the high ones to yield an NPS. This single number captures the strength of customer loyalty and commitment as measured by how strongly customers would recommend a firm or a product to a family member or friend.

Reichheld argues in his 2006 book *The Ultimate Question* that the response to “Would you recommend us to a friend?” represents the key predictor of long-run success for any business. His NPS of loyalty can, over time, give employees something

to shoot for and to celebrate as they are rewarded for moving this needle.

But such measures can also cause problems. When I recently bought a car, the salesman instructed me in hushed tones to “give me only scores of 9 or 10” when responding to the customer survey. His reason? “Anything else will hurt me.” In one company on whose board I serve, employees are doing uneconomic backflips to impress customers in order to grow their NPS. Again, their bonuses depend on increasing an NPS from 71 (already extremely high) to 75 (stratospheric).

Since I’ve become a Fitbit enthusiast, I’ve discovered that some users have likewise learned to game the Fitbit metrics. A friend told me that she had been so excited by the immediacy and specificity of the feedback that she joined a group of friends to compete online with one another. As their competition went from friendly to fierce, she admitted to strapping her wristband on her dog to increase her activity levels so she could “win.”

For my friend, winning the dashboard competition began to defeat the real purpose of promoting her fitness and health. In business, the solution to the tendency to manage dashboard wins requires a certain level of complexity and the principle of triangulation, as used for centuries in surveying and navigating.

Because businesses have three primary constituencies — customers, employees, and shareholders — they need more than Fitbit-like metrics. They need information around three areas of performance: profitability, growth, and customer delight (the last, according to Reichheld’s studies, will drive the other two over time).

“The real trick has always been to figure out what to measure. Measure the wrong thing and you get the wrong outcomes.”

Too often, organizations measure what’s easy to measure. But giving a three-dimensional picture of success from the angles of delight, profits, and growth is key for a complete understanding of business health and to keep people from rigging the scoreboard.

According to quality guru and scholar Edwards Deming, pure information is not knowledge. Knowledge comes from having a good theory that allows us to use information to predict results. After turning data into information, we must turn information into action in order to manage results. Fitbit-like dashboards can help, but without the benefits of triangulation and a clear notion of cause and effect, we have no more likelihood of managing sustainable outcomes than my friend will have at influencing her health by strapping her Fitbit wristband to her Labrador retriever.

In business, poorly conceived and simplistic dashboards that fail to tap into the essential drivers of success will give one-dimensional pictures that risk promoting short-term quarterly results over success derived from engaged teams collaborating to achieve meaningful and sustainable results.

Worse, poorly implemented, simplistic, or short-term-only dashboards can build fear, pit one group against another, and fuel internal politics. Employees could end up discouraged at having fallen short of standards or simply ignore the point and the power of measurement.

Although I’m delighted to have the information Fitbit has given me, I realize that it is not really the point. My overall health is the point. And in managing organizations, the scorecards and metrics that drive bonuses and promotions are not the point. A business leader must assure that employees have a line of sight from their jobs to a meaningful objective that they buy into and can achieve. ▲

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CAREER

Why Workers Should Design Their Jobs

You may be less stuck than you think.

BY LOUISE LEE

Traditionally, managers assign job duties and decide how employees should perform them. But sometimes employees themselves are a better source of ideas about how they should spend their time.

One way to elicit their ideas is through “job crafting,” the process of employees redesigning their own jobs to better suit their strengths and interests. Job crafting can boost your happiness and creativity at work, says Justin Berg, a professor at Stanford Graduate School of Business, who has researched the concept with Amy Wrzesniewski at the Yale School of Management and Jane Dutton at Michigan’s Ross School of Business. Berg spoke with *Stanford Business* about job crafting and how employees, managers, and companies can benefit from it.

Justin Berg is an assistant professor of organizational behavior at Stanford GSB.

Illustration by Marina Muun



What is job crafting? Job crafting is a set of techniques for helping you reconfigure the elements of your job to spark greater engagement and meaning. We've studied three different forms of job crafting:

Task crafting is about retooling the activities included in your job, *relational crafting* is about revamping your interactions with others, and *cognitive crafting* is about reframing how you view your tasks and relationships. We find that people get the best results when they use all three forms together. For example, a corporate attorney with a passion for teaching could start an intern program (task crafting), get her colleagues involved in the program (relational crafting), and mentally frame the program as an opportunity to fulfill and spread her passion for teaching (cognitive crafting).

Where did the theory of job crafting come from?

Job design research began in the 1970s with a focus on how managers should design jobs for employees from the top down. This revealed helpful insights, like the benefit of managers building autonomy, feedback, and significance into the job. However, the initial job description is only part of what determines how jobs are performed — employees may also shape their own jobs over time. My colleagues Amy and Jane developed the theory of job crafting to capture this notion that employees can and do redesign their own jobs from the bottom up. Since their theory was published in 2001, there's been an explosion of research on job crafting. I was lucky enough to team up with them about a decade ago, and the three of us have been studying job crafting ever since.

How can people utilize job crafting?

Based on our research, we have developed a tool called the Job Crafting Exercise, which helps people discover opportunities for crafting their jobs in beneficial ways. We created a workbook to guide people through the process. It's easy to get stuck in the day-to-day grind of your job, leading you to think your job is more fixed than it may

“It gives a concrete and visual way to talk about changes you want to make.”

actually be. The Job Crafting Exercise helps you view your job as a flexible set of building blocks, rather than a fixed list of duties. This helps you identify creative ways to redesign your job to benefit you and those around you.

Using our workbook, you first build a “before sketch,” breaking up your job into “task blocks” and grouping them by how much time and energy you spend on them. Then you create an “after diagram,” which is a more ideal but still realistic version of your job, a vision of something to work toward. To build your after diagram, you revise the set of task blocks from your before sketch to better match your values, strengths, and passions, which are three key traits that our research suggests are helpful drivers of job crafting. We've found that going through this process can be really eye-opening for people — they often see opportunities for job crafting they never thought about before.

Is it realistic to expect to transform your job completely? Obviously, you can't change everything, but we've found that even a few small changes can make a big difference.

How can companies best use the Job Crafting Exercise? We've found that it's most effective when an entire work group or team is doing the exercise together with the manager's support. While you're constructing your job crafting plan, you can talk with others who will be involved and might be able to help you execute it, and you can see how you may be able to help others implement their plans. You might see, for instance, that you'd like to spend less time on a particular task and learn that a co-worker is actually seeking to spend more time on it, so you could arrange a task swap that would be a win-win.

Why not just tell your manager you want to make changes to your job? You can, but these conversations are often awkward and too abstract to translate into much change. We've found that the Job Crafting Exercise is helpful not only for identifying what changes you might want to make, but also for communicating these changes to others, including your manager. It gives a concrete and visual way to talk about the changes you want to make. If your manager has completed the exercise as well, it gives you a common language and framework to discuss how you might craft your job in ways that are good for you and your company.

What's in it for the employer? We tested the effects of the Job Crafting Exercise in an experiment at Google. Participating in a job crafting workshop led employees to be significantly happier and more effective in their jobs six weeks later, based on ratings from their peers and managers. Although some job crafting may be good for the employee but not his or her company, our research suggests that, on average, it's good for both.

Job crafting may also help facilitate creativity and innovation. It's very difficult for a company to stay innovative if everyone's job stays the same. We are creatures of habit, and organizations tend to be bureaucracies that impose order and consistency. The default will always be for people to get stuck in the day-to-day and have a lot of trouble taking a step back and seeing opportunities for reshaping their jobs. To quote organizational theorist Karl Weick, creative ideas come from “putting new things in old combinations and old things in new combinations.” Job crafting is a way to ensure that people are thinking about how to combine the old and new, rather than remaining stuck in the old. In this way, job crafting may help companies sustain creativity and innovation over time, which is notoriously difficult to do. ▲



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What Researchers Love About Facebook

Social media says plenty about the human experience — and you.

BY MICHAL KOSINSKI

Will Facebook replace psychological testing and traditional surveys for social scientists researching the human condition?

Perhaps. Using computational methods, researchers can now tap into the huge amounts of information on some 1.4 billion Facebook profiles, opening new avenues of study into human personality and behavior that can scale to proportions previously possible only with huge grants and tenure.

Although there is a wide range of social media environments, such as Twitter or YouTube, I have found that Facebook is particularly convenient for conducting social science research. Facebook profiles contain a wealth of demographic information and behavioral footprints that are, in most cases, much more personal than those in other environments. Also, the information found on Facebook profiles is of exceptionally high quality — invalid profile information is difficult to maintain in a network of friends who can challenge false assertions.

Michal Kosinski is an assistant professor of organizational behavior at Stanford GSB. "Facebook as a Research Tool for the Social Sciences" — written with Samuel D. Gosling of the University of Texas and Sandra C. Matz, Vesselin Popov, and David Stillwell of the University of Cambridge — was published in the September 2015 issue of *American Psychologist*.



MICHAL KOSINSKI
Facebook is the
new research lab.

The breadth of Facebook data allows for discovering patterns that would be impossible to detect using traditional approaches. By analyzing Facebook Likes of millions of users we can reveal subtle patterns that would be difficult to identify using traditional surveys. If someone likes *The Matrix*, a human analyst would have trouble translating it into a prediction of the given person's character, but a computer model can put it into the context of millions of other users and would conclude, in this case, that the individual is likely to be intelligent and introverted.

The results, too, are often spot on. My research, published last year in the *Proceedings of the National Academy of Sciences*, showed that a computer model based on Facebook Likes can predict personality traits better than one's friends and family members. I further discuss how Facebook and other social media are changing research methods in "Facebook as a Research Tool for the Social Sciences," published in *American Psychologist*.

Another advantage of Facebook-based research is the size of the population that we can tap into — currently 1.4 billion. That means that even those demographic groups that are underrepresented on Facebook, such as older or less educated, are still available in very large numbers.

“Perhaps the biggest issues with using Facebook for research are the ethical ones and protecting the privacy of users.”

This population can also be accessed at a relatively low cost, especially if one includes viral features that encourage participants to invite their Facebook friends. In 2007, my colleague David Stillwell, a graduate student at the time, launched a Facebook app called myPersonality, which offered participants access to 25 psychological tests as well as feedback on their scores. He invited 150 of his Facebook friends at the time. Four years later, we had attracted an astounding 6 million participants. We make the database available to others and, so far, almost 200 researchers from more than 100 academic institutions have used data from it.

Yet using Facebook data has its flaws, too. First of all, while there is a lot of empirical evidence showing that, in general, Facebook profiles reflect the actual and not self-idealized image of their owners, researchers have to be aware that users can control and selectively remove information from their profiles, painting their lives as more (or less) idyllic than the reality. Second, the behavior of Facebook users is, to some extent, affected by the algorithms of the platform. For example, stories that appear on one's news feed are clearly more likely to be liked. Thus, while studying Facebook data, researchers have to cautiously separate the effects of users' preferences and behaviors from the effects of Facebook algorithms.

Perhaps the biggest issues with using Facebook for research are the ethical ones and particularly protecting the privacy of its users. Of course, individuals must opt in to take a researcher's Facebook-based personality test or to allow access to their Facebook profiles. However, when they hit that "I agree" button on the consent form, they may not realize just how much information they're allowing the researchers to see. They may be fine with sharing their gender, location, and even political leanings, but they may not realize that a particular photo might reveal something about their health or sexual orientation.

That's why researchers should shoulder the burden of being specific with prospective participants regarding what they could be sharing upon signing the

consent form. The mere availability of data and participants' willingness to share it does not grant researchers an automatic right to record and use it freely.

The privacy questions extend beyond the participants to their friends. Many elements of a Facebook profile, such as comments or photos, contain data about the user's friends, who have not consented to participating in the research. Researchers may have access to such data, but should they use it? I believe that it is acceptable to use such data, as long as it is used only to learn about the participant and not the friend. For example, we should be able to note a friend's gender to help us determine how many male and female friends the participant has. Or, if we see that friends have posted photos related to extreme sports, we might learn more about the participant's interest in those activities. We'd focus not on the friends themselves, but rather on what they tell us about the participant. Certainly, we need to develop more guidelines pertaining to new privacy challenges posed by social media environments.

Despite the hurdles they present, Facebook and other social media sites will only continue to grow as research tools. Compared with old-style laboratory-based research, Facebook provides a powerful approach to studying people. I am quite sure that one day research based in a digital environment will become more widespread than traditional psychological experiments and studies. ▲



CONNECTION

Plugging in to a Smarter Household

**How to make products that
do things on behalf of the user**

BY THERESA JOHNSTON

While working as a general partner at Kleiner Perkins Caufield & Byers, Trae Vassallo became fascinated by the marriage of everyday household objects with network connectivity, a phenomenon known as the Internet of Things. One of the successful ventures she funded, Dropcam, allowed people to keep tabs on their children and pets at home through Wi-Fi video-streaming cameras. Another new company, Nest Labs, promised to change the world through its sensor-driven, Wi-Fi-enabled thermostats.

Today Vassallo, after working for 12 years at Kleiner Perkins, is an independent investor, those two startups are parts of Google, and the Internet of Things is hotter than ever. “It is the next frontier of innovation,” says Vassallo, a former IDEO product developer who earned her master’s degrees in business administration and mechanical engineering from Stanford. “The Internet of Things is the next new platform area: post the iPhone, the smartphone, and the tablet ecosystem.”

