

MIT Sloan
Management Review

**SPECIAL
COLLECTION**



SPRING 2017

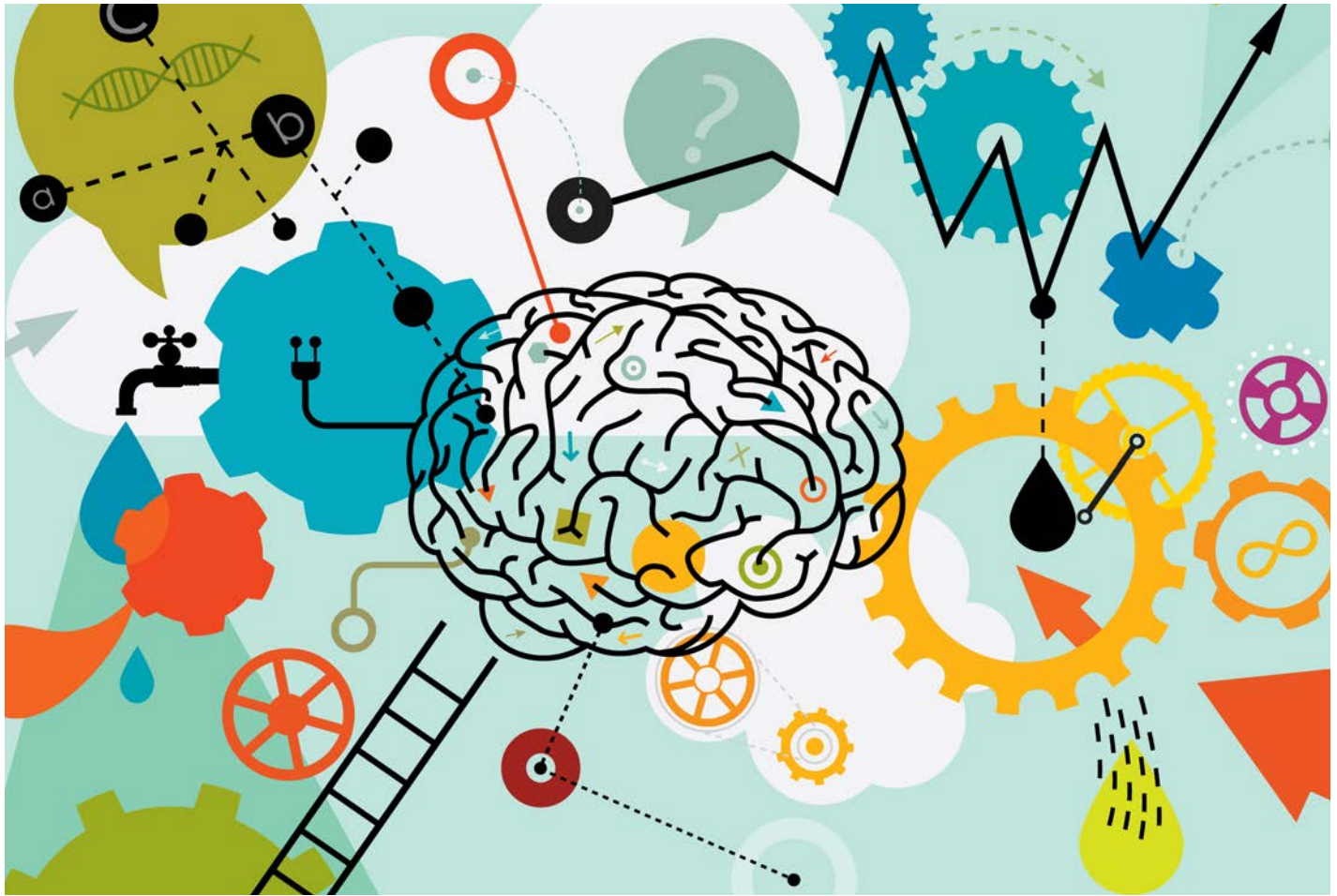
LEADERSHIP

How to Make Your Company Smarter

How managers are making both
themselves and their organizations
smarter and more effective.

Brought to you by:

 **Columbia Business School**
AT THE VERY CENTER OF BUSINESS™
EXECUTIVE EDUCATION



How to Make Your Company Smarter

HOW WISELY DO senior executives in your company make decisions? The answer to that question could prove pivotal to the organization's future. "In the knowledge economy, strategic advantages will increasingly depend on a shared capacity to make superior judgments and choices," write Paul J.H. Schoemaker and Philip E. Tetlock in their article, "Building a More Intelligent Enterprise."

Making good decisions is essential to business success, but so is effective problem-solving. In "The Most Underrated Skill in Management," Nelson P. Repenning and Don Kieffer of the MIT Sloan School of Management team up with Todd Astor of Massachusetts General Hospital and Harvard Medical School to explain how to improve an organization's ability to formulate and solve problems. Finally, in "The Smart Way to Respond to Negative Emotions at Work," Christine M. Pearson of Thunderbird School of Global Management offers guidance on tackling thorny emotions that, if left to fester, can lead both executives and employees to act in ways that, well, just aren't smart. We hope you'll find all three of these articles valuable and thought-provoking.

SPECIAL REPORT

2
Building a More Intelligent Enterprise

12
The Most Underrated Skill in Management

22
The Smart Way to Respond to Negative Emotions at Work

Building a More Intelligent Enterprise

In coming years, the most intelligent organizations will need to blend technology-enabled insights with a sophisticated understanding of human judgment, reasoning, and choice. Those that do this successfully will have an advantage over their rivals.

BY PAUL J.H. SCHOEMAKER AND PHILIP E. TETLOCK

TO SUCCEED IN the long run, businesses need to create and leverage some kind of sustainable competitive edge. This advantage can still derive from such traditional sources as scale-driven lower cost, proprietary intellectual property, highly motivated employees, or farsighted strategic leaders. But in the knowledge economy, strategic advantages will increasingly depend on a shared capacity to make superior judgments and choices.

Intelligent enterprises today are being shaped by two distinct forces. The first is the growing power of computers and big data, which provide the foundation for operations research, forecasting models, and artificial intelligence (AI). The second is our growing understanding of human judgment, reasoning, and choice. Decades of research has yielded deep insights into what humans do well or poorly.¹ (See “About the Research,” p. 30.)

In this article, we will examine how managers can combine human intelligence with technology-enabled insights to make smarter choices in the face of uncertainty and complexity. Integrating the two streams of knowledge is not easy, but once management teams learn how to blend them, the advantages can be substantial. A company that can make the right decision three times out of five as opposed to 2.8 out of five can gain an upper hand over its competitors. Although this performance gap may seem trivial, small differences can lead to big statistical advantages over time. In tennis, for example, if a player has a 55% versus 45% edge on winning points throughout the match, he or she will have a greater than 90% chance of winning the best of three sets.²

To help your company gain such a cumulative advantage in business, we have identified five strategic capabilities that intelligent enterprises can use to outsmart the competition through better judgments and wise choices. Thanks to their use of big data and predictive analytics, many companies have begun cultivating some of these capabilities already.³ But few have systematically integrated the power of computers with the latest understanding of the human mind. For managers looking to gain an advantage on competitors, we see opportunities today to do the following:

1. Find the strategic edge. In assessing past organizational forecasts, home in on areas where improving subjective predictions can really move the needle.



THE LEADING QUESTION

How can companies make smarter business decisions?

FINDINGS

- ▶ Small improvements in subjective predictions can lead to big strategic advantages.
- ▶ Even a small amount of training about decision-making biases can help managers create better forecasts.
- ▶ Few companies have systematically integrated the power of computers with the latest understanding of the human mind.