Following a symposium sponsored by the Center for Entrepreneurial Studies at Stanford Graduate School of Business, Vassallo discussed how to be part of the future of the Internet of Things.

Trae Vassallo is an independent investor and former general partner at Kleiner Perkins Caufield & Byers. She received her MBA from Stanford GSB in 2000.

Illustration by Javier Jaén

REINVENT OLD MODELS

People have been trying to connect their environments to the internet since it was created, Vassallo says. The difference today is in the hardware. Smartphone technology is now so cheap, and sensor technology so good, that smart devices can understand the context in which they operate and then take action that makes people's lives better. "Dropcam is a great example of this," Vassallo says. The device allows people to catch robberies in action or watch from across the country while their kids take their first steps. "It provides great new functionality, yet it fits very easily into this old paradigm of home security and wanting to keep an eye on things."

PACKAGE IT WITH THE CUSTOMER IN MIND

While many network-connected devices are tricky to install and use, these products are becoming increasingly user-friendly. Nest thermostats, for example, were designed by engineers who worked on the Apple iPhone. "The key is making sure that you not only have the right technology but you have it packaged in the right way. It has to be easy for a customer to see the value and then ultimately deploy it."

KEEP IT SIMPLE

"I really look for products and services that use sensors to understand context and do something on behalf of the customer that ultimately make decisions faster, easier, and improve things in some way," she says.

Nest thermostats, for example, are essentially smartphones that manage household temperatures. Their sensors determine whether the occupants are home, and the house's heating or air conditioning systems adjust accordingly. "It's not adding complexity; it's actually simplifying your life," says Vassallo.

"The key is making sure that you not only have the right technology but you have it packaged in the right way."

DOES IT SAVE MONEY?

Vassallo has invested in a company called Enlighted, a startup that is essentially a Nest for commercial buildings. "They put a sensor in every light in the building, and these sensors allow them to control energy use based on occupancy," she says. In addition to making the office environment better for workers, the sensors can save companies a lot of money — 50% to 70% on lighting costs alone. "The environmental implications are massive."

HAVING THE RIGHT PEOPLE MATTERS

Companies that want to get involved in the Internet of Things need employees with a wide variety of expertise, Vassallo says. "What I look for is a lot of passion in the founder," Vassallo says, "and someone who's able to recruit great people."

THERE'S STILL A LONG WAY TO GO

In Silicon Valley, waves of innovation usually start with hardware improvements, followed by a long period of software development. For these internet-connected devices, the basic hardware platforms still are in their infancy. Engineers are still trying to figure out basic communications standards to allow smart household objects to communicate more seamlessly with the internet and each other.

As Vassallo puts it, "Right now, it is early and we are still in the Wild West." ▲



SWITCH IT UP Netflix shifted its business model from solely mailing DVD rentals to streaming video content.

PIVOT

How to Know When to Switch to Plan B

**Novice entrepreneurs often
stick with a plan for too long.**

BY DEBORAH PETERSEN

Entrepreneurs are consummate optimists. They have to be. How else could they power through all the things that go wrong when starting a new venture?

Their positive attitude, however, can also blind them to the warnings that it is time to consider plan B, says Robert Chess, a lecturer in management at Stanford Graduate School of Business.

“The first-time entrepreneurs oftentimes don’t recognize the signs that a pivot needs to be made, and [they] will stick with things too long,” says Chess, who is also chairman of Nektar Therapeutics, a biopharmaceutical company. Chess shared his thoughts with *Stanford Business* on how to know when to change the direction of a company, following a symposium sponsored by the Center for Entrepreneurial Studies at Stanford GSB.

Robert Chess is a lecturer in management at Stanford GSB and chairman of Nektar Therapeutics, a health care biotechnology company, and Biota Technologies.

USE BOTH SIDES OF YOUR BRAIN

Company founders need to have a split personality: the optimist who thinks everything is going to work out and the pessimist who can be the risk optimizer, keeping an eye out for what can go wrong, he says.

“I think you have to have those two almost disconnected parts that can operate simultaneously,” Chess says.

DETERMINE WHAT NEEDS TO CHANGE

“A pivot involves keeping one foot on the ground and moving the other foot,” says Chess. That means something needs to remain constant in the company when it becomes clear that the current business plan is not working.

You may have a great product and the right customer fit, for example, but the team that’s executing it may not have the right skills to bring it to market. Or, you may have a dynamic team and a quality product, but you may be targeting the wrong market.

Typically, the area where startups get it wrong initially is the market for their product and, luckily, that is not a fatal error. It’s much easier to find a new application for a product than to pivot on the product, which can take years, he says. Also, it is difficult to change out the team and investors. “It sounds like an easy thing, but it’s not,” Chess says.

When is it time to call it quits? If multiple key areas — product, market, and team — are not working, “that may be time to pack it in,” he says.

Entrepreneurs cannot ignore objective data; nor can they ignore their instincts.

MAKE CHANGE PART OF THE CULTURE

The companies that build nimbleness into their credo from the start are the most successful at making the switch to plan B.

They signal to employees and investors early on that because theirs is a startup, there will be bumps along the way and there will be failures. A company might, for example, seek a cushion with its early investors, building in sufficient money for product experimentation and tailoring the product-market fit.

“You have to bring your investors along. You need to bring your board along. You need to bring your employees along,” Chess says. The most important thing is having them buy into the overarching mission of company, knowing that the exact details of the product or service they provide may change over time.

“All these things that you might call ‘failure’ are really just learnings and actually are contributions to the intellectual success, intellectual base, and eventual success of the company,” he says.

TOO BIG TO PIVOT?

Even larger, more well-established companies may find they need to change course from time to time. Netflix’s decision to stream video content as DVDs became less popular is a classic example of a product pivot, Chess says. Even in the biotech industry, where scientific research demands long product development lead times, 80% of firms are successful in areas very different from their original ideas, he says. “I don’t think any company is too large [to pivot], and every company needs to adapt.”

TRUST YOUR GUT (AND ANALYTICS)

Entrepreneurs cannot ignore objective data; nor can they ignore their instincts.

“Steve Jobs did not make his decisions based on a lot of analytics. He was making them based on gut and based on a true understanding of what the customer would want, if it only existed,” Chess says.

It may take a while for a product or application to work out, but there are ways of testing it to make sure that the product concept and market are right, he says. “I think the key thing is setting up a lot of experiments — setting up hypotheses and finding ways of testing them.”

Then, have a trustworthy adviser outside your immediate sphere who can help you be more objective when you’re evaluating that data. ▲

SOLUTIONS

Three Entrepreneurs Discuss Fears, Security, and Success

BY ERIKA BROWN EKIEL

“The Nature of Work Has Changed.”

Tony Xu is cofounder and CEO of DoorDash, an on-demand food delivery service. DoorDash lets customers order from nearby restaurants via its website or mobile app, and then “dashers” bring the food by car, bike, foot, or scooter.

DoorDash was founded in June 2013 and is now available in 21 cities, including San Francisco, where the company is based, as well as Los Angeles, Denver, and Toronto. The company employs more than 150 people and serves fare from “tens of thousands” of merchants. Today, you can order pepperoni pizza and spicy pad thai through DoorDash, but Xu’s long-term vision includes shoes, wrenches, and baby dolls — anything sold by a business near you. Xu founded the company with Evan Moore, a classmate at Stanford Graduate School of Business (both graduated Class of 2013), and Andy Fang and Stanley Tang, whom he met while they were studying computer science at Stanford University (both Class of 2014). Xu talks to *Stanford Business* about how evolving trends in our home and work lives are changing the way Americans eat.

In 10 words or fewer, what is the big idea behind your business? To build the world’s first and largest software-enabled logistics company.

Why now? We started off with an idea that we wanted to help small businesses. Before we started DoorDash, we interviewed a lot of business owners. We learned they consistently had three problems: making sure their employees were going to show up for work, figuring out where their customers were coming from, and getting more business. Meanwhile, we saw they had clipboards full of orders they turned down because they were unable to handle deliveries. We did the research and saw 85% of restaurants don’t deliver; 99% of small businesses don’t deliver. DoorDash offers a new revenue stream.

Demand is also coming from consumers. The U.S. Department of Agriculture reported that in 2013, for the first time since starting to track this in the 1960s, Americans now spend equal amounts on restaurants as we spend on groceries. People are getting busier. There are more and more homes where both parents work full time, so it’s harder to prepare a complete dinner every day.

How has DoorDash’s platform helped meet this demand? The rise of mobile devices has given us access to an on-demand, flexible workforce. In the past if you wanted to get John to show up to work or see if Tiffany could cover his shift, what would you do? Call them? Send them a fax? It was all written down on a clipboard in the back room. Now people have computers in their pockets. The nature of work has changed, and people value freedom and

flexibility. Some people are working to pay for their education, others have more than one job.

When we first started, we were the drivers ourselves. We also experimented by delivering for other services. After six months of doing deliveries, you learn it’s really complicated. You have to get lots of things right in a short time. All the orders for lunch come in at the same time! Humans are not good at parallel processing, which is what you need to do to solve peak demand. Software can solve these problems.

How do you describe your primary target audience? Young families are some of the most time-starved people out there, especially when both parents are working.

What are your biggest challenges right now in building your business? The most important first hurdle for a new business is finding product market fit. We found that. Now it’s: Can you maintain quality of service? This is not a product you buy once every two years. People eat three times a day. Every impression matters.

What is the best advice you’ve ever received? Many people have told me to double down on strengths and worry less about weaknesses. This is not how school is set up, but it helps you deliver the best productive value and brings you the greatest levels of personal satisfaction.

What advice would you give other entrepreneurs on how to build a great business? DoorDash is not yet a success. The most important thing is to build something people want. Without that, everything else is irrelevant.



Tony Xu

If there was one thing that enabled you to be successful as an entrepreneur, what was it? Holding a very high bar for intellectual honesty. It's easy to get caught up in "everyone else is doing it!" It's important to have your own point of view.

How do you come up with your best ideas? I go on long runs. I used to do marathons. Golden Gate Park is an escape from the city life. Ignoring the noise helps me think independently.

What is your greatest achievement? Recruiting a group of people far more talented than myself on this long and ambitious mission.

What do you consider your biggest failure? When I was younger, my biggest fear was what other people thought of me. You want so desperately to find a new environment to which you can belong. My failure was in not focusing on what I was good at and what I was interested in. I did the things I was supposed to do.

What values are important to you in business? Thinking in first principles. It helps you focus on what's most important for your customer.

What was your first paying job? Mowing lawns with a friend when I was 9. I was born in China and my family immigrated to Illinois. We mowed lawns and charged more for designs, like a checkered lawn. I learned you can do more than you think you are capable of doing. I could barely reach the handle of the mower!

What is the best business book you have read? *High Output Management* by Andy Grove and *Zero to One* by Peter Thiel. We give them to all our managers.

What businessperson do you most admire? Jeff Bezos. Building a business is way harder than starting one. It's not like it gets easier when you get bigger! I admire his ability to go the distance — the endurance, the horsepower to last 20 years.

What do you think is the greatest innovation in the past decade? The mobile phone revolution. It makes the world a more accessible place for everyone.



Marcelo Camberos

“Think Critically and Independently.”

Marcelo Camberos is the founder and CEO of ipsy, an online beauty community anchored by the monthly Glam Bag, a personalized beauty sampling service, and a network of beauty creators with large followings on YouTube, Instagram, and Snapchat. Ipsy's 1.5 million subscribers will bring the company more than \$150 million in revenue in 2015. As a core part of the community, ipsy's Michelle Phan and six other creators deliver makeup tips and kinship to more than 20 million people each month. Camberos, who received his MBA from Stanford Graduate School of Business in 2007, explains why community is so important to the future of commerce and how self-expression can turn into a business.

How did you get into this? I'm not passionate about makeup any more than I was passionate about comedy. I was one of the first employees at Funny or Die, Will Ferrell's comedy company. While at Funny or Die, I noticed that there were a number of YouTube celebrities who were becoming bigger than our "traditional" A-list comedians. I started a company called Real Influence that matched online personalities with brands. That's how I got connected with Michelle Phan, who is the most viewed beauty creator on YouTube. Michelle saw people coming to her channel instead of traditional magazines. Michelle understood that this change would transform the beauty industry. Right after ipsy launched, I was introduced to Jennifer Goldfarb, who received her MBA from Stanford GSB in

2002. She previously ran the infomercial business for Bare Escentuals. She is now our president and an ipsy cofounder.

In 10 words or fewer, what is the big idea behind your business? Online personalities have become the biggest influencers in millennials' beauty decisions.

How do you describe your primary target audience? It started out being millennials age 18 to 25. It has become a lot wider.

What are your biggest challenges right now in building your business? People. It's very hard to recruit in the San Francisco Bay Area. Marketing roles are hard. You want someone with a brand and customer focus but who also understands data science. Also, staying one step ahead of the competition; always providing a better and better service; continuing to build the community around our creators.

What is the best advice you've ever received? My mom always encouraged me to come up with what you think is the right thing regardless of what other people are telling you — even if it comes from an authority figure. Do your own research and come to your own conclusions.

What was the most difficult lesson you have learned on the job? We took a long time to set up a hiring infrastructure, and that hurt us.

What advice would you give other entrepreneurs on how to build a great business? Make good decisions. Think critically and independently.

If there was one thing that has enabled you to be successful as an entrepreneur, what was it? You can't be a good entrepreneur without a good support system. There are so many ups and downs and so much stress; you need someone to share all that with.

What inspires you/how do you come up with your best ideas? Listening to what our customers are telling us. After that, it is a little solitary.

What is your greatest achievement? Building a community that is positive and centered on a viewpoint of unique beauty and self-expression. I have met thousands

of people in our community through our events. Beauty is not prescriptive or about what everyone else is doing.

What do you consider your biggest failure?

Not hiring big enough or fast enough.

What values are important to you in business?

Transparency. Hard work. Not taking yourself too seriously.

What was your first paying job?

I played a lot of bridge growing up. I sold lessons online. I learned that you can do things that are not a “normal” job and make money while being independent. Independence is powerful.

What is the best business book you have read?

I don't enjoy reading business books. I really liked *This Is Your Brain on Music*.

What businessperson do you most admire?

My dad. He has run big businesses as a CEO. He is a savvy operator and thinks critically and independently to make the best decisions.

“You Don't Want to Get Too Much Over Your Skis.”

Manoj Leelanivas is president and chief executive officer of security software startup Cyphort. The Santa Clara, California-based company detects and mitigates advanced malware and other security breaches of a company's networks, data centers, and cloud. The company was founded in 2011 and publicly launched in 2014. Its customers include large finance, healthcare, technology, and media companies. Cyphort has raised \$55 million in venture capital from Matrix Partners, Foundation Capital, and Trinity Ventures. Leelanivas graduated from the Stanford Graduate School of Business Executive Education program in 2006.

In 10 words or fewer, what is the big idea behind your business?

We provide a single-pane-of-glass view of advanced threats in the enterprise.

Why is this type of business important now?

The world is flatter than ever. Anyone anywhere can hack into any system around the world. The bad guys have amazingly good tools, huge amounts of computer storage, and anonymity. By now most people have heard about the security breaches at Target (in which the debit and credit card information of as many as 70 million people was stolen), JP Morgan Chase, and now the U.S. Office of Personnel Management (which included, among other things, the Social Security numbers of 21.5 million people and fingerprints of 5.6 million people).

The ease with which hackers can attack is unprecedented. Every asset of a company is connected on the internet today. Two decades ago the perimeter of an enterprise was the four walls of a building. With the internet, cloud, and mobile computing, the walls have broken down. The perimeter is porous. If you look at the Fortune 500 today, 75% of them have embraced “bring your own device” in some shape or form; 50% of them are running 300-plus cloud applications.

What is the toughest aspect of protecting your clients?

We protect the customers from breaches that go after their “crown jewels.” For a financial institution, it's financial or customer data. For a tech company, it's intellectual property. A media brand could be damaged by misinformation. For governments, the price is even higher. Everything is open to everything. The average dwell time is more than 200 days for breaches. At Target, the threat came through the HVAC system. From there, the malware carried itself to the point of sale, or point of fail.



Manoj Leelanivas

What are your biggest challenges right now in building your business?

We need to scale quickly and be strategic in terms of how fast to invest ahead of returns. You don't want to get too much over your skis but you also don't want to be too conservative.

What is the best advice you've ever received?

John Morgridge, the former Cisco CEO and chairman, said you cannot run a company from an ivory tower. You need to have the understanding of what's happening at the front lines.

What was the most difficult lesson you have learned on the job?

When the going is great, humans have a tendency to focus on things that are going well. All the goodness can mask underlying problems unless you know your blind spots.

What is your greatest achievement?

I had very humble beginnings in India. Running a \$2 billion-plus business was something I did not think was possible 20 years ago. I had some challenges in life to get to this country and build a career for myself. The United States is one of the only countries where meritocracy thrives.

What values are important to you in business?

I'm a big believer in driving the customer experience and solving any problems quickly. I also believe in a culture of open communication and transparency.

What was your first paying job?

I worked at a desktop publishing software company in Bangalore, India. I was a quick programmer. I didn't see why I had to hang around and waste time after I was finished working, so I left early sometimes. A manager made a public example of me as someone *not* to follow. He said what mattered was that I stayed and followed the discipline of the company, irrespective of how much work gets done. I decided that day it was time to move on.

What is the best business book you have read?

Biographies of Alexander the Great. His way of leading from the front appeals to me. Also *Into Thin Air*. The author talks about how important it is to follow certain rules and how the human mind plays tricks on you when you are under stress. ▲



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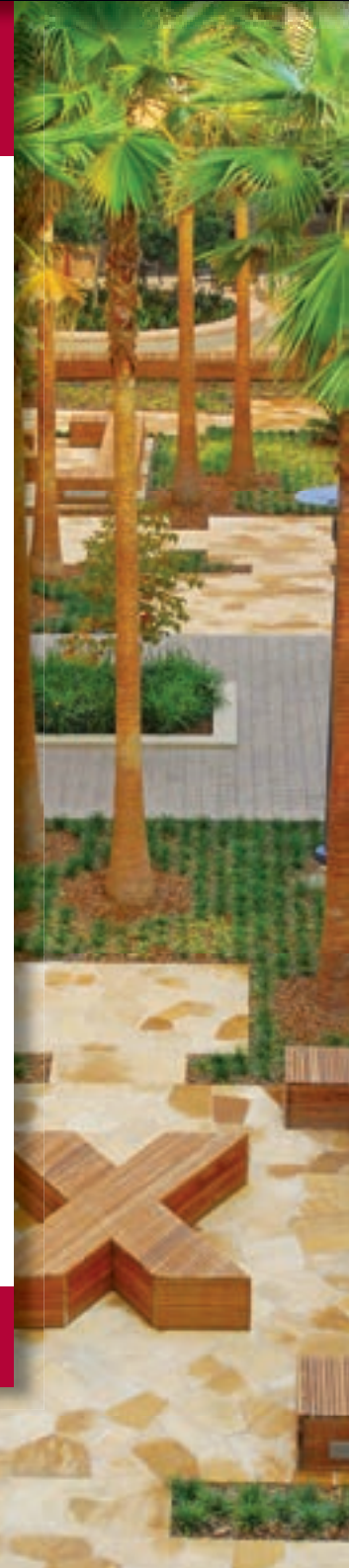
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All support was received between September 1, 2014 and August 31, 2015.

Change lives. Change organizations. Change the world.





TOM STAGGS Disney is about more than castles and tea cups.

ENTERTAINMENT

How a 93-Year-Old Media Company Keeps the Magic Alive

At Walt Disney Company, it's all about the customer experience.

BY EILENE ZIMMERMAN

The ability to innovate quickly and frequently is par for the course at startups and small businesses because their size makes them inherently nimble. But what is it like to try to innovate at the largest entertainment company in the world?

At the Walt Disney Company, innovation has been part of the DNA since the early days, when Walt Disney was using animation in ways it had never been used before and inventing the modern-day theme park.

“At the most basic level innovation has played a role in the competitive advantage of this company throughout its history,” says Disney Chief Operating Officer Tom Staggs, who earned his MBA in 1987. “And innovation is critical to extending it.”

Tom Staggs is the chief operating officer at Walt Disney Company. He received his MBA from Stanford GSB in 1987.

Staggs, a 25-year veteran of the Walt Disney Company, became its COO in February 2015. He was chief financial officer for 12 years and, in 2010, became chairman of Disney Parks and Resorts. During his tenure, Staggs more than doubled theme park profit, growing it from \$1.4 billion in 2009 to more than \$3 billion in 2015, and he spearheaded ambitious, innovative changes.

One currently under way is the creation of an addition to Disney's Animal Kingdom theme park based on the film *Avatar*. In early discussions, Staggs and Disney CEO Bob Iger suggested to *Avatar*'s producer Jon Landau and director James Cameron that they create an entirely immersive experience for visitors because the material on which they were basing it was so rich — the mystical, elaborately beautiful world of Pandora. In 2014, the company began construction on the project. "Creating an entire land that allows people to visit the fictional Pandora and ride on a banshee, taps directly into how we think about innovation," says Staggs, "as something critical for staying relevant to audiences."

Possibly the most game-changing innovation at Disney in recent memory has been the introduction of MyMagic+ in 2014. MyMagic+ is a visitor management system that lets guests plan in advance the attractions and rides they want to visit and

make reservations for them, so they aren't waiting in long lines or sprinting from one attraction to the next in order to squeeze in as much as they can. "At the end of the day, our product is not the castle, or the tea cups, or the physical things we build. Our product is the guest experience," Staggs says. "That's what keeps people coming back."

Yet even if the entire company understands the importance of the guest's experience, making changes to improve and support it isn't easy. At a company as massive as Disney and with its entrenched processes, it can be challenging to get people to move beyond their comfort zone, Staggs says. "When you find something that works, the inclination is to repeat it. That translates to doing what we did yesterday, and that's not the way to succeed," he says.

In fact, that's why the team developing MyMagic+ did so in isolation, to a certain extent, so that the fear of — and pushback against — change would not affect their ability to innovate. "We wanted the team to be able to incubate their idea, and when we were satisfied they were onto something we believed could be transformative, then we would tell people about it," he says.

"If you're feeling really comfortable doing your job, then you're not pushing yourself enough."

The way the company was able to implement such a sweeping change, one that impacted more than 74,000 employees and 28,000 acres of land, was by tying it back to the mission. "MyMagic+ was changing the way we had done things for many, many years, and that's scary for people," says Staggs. "So we spent a great deal of time relating the changes we were making to how they would positively impact the guest experience."

As a manager, Staggs has tried to get people to embrace the notion of "constructive discomfort," or understanding that pushing one's own boundaries is part of creativity and innovation. "If you're feeling really comfortable doing your job, then you're not pushing yourself enough," he says. Disney's leadership encourages employees at every level and in every area to bring forth innovative ideas. Successful innovation is recognized and celebrated in a variety of ways, including annual Disney Innovator and Disney Inventor awards. Staggs says he has also found it important to remind people that innovation happens everywhere in an organization, not just by those in roles defined specifically as "creative."

The other more important move a manager must make is to put the right people into the right roles and then give them the freedom to run with their ideas. "Of course, it's also really critical to set the bar for excellence high because it pushes people in ways that bring out not just their best work but also satisfaction in their accomplishments," he says. "And few things are more important than that." ▲

Organizations

“At some point,
do individuals get banned from
having the right to drive?

**It sounds
really
far-fetched
now.”**

— Ken Shotts PAGE 35



RISK

Why Criticism Is Good For Innovation

How to quash bad ideas without stifling creativity

BY THERESA JOHNSTON

In the 1960s and 1970s, few workplaces could boast of such brilliant engineers as Xerox's Palo Alto Research Company (PARC). Among their inventions were the first true personal computer and the world's first laser printer. Yet few of their ideas ever earned much money for Xerox.

The problem wasn't a lack of creativity, says Jonathan Bendor, a professor of political economy at Stanford Graduate School of Business. Instead, what the Xerox PARC engineers really needed was something their managers should have dispensed more freely — constructive criticism.

Bendor, who led a discussion on the topic at an entrepreneur symposium sponsored by the Center for Entrepreneurial Studies at Stanford GSB, calls Xerox PARC "an example of where the technical people, the idea generation people, were not being pushed hard enough." He says it would have been far better if someone had told those engineers, "You guys are brilliant and you're coming up with really neat ideas, but where's the market value?"

Jonathan Bendor is the Walter and Elise Haas Professor of Political Economics and Organizations at Stanford GSB and a professor of political science by courtesy at the Stanford School of Humanities and Sciences.

Photograph by Gabriela Hasbun



JONATHAN
BENDOR Criticism
and creativity are
complementary.

Many people believe that criticism and creativity are incompatible in the workplace. But as Bendor sees it, creativity and criticism are like the Chinese principles of yin and yang: two complementary forces that interact to form a greater whole. “I think not only can they live together,” he says, “they have to live together.”

If a company has “a wild and crazy R&D unit and no scrutiny,” for example, managers and executives will receive plenty of ideas, but they also run the risk of accepting some very bad ones. And if it’s a tough-minded firm, he says, “with lots of hurdles that a new project has to get over,” they may avoid adopting bad ideas but stifle innovation. “The really hard problem that entrepreneurs face is how to reduce both types of errors to acceptable levels,” Bendor says.

If an idea really is terrible, the rubric can soften the blow.

One way to give employees useful feedback is through a formal rubric or scoring system where their ideas are graded on various dimensions, such as technical merit and market potential. Unlike a global criticism of “this is no good!” Bendor explains, rubrics can help problem-solvers figure out why they’re stalled and what they can do about it.

If an idea is fixable, a manager can point to the rubric and say, “This part of the solution is OK. This part of the solution needs serious work, and this part of the solution we have to simply start over.” If an idea really is terrible, the rubric can soften the blow. Bendor suggests being blunt in those cases, “but in a humorous or warm way, so that you [both] recognize that it’s not a personal matter; it just happens this is not going to work. A manager might say, ‘Our rubric says it didn’t score well on [criteria] 3, 5, and 6.’ And that’s it.”

Probably the best thing about rubrics is that they shift the process away from egos and personalities, and more toward the nature of the problem itself. It’s like when a surgeon takes a scalpel and cuts into the flesh of another human being, Bendor says. “The surgeon is actually not thinking of the person on the table as a father, a brother, a son, but rather as a problem to be solved.” Likewise, when attention shifts to the nature of a problem rather than the employee trying to solve it, “temperatures can cool down and you can focus on what needs to be done.”