2. **Run prediction tournaments.** Discover the best forecasting methods by encouraging competition, experimentation, and innovation among teams.
3. **Model the experts in your midst.** Identify the people internally who have demonstrated superior insights into key business areas, and leverage their wisdom using simple linear models.
4. **Experiment with artificial intelligence.** Go beyond simple linear models. Use deep neural nets in limited task domains to outperform human experts.
5. **Change the way the organization operates.** Promote an exploratory culture that continually

looks for better ways to combine the capabilities of humans and machines.

1. Find the Strategic Edge

The starting point for becoming an intelligent enterprise is learning to allocate analytical effort where it will most pay off — in other words, being strategic about which problems you decide to tackle head-on. The sweet spot for intelligent enterprises is where hard data and soft judgment can be productively combined. On one side, this zone is bounded by problems that philosopher Karl

Popper dubbed “clocklike” because of their deterministic regularities; on the other side, it is bounded by problems he dubbed “cloudlike” because of their uncertainty.⁴

Clocklike problems are tractable and stable, and they can be defined by past experience (as in actuarial tables or credit reports). Statistical prediction models can shine here. Human judgment operates on the sidelines, although it still plays a role under unusual conditions (such as assessing the impact of new medical advances on life expectancies). Cloudlike problems (for example, assigning probabilities to global warming causing mega-floods in Miami in 2025 or ascertaining whether intelligent life exists on other planets) are far murkier. However, what’s most critical in such cases is the knowledge base of experts and, more importantly, their nuanced appreciation of what they do and don’t know. The sweet spot for managers lies in combining the strengths of computers and algorithms with seasoned human judgment and judicious questioning. (See “Finding the Sweet Spot.”) By avoiding judgmental biases that often distort human information

leaders to the biases and traps of undisciplined thinking.⁵ However, few companies have been able to transform these insights into game-changing practices that make their business much smarter. Companies that perform data mining remain blissfully unaware of the quirks and foibles that shape their analysts’ hunches. At the same time, executive teams advancing opinions are seldom asked to defend their views in depth. In most cases, outcomes of judgments or decisions are rarely reviewed against the starting assumptions. There is a clear opportunity to raise a company’s IQ by both improving corporate decision-making processes and leveraging data and technology tools.

2. Run Prediction Tournaments

One promising method for creating better corporate forecasts involves using what are known as prediction tournaments to surface the people and approaches that generate the best judgments in a given domain. The idea of a prediction tournament is to incentivize participants to predict what they think will happen, translate their assessments into probabilities, and then track which predictions proved most accurate. In a prediction tournament, there is no benefit in being overly positive or overly negative, or in engaging in strategic gaming against rivals. The job of tournament organizers is to develop a set of relevant questions and then attract participants to provide answers.

One organization that has used prediction tournaments effectively is the Intelligence Advanced Research Projects Activity (IARPA). It operates within the U.S. Office of the Director of National Intelligence and is responsible for running high-risk, high-return research on how to improve intelligence analysis. In 2011, IARPA invited five research teams to compete to develop the best methods of boosting the accuracy of human probability judgments of geopolitical events. The topics covered the gamut, from possible Eurozone exits to the direction of the North Korean nuclear program. One of the authors (Phil Tetlock) co-led a team known as the Good Judgment Project,⁶ which won this tournament by ignoring folklore and conducting field experiments to discover what really drives forecasting accuracy. Four key factors emerged as critical to successful predictions:⁷

ABOUT THE RESEARCH

This article combines insights from strategy, organization theory, human judgment, predictive analytics, and management science. The ideas described in several of the five methods are based on what we learned in working with companies, as well as from our involvement in a geopolitical and economic forecasting tournament that ran from 2011 through 2015, funded by the Intelligence Advanced Research Projects Activity (IARPA). This tournament required the entrants to develop probabilistic forecasts, which were then scored based on actual outcomes. Five academic research teams recruited a total of 20,000 forecasters to participate in four yearly rounds of the IARPA tournament. The official performance metric for each team was its cumulative Brier score, a measure that assesses probabilistic accuracy. The scores were compared across questions, teams, and experimental conditions. Phil Tetlock and Barbara Mellers, the I. George Heyman University Professor at the University of Pennsylvania, led the Good Judgment Project team, with Paul Schoemaker serving as one of several advisers. This team won the competition.

processing and by recognizing the precarious assumptions on which statistical models sometimes rest, the analytical whole can occasionally become more than the sum of its parts.

Creating a truly intelligent enterprise is neither quick nor simple. Some of what we recommend will seem counterintuitive and requires training. Breakthroughs in cognitive psychology over the past few decades have attuned many sophisticated

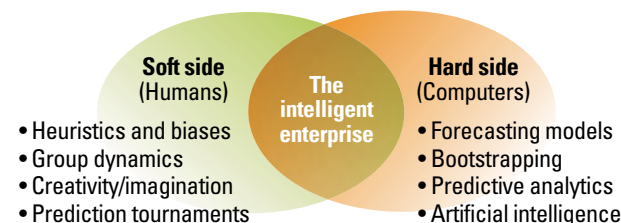
1. Identifying the attributes of consistently superior forecasters, including their greater curiosity, open-mindedness, and willingness to test the idea that forecasting might be a skill that can be cultivated and is worth cultivating;
2. Training people in techniques for avoiding common cognitive biases such as overconfidence and overweighting evidence that reinforces their preconceptions;
3. Creating stimulating work environments that encourage the best performers to engage in collaborative teamwork and offer guidance on how to avoid groupthink by practicing techniques like precision questioning and constructive confrontation;
4. Devising better statistical methods to extract wisdom from crowds by, for example, giving more weight to forecasters with better track records and more diverse viewpoints.⁸

Based on our experience, the biggest benefit of prediction tournaments within organizations is their power to accelerate learning cycles. Companies can accelerate learning by adhering to several principles.

- The first principle involves careful record keeping. By keeping accurate records, it is harder to misremember earlier forecasts, one's own, and those of others. This is a critical counterweight to the self-serving tendency to say "I knew it all along," as well as the inclination to deny credit to rivals "who didn't have a clue."
- Second, by making it difficult for contestants to misremember, tournaments force people to confront their failures and the other side's successes. Typically, one's first response to failure is denial. Tournaments prompt people to become more reflective, to engage in a pattern of thinking known as preemptive self-criticism; they encourage participants to consider ways in which they might have been deeply wrong.
- Third, tournaments produce winners, which naturally awakens curiosity in others about how the superior results were achieved. Teams are encouraged to experiment and improve their methods all along.
- Fourth, the scoring in prediction tournaments is clear to all involved up front.⁹ This creates a sense of fair competition among all.

FINDING THE SWEET SPOT

To create a more intelligent enterprise, executives need to leverage the strengths of both humans and computers in order to produce superior judgments. That will require a sophisticated understanding of both human decision making (the "soft side") and evolving technology-enabled capabilities (the "hard side").



Until recently, there was little published research that training in probabilistic reasoning and cognitive debiasing could improve forecasting of complex real-world events.¹⁰ Academics felt that eliminating cognitive illusions was nearly impossible for people to achieve on their own.¹¹ The IARPA tournaments revealed, however, that customized training of only a few hours can deliver benefits. Specifically, training exercises involving behavioral decision theory — from statistical reasoning to scenario planning and group dynamics — hold great promise for improving managers' decision-making skills. At companies we have worked with, the training typically involves individual and group exercises to demonstrate cognitive biases, video tutorials on topics such as scenario planning, and customized business simulations.