Bendor adds that people at all levels in an organization can benefit from depersonalized, discerning feedback like this — even the CEO. As he points out, “Everybody makes mistakes. And when you’re a leader, if you don’t create the kind of organization that will correct your errors, you could lead your firm right over a cliff.” ▲



BEHIND THE WHEEL New automotive technology is raising thorny ethical questions.

RESPONSIBILITY

Exploring the Ethics Behind Self-Driving Cars

How do you code life-or-death decisions?

BY IAN CHIPMAN

Imagine a runaway trolley barreling down on five people standing on the tracks up ahead. You can pull a lever to divert the trolley onto a different set of tracks where only one person is standing. Is the moral choice to do nothing and let the five people die? Or should you hit the switch and therefore actively participate in a different person's death?

In the real world, the “trolley problem” first posed by philosopher Philippa Foot in 1967 is an abstraction most won't ever have to face. And yet, as driverless cars roll into our lives, policymakers and auto manufacturers are edging into similar ethical dilemmas.

Ken Shotts is the David S. and Ann M. Barlow Professor of Political Economy at Stanford GSB and professor of political science by courtesy at the School of Humanities and Sciences. Neil Malhotra is a professor of political economy at Stanford GSB and a professor of political science by courtesy at the School of Humanities and Sciences.



What are the ethical issues we need to be thinking about in light of driverless cars? This is a great example of the “trolley problem.” You have a situation where the car might have to make a decision to sacrifice the driver to save some other people or sacrifice one pedestrian to save some other pedestrians. And there are more subtle versions of it. Say there are two motorcyclists — one is wearing a helmet and the other isn’t. If I want to minimize deaths, I should hit the one wearing the helmet, but that just doesn’t feel right.

These are all hypothetical situations that you have to code into what the car is going to do. You have to cover all these situations, and so you are making the ethical choice up front.

It’s an interesting philosophical question to think about. It may turn out that we’ll be fairly consequentialist about these things. If we can save five lives by taking one, we generally think that’s something that should be done in the abstract. But it is something that is hard for automakers to talk about because they have to use very precise language for liability reasons when they talk about lives saved or deaths.

What are the implications of having to make those ethical choices in advance? Right now, we make those instinctive decisions as humans based on our psychology. And we make those decisions erroneously some of the time: We make mistakes, we mishandle the wheel. But we make gut decisions that might be less selfish than what we would do if we were programming our own car. One of the questions that comes up in class discussions is whether, as a driver, you should be able to program a degree of selfishness, making the car save the driver and passengers rather than people outside the car. Frankly, my answer would be very different if I was programming it for driving alone versus having my 7-year-old daughter in the car. If I have her in the car, I would be very, very selfish in my programming.

“My answer would be very different if I was programming it for having my 7-year-old daughter in the car.”

For instance, how do you program a code of ethics into an automobile that performs split-second calculations that could harm one human over another? Who is legally responsible for the inevitable driverless-car accidents — car owners, carmakers, or programmers? Under what circumstances is a self-driving car allowed to break the law? What regulatory framework needs to be applied to what could be the first broad-scale social interaction between humans and intelligent machines?

Ken Shotts and Neil Malhotra, professors of political economy at Stanford GSB, along with Sheila Melvin, mull the philosophical and psychological issues at play in a case study titled “The Nut Behind the Wheel” to ‘Moral Machines’: A Brief History of Auto Safety.” Shotts discussed some of the issues with *Stanford Business*:





Who needs to be taking the lead on parsing these ethical questions — policymakers, the automotive industry, philosophers? The reality is that a lot of it will be what the industry chooses to do. But then policymakers are going to have to step in at some point. And at some point, there are going to be liability questions.

There are also questions about breaking the law. The folks at the Center for Automotive Research at Stanford have pointed out that there are times when normal drivers do all sorts of illegal things that make us safer. You're merging onto the highway and you go the speed of traffic, which is faster than the speed limit. Someone goes into your lane and you briefly swerve into an oncoming lane. In an autonomous vehicle, is the "driver" legally culpable for those things? Is the automaker legally culpable for it? How do you handle all of that? That's going to need to be worked out. And I don't know how it is going to be worked out, frankly, just that it needs to be.

Are there any lessons to be learned from the history of auto safety that could help guide us? Sometimes eliminating people's choices is beneficial. When seatbelts were not mandatory in cars, they were not supplied in cars, and when they were not mandatory to be used, they were not used. Looking at cost-benefit analysis, seatbelts are incredibly cost effective at saving lives, as is stability control. There are real benefits to having things like that mandated so that people don't have the choice not to buy them.

The liability system can also induce companies to include automated safety features. But that actually raises an interesting issue, which is that in the liability system, sins of commission are punished more severely than sins of omission. If you put in airbags and the airbag hurts someone, that's a huge liability issue. Failing to put in the airbag and someone dies? Not as big of an issue. Similarly, suppose that with

a self-driving car, a company installs safety features that are automated. They save a lot of lives, but some of the time they result in some deaths. That safety feature is going to get hit in the liability system, I would think.

What sort of regulatory thickets are driverless cars headed into? When people talk about self-driving cars, a lot of the attention falls on the Google car driving itself completely. But this really is just a progression of automation, bit by bit by bit. Stability control and anti-lock brakes are self-driving-type features, and we're just getting more and more of them. Google gets a lot of attention in Silicon Valley, but the traditional automakers are putting this into practice.

So you could imagine different platforms and standards around all this. For example, should this be a series of incremental moves or should it be a big jump all the way to a Google-style self-driving car? Setting up different regulatory regimes would favor one of those approaches over the other. I'm not sure whether it's the right policy, but incremental moves could be a good policy. But it also would be really good from the perspective of the auto manufacturers and less good from the perspective of Google. And it could be potentially to a company's advantage if it could try to influence the

direction that the standards go in a way that favors the company's technology. This is something that companies moving into this area have to think about strategically, in addition to thinking about the ethical stuff.

What other big ethical questions do you see coming down the road? At some point, do individuals get banned from having the right to drive? It sounds really far-fetched now. Being able to hit the road and drive freely is a very American thing to do. It feels weird to take away something that feels central to a lot of people's identity.

But there are precedents for it. The one that Neil Malhotra, one of my coauthors on this case, pointed out is building houses. This used to be something we all did for ourselves with no government oversight 150 years ago. That's a very immediate thing — it's your dwelling, your castle. But if you try to build a house in most of the United States nowadays, there are all sorts of rules for how you have to do the wiring, how wide this has to be, how thick that has to be. Every little detail is very, very tightly regulated. Basically, you can't do it yourself unless you follow all those rules. We've taken that out of the hands of individuals because we viewed there were beneficial consequences of taking it out of their hands. That may well happen for cars. ▲



TOTAL VENTURE William Hewlett and David Packard didn't just make products — they created the "HP Way."

CULTURE

Creating an Impactful Company

It's not just about the product.

BY DEBORAH PETERSEN

Creating a company that has impact takes more than just hitting on the right product or service for the right market. It requires designing the total venture, including the business model, the organization and culture, and the business-management systems that will allow it to add value to the overall economy by growing and creating jobs as well as profits, says Charles Holloway, professor emeritus at Stanford GSB.

Holloway, who joined Stanford GSB in 1968 and was co-director of the school's Center for Entrepreneurial Studies for 17 years, discussed what makes an impactful company at a forum sponsored by the center. He also sat down for an interview with *Stanford Business*.

Charles Holloway is the Kleiner Perkins Caufield & Byers Professor of Management, emeritus, at Stanford GSB.

FIND AN INNOVATIVE BUSINESS MODEL

You must design your entire company, not just the product, Holloway says. This includes the business model, the management organization, and the culture.

“It turns out that, if you look at innovations in companies, roughly half of them come in the business model, not in the product or service,” he says. There are many examples in which companies sell virtually the same product or service, but whether they succeed largely depends on how they were built.

Netflix is an example, he says, as is the former Sun Microsystems, which was founded in 1982. When the computer systems company started, there were 27 other companies building the same type of product, but few thrived and scaled the way Sun did. In what was a unique business model at the time, Sun used components from the supply network and allowed others to create products that could be integrated with Sun’s workstation, Holloway says. The company was acquired by Oracle Corp. in 2010 for more than \$7 billion.

CULTURE DOES NOT JUST HAPPEN

“David Packard and Bill Hewlett and HP were examples of that early on. They created not only products, but a culture that allowed them to continue to deliver the products and create other products,” Holloway says.

Innovative companies have been doing this for a long time. “Often people talk about the HP culture, the ‘HP Way.’ The HP Way didn’t invent itself,” he says. And, as was the case with Hewlett-Packard, sometimes the culture changes over time, he says.

INNOVATE TO COMPETE

For a company to scale and profit over the long haul, both its product and its business model must evolve. Finding ways to sustain innovation in these areas is especially important as a startup transitions to a midsize company and, eventually, a large corporation.

In its early stages, Sun Microsystems had 15 engineers and Hewlett-Packard had 300, he says. They were competing in the same market. How did Sun compete? It developed a strong supply network so it could get the components it needed, Holloway says. Sun focused on suppliers who provided parts — disk drives and monitors, for example. “Sun didn’t focus on designing the entire set of computer products like its competitors did, and it was able to get better technology,” he says.

ATTRACT GREAT PEOPLE

Part of creating a quality work force is related to the company culture. “But part of it is the way in which you go after the people and offer them salary and other benefits, and innovation can be important here,” Holloway says.

For example, the Gordon Biersch Brewing Company needed waiters when it opened its first brewpub in the late 1980s. Typically, waiters are paid minimum wage, but the company wanted to attract employees who felt a sense of ownership of the company and its customers, Holloway says. Therefore, in addition to wages, the company offered stock benefits when it hired waiters. “This is an innovative business model for a restaurant that allowed it to attract waiters who would help it with the way in which it developed the business.”

“It turns out that questions can be valuable, not only for the person who asks the question.”

ONE SIZE DOES NOT FIT ALL

A company culture can and often should vary within a single corporation, he says. As Sun Microsystems grew, it eventually spun off its food services as a separate company because the culture that was created for its engineers and technologists was not as applicable for its service workers. “So you can have creative ways of multiple cultures in the same organization.”

REMEMBER THE FUNDAMENTALS

Holloway says his best advice to entrepreneurs is quite basic: Ask questions and say “thank you.”

“It turns out that questions can be valuable, not only for the person who asks the question but for the person to whom the question is asked, because it helps clarify situations,” he says. Too often situations that are not clarified proceed in the wrong direction because not everyone is on the same page.

Having gratitude is just as important. “I don’t think people say thank you enough,” Holloway says.

HOLD ON TO THE VISION

“Designing a new venture is a journey,” Holloway says, and it requires a vision that is sustained over time. Sometimes, you will need to pivot and make changes along the way. “It’s important for you to keep the vision, even though you’re pivoting,” he says.

“Understand it’s a journey. Changes will need to be made, but keep the goal in mind.” **▲**

REJUVENATION

How to Mitigate the Downside of Success

Mature companies often see creativity dwindle over time.

BY LOUISE LEE

Why do highly innovative organizations often lose their creative edge?

Organizations and companies that experience a “flare-up” of innovation usually see their creativity fade precisely because of the self-confidence and growth that success brings, says Stanford GSB professor emeritus James G. March. “Self-confidence and growth are usually good, but they have some negative consequences,” says March. “You don’t want to avoid them, but you’d like to avoid the negative consequences. How do we grow without growing?”

March, Mie Augier of the Naval Postgraduate School, and Andrew W. Marshall published their recent paper, “The Flaring of Intellectual Outliers: An Organizational Interpretation of the Generation of Novelty in the RAND Corporation,” in the July-August 2015 issue of *Organization Science*. Although the paper specifically examines the nonprofit research institution RAND Corp., its conclusions may apply to companies and other organizations, say the researchers.

While the original mission of RAND, based in Santa Monica, Calif., was to study weapons planning for the Air Force, the organization experienced a burst of creativity in other areas for a decade starting in the late 1940s, the researchers say. RAND made groundbreaking advances in systems analysis and game theory largely because researchers from different disciplines and backgrounds worked together. Despite people’s natural inclination to stick

with those most like themselves, RAND successfully created heterogeneous pools of researchers who could feed off each other’s knowledge and maximize the creative and intellectual abilities of the group. RAND also frequently made hiring decisions based on the recommendations of its researchers, who singled out friends or former colleagues who they knew were exceptionally intelligent and imaginative. That “recruitment of intellectual cronies” facilitated collaboration and trust in the group, the researchers note.

But that period of innovation was destined to end, the researchers say. RAND began to experience the negative consequences of self-confidence, which leads people to stick with and repeat the actions that brought them past success — and forgo exploring new ideas or methods that might lead to more innovations. “When you’re highly self-confident, you don’t pay much attention to evidence to the contrary,” thereby cutting off certain ideas, says March.

RAND’s growth as an organization also led to a decline in its culture of innovation. From 1948 to 1962, RAND grew from 225 employees with a \$3.5 million annual budget to 1,100 employees with a more than \$20 million annual budget, according to the researchers. Growth has benefits, but RAND’s expansion beyond a face-to-face organization led individuals to stick safely with the people and thus the ideas they knew, instead of mingling freely. Big organizations also tend to hire people who conform to conventional methods and thinking

instead of challenging them; meanwhile, the ambitious intellectual renegades leave, the researchers say. RAND’s growth also created layers of administrators and more bureaucratic processes such as meetings, committees, and other “red tape” that drowned out intellectual creativity, the researchers found.

“The larger organizations become, they become better and better at eliminating that element of innovation, unless they work to save it,” says Augier.

So how can organizations try to mitigate the negative effects of success and maintain some spark of innovation? For starters, they can re-emphasize the value of the long-range thinking that exploration requires, the researchers say. “In general, the returns of exploratory activities tend to be long term,” says March. “If you can get people to look further ahead, you’ll probably help exploration because it is in the long run that exploration pays off.”

Organizations might also underscore the notion of professional identity and encourage researchers to embrace it. “Almost all thinking is consequential thinking, with people doing things because of anticipated consequences,” says March. That kind of thinking can stifle the free exploration that leads to innovations because researchers might be motivated by other incentives instead of by new ideas for their own sake. RAND, for instance, lost its edge in innovation partly because it began hiring people interested more in financial rewards or career advancement rather than pure research. That “made RAND less attractive to employees with strong fundamental research identities,” says March.

Avoiding a decline in innovation is difficult; some of Silicon Valley’s best-known companies have struggled with the problem. And because large companies can face big difficulties in developing breakthrough ideas, new innovations may continue to emerge from small firms. “That’s the Silicon Valley model,” says March. “You innovate, you’re successful, and you exploit your discovery. ... Innovation from little companies, efficiencies from big companies.” ▲

James G. March is the Jack Steele Parker Professor of International Management, emeritus, at Stanford GSB and holds appointments at the Graduate School of Education and in the departments of political science and sociology at Stanford.





INVESTMENT

What Really Matters to Early-Stage Investors

The team behind a business concept can be more important than the idea itself.

BY EILENE ZIMMERMAN

**STEVE CHEN AND
CHAD HURLEY**
YouTube founders

Early-stage investors are crucial to startups, providing the capital that allows entrepreneurs to launch new businesses. These investments, however, are enormously risky. Early-stage firms have no history, offer little financial data, and because they are usually trying to do something radically new, there is no track record for predicting their success.

In such an uncertain environment, what pieces of information do investors rely on the most to make their spending decisions? Stanford Graduate School of Business professor Shai Bernstein designed an experiment to find out. “With such huge uncertainty and so little information, it’s important for both the startups and the investment community to know what investors are really paying attention to,” says Bernstein.

He and two colleagues, Arthur Korteweg from the University of Southern California and Kevin Laws from AngelList, focused their research on three aspects of a startup: the founding team, the company’s traction in the market, and the other current investors. To explore whether these information categories matter for investors, they enlisted the help of AngelList, an online platform that matches startups with potential investors.

“Early-stage investors might see 1,000 business plans a year that they have to narrow down to 50 meetings.”

The vast majority of startups looking for funding and exposure establish a profile on the platform. They designed an experiment that relied on the fact that, at the time of the experiment, AngelList regularly sent investors emails that featured certain startups on its platform. These emails included information about the startup’s underlying idea, funding goal, details about its founding team, its traction, and the identity of other investors.

For a category to be included in the email, it had to meet a certain quality threshold set by AngelList. For example, information about traction would be included only if AngelList deemed it significant, or details about other investors would be included only if their backgrounds — for instance, the number of past investments that resulted in successful exits — met the criteria established by AngelList. Investors knew that if a category was missing from an email, it was because AngelList deemed it low quality.

For the experiment, the researchers manipulated the information about real startups on AngelList’s platform. They created different emails about the same startup and randomly chose the categories to include in a given email. For example, an investor might receive an email about a featured startup that included information about its traction and investors, but not about the founding team. Another investor would receive one about the same startup that included information about traction and the founding team but lacked information about current investors. In this way, the researchers were able to change an investor’s perception of the quality of a startup’s current investors, founding team, and market traction, while all other characteristics of the startup, including its idea, remained unchanged.

Nearly 5,000 AngelList investors participated. Bernstein and his colleagues measured each investor’s level of interest in a startup by recording whether that investor chose to learn more about the business on AngelList’s platform.

“Early-stage investors might see 1,000 business plans a year that they have to somehow narrow down to 50 meetings and then to maybe two companies in which they invest,” says Bernstein. “We were looking at the initial filtering process.”

Investors were most influenced by information about the founding team. In fact, experienced, successful investors chose to respond only to information about the founding team, which suggests that focusing most on the quality of the founding team is a successful and viable investment strategy for early-stage investors. Bernstein also found that less experienced investors reacted to all the information, essentially giving all equal weight.

He says investors may respond strongly to the quality of the founding team because they may see it as a reliable indication of whether the idea behind a company is a good one. High-quality founding teams — those from top schools, for example — generally have lots of options to pursue as entrepreneurs, and their choice to pursue a startup and its particular idea over other strong options sends a powerful signal to an investor that the idea is a promising one.

But Bernstein also notes that if the team was important only as a way to understand the quality of the idea, then investors who were experts in a particular startup’s area would not have responded so strongly to it. “If they are experts in the area, they can judge the underlying idea for themselves, yet these kinds of investors responded to the quality of the team as strongly as everyone else,” says Bernstein. That likely means a founding team’s ability to execute is what really makes a difference to investors. “Even if they can judge the quality of the business’ idea on their own, they aren’t the ones that will execute it,” he says. “They need the right team for that.” ▲

Shai Bernstein is an assistant professor of finance at Stanford GSB. The paper “Attracting Early-Stage Investors: Evidence from a Randomized Field Experiment” was co-authored with Arthur Korteweg at the University of Southern California’s Marshall School of Business and Kevin Laws, chief operating officer at AngelList.

PERFORMANCE

Earnings Reports, Revisited

Why are investors smitten with old-fashioned financial statements?

BY LEE SIMMONS

Public companies release financial results every quarter, and earnings season is always met by hoopla and speculation in the press: Will Company X meet or beat analyst estimates? It's the kind of bottom-line, win-or-lose drama the media love. But are those earnings reports, in 10-Q filings and press releases, actually useful to investors?

That might sound like a silly question; After all, the whole point is to give people the information they need to participate in the stock market. So it may surprise you to learn that accounting scholars, who are more acutely aware than anyone of the limitations of financial reporting, have been debating that very question for decades.

"We have a whole industry in the accounting profession whose aim it is to produce financial statements. You want to know, to what end?" laughs Maureen McNichols, a professor of accounting at Stanford Graduate School of Business. "You know, does it make a difference?"

Nearly 50 years ago, Bill Beaver, now an emeritus professor of accounting at Stanford, published a study in which he answered that question in the affirmative. That paper won the Seminal Contributions to Accounting Literature Award, an honor that's been conferred just six times.

But the world has changed, and some have argued that those 10-Q filings might not be as useful or necessary as they once were. So McNichols decided to team up with Beaver (who was her mentor and an inspiration at the start of her own career) and newly minted PhD Zach Wang — "three generations of Stanford accounting faculty," as she puts it — to revisit the issue.

The researchers compiled a database covering every firm on the three major exchanges from 1971 through 2011 and analyzed stock swings following earnings announcements. What they found, as reported in a new paper, is that earnings reports still convey valued information to investors. But here's the kicker: Their value has increased over time, and dramatically so since 2001.

Maureen McNichols is the Marriner S. Eccles Professor of Public and Private Management at Stanford GSB and a professor by courtesy at Stanford Law School.

Photograph by Boris Zharkov

MAUREEN MCNICHOLS
Financial statements
look at the past,
not ahead to the future.

of information in providing official
allocating in
Capital Markets
- Accounting Information
- Audit Quality
Social Capital Markets
- Skoll Foundation
- Social Capital
- Beneficial State Bank
- Tipping Point Community
- microhabit.org
- Reach Capital
- CSI



OLD NEWS, SQUISHY NUMBERS

There are good reasons to have expected otherwise. For starters, financial statements look at past performance, and only future performance matters to an investor's buy/sell decision. Even then, the numbers are iffy. Any earnings figure is contingent on a raft of arbitrary choices concerning cost allocation, depreciation, accruals, deferrals, and so on. As the author of a classic accounting text wrote in 1965, "The task of measuring corporate income and position objectively is an impossible assignment."

What's more, the quality of the data may have declined. One of the biggest flaws in our accounting model is its failure to capture the value of intangible assets. In particular, the inability to capitalize intellectual property, a key driver of success in today's economy, is a serious blind spot.

"R&D is treated as an operating cost when it's typically an investment," McNichols says. We do it that way because it's hard to know what its value will turn out to be. But the result is clearly a distortion of both profitability and assets. "On that score, you'd expect accounting numbers to do less well over time as an indicator of performance," she says.

Finally, that formal earnings report is, well, just so last-century. Digital technology has lowered the cost of producing and disseminating information, and investors today have access to timelier insights from analysts, blogs, and statistical services, not to mention on-the-fly updates from the companies themselves. In this continuous information environment, can the period end financial statement tell investors anything they don't already know?

GAUGING THE INFORMATION

To answer that question, the researchers used an analytical technique pioneered by Beaver in 1968. The basic idea is that you can quantify the amount of new information contained in a given disclosure by measuring how much the company's

stock price changes afterward. If it's old news, it will have already been impounded in the market's valuation and the movement will be minimal.

When they applied this approach to their sample of 700,000 quarterly earnings reports from 1971 through 2011, they found that price revisions were much larger in the days surrounding an announcement than at other times. And that held true in every year, for every randomly selected comparison interval. Over the sample period as a whole, a statistical measure of price volatility averaged 1.18 in non-announcement periods and 2.54 for announcements — confirming and updating the findings in Beaver's original paper.

But the researchers also noticed something remarkable: That difference widened over time, gradually at first and then sharply after 2001. Between 2002 and 2011, the volatility statistic for announcements averaged 3.51, reaching 4.15 in the final year. In other words, the informational value of earnings announcements has actually increased at a time when the internet and internet-based business models were supposed to have made them less informative.

Of course, McNichols points out, there were other things going on, including major reforms in accounting standards and reporting requirements following the dot-com bust and high-profile scandals at Enron and WorldCom. One interpretation of the data is that new regulations under the Sarbanes-Oxley Act (SOX) of 2002 increased public confidence in financial statements.

"A lot of people have looked at the information content of earnings announcements," McNichols says. "As far as we know, this is the first paper to carry the analysis into the 2000s, so discovering this sudden shift is exciting — it makes you want to know what's behind it."

"You could say, well, firms put out so much information nowadays, why do we need financial statements?"

THE ROLE OF ANALYSTS

The researchers also took some cross-sectional cuts on their large database to find out whether the price response differs for firms facing different information environments. For instance, you might think that big corporations, dogged by analysts and journalists dissecting their every move, would see some of the news value of their earnings reports eroded.

Indeed, research in the 1980s observed that the price response was higher for small-cap firms. But McNichols and her colleagues find that the pattern flipped in the 1990s, and since then it has been just the opposite: The larger the company and the more analysts who follow it, the larger the reaction to its announcements. "It could be that analysts serve as intermediaries," she says, "amplifying the information and maybe even influencing disclosure decisions." But then, why did the pattern change over time?

NEW AVENUES FOR RESEARCH

That's just one of several fascinating questions raised by the findings in this study — none more intriguing than why the value of earnings announcements jumped after 2001. "We don't yet know what caused that," McNichols says, but her intergenerational A-team is launching a follow-up study to find out. "Has the process changed? Are companies bundling additional information in their quarterly reports? What role have SOX and post-Enron regulatory reforms played? These are things we'll be looking at closely."

But one thing is clear: The hoopla over earnings season appears to be justified — investors really do pay attention when companies turn in their 10-Qs. "You could say, well, firms put out so much information nowadays, why do we need financial statements? These results show that the information they provide isn't preempted through other channels," McNichols says.

"In my mind, the reporting process, the legal environment, the standards and SEC rules, the fact that statements are audited or reviewed — it all makes for a unique kind of information that investors can't get any other way."

Looks like accountants won't need to worry about job security anytime soon. ▲



DOWAGER COUNTESS "I can be as contrary as I choose."

CONFLICT

In Defense of The Contrarian

**A divergent opinion can lead
to better decisions.**

BY ELIZABETH MACBRIDE

PBS/PhotoFest

Does every team need a skilled contrarian? Maybe so, based on new research from Stanford GSB.

"It's important for teams to have a devil's advocate who is constructive and careful in communication, who carefully and artfully facilitates discussion," says Lindred Greer, a professor of organizational behavior.

Greer and her research colleagues examined a dynamic in teams, which they call skewed conflict. In it, one person — or a small minority group acting together — carefully and constructively points out the differences and weaknesses in a team's approach to a problem.

When this divergent opinion is presented in a nuanced way in which other members don't even see the difference of opinion as a conflict, it can provide for a healthy disagreement, the research shows.

"Take for example a startup team where one member saw in a previous startup that coding the website in a certain way would lead to problems later on," Greer says.

Lindred L. Greer is an assistant professor of organizational behavior at Stanford GSB and the Younger Family Faculty Scholar for 2015–2016.

Researchers have long struggled to understand how to compose teams that have healthy conflicts.

When the team member — the only one who has this insight — questions the majority view in a non-confrontational manner, it leads to a reflective discussion, she says. And in the end, the team produces a better product.