3. Model the Experts in Your Midst

Another way to create a more intelligent enterprise is to model the knowledge of expert employees so it can be leveraged more effectively and objectively. This can be done using a technique known in decision-making research as bootstrapping.¹² An early example of bootstrapping research in decision psychology involved a study that explored what was on the minds of agricultural experts who were judging the quality of corn at a wholesale auction where farmers brought their crops.¹³ The researchers asked the corn judges to rate 500 ears of corn to predict their eventual prices in the marketplace. These expert judges considered a variety of factors, including the length and circumference of each ear, the weight of the kernels, the filling of the kernels at the tip, the blistering, and the starchiness. The researchers then

created a simple scoring model based on cues that judges claimed were most important in driving their own predictions. Both the judges and the researchers expected the simple additive models to do much worse than the predictions of seasoned experts. But to everyone's surprise, the models that mimicked the judges' strategies nearly always performed better than the judges themselves.

Similar surprises occurred when banks introduced computer models several decades ago to assist in making loan decisions. Few loan officers believed that a simplified model of their professional judgments could make better predictions than experienced loan officers could make. The sense was that consumer loans contained many subjective factors that only savvy loan officers could properly assess, so there was skepticism about whether distilling intuitive expertise into a simple formula could help new loan officers learn faster. But here, too, the models performed better than most loan experts.¹⁴ In other fields, from predicting the performance of newly hired salespeople to the bankruptcy risks of companies to the life expectancies of terminally ill cancer patients, the experience has been essentially the same.¹⁵ Even though experts usually possess deep knowledge, they often do not make good predictions.¹⁶

When humans make predictions, wisdom gets mixed with "random noise." By noise, we mean the inconsistencies that creep into human judgments due to fatigue, boredom, and other vagaries of being human.¹⁷ Bootstrapping, which incorporates expert judgment into a decision-making model, eliminates such inconsistencies while preserving the expert's insights.¹⁸ But this does not occur when human judgment is employed on its own. In a classic medical study, for instance, nine radiologists were presented with information from 96 cases of suspected stomach ulcers and asked to evaluate them for the likelihood of a malignancy.¹⁹ A week later, the

radiologists were shown the same information, although this time in a different order. In 23% of the cases, the second assessments differed from their first.²⁰ None of the radiologists was completely consistent across their two assessments, and some were inconsistent nearly half of the time.

In fields ranging from medicine to finance, scores of studies have shown that replacing experts with models of experts produces superior judgments.²¹ In most cases, the bootstrapping model performed better than experts on their own.²² Nonetheless, bootstrapping models tend to be rather rudimentary in that human experts are usually needed to identify the factors that matter most in making predictions. Humans are also instrumental in assigning scores to the predictor variables (such as judging the strength of recommendation letters for college applications or the overall health of patients in medical cases). What's more, humans are good at spotting when the model is getting out of date and needs updating.

Bootstrapping lacks the high-tech pizzazz of deep neural nets in artificial intelligence. However, it remains one of the most compelling demonstrations of the potential benefits of combining the powers of models and humans, including the value of expert intuition.²³ It also raises the question of whether permitting more human intervention (for example, when a doctor has information that goes beyond the model) can yield further benefit. In such circumstances, there is the risk that humans want to override the model too often since they will deem too many cases as special or unique.²⁴ One way to incorporate additional expert perspective is to allow the expert (for example, a loan officer or a doctor) a limited number of overrides to the model's recommendation.

A field study by marketing scholars tested the effects of combining humans and models in the retail sector.²⁵ The researchers studied two different



In fields ranging from medicine to finance, scores of studies have shown that replacing experts with models of experts produces superior judgments.

situations: (1) predictions by professional buyers of catalog sales for fashion merchandise, and (2) brand managers' predictions for coupon-redemption rates. Once the researchers had the actual results in hand, they compared the results to the forecasts. Then they tested how different combinations of humans and models might perform the same tasks. The researchers found that in both the catalog sales and coupon-redemption settings, an even balance between the human and the model yielded the best predictions.

4. Experiment With Artificial Intelligence

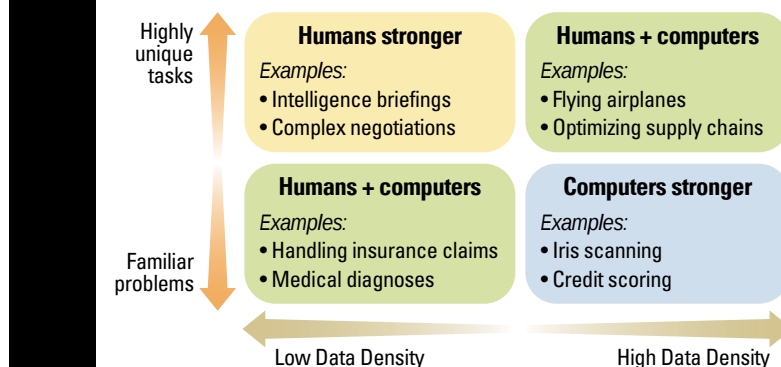
Bootstrapping uses a simple input-output approach to modeling expertise without delving into process models of human reasoning. Accordingly, bootstrapping can be augmented by AI technologies that allow for more complex relationships among variables drawn from human insights or from mining big datasets.

Deeper cognitive insights drove computer modeling of master chess players back in the early days of AI. But modeling human thinking — with all its biases — has its limits; often, computers are able to develop an edge simply by using superior computing power to study old data. This is how IBM Corp.'s Deep Blue supercomputer managed to beat the world chess champion Garry Kasparov in 1997. Today AI covers various types of machine intelligence, including computer vision, natural language comprehension, robotics, and machine learning. However, AI still lacks a broad intelligence of the kind humans have that can cut across domains. Human experts thus remain important whenever contextual intelligence, creativity, or broad knowledge of the world is needed.

Humans simplify the complex world around them by using various cognitive mechanisms, including pattern matching and storytelling, to connect new stimuli to the mental models in their heads.²⁶ When psychologists studied jurors in mock murder trials, for example, they found that jurors built stories from the limited data available and then processed new information to reinforce the initial storyline.²⁷ The risk is that humans get trapped in their own initial stories and then start to weigh confirming evidence more heavily than

THE COMPARATIVE ADVANTAGES OF HUMANS AND COMPUTERS

Whether humans or computers have the upper hand depends on many factors, including whether the tasks being undertaken are familiar or unique. When tasks are familiar and much data is available, computers will likely beat humans by being data-driven and highly consistent. Although artificial intelligence is advancing rapidly, a general rule of thumb is that when tasks are unique and when data overload is not a problem for humans, humans likely have an advantage. In many situations, the strongest performance comes from humans and computers working together.



information that doesn't fit their internal narratives.²⁸ People often see patterns that are not really there, or they fail to see that new data requires changing the storyline.²⁹

Human experts typically provide signal, noise, and bias in unknown proportions, which makes it difficult to disentangle these three components in field settings.³⁰ Whether humans or computers have the upper hand depends on many factors, including whether the tasks being undertaken are familiar or unique. When tasks are familiar and much data is available, computers will likely beat humans by being data-driven and highly consistent from one case to the next. But when tasks are unique (where creativity may matter more) and when data overload is not a problem for humans, humans will likely have an advantage. (See "The Comparative Advantages of Humans and Computers.")

One might think that humans have an advantage over models in understanding dynamically complex domains, with feedback loops, delays, and instability. But psychologists have examined how people learn about complex relationships in simulated dynamic environments (for example, a computer game modeling an airline's strategic decisions or those of an electronics company managing a new product).³¹ Even after receiving extensive feedback after each round of play, the

human subjects improved only slowly over time and failed to beat simple computer models. This raises questions about how much human expertise is desirable when building models for complex dynamic environments. The best way to find out is to compare how well humans and models do in specific domains and perhaps develop hybrid models that integrate different approaches.