In this case, when the other members were asked about the discussion afterward, they didn't even realize there had been a conflict.

Indeed, teams with a lone minority dissenter outperform other teams where all members agree, according to the research that Greer conducted with Ruchi Sinha of the University of South Australia, Niranjan Janardhanan of the University of Texas, Donald Conlon of Michigan State University, and Jeff Edwards of the University of North Carolina.

They also are more successful than teams in which all members disagree and fall prey to escalated, emotional, difficult-to-resolve team brawls.

Researchers and practitioners have long struggled to understand how to compose and manage teams that have healthy conflicts, and the concept of skewed conflict provides a potential solution to understanding the roots and dynamics of such constructive disagreements in teams.

That devil's advocate — which could be an individual or a small minority — has the sensitivity to see differences, perceives them as conflict, and then communicates about the differences in non-confrontational ways. The researchers came to their conclusions in two studies. In the first, 571 post-grad students at a top business school in India were assigned to 120 teams. They were asked to participate in a decision-making game and then asked to rate the conflict on their teams. In a second study, the researchers surveyed members of 41 pre-existing teams at a large financial corporation in the Netherlands.

One of the most interesting ideas to emerge from the research is that past academic work might have missed the point in understanding whether conflict helps or hurts teams. Past research has focused on whether teams with conflicts do better or worse than teams with no conflicts and has neglected to examine the structure of conflicts in teams as being critical.

For managers, the research points to the benefits of constructing a team where there is at least one member with high emotional intelligence who is willing to play the devil's advocate role. Having such a vocal minority can help teams obtain the holy grail of team dynamics — “healthy” conflicts that improve team creativity, decisions, and outcomes. ▲

World

“Materials problems are everywhere,
and they’re some of the hardest

**problems
that humanity
faces.”**

—Greg Mulholland PAGE 60



PURPOSE

Can Companies Help the Government?

How a coin exchange company pursued social entrepreneurship

BY SARAH A. SOULE

In early 1996, six months after Coinstar put 100 machines in supermarkets in the Los Angeles area, founder Jens Molbak got a call from the Federal Reserve.

At the time, the company was not only succeeding as a business, but helping nonprofits. The phone call led it to fulfill a third purpose: working with the public sector. How did Molbak do all three with Coinstar, which went public in 1997 and over the years has recycled more than 1 trillion coins worth \$40 billion and funneled nearly \$100 million in donations to charities?

In a talk with me at Stanford GSB, he explained some of the ideas that went into creating the win-win-win, including how the call from the Federal Reserve led to a working relationship between Coinstar and the federal government.

Molbak is now researching and pursuing a new venture, Win/Win, an organization that will host entrepreneurs in residence to research business opportunities that overlap with charity and public sector purposes. He plans to raise \$100 million to invest in triple-sector enterprises similar to Coinstar.

"I believe that there are hundreds of opportunities like this," he says. Here are some of the lessons from Coinstar's success:

Sarah A. Soule is the Morgridge Professor of Organizational Behavior at Stanford GSB and the Louise & Claude Rosenberg Jr. codirector of the Center for Social Innovation.

Photograph by Drew Kelly



SARAH A. SOULE
Some companies can score a triple play: make a profit, give to charity, and help the government.

THE ROOTS

Molbak learned the value of a penny early. His parents owned a garden center business in Seattle and during the summer he was 11 years old, his parents paid him a penny per pot to clean flowerpots. He scrubbed 28,000.

On top of instilling a work ethic in him, his parents also placed an unusual emphasis on public good. “My parents are immigrants from Denmark,” Molbak says. “They had had a foreign-born pride in the democracy of the United States. That was deeper in my DNA than I realized.”

When he got into the working world in a job at Morgan Stanley, Molbak’s life felt out of whack: He was working 80 or 90 hours a week. His charitable donations meant “writing a \$10 check at the end of the year to the Cousteau Society.”

The Coinstar idea was one of five or six he looked at while attending graduate school at Stanford GSB. He knew coins cluttered up his own dresser. He discovered he was not alone — there was \$8 billion worth of coins out of circulation, costing the U.S. Mint, well, a mint. When he remembered charities’ history with coins — the Salvation Army buckets during the holiday season, for instance — he knew he could offer consumers a choice of converting their coins to cash or donating to charity.

THE BUSINESS MODEL COMES FIRST

The early years of Coinstar looked much like that of any business. He struggled to raise money and get Coinstar off the ground as a profit-making enterprise.

For instance, he says, he conducted 1,500 interviews and surveys at supermarkets about how people used and saved their coins. He also made 300 pitches to venture capitalists and investors before he decided to ask people with whom he had a personal relationship and those with an interest in the supermarket business. He closed his first round of equity financing, \$500,000, from angel investors, in March 1992. He hired David Kelley Design, now IDEO, to build prototypes for Safeway stores.

The point here is recognizing how much went into Molbak’s idea: years of research to develop the business model, and then all of the usual care in building a scalable company culture. But Molbak was worried the public sector and nonprofit sector elements of his model would hurt Coinstar’s credibility, so he buried those sides of the story with investors.

SEE THE PUBLIC SECTOR AS A PARTNER

The atmosphere has changed, and entrepreneurs and others might be ready to conceive of companies that can succeed in all three sectors. Molbak believes great promise lies in the public sector. He lists areas like voting kiosks, scheduling jury duty, issuing passports, and signing up for and redeeming food stamps.

“There are large inefficiencies in the public sector. The mindset shift is to see those inefficiencies as a source of opportunity instead of as problems,” he says.

In the case of Coinstar, Molbak knew recycling coins would benefit the public sector. Then he found more synergies after the call from the Federal Reserve. The Fed had noticed that the number of pennies being returned to the system near Los Angeles was far higher than usual. This posed a problem, because the Fed was responsible for keeping the number of coins in balance, receiving coins from stores’ deposits and then issuing the right amounts of new and circulated coins to different regions.

“We swamped the L.A. market,” says Molbak. To help the Fed rebalance regional coin supply and demand, Coinstar proactively shared information about where it was putting new machines.

The cooperative relationship paid off a few years later, when, on the Fed’s recommendation, the United Kingdom’s

Royal Mint invited Coinstar into the country, enabling the company to accelerate its expansion there. Molbak is now researching opportunities for entrepreneurs, beginning with mapping the goods and services of 500 federal agencies. He plans to find opportunities for the public and private sectors to collaborate.

He is also launching an impact investing fund and creating Win/Win ecosystems, which will likely be based around universities, to help young entrepreneurs do what he did: found a company that succeeds not only in business and charity — but in broader society, too. As part of his research, he is asking people to think about what services the government provides well, or poorly. For entrepreneurs who doubt whether businesses can work with the public sector or whether the public sector can be innovative, he points to history and the innovation that went into founding the United States.

“We had the most innovative public sector in the world 250 years ago. Look at the fruits of that innovation today,” he says. “But that innovation has waned. Today, no one would label our public sector as innovative. Yet, we have incredibly innovative private and nonprofit sectors. We’re really good at innovation in this country. How can we take some of our innovation talent and innovation capital and embrace the public sector?”

Many of the students in my classes at Stanford GSB are social entrepreneurs who want to create good companies — good in the broadest sense of the word, companies that help people as well as turn a profit. Coinstar’s example and Jens Molbak’s Win/Win initiative show there’s an even broader way to think of a company. With the right idea and care along the way, a company can succeed across the for-profit and nonprofit sectors — and the public sector, as well. ▲

“He knew coins cluttered his own dresser. He discovered he was not alone.”



ROBO-INVESTING Exchange-traded funds are growing, with consequences.

MARKETS

Are Exchange-Traded Funds Dumbing Down the Markets?

These investments come with a downside.

BY EDMUND L. ANDREWS

Over the past decade, no investment vehicle has enjoyed more explosive growth than the robot-like exchange-traded funds, or ETFs.

ETFs are simply baskets of stocks that automatically mimic a particular index, from the broad S&P 500 Index to scores of narrower indexes on everything from small-cap tech stocks to precious metals and real estate stocks. They're attractive to investors because they offer great diversity, yet are inexpensive and simple. Whereas a traditional, managed mutual fund might charge 2% a year in fees, an ETF charges as little as 0.1%.

And because research has shown few actively managed mutual funds actually outperform the market averages on a regular basis, legions of investors have abandoned the middleman and moved to ETFs. In the past five years alone, the assets of ETFs have tripled from about \$1 trillion to \$3 trillion. Last year, ETFs for the first time attracted slightly more money than once-glamorous hedge funds.

Charles Lee is the Moghadam Family Professor of Management at Stanford GSB.

But a paper co-authored by Charles Lee, a professor of accounting at Stanford Graduate School of Business, finds that the boom in robo-funds may end up dumbing down the stock market as a whole.

The researchers found that ETFs increase the volatility of the underlying individual stocks and raise transaction costs for active investors who want to make bets based on their own research and analysis. As a result, ETFs reduce the returns to “alpha-seeking” investors who put time and money into acquiring knowledge that gives them an extra edge.

Given all the skepticism about high-priced portfolio managers, that may not sound like a problem. But Lee argues that the accuracy of market pricing ultimately requires good information, which in turn requires people who are willing to dig for information, develop sophisticated background knowledge, and conduct hard-headed analysis.

“We need to remember that markets don’t correct themselves,” Lee argues. “The price of a stock is only right because some investors are expending resources to acquire information about each company. In other words, there is also a market for information on individual companies, which only functions properly when costs of acquiring better information are balanced by the benefits. Our findings suggest the growth of ETFs is increasing the costs and reducing the benefits of information acquisition. And if everybody is buying passive funds, nobody will be out there to make sure that the prices are right.”

The researchers examined the stocks of nearly 7,500 publicly traded companies from 2000 to 2014.

THE DATA

The new paper, which Lee co-authored with Doron Israeli at the Arison School of Business in Israel and Suhas Sridharan at UCLA’s Anderson School of Management, documented striking effects of ETFs in both increasing the trading cost and decreasing the information value of prices in the underlying stocks.

The researchers examined the stocks of nearly 7,500 publicly traded companies from 2000 to 2014.

Not surprisingly, they found that the share of ETF ownership in companies has skyrocketed — from about 0.1% on average in 2000 to 7% in 2014.

More important, the researchers found that stock “liquidity,” the shares available for trading at reasonable cost, had decreased in stocks that were heavily owned by ETFs. That in turn increased the cost of buying and selling the individual underlying shares, as reflected in the spread between bid and ask prices offered by traders. A wider bid-ask spread means higher transaction costs for buyers and sellers. On average, the researchers found, companies with high levels of ETF ownership — defined as 3% or more of a company’s shares — had bid-ask spreads that were 6.4% wider.

That wasn’t all. The researchers also found that stocks with high ETF ownership were more likely to move in response to broad trends rather than to specific information about the companies themselves. Stock-return “synchronicity,” a measure of how much a stock moves in tandem with the market and with other stocks in the same industry, was 45% higher for companies with high ETF ownership.

The researchers found that firms with high ETF ownership were followed by fewer Wall Street analysts and that the number of analysts who followed a stock declined as

the ETF ownership went up. On a technical level, the researchers found that the stock returns at a company with high ETF ownership were also less reliable predictors of the company’s future earnings.

DIVERGING FROM HEDGE FUNDS

One might reasonably wonder: Why would ETFs have a different effect than traditional mutual funds or hedge funds? Those institutions buy and sell huge baskets of shares, too, and many hedge funds are driven by their own robot-like trading algorithms. Yet the study finds that institutional ownership by these funds does not have the same detrimental effect on stock liquidity and pricing efficiency.

Lee says one key difference is the unprecedented appeal of ETFs to uninformed traders. Unlike a traditional mutual fund, which can only be bought once a day, an ETF is structured so that it can be bought and sold all day long — like an individual stock. ETFs are also typically low-cost, tax-efficient, and offered in small enough units to appeal to small investors. For these reasons, they are particularly attractive to uninformed traders who would otherwise trade the underlying component securities.

Lee’s immediate concern is that ETFs will dumb down financial markets by reducing the benefits of hunting for cutting-edge information and insight. If that happens, stock prices will become less accurate barometers of corporate prospects.

Lee also has longer-term concerns. Because of the way ETFs are structured, they provide an easy way of investing in otherwise hard-to-trade assets. The downside is that investors could increasingly bet on an index without buying any actual shares at all — much the way that Wall Street firms began trading “synthetic” mortgage-backed securities that simply mirrored mortgage-market indices.

Lee doesn’t argue that individual investors should abandon ETFs. For people who don’t want to do their own research, ETFs still offer a very inexpensive way to build a diversified and customized portfolio.

“All of this is really good, especially for small investors,” he says. “But we should also recognize that nothing is free and there may be another shoe to drop.” ▲



ECONOMY

Rethinking Whether Startups Are Job Engines

Entrepreneurship can be good for the economy — to a point.

BY LEE SIMMONS

Illustration by Adam Simpson

Everybody wants to be an entrepreneur. The myth of footloose 25-year-olds changing the world while incidentally becoming deliriously rich has intoxicated a generation. And governments are eagerly handing out tax breaks to help them get started. After all, those new companies are engines of economic growth and job creation, right?