AI systems have been rapidly improving in recent years. Traditional expert systems used rule-based models that mimicked human expertise by employing if-then rules (for example, “If symptoms X, Y, and Z are present, then try solution #5 first.”).³² Most AI applications today, however, use network structures, which search for new linkages between input variables and output results. In deep neural nets used in AI applications, the aim is to analyze very large data sets so that the system can discover complex relationships and refine them whenever more feedback is provided. AI is thriving thanks to deep neural nets developed for particular tasks, including playing games like chess and Go, driving cars, synthesizing speech, and translating language.³³

Companies should be closely tracking the development of AI applications to determine which aspects are worthiest of adoption and adaptation in their industry. Bridgewater Associates LP, a hedge fund firm based in Westport, Connecticut, is an example of a company already experimenting with AI. Bridgewater Associates is developing various algorithmic models designed to automate much of the management of the firm by capturing insights from the best minds in the organization.³⁴

Artificial general intelligence of the kind that most humans exhibit is emerging more slowly than targeted AI applications. Artificial general intelligence remains a rather small portion of current AI research, with the high-commercial-value work focused on narrow domains such as speech recognition, object classification in photographs, or handwriting analysis.³⁵ Still, the idea of artificial general intelligence has captured the popular imagination, with movies depicting real-life robots capable of performing a broad range of complex tasks. In the near term, the best predictive business systems will likely deploy a complex layering of humans and machines in order to garner the comparative advantages of each. Unlike machines,

human experts possess general intelligence that is naturally sensitive to real-world contexts and is capable of deep self-reflection and moral judgments.

5. Change the Way the Organization Operates

In our view, the most powerful decision-support systems are hybrids that fuse multiple technologies together. Such decision aids will become increasingly common, expanding beyond narrow applications such as sales forecasting to providing a foundation for broader systems such as IBM’s Watson, which, among other things, helps doctors make complex medical diagnoses. Over time, we expect the underlying technologies to become more and more sophisticated, eventually reaching the point where decision-support devices will be on par with, or better than, most human advisers.

As machines become more sophisticated, humans and organizations will advance as well. To eliminate the excessive noise that often undermines human judgments in many organizations and to amplify the signals that truly matter, we recommend two strategies. First, organizations can record people’s judgments in “prediction banks” to monitor their accuracy over time.³⁶ Rather than being overly general, predictions should be clear and crisp so they can be unambiguously scored *ex post* (without any wiggle room). Second, once managers accumulate personal performance scores in the prediction bank, their track record can help determine their “reputational capital” (which might determine how much weight their view gets in future decisions). Ray Dalio, founder of Bridgewater Associates, has been moving in this direction. He has developed a set of rules and management principles to create a culture that records, scores, and evaluates judgments on an ongoing basis, with high transparency and incentives for personal improvement.³⁷

Truly intelligent enterprises will blend the soft side of human judgment, including its known frailties and biases, with the hard side of big data and business analytics to create competitive advantages for companies competing in knowledge economies. From an organizational perspective, the type of transformation we envision will require focusing on three factors. The first involves strategic focus. Leaders will need to determine what kind of intelligence



Organizations will need to promote cultural and process transformations to give employees the confidence to speak truth to power.

edge they want to develop. For example, do they want to develop superior human judgment under uncertainty, or do they want to push the frontiers of automation? Second, companies will need to focus on building the mindsets, skills, habits, and rewards that can convert judgmental acumen into better calibrated subjective probabilities. Third, organizations will need to promote cultural and process transformations to give employees the confidence to speak truth to power, since the overall aim is to experiment with approaches that challenge conventional wisdom.³⁸ All this will require changing incentives and, where necessary, breaking down silos so that information can easily flow to where it is most needed.

Having discussed how to improve the science of prediction, it seems fitting to examine the future of forecasting itself. For the sake of comparison, it's worth noting that medicine emerged very rapidly from the time when bloodletting was common to a more scientific approach based on control groups, placebos, and evidence-based research. Currently, the field of subjective prediction is moving beyond its own black magic, thanks to advances in cognitive science. Given how often forecasting methods still fail, we will need to pay attention to outcome-based approaches that rely on experiments and field studies to unearth the best strategies.

Despite ongoing challenges, the science of subjective forecasting has been steadily getting better, even as the external world has become more complex. From wisdom-of-crowd approaches and prediction markets to forecasting tournaments, big data and business analytics, and artificial intelligence, there is much hope about identifying the best approaches.³⁹ However, there is confusion about how to improve subjective prediction. For example, insurance underwriters are still struggling to properly price risks posed by terrorism, global warming, and geopolitical turmoil.⁴⁰

The cognitive-science revolution holds both promise and challenge for business leaders. For most

companies, the devil will be in the details: which human versus machine approaches to apply to which topics and how to combine the various approaches. Sorting all this out will not be easy, because people and machines think in such different ways. But there is often a common analytical goal and point of comparison when dealing with tasks where foresight matters: assigning well-calibrated probability judgments to events of commercial or political significance. We have focused on real-world forecasting expressed in terms of subjective probabilities because such judgments can be objectively scored later once the outcomes are known. Scoring is more complicated with other important tasks where humans and models can be symbiotically combined, such as making strategic choices. However, once an organization starts to embrace hybrid approaches for making subjective probability estimates and keeps improving them, it can develop a sustainable strategic intelligence advantage over rivals.

Paul J.H. Schoemaker is the former research director of the Mack Center for Technological Innovation at the University of Pennsylvania's Wharton School and the coauthor, with Steven Krupp, of *Winning the Long Game: How Strategic Leaders Shape the Future* (PublicAffairs, 2014). **Philip E. Tetlock** is the Annenberg University Professor at the University of Pennsylvania and coauthor, with Dan Gardner, of *Superforecasting: The Art and Science of Prediction* (Crown, 2015). Comment on this article at <http://sloanreview.mit.edu/x/58301>, or contact the authors at smrfeedback@mit.edu.

ACKNOWLEDGMENTS

The authors thank Rob Adams, Barbara A. Mellers, Nanda Ramanujam, and J. Edward Russo for their helpful feedback on earlier drafts.

REFERENCES

1. Two classic research anthologies are D. Kahneman, P. Slovic, and A. Tversky, eds., "Judgment Under Uncertainty: Heuristics and Biases" (Cambridge, United Kingdom: Cambridge University Press, 1982); and D. Kahneman and A. Tversky, eds., "Choices, Values,

and Frames" (Cambridge, United Kingdom: Cambridge University Press, 2000). See also W.M. Goldstein and R.M. Hogarth, eds., "Research on Judgment and Decision Making: Currents, Connections, and Controversies" (Cambridge, United Kingdom: Cambridge University Press, 1997); D.J. Koehler and N. Harvey, eds., "Blackwell Handbook of Judgment and Decision Making" (Malden, Massachusetts: Blackwell Publishing, 2004); and D. Kahneman, "Thinking: Fast and Slow" (New York: Farrar, Straus, and Giroux, 2011).

2. Readers can examine different probabilities of winning in tennis at "Tennis Calculator," 2015, www.mfbennett.com. For analytical derivations, see F.J.G.M. Klaassen and J.R. Magnus, "Forecasting the Winner of a Tennis Match," *European Journal of Operational Research* 148, no. 2 (2003): 257-267.