Well, *maybe*, says Stanford Graduate School of Business professor George Foster. He suggests that policymakers and would-be tycoons alike could do with a sobering belt of reality. In a multi-country study, he finds that most startups never take off — and among those that do, setbacks destroy a sizable share of the employment and revenue gains in the sector.

“Most of the stories you hear about startups have a very glossy ring,” Foster says. “They talk about all the new jobs created and all these great experiences. It’s always this hockey-stick graph of continuous growth and happily-ever-after. My experience with early-stage companies — and what I’ve heard from all the many entrepreneurs that visit Stanford — is that there’s a lot of carnage, and even the most successful CEOs have a roller-coaster existence. So I wanted to do a systematic study and see what’s really going on.”

SPUTTERING ENGINES

Foster and his collaborators gathered data on more than 158,000 startups worldwide, tracking each company for five years. What they found is that while some young firms enjoy significant revenue and job growth, those gains are substantially offset by losses in other firms. Among companies in their fifth year, for example, total job destruction — declines in headcount among retrenching companies — amounted to 65% of all the new jobs created in that year.

And that estimate on the debit side of the ledger probably understates the bloodshed. It doesn’t count jobs lost in startups that went belly-up or jobs cannibalized when startups take market share from incumbent firms, what economist Joseph Schumpeter called “creative destruction.”

The upshot, Foster says, is that the economic contribution of the early-stage sector, particularly in terms of employment, is much smaller than commonly assumed. “Politicians keep talking about gross job creation. When I say that net job creation is a better measure, they either look at me with a blank stare or they don’t want to hear it.”

They need to hear it though, because these findings point to a different policy approach, focused not on increasing the number of startups (which may result in

companies being founded that never should have been) but on improving their success rate. “To me, one of the big messages is that public policy needs to be more oriented to sustain the scaling of ventures,” Foster says.

Indeed, the numbers show that revenue and job destruction rise as companies age from three to five years, suggesting that promising businesses often have trouble making the transition out of startup mode. “If you’ve gone to 200 or 300 employees in a few years, you’re probably stretching the limits of management systems and executive mindshare,” Foster says. “If you don’t get a scalable infrastructure in place, you can get derailed and plummet very, very fast.”

But then, most entrepreneurs would love to have the problem of managing growth. Among five-year-old firms, the top-performing 10% provide roughly 80% of gross revenue and job creation, the study shows. An even smaller percentage account for most of the declines — because, as Foster points out, you can lose ground only if you’ve previously gained ground. “The majority of startups start small and stay small, so there’s nothing to destroy.”

He emphasizes that the study’s findings on early-stage companies are consistent across countries — the data set covers 10 developed nations in Europe and Asia (but not the United States, due to weaker reporting requirements) — and across industries. The numbers vary, but the patterns are the same no matter how you slice the data: “There is revenue and job creation, but it comes from a relative handful of firms, and there’s a lot of destruction going on at the same time,” Foster says.

“If you don’t get a scalable infrastructure in place, you can get derailed and plummet very, very fast.”

SNAKES AND LADDERS

Another common myth about startups is that good ideas are rewarded with consistent year-on-year growth. No doubt that's why so many first-time entrepreneurs have those hockey-stick graphs in their pitch deck, anticipating launch as something like a jetliner taking to the sky. In reality, Foster says, continuous growth is more the exception than the rule in young companies.

The researchers looked at each of the 158,000 startups in the sample and classified their annual revenue and job growth in years three, four, and five as either positive, negative, or unchanged. They found that 64% of all firms — nearly two-thirds — had at least one year of actual revenue decline. On employment the most common trajectory in years three to five was zero job creation. Among firms that did add jobs in any given year, fewer than half added any more the following year. Only 8% increased headcount in all three years.

“That hockey-stick world is a fantasy,” Foster says. “The reality for most startups is a lot of jarring ups and downs, more like a high-speed game of snakes and ladders.”

KILLING THE ROMANCE

But is there anything wrong with a little naïve optimism? “Romanticizing it does no one any good,” Foster says. “Building a viable business is brutally hard. It takes enormous perseverance to drive through to success, and even then so much is beyond your control — even great ideas may fail. At least if you're going into it with your eyes open, your chances are better.”

For one thing, he says, entrepreneurs must be alive to potential dangers. “You may have created an exciting new market and face little competition at first.

Well, big powerful companies are going to see that and try to take it away from you. A little early success makes you the bull's-eye, so you better be ready with a plan.”

There's also a personal reckoning to be made, and here it's equally crucial to be realistic, Foster says. “The life of an entrepreneur isn't for everyone. There are personalities who can handle the roller coaster; for others, taking on that level of risk and stress isn't good for them, it isn't good for their families, and in the end it isn't good for the firm.”

There's no question that building your own business can be enormously rewarding. And for policymakers, encouraging dynamic new ventures is smart economic strategy — though perhaps more for bubbling up innovative ideas than as a sort of jobs program 2.0, as it's often sold.

But we can improve the prospects for sustained success, Foster says, by starting with a healthy respect for the hill to climb: “Inspired ambition combined with a grounded understanding of the challenges and possible ways of overcoming them is a great pairing for an entrepreneur.” ▲

George Foster is the Konosuke Matsushita Professor of Management at Stanford GSB and the director of the Executive Program for Growing Companies.



8%

Percentage of companies that increased their headcount in their third to fifth years

SOCIETY

Is Affordable Housing Good for the Neighborhood?

Results are mixed when it comes to affecting home prices and diversity.

BY SHANA LYNCH

In a lawsuit filed in 2008 and elevated to the U.S. Supreme Court, nonprofit Inclusive Communities Project sued the Texas Department of Housing and Community Affairs, arguing it supported racial segregation by allocating too many housing credits to develop affordable housing in poorer, predominantly black neighborhoods. The high court sided with the nonprofit in June 2015, returning the case to the lower court.

But research shows that the housing department may have been on to something. A study by Stanford GSB professors Rebecca Diamond and Timothy McQuade shows that affordable housing development could be an effective policy to help revitalize and integrate low-income areas, Diamond says.

The two studied affordable housing projects' impact on the surrounding neighborhoods over a 10-year span and found that new projects in poorer neighborhoods increased surrounding home prices and reduced crime, while new projects in wealthier neighborhoods drove down home prices and decreased racial diversity.

"Perhaps counterintuitively, if you build in high-minority areas, it will actually attract higher-income homebuyers as well as non-minority homebuyers to the area,"

McQuade says. "It can actually achieve to some extent a goal of integration."

THE RESEARCH

Analyzing the effects of affordable housing holds merit, considering what Americans spend on these programs. Each year, U.S. federal, state, and local governments drop more than \$97 billion on housing assistance. One such program, the Low Income Housing Tax Credit (or LIHTC) provides developer incentives to build affordable housing. Launched in 1986, the program has funded about a fifth of multifamily developments. Diamond and McQuade analyzed the impact these LIHTC projects had on surrounding areas, by pulling data on housing transactions, as well as homebuyer race and income information. They were able to study about 16 million transactions from 15 states around 7,098 LIHTC sites.

In low-income neighborhoods, where median incomes fell below \$26,000, the researchers saw home values appreciate 6.5% within a tenth of a mile of an LIHTC project. Crime rates also fell, and more non-minorities moved into the area, increasing diversity. In higher-income neighborhoods, those with median incomes above \$54,000, housing prices declined approximately

2.5% within a tenth of a mile of a project and segregation increased (the researchers noticed no crime impact).

Why the difference? In many cases, a new building in a poorer neighborhood created a "sort of revitalization effect," Diamond says. "These areas don't tend to have a lot of investment in them. It makes the neighborhood appear more desirable." That, in turn, drew more homebuyers, particularly non-minorities.

On the flip side, wealthier neighborhoods didn't see affordable housing as an attractive amenity. And that impact rippled through the area years after construction started.

"In the high-income areas, you saw a strong housing price drop very locally, and then it radiated outward over time," McQuade says. The price effects remain even after 10 years, Diamond adds.

Furthermore, by aggregating the housing price changes in transactions following a new development, Diamond and McQuade were able to determine how much a project was worth to the surrounding neighborhood — in other words, how much more people were willing to pay to live close to the site or, conversely, how much they'd be willing to lose to move away from it. Their analysis revealed that an LIHTC project in a low-income region was worth about \$116 million to the immediate surrounding neighborhood. In higher-income areas, the new building led to a loss of approximately \$17 million.

The researchers say that examining neighborhood impact is only one way to analyze affordable housing. Another method would consider personal impact to tenants. For example, another study found moving children from poor neighborhoods to higher-income ones increases their future earnings.

"In terms of the actual people who live in these buildings, it could be better to move them to better neighborhoods," McQuade says. "What we're saying is that the government needs to think seriously about the tradeoff of how much we are benefiting the tenants of affordable housing versus what the effects are on the local neighborhood." ▲

Rebecca Diamond is an assistant professor of economics at Stanford GSB. Timothy McQuade is the Philip F. Maritz Faculty Scholar for 2015–16.



BOXES 'N'
CRATES

JOE ZOOMER
& SONS

U-DO-IT

RENT A
MOVE

TURBO
MOVERZ →

ZIPCO

whistle
move.

MEGA
TRUCK

Home 2
Home

INVENTION

Shaping Tomorrow's Breakthrough Materials

**A young company brings big data
to materials discovery.**

BY IAN CHIPMAN

At first blush, a company like Tesla Motors might not appear to have much in common with a company like Dow. But to materials scientists like Bryce Meredig and Greg Mulholland, both 2014 graduates of Stanford GSB, those two companies — and more like them — are simply in the business of inventing and producing materials that the world has never seen before.

In 2013, Meredig and Mulholland co-founded Citrine Informatics, which now has five employees and plans to expand. Citrine's software combines big-data analysis with advanced computer learning to help those companies with every phase of their materials development, from initial R&D through product design to manufacturing at scale. It's a long, fraught process, and often a company doesn't know even where to start. "A lot of companies don't know what materials they need," Mulholland says. "They just know they need to solve a problem."

That space of uncertainty presents an opportunity for Citrine, which has raised an undisclosed amount of funding from investors, including Innovation Endeavors and XSeed Capital. "Materials problems are everywhere, and they're some of the hardest problems that humanity faces," says Mulholland. "We think we can make them much easier."

**Bryce Meredig and Greg Mulholland
cofounded Citrine Informatics
in 2013, a year before earning their
MBAs from Stanford GSB.**

Photograph by Jason Henry

GREG MULHOLLAND
AND BRYCE MEREDIG
Materials enable
the future.



A DATA-DRIVEN APPROACH

The amount of advanced materials work that goes into everything from the smartphones in our pockets to the aircraft in the sky is tremendous. Mulholland witnessed all the pain points of materials development as an engineer and then director of operations at Kyma Technologies, a company that specializes in growing and fabricating advanced semiconductor materials. From trying to understand what a material is doing on a fundamental level through having it perform as expected to producing it at scale, “it turns out that making things is really hard,” he says.

Citing a study by the National Academy of Sciences, he estimates that, due to the onerous cycles of testing and failing and tweaking and retesting, the process of developing a material and being able to insert it into a product takes about 20 years. “It’s one of the slowest product pipelines on Earth,” he says.

Citrine’s approach is to use data to dramatically accelerate the entire pipeline. There are huge amounts of data available about how various materials perform under different circumstances, but they all live in different places and in different guises.

Citrine’s algorithms mine and aggregate all the available data — from academic literature to public databases to a company’s own proprietary research and documentation. The models can then identify a list of candidate materials with the necessary properties for a product — as well as predict the most likely ways that those materials might fail, giving the company a chance to ameliorate problems during the R&D process.

“What we do represents a big change in the status quo,” Meredig says. “A lot of the scientists in these industries don’t have a natural inclination to turn to software to solve these problems.”

Citrine first put its technology to work in a pilot program with researchers at UC Santa Barbara to convert waste heat into

electricity. They ingested data about a wide variety of known thermoelectric materials and applied analytic engines to identify new candidate materials that were well outside of the list of usual suspects. The researchers made one of those materials and found that it worked. “They said never in a million years would they have thought about it on their own,” Mulholland says.

While Citrine’s early success has come in the discovery side, mostly dealing with thermoelectrics and solid-state lighting, the company is now focusing more on so-called smart manufacturing. “That’s a huge opportunity,” Meredig says. “Helping companies use their materials data to optimize manufacturing is the direction we’re headed in now.”

In fact, Mulholland says, the future of manufacturing lies in promising technologies like 3D printing. Look forward 50 years, and 3D printing will be a major component of everything from the products we use every day to advances in aerospace technology. And yet, one of the major challenges in taking 3D printing to the next level will be in understanding how those printed materials will perform in extreme conditions. A data-driven approach like Citrine’s could help clear those hurdles.

MATERIALS FOR SUSTAINABLE ENERGY

Citrine Informatics received an early seed grant from Stanford’s TomKat Center for Sustainable Energy, which provides grants and mentorship to develop renewable energy technologies and policies. While

the potential applications for Citrine’s platform are broad — Mulholland estimates that at least a third of the companies on the S&P 500 either make or rely on advanced materials — the work is particularly relevant in advancing the mission of the TomKat Center.