3. E. Siegel, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (Hoboken, New Jersey: John Wiley & Sons, 2013); and T.H. Davenport and J.G. Harris, "Competing on Analytics: The New Science of Winning" (Boston: Harvard Business Review Press, 2007).

4. K. Popper, "Of Clocks and Clouds," in "Learning, Development, and Culture: Essays in Evolutionary Epistemology," ed. H.C. Plotkin (Hoboken, New Jersey: John Wiley & Sons, 1982), 109-119.

5. Notable books in this regard are J. Baron, "Thinking and Deciding," 3rd ed. (Cambridge, United Kingdom: Cambridge University Press, 2000); J.E. Russo and P.J.H. Schoemaker, "Winning Decisions: Getting It Right the First Time" (New York: Doubleday 2001); G. Gigerenzer and R. Selten, eds., "Bounded Rationality: The Adaptive Toolbox" (Cambridge, Massachusetts: MIT Press, 2002); D. Ariely, "Predictably Irrational: The Hidden Forces That Shape Our Decisions" (New York: HarperCollins, 2008); and M. Lewis, "The Undoing Project" (New York: W.W. Norton, 2016).

6. P.E. Tetlock and D. Gardner, "Superforecasting: The Art and Science of Prediction" (New York: Crown, 2015).

7. P.J.H. Schoemaker and P.E. Tetlock, "Superforecasting: How to Upgrade Your Company's Judgment," *Harvard Business Review* 94, no. 5 (May 2016): 72-78.

8. For more details about best practices for setting up and running prediction tournaments, see Schoemaker and Tetlock, "Superforecasting."

9. Prediction tournaments are scored using a rigorous, widely accepted yardstick known as the Brier score. For more information about the Brier score, see G.W. Brier, "Verification of Forecasts Expressed in Terms of Probability," *Monthly Weather Review* 78, no. 1 (January 1950): 1-3.

10. B. Fischhoff, "Debiasing," in "Judgment Under Uncertainty," ed. Kahneman, Slovic, and Tversky, 422-444; and J.S. Lerner and P.E. Tetlock, "Accounting for the Effects of Accountability," *Psychological Bulletin* 125, no. 2 (March 1999): 255-275.

11. B. Fischhoff, "Debiasing;" G. Keren, "Cognitive Aids and Debiasing Methods: Can Cognitive Pills Cure Cognitive Ills?," *Advances in Psychology* 68 (1990): 523-552; and H.R. Arkes, "Costs and Benefits of Judgment Errors:

Implications for Debiasing," *Psychological Bulletin* 110, no. 3 (November 1991): 486-498.

12. The term "bootstrapping" has a different meaning in statistics, where it refers to repeated sampling from the same data set (with replacement) to get better estimates; see, for example, "Bootstrapping (Statistics)," Jan. 26, 2017, <https://en.wikipedia.org>.

13. H.A. Wallace, "What Is in the Corn Judge's Mind?," *Journal of American Society for Agronomy* 15 (July 1923): 300-304.

14. S. Rose, "Improving Credit Evaluation," *American Banker*, March 13, 1990.

15. These tasks included, among others, predicting repayment of medical students' loans. See R. Cooter and J.B. Erdmann, "A Model for Predicting HEAL Repayment Patterns and Its Implications for Medical Student Finance," *Academic Medicine* 70, no. 12 (December 1995): 1134-1137. For more detail on how to build linear models — both objective and subjective — see A.H. Ashton, R.H. Ashton, and M.N. Davis, "White-Collar Robotics: Levering Managerial Decision Making," *California Management Review* 37, no. 1 (fall 1994): 83-109. Especially useful is their discussion of possible objections to using linear models in applied settings, as in their example of predicting advertising space for Time magazine.

16. For a thorough analysis of the multiple reasons for this paradox, see C.F. Camerer and E.J. Johnson, "The Process-Performance Paradox in Expert Judgment: How Can Experts Know So Much and Predict So Badly?," chap. 10 in "Research on Judgment and Decision Making," ed. Goldstein and Hogarth.

17. Random noise can produce much inconsistency within as well as across experts; see R.H. Ashton, "Cue Utilization and Expert Judgments: A Comparison of Independent Auditors With Other Judges," *Journal of Applied Psychology* 59, no. 4 (August 1974): 437-444; J. Shanteau, D.J. Weiss, R.P. Thomas, and J.C. Pounds, "Performance-Based Assessment of Expertise: How to Decide if Someone Is an Expert or Not," *European Journal of Operational Research* 136, no. 2 (January 2002): 253-263; R.H. Ashton, "A Review and Analysis of Research on the Test-Retest Reliability of Professional Judgment," *Journal of Behavioral Decision Making* 13, no. 3 (July/September 2000): 277-294; S. Grimstad and M. Jørgensen, "Inconsistency of Expert Judgment-Based Estimates of Software Development Effort," *Journal of Systems and Software* 80, no. 11 (November 2007): 1770-1777; and A. Koriati, "Subjective Confidence in Perceptual Judgments: A Test of the Self-Consistency Model," *Journal of Experimental Psychology: General* 140, no. 1 (February 2011): 117-139.

18. Beyond just predictions, noise reduction is a broad strategy for improving decisions; see D. Kahneman, A.M. Rosenfield, L. Gandhi, and T. Blaser, "Noise: How to Overcome the High, Hidden Cost of Inconsistent Decision Making," *Harvard Business Review* 94, no. 10 (October 2016): 38-46.

19. The radiologist example was taken from P.J. Hoffman, P. Slovic, and L.G. Rorer, "An Analysis-of-Variance Model for Assessment of Configural Cue Utilization in Clinical Judgment," *Psychological Bulletin* 69, no. 5 (May 1968):

338-349. Note that these were highly trained professionals making judgments central to their work. In addition, they knew that their medical judgments were being examined by researchers, so they probably tried as hard as they could. Still, their carefully considered judgments were remarkably inconsistent.

20. The average intra-expert correlation was .76, which equates to a 23% chance of getting a reversal in the ranking or scores of two cases from one time to the next. In general, a Pearson product-moment correlation of r translates into a $[.5 + \arcsin(r)/\pi]$ probability of a rank reversal of two cases the second time, assuming bivariate normal distributions; see M. Kendall, "Rank Correlation Methods" (London: Charles Griffin & Co., 1948).

21. A provocative brief for this structured numerical approach in medicine can be found in J.A. Swets, R.M. Dawes, and J. Monahan, "Better Decisions Through Science," *Scientific American*, October 2000, 82-87.

22. For a general review of bootstrapping performance, see C. Camerer, "General Conditions for the Success of Bootstrapping Models," *Organizational Behavior and Human Performance* 27, no. 3 (1981): 411-422, which builds on and refines the classic paper by K.R. Hammond, C.J. Hirsch, and F.J. Todd, "Analyzing the Components of Clinical Inference," *Psychological Review* 71, no. 6 (November 1964): 438-456.

23. G. Klein, "The Power of Intuition" (New York: Currency-Doubleday, 2004); and R.M. Hogarth, "Educating Intuition" (Chicago: University of Chicago Press, 2001). See also D. Kahneman and G. Klein, "Conditions for Intuitive Expertise: A Failure to Disagree," *American Psychologist* 64, no. 6 (September 2009): 515-526.

24. P. Goodwin, "Integrating Management Judgment and Statistical Methods to Improve Short-Term Forecasts," *Omega* 30, no. 2 (April 2002): 127-135; for medical examples, see J. Reason, "Human Error: Models and Management," *Western Journal of Medicine* 172, no. 6 (June 2000): 393-396; and B.J. Dietvorst, J.P. Simmons, and C. Massey, "Algorithm Aversion: People Erroneously Avoid Algorithms After Seeing Them Err," *Journal of Experimental Psychology: General* 144, no. 1 (February 2015): 114-126.

25. R.C. Blattberg and S.J. Hoch, "Database Models and Managerial Intuition: 50% Model + 50% Manager," *Management Science* 36, no. 8 (August 1990): 887-899.

26. Related cognitive processes involve associative networks, scripts, schemata, frames, and mental models; see J. Klayman and P.J.H. Schoemaker, "Thinking About the Future: A Cognitive Perspective," *Journal of Forecasting* 12, no. 2 (1993): 161-186.

27. R. Hastie, S.D. Penrod, and N. Pennington, "Inside the Jury" (Cambridge, Massachusetts: Harvard University Press, 1983).

28. J. Klayman and Y.-W. Ha, "Confirmation, Disconfirmation, and Information in Hypothesis Testing," *Psychological Review* 94, no. 2 (April 1987): 211-228; and J. Klayman and Y.-W. Ha, "Hypothesis Testing in Rule Discovery: Strategy, Structure, and Content," *Journal of Experimental Psychology: Learning, Memory, and Cognition* 15, no. 4 (July 1989): 596-604.

29. T. Gilovich, "Something Out of Nothing: The Misperception and Misinterpretation of Random Data," chap. 2 in "How We Know What Isn't So: The Fallibility of Human Reason in Everyday Life" (New York: Free Press, 1991); see also N.N. Taleb, "Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets" (New York: Random House, 2004).

30. The best way to untangle the confounding effects is through controlled experiments, and even then it may be difficult. For a research example of how to do this, see P.J.H. Schoemaker and J.C. Hershey, "Utility Measurement: Signal, Noise and Bias," *Organizational Behavior and Human Decision Processes* 52, no. 3 (August 1992): 397-424.

31. J.D. Sterman, "Business Dynamics: Systems Thinking and Modeling for a Complex World" (New York: McGraw-Hill, 2000).

32. For textbook introductions to some of these technologies, see J.M. Zurada, "Introduction to Artificial Neural Systems" (St. Paul, Minnesota: West Publishing Company, 1992); and S. Haykin, "Neural Networks: A Comprehensive Foundation," 2nd ed. (Upper Saddle River, New Jersey: Prentice Hall, 1998).

33. "Finding a Voice," *Economist*, Technology Quarterly, Jan. 7, 2017, pp. 3-27; see also J. Turow, "The Daily You: How the New Advertising Industry Is Defining Your Identity and Your Worth" (New Haven, Connecticut: Yale University Press, 2011).

34. R. Copeland and B. Hope, "The World's Largest Hedge Fund Is Building an Algorithmic Model From Its Employees' Brains," *The Wall Street Journal*, Dec. 22, 2016, www.wsj.com.

35. "Perspectives on Research in Artificial Intelligence and Artificial General Intelligence Relevant to DoD," JASON Study JSR-16-Task-003, MITRE Corporation, McLean, Virginia, January 2017, <https://fas.org/irp/agency/dod>.

36. Prediction banks are a special case of the more general notion of a setting up a mistake bank; see J.M. Caddell, "The Mistake Bank: How to Succeed by Forgiving Your Mistakes and Embracing Your Failures" (Camp Hill, Pennsylvania: Caddell Insight Group, 2013).

37. R. Feloni, "Billionaire Investor Ray Dalio's Top 20 Management Principles," Nov. 5, 2014, www.businessinsider.com.

38. A. Edmondson, "Psychological Safety and Learning Behavior in Work Teams," *Administrative Science Quarterly* 44, no. 2 (June 1999): 350-383.

39. R.S. Michalski, J.G. Carbonell, and T.M. Mitchell, eds., "Machine Learning: An Artificial Intelligence Approach" (Berlin: Springer Verlag, 1983).

40. See, for example, H. Kunreuther, R.J. Meyer, and E.O. Michel-Kerjan, eds. (with E. Blum), "The Future of Risk Management," under review with the University of Pennsylvania Press.

Reprint 58301.

Copyright © Massachusetts Institute of Technology, 2017.
All rights reserved.

The Most Underrated Skill in Management

There are few management skills more powerful than the discipline of clearly articulating the problem you seek to solve before jumping into action.

BY NELSON P. REPENNING, DON KIEFFER, AND TODD ASTOR

IT'S HARD TO pick up a current business publication without reading about the imperative to change. The world, this line of argument suggests, is evolving at an ever-faster rate, and organizations that do not adapt will be left behind. Left silent in these arguments is which organizations will drive that change and how they will do it. Academic research suggests that the ability to incorporate new ideas and technologies into existing ways of doing things plays a big role in separating leaders from the rest of the pack,¹ and studies clearly show that it is easier to manage a sequence of bite-sized changes than one huge reorganization or change initiative.² But, while many organizations strive for continuous change and learning, few actually achieve those goals on a regular basis.³ Two of the authors have studied and tried to make change for more than two decades, but it was a frustrating meeting that opened our eyes to one of the keys to leading the pack rather than constantly trying to catch up.

In the late 1990s, one of the authors, Don Kieffer, was ready to launch a big change initiative: implementing the Toyota production system in one of Harley-Davidson Inc.'s engine plants. He hired a seasoned consultant, Hajime Oba, to help. On the appointed day, Mr. Oba arrived, took a tour of the plant, and then returned to Don's office, where Don started asking questions: When do we start? What kind of results should I expect? How much is it going to cost me? But, Mr. Oba wouldn't answer those questions. Instead he responded repeatedly with one of his own: "Mr. Kieffer, what problem are you trying to solve?" Don was perplexed. He was ready to spend money and he had one of the world's experts on the Toyota production system in his office, but the expert (Mr. Oba) wouldn't tell Don how to get started.



THE LEADING QUESTION

How can executives lead organizational change more effectively?

FINDINGS

- ▶ Articulate a clear statement of the problem you are trying to solve before initiating changes.
- ▶ Break big problems into a series of smaller ones that can each be tackled quickly.
- ▶ Follow a structured approach to problem-solving using the A3 form originally developed by Toyota Motor Corp.



The day did not end well. Don grew exasperated with what seemed like a word game, and Mr. Oba, tired of not getting an answer to his question, eventually walked out of Don's office. But, despite the frustration on both sides, we later realized that Mr. Oba was trying to teach Don one of the foundational skills in leading effective change: formulating a clear problem statement. Since Mr. Oba's visit, two of the authors have studied and worked with dozens of organizations and taught over 1,000 executives. We have helped organizations with everything from managing beds in a cardiac surgery unit to sequencing the human genome.⁴ Based on this experience, we have come to believe that problem formulation is the single most underrated skill in all of management practice.

There are few questions in business more powerful than "What problem are you trying to solve?" In our experience, leaders who can formulate clear problem statements get more done with less effort and move more rapidly than their less-focused counterparts. Clear problem statements can unlock the energy and innovation that lies within those who do the core work of your organization.

As valuable as good problem formulation can be, it is rarely practiced. Psychologists and cognitive scientists have suggested that the brain is prone to leaping straight from a situation to a solution without pausing to define the problem clearly. Such "jumping to conclusions" can be effective, particularly when done by experts facing extreme time pressure, like fighting a fire or performing emergency surgery. But, when making change, neglecting to formulate a clear problem statement often prevents innovation and leads to wasted time and money. In this article, we hope to both improve your problem formulation skills and introduce a simple method for solving those problems.