“The biggest energy issues facing us today are materials issues,” says Mulholland. Look at the batteries being touted by Tesla, he says. They are a pure materials problem, literally three materials layered on top of each other in an interesting way. Solar energy has a significant materials component, from the composition of the panels themselves to making the manufacturing process more efficient for U.S. firms to better compete with market-leader China. Even considering the realm of fossil fuels, combustion is more efficient the hotter that fuels burn, so high-temperature alloys can have a significant impact in reducing the amount of carbon emissions. Even problems like California’s water shortage can be tackled by novel materials, Meredig says, as advanced membranes could unlock innovative technologies for seawater desalination.

Energy consumption, water usage, and the next generation of devices is being led by the materials that enable them, say Meredig and Mulholland. And while there is often a great deal of headline-grabbing when a promising new material pops up — just look at graphene — the team at Citrine is focused on enabling the work involved in going from a cool idea to a scalable product.

“Materials development can be such a boon for society, but there is also a tendency to chase bright, shiny objects,” Meredig says. “What we care about as a company is putting materials into a car, putting new solar materials on people’s roofs. Until that happens, we haven’t succeeded.” ▲

The next generation of devices is being led by the materials that enable them.



KANYE WEST Big personalities can help startups come up with better ideas.

PERSONALITY

Why You Should Have an Extrovert on Your Team

Communication styles make a difference within business networks.

BY ELIZABETH MACBRIDE

The benefits of personal networks in business are well documented, but do personality types help predict the ultimate success of those networks? New research from Stanford Graduate School of Business based on work in India says yes. Moreover, it's having extroverts in the network that eventually produces better ideas for startups and teams.

The researchers examined the experiences of more than 100 entrepreneurs who attended a June 2014 boot camp in New Delhi. Networks of peers, the researchers found, help entrepreneurs generate ideas, find talented cofounders, and gain the skills they need to scale businesses.

Networks, the research also suggests, could be especially vital to develop entrepreneurship in emerging markets, where entrepreneurs don't yet know the norms of startup life. A rich network can inform an entrepreneur of those norms.

Sharique Hasan is an associate professor of organizational behavior at Stanford GSB.

“These results provide strong evidence that peer interaction increases the quality of individual ideas.”

“By talking to people, you get a view and perspective that others don’t have,” says Sharique Hasan, associate professor of organizational behavior at Stanford GSB. His co-researcher was doctoral student Rembrand Koning. “You can grasp onto an idea to design around, to elevate you out of your very narrow well. You can see a broader perspective.”

The work shows that matching people with specific traits — extroversion and openness — makes networking easier and eventually produces better ideas. It also shows that networking helps cofounders find each other by removing some of the uncertainty around pairing up in advance and that entrepreneurs use information gained during networking to find talented cofounders. So far, two papers have been produced; a third is planned.

The researchers brought together the entrepreneurs for three weeks during a boot camp supported through a research grant from Seed, the Stanford Institute for Innovation in Developing Economies.

To examine how the traits of openness and extroversion affected the quality of ideas by individuals and in teams, the researchers assigned the boot camp participants to come up with concepts for startups in the Indian wedding industry, estimated to be worth around 2.25 trillion Indian rupees, or \$38 billion, annually. On November 27, 2011, for instance, more than 60,000 weddings took place in New Delhi, because the date was considered auspicious. “Even on less auspicious days, Indian weddings are big, fun, complex, loud, colorful, and most of all expensive,” the researchers wrote.

The ideas got better from people, especially those open to new ideas, after they were paired with extroverted people. “These results together provide strong evidence that peer interaction — namely, interaction with extroverted peers — increases the quality of individual ideas. Further, we find evidence that this effect is larger for individuals more open to experience,” the researchers wrote.

To determine how networking affects the quality of the cofounders that entrepreneurs find, the researchers used data from the application process and weekly 360-reviews to generate measures of entrepreneurs’ underlying talent and interpersonal ability. Then they set up randomized interactions between entrepreneurs and tracked them. Just before the third week, they asked entrepreneurs’ preferences for whom they wanted to work with. The researchers found, first, that entrepreneurs had a greater preference simply for working with someone they’d worked or had any interaction with before. More interestingly, the researchers found that entrepreneurs learned different things about potential cofounders through the three types of interactions created by the researchers — direct collaborations, indirect relations, and short conversations. The researchers found that direct collaborations — working intensively on a team together — resulted in the most information about potential cofounders. However, they found that short conversations led to the entrepreneurs learning only about a potential cofounder’s ability, but not interpersonal skills. Conversely, indirect connections (that is, having a shared friend or acquaintance) led to more information about a potential cofounder’s interpersonal ability, but not talent.

The researchers plan to track the results of the entrepreneurs who have gone on to join or found fast-growing startups.

Hasan says the work produces some ideas for people who want to help entrepreneurs in emerging markets. Organizations that want to help promote networks could focus on creating public goods and places where networking events can be held and on bringing people together. They can support data and research in the field, to show what works and what doesn’t. Networks that help raise awareness and identify role models are effective, he says.

“People can model themselves after stories of successful entrepreneurs,” he says. “It’s about getting more people interested in becoming entrepreneurs.” ▲



CLEAN LIGHT “Is a product needed?” is the first question companies should ask.

IMPACT

Four Questions to Ask About Your Company

You need more than a good idea to change the world.

BY JONATHAN XAVIER

When Kevin Starr was put on the board of a foundation set up to honor the memory of his late mentor, the physician and philanthropist Rainer Arnhold, he admits he didn't know much about philanthropy. Although he'd worked with Arnhold to bring medicine to where it was badly needed in the developing world, Starr's work was as a doctor, not as a donor. But as managing director of the newly minted Mulago Foundation, he was eager to learn all that he could.

Coming from the world of medicine, where everything is rigorously tested for effectiveness before it ever gets to market, what Starr learned surprised him. He saw a lot of money flowing toward good causes, but very little effort spent trying to figure out whether it was actually going to have a big impact.

“We operate in a dysfunctional market. Often there is no market, in fact,” he said. “We just don't have a funding environment where resources flow efficiently to organizations that are successful. Funding doesn't fall on results.”

Mulago aims to be different. It operates more closely to a venture capital firm than a traditional foundation. Like a VC, Mulago is looking to allocate its resources in such a way as to give the best possible return, albeit measured in impact on the causes it supports rather than cash.

Also like a VC, Mulago offers the organizations it works with ongoing support, rather than making the one-time grants that many private foundations favor. So long as an organization keeps performing, Mulago will keep supporting it with unrestricted funding.

Kevin Starr directs the Mulago Foundation, which funds early-stage social entrepreneurs devoted to impact in developing countries, and the Rainer Arnhold Fellows Program.

That's also led Mulago to ignore the normal grant writing process, which Starr says is a waste of time. Mulago doesn't accept applications. Instead, it relies on its network and its judgment to find the opportunities to do the most good.

To date, the foundation has funded more than 50 social entrepreneurship projects, including VillageReach, LivingGoods, and Root Capital. The foundation had about \$154 million in gross assets in 2013, according to its most recent IRS filing, and makes about \$7 million in grants annually.

Which is all well and good, but it raises an interesting question: How does one know that an organization is going to have an impact?

To determine whether an organization is worth funding, Starr said the nonprofit has developed a deceptively simple test. There are just four short questions, but they all have to be answered with a "yes":

1. Is it needed?
2. Does it work?
3. Will it be used?
4. Will it reach those who need it most?

As with most things that seem simple, there's a lot of hidden complexity in these questions. Here Starr explains what they mean and why so many organizations come up with the wrong answer. The following interview has been edited for length and clarity.

When you're answering your first question, "Is it needed?" you say social entrepreneurship organizations must have a concise mission statement. What are the things that make a good

"I am constantly urging people to take their prototypes into the field to observe them being used."

mission statement? Well, first off, just having one goes a long way. You'd be surprised how many organizations fail to come up with one or come up with one that's not specific or which doesn't point to anything at all important.

That said, having clarity about an outcome and a target population is everything. What we find is that a good mission statement has a clear success or failure statement.

Also, a mission statement is about "what" rather than "how." Your mission statement might be "lower the mortality rate for children under 5 in Liberia." And there are probably a lot of organizations doing that in a number of different ways, but they're all usefully sharing the same mission statement.

Is answering "Does it work?" a big hurdle that a lot of organizations face? How common is it for someone to come to you with an idea that doesn't work?

Oh, it happens pretty often. The most common reasons it doesn't work is they didn't understand the specifications as well as they thought they did in the first place, or they didn't know enough about the user.

But it can also be a question of how you define "work."

I'll give you an example. There was this thing called the Soccket. It was a soccer ball you kicked around and it stored up the energy and then you could plug in a lamp and have light. And in one sense it works: It does create light.

But I would ask, does it work if it just puts out a few watts of very localized power? What does it mean to work? What is a light for?

Your next question is "Will it be used?" How can you tell if something is going to be used before it's in the field? You can't. I am constantly urging people to take their prototypes into the field to observe them being used for an extended period of time and then to do that again once they have what they think is a finished product.

A good field trial means you have a good understanding of who will use something. It means you understand how they will use it. That means you know all the ingenious ways they'll use it wrong, that you've seen all the ways people jury-rig and break things. And it means you'll have done it for however long the lifetime of your product is supposed to be. If you have something that's supposed to last two years, but you don't know if people will even still be using it two years from now, you didn't do a good enough field trial.

That seems very different from the traditional "move fast and break things" ethos of Silicon Valley startups. Well,

that's an example of a company trying to make money when it's really still in the R&D stage. They can do it because the stakes are low. Poor people aren't spending everything they have on it, they can quickly iterate because they're right in the middle of their target market, and there's a fundamental behavior of sales that helps guide them to a real market. It's very different from social entrepreneurship. I mean, even down to something as fundamental as getting your product to your target.

Hence your fourth question: "Will it reach those who need it most?" Yeah. It's really three questions: How do you actually get it to where your customers are? What distribution channels do you work with to get it in front of them? And then how do you sell it?

So much of that is just knowing who your real customers are. For example, teams that want to distribute medical devices in the developing world often make the mistake of asking doctors if they would want the thing and if they would buy the thing.

And of course the doctors will say yeah, but the truth is they don't buy anything. The customer is actually some guy in an office somewhere that makes that decision for them.

That doesn't seem that different from a traditional business — you have to know whom you're actually selling to before you can come up with a strategy that works.

Yes. But what makes it that much harder is your customer is often someone with very limited money who's trying to stretch it out in the most efficient, effective way possible. You're marketing to people with no disposable income and a lot to lose. It's basically the most conservative buyer on Earth when it comes to spending choices.

And you're competing with beer. I mean, that sounds a little weird, but I'm using beer here as a metaphor for a lot of things. Because when people get money, it's true, they spend it on health care, they spend it on better food, they spend it on water, but they also spend it on parties. They spend it on cultural events, entertainment, and celebrations. Even when you're marketing to poor people, you're going to have to compete for their attention. ▲

EXCHANGE

SOME FINAL THOUGHTS ON INNOVATION
EDITED BY NATALIE WHITE

“I like to
immerse
myself in the world around me and think
about what is missing.”
— **Leslie Silverglide**, cofounder of Wello
and 2011 graduate of Stanford GSB,
for *Insights* by Stanford Business
<http://stanford.io/1CsHVAE>

“Everyone thinks they innovate,
but most of the time it’s just
improvement.”
— **Ron Johnson**, former CEO of J.C. Penney,
during a *View From the Top* talk
<http://stanford.io/1sonklv>

“**Great**
ideas usually happen when
two old ideas meet together for the first time.”
— **Stefanos Zenios**,
professor at Stanford GSB,
for *Insights* by Stanford Business
<http://stanford.io/1ZLYpiC>

“The key to successful innovation is
persistence.

Keeping your focus
over time builds deep knowledge.”
— **William Barnett**, a Stanford GSB professor,
for his blog *Bill Barnett on Strategy*
<http://stanford.io/1hIxDU8>

“It shouldn’t be a question of if there’s going to be
challenges.
It’s just a question of what challenges
are going to show up this week.”
— **Brian Helmick**, 2005 graduate of
Stanford GSB, for *Insights* by Stanford Business
<http://stanford.io/1ihnvC9>

“I talk to many people and
test
my ideas on others.”
— **Susan Akbarpour**, founder of
Mavatar and 2010 graduate
of the MSx program at Stanford GSB,
for *Insights* by Stanford Business
<http://stanford.io/1RtWtpJ>

“We can’t use old methods and expect
new results.”
— **Fahd Al-Rasheed**, Group CEO of Emaar and 2005
graduate of Stanford GSB,
during a *Global Speaker Series* talk
<http://stanford.io/1FsziSV>

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The Takeaway



Are Earnings Reports Necessary?

The hoopla over earnings season appears to be justified: Investors really do pay attention when companies turn in their earnings statements.

—Maureen McNichols

THE ESSENTIALS

FIVE LESSONS FROM OUR STORIES ON INNOVATION

EDITED BY LILY B. CLAUSEN

Embrace Criticism

Creativity and criticism are like the Chinese principles of yin and yang: two complementary forces that interact to form a greater whole.

—Jonathan Bendor



Measure What Matters

Scoreboards are used extensively — and never more effectively than in today's wired world, where one can pull information on a smartphone for real-time feedback.

—Joel Peterson



Get Out of the Grind

Jobs often feel more fixed than they really are and job crafting can help you view your job as a set of building blocks that can be creatively and flexibly redesigned.

—Justin Berg



Failure Matters

Innovation is an unknown that can be discovered only through trial and error.

—Baba Shiv





Rebecca Diamond

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Jonathan Bendor

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