How Our Minds Solve Problems

Research done over the last few decades indicates that the human brain has at least two different methods for tackling problems, and which method dominates depends on both the individual's current situation and the surrounding context. A large and growing collection of research indicates that it is useful to distinguish between two modes of thinking, which psychologists and cognitive scientists sometimes call automatic processing and

conscious processing (also sometimes known as system 1 and system 2).⁵ These two modes tackle problems differently and do so at different speeds.

Conscious Processing Conscious processing represents the part of your brain that you control. When you are aware that you are thinking about something, you are using conscious processing. Conscious cognition can be both powerful and precise. It is the only process in the brain capable of forming a mental picture of a situation at hand and then playing out different possible scenarios, even if those scenarios have never happened before.⁶ With this ability, humans can innovate and learn in ways not available to other species.

Despite its power, conscious processing is "expensive" in at least three senses. First, it is much slower than its automatic counterpart. Second, our capacity to do it is quite finite, so a decision to confront one problem means that you don't have the capacity to tackle another one at the same time. Third, conscious processing burns scarce energy and declines when people are tired, hungry, or distracted. Because of these costs, the human brain system has evolved to "save" conscious processing for when it is really needed and, when possible, relies on the "cheaper" automatic processing mode.

Automatic Processing Automatic processing works differently from its conscious counterpart. We don't have control over it or even feel it happening. Instead, we are only aware of the results, such as a thought that simply pops into your head or a physical response like hitting the brake when the car in front of you stops suddenly. You cannot directly instruct your automatic processing functions to do something; instead, they constitute a kind of "back office" for your brain. When a piece of long-sought-after information just pops into your head, hours or days after it was needed, you are experiencing the workings of your automatic processing functions.

When we tackle a problem consciously, we proceed logically, trying to construct a consistent path from the problem to the solution. In contrast, the automatic system works based on what is known as association or pattern matching. When confronted with a problem, the automatic processor tries to

match that current challenge to a previous situation and then uses that past experience as a guide for how to act. Every time we instinctively react to a stop sign or wait for people to exit an elevator before entering, we rely on automatic processing's pattern matching to determine our choice of action.

Our "associative machine" can be amazingly adept at identifying subtle patterns in the environment. For example, the automatic processing functions are the only parts of the brain capable of processing information quickly enough to return a serve in tennis or hit a baseball. Psychologist Gary Klein has documented how experienced professionals who work under intense time pressure, like surgeons and firefighters, use their past experience to make split-second decisions.⁷ Successful people in these environments rely on deep experience to almost immediately link the current situation to the appropriate action.

However, because it relies on patterns identified from experience, automatic processing can bias us toward the status quo and away from innovative solutions. It should come as little surprise that breakthrough ideas and technologies sometimes come from relative newcomers who weren't experienced enough to "know better." Research suggests that innovations often result from combining previously disparate perspectives and experiences.⁸ Furthermore, the propensity to rely on previous experiences can lead to major industrial accidents like Three Mile Island if a novel situation is misread as an established pattern and therefore receives the wrong intervention.⁹

That said, unconscious processing can also play a critical and positive role in innovation. As we have all experienced, sometimes when confronting a hard problem, you need to step away from it for a while and think about something else. There is some evidence for the existence of such "incubation" effects. Unconscious mental processes may be better able to combine divergent ideas to create new innovations.¹⁰ But it also appears that such innovations can't happen without the assistance of the conscious machinery. Prior to the "aha" moment, conscious effort is required to direct attention to the problem at hand and to immerse oneself in relevant data. After the flash of insight, conscious attention is again needed to evaluate the resulting combinations.

The Discipline of Problem Formulation

When the brain's associative machine is confronted with a problem, it jumps to a solution based on experience. To complement that fast thinking with a more deliberate approach, structured problem-solving entails developing a logical argument that links the observed data to root causes and, eventually, to a solution. Developing this logical path increases the chance that you will leverage the strengths of conscious processing and may also create the conditions for generating and then evaluating an unconscious breakthrough. Creating an effective logical chain starts with a clear description of the problem and, in our experience, this is where most efforts fall short.

A good problem statement has five basic elements:

- It references something the organization cares about and connects that element to a clear and specific goal;
- it contains a clear articulation of the gap between the current state and the goal;
- the key variables — the target, the current state, and the gap — are quantifiable;
- it is as neutral as possible concerning possible diagnoses or solutions; and
- it is sufficiently small in scope that you can tackle it quickly.

Is your problem important? The first rule of structured problem-solving is to focus its considerable power on issues that really matter. You should be able to draw a direct path from the problem statement to your organization's overall mission and targets. The late MIT Sloan School professor Jay Forrester, one of the fathers of modern digital computing, once wrote that "very often the most important problems are but little more difficult to handle than the unimportant."¹¹ If you fall into the trap of initially focusing your attention on peripheral issues for "practice," chances are you will never get around to the work you really need to do.

Mind the gap. Decades of research suggest that people work harder and are more focused when they face clear, easy-to-understand goals.¹² More recently, psychologists have shown that mentally comparing a desired state with the current one, a process known as mental contrasting, is more likely to lead people to change than focusing only on the future or on

current challenges.¹³ Recent work also suggests that people draw considerable motivation from the feeling of progress, the sense that their efforts are moving them toward the goal in question.¹⁴ A good problem statement accordingly contains a clear articulation of the gap that you are trying to close.

Quantify even if you can't measure. Being able to measure the gap between the current state and your target precisely will support an effective project. However, structured problem-solving can be successfully applied to settings that do not yield immediate and precise measurements, because many attributes can be subjectively quantified even if they cannot be objectively measured. Quantification of an attribute simply means that it has a clear direction — more of that attribute is better or worse — and that you can differentiate situations in which that attribute is low or high. For example, many organizations struggle with so-called “soft” variables like customer satisfaction and employee trust. Though these can be hard to measure, they can be quantified; in both cases, we know that more is better. Moreover, once you start digging into an issue, you often discover ways to measure things that weren't obvious at the outset. For example, a recent project by a student in our executive MBA program tackled an unproductive

weekly staff meeting. The student began his project by creating a simple web-based survey to capture the staff's perceptions of the meeting, thus quickly generating quantitative data.

Remain as neutral as possible. A good problem formulation presupposes as little as practically possible concerning why the problem exists or what might be the appropriate solution. That said, few problem statements are perfectly neutral. If you say that your “sales revenue is 22% behind its target,” that formulation presupposes that problem is important to your organization. The trick is to formulate statements that are actionable and for which you can draw a clear path to the organization's overarching goals.

Is your scope down? Finally, a good problem statement is “scoped down” to a specific manifestation of the larger issue that you care about. Our brains like to match new patterns, but we can only do so effectively when there is a short time delay between taking an action and experiencing the outcome.¹⁵ Well-structured problem-solving capitalizes on the natural desire for rapid feedback by breaking big problems into little ones that can be tackled quickly. You will learn more and make faster progress if you do 12 one-month projects instead of one 12-month project.

To appropriately scope projects, we often use the “scope-down tree,” a tool we learned from our colleague John Carrier, who is a senior lecturer of system dynamics at MIT. The scope-down tree allows the user to plot a clear path between a big problem and a specific manifestation that can be tackled quickly. (See “Narrowing a Problem's Scope.”)

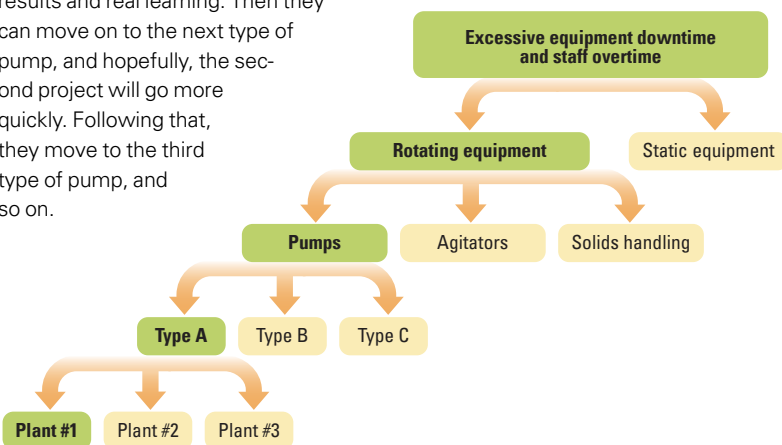
Managers we work with often generate great results when they have the discipline to scope down their projects to an area where they can, say, make a 30% improvement in 60 days. The short time horizon focuses them on a set of concrete interventions that they can execute quickly. This kind of “small wins” strategy has been discussed by a variety of organizational scholars, but it remains rarely practiced.¹⁶

Four Common Mistakes

Having taught this material extensively, we have observed four common failure modes. Avoiding these mistakes is critical to formulating effective problem statements and focusing your attention on the issues that really matter to you and your organization.

NARROWING A PROBLEM'S SCOPE

Good structured problem-solving involves breaking big problems into smaller ones that can be tackled quickly. In this “scope-down tree,” developed by John Carrier of MIT, the overall problem of excessive equipment downtime at a company's plants is broken down first into two types of equipment (rotating and nonrotating), and then further into different subcategories of equipment, ultimately focused on a specific type of pump in one plant. The benefit of reducing the problem's scope is that instead of a big two-year maintenance initiative, a team can do a 60-day project to improve the performance of the selected pumps and generate quick results and real learning. Then they can move on to the next type of pump, and hopefully, the second project will go more quickly. Following that, they move to the third type of pump, and so on.



1. Failing to Formulate the Problem The most common mistake is skipping problem formulation altogether. People often assume that they all already agree on the problem and should just get busy solving it. Unfortunately, such clarity and commonality rarely exist.

2. Problem Statement as Diagnosis or Solution

Another frequent mistake is formulating a problem statement that presupposes either the diagnosis or the solution. A problem statement that presumes the diagnosis will often sound like “The problem is we lack the right IT capabilities,” and one that presumes a solution will sound like “The problem is that we haven’t spent the money to upgrade our IT system.” Neither is an effective problem statement because neither references goals or targets that the organization really cares about. The overall target is implicit, and the person formulating the statement has jumped straight to either a diagnosis or a solution. Allowing diagnoses or proposed solutions to creep into problem statements means that you have skipped one or more steps in the logical chain and therefore missed an opportunity to engage in conscious cognitive processing. In our experience, this mistake tends to reinforce existing disputes and often worsens functional turf wars.

3. Lack of a Clear Gap A third common mistake is failing to articulate a clear gap. These problem statements sound like “We need to improve our brand” or “Sales have to go up.” The lack of a clear gap means that people are not engaging in clear mental contrasting and creates two related problems. First, people don’t know when they have achieved the goal, making it difficult for them to feel good about their efforts. Second, when people address poorly formulated problems, they tend to do so with large, one-size-fits-all solutions that rarely produce the desired results.

4. The Problem Is Too Big Many problem statements are too big. Broadly scoped problem formulations lead to large, costly, and slow initiatives; problem statements focused on an acute and specific manifestation lead to quick results, increasing both learning and confidence. Use John Carrier’s scope-down tree and find a specific manifestation of your problem that creates the biggest headaches. If you can solve that instance of the

problem, you will be well on your way to changing your organization for the better.

Formulating good problem statements is a skill anybody can learn, but it takes practice. If you leverage input from your colleagues to build your skills, you will get to better formulations more quickly. While it is often difficult to formulate a clear statement of the challenges you face, it is much easier to critique other people’s efforts, because you don’t have the same experiences and are less invested in a particular outcome. When we ask our students to coach each other, their problem formulations often improve dramatically in as little as 30 minutes.

Structured Problem-Solving

As you tackle more complex problems, you will need to complement good problem formulation with a structured approach to problem-solving. Structured problem-solving is nothing more than the essential elements of the scientific method — an iterative cycle of formulating hypotheses and testing them through controlled experimentation repackaged for the complexity of the world outside the laboratory. W. Edwards Deming and his mentor Walter Shewhart, the grandfathers of total quality management, were perhaps the first to realize that this discipline could be applied on the factory floor. Deming’s PDCA cycle, or Plan-Do-Check-Act, was a charge to articulate a clear hypothesis (a Plan), run an experiment (Do the Plan), evaluate the results (Check), and then identify how the results inform future plans (Act). Since Deming’s work, several variants of structured problem-solving have been proposed, all highlighting the basic value of iterating between articulating a hypothesis, testing it, and then developing the next hypothesis. In our experience, making sure that you use a structured problem-solving method is far more important than which particular flavor you choose.

In the last two decades, we have done projects using all of the popular methods and supervised and coached over 1,000 student projects using them. Our work has led to a hybrid approach to guiding and reporting on structured problem-solving that is both simple and effective. We capture our approach in a version of Toyota’s famous A3 form that we have modified to enable its use for work in settings other than manufacturing.¹⁷ (See “Tracking Projects Using an A3 Form,” p. 44.)

TRACKING PROJECTS USING AN A3 FORM

To track problem-solving projects, we have modified the A3, a famous form developed by Toyota, to better enable its use for tracking problem-solving in settings other than manufacturing. The A3 form divides the structured problem-solving process into four main steps, represented by the big quadrants, and each big step has smaller subphases, captured by the portions below the dotted lines. To view a completed A3 form, visit the online version of this article at <http://sloanreview.mit.edu/x/58330>.

PROBLEM STATEMENT Background	TARGET DESIGN Improvement Goal Leadership Guidelines											
CURRENT DESIGN (based on seeing the work)	EXECUTION PLAN	<table border="1"> <thead> <tr> <th colspan="3">Track Results</th> </tr> <tr> <th>Date</th> <th>Target</th> <th>Actual</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		Track Results			Date	Target	Actual			
Track Results												
Date	Target	Actual										
Root Causes	What Did We Learn and What's Next?											

The original A3 form was developed by Toyota Motor Corp. to support knowledge sharing in its factories by summarizing a structured problem-solving effort in a single page. Though the form may often have supporting documentation, restricting the project summary to a single page forces the user to be very clear in his or her thinking. The A3 divides the structured problem-solving process into four main steps, represented by the big quadrants, and each big step has smaller subphases, captured by the portions below the dotted lines. The first step (represented by the box at the upper left) is to formulate a clear problem statement. In the Background section (in the bottom part of the Problem Statement box), you should provide enough information to clearly link the problem statement to the organization's larger mission and objectives. The Background section gives you the opportunity to articulate the why for your problem-solving effort.

Observing the Current Design The next step in the A3 process is to document the current design of the process by observing the work directly. Due to

automatic processing, most people, particularly those who do repetitive tasks, cannot accurately describe how they actually execute their work. Through pattern matching, they have developed a set of habitual actions and routine responses of which they may not be entirely aware.

Because those who do the work often cannot fully describe what they do, you as a manager must get as close to the locus of the problem as you can and watch the work being done. Taiichi Ohno, one of the founding fathers of the Toyota production system, developed the Gemba walk (Gemba is a Japanese word that roughly translates to "the real place") as a means for executives to find out what really happens on a day-to-day basis. The goal is to understand how the work is really done. This could mean watching a nurse and a doctor perform a medical procedure, engineers in a design meeting, or salespeople interacting with a customer.

Senior executives are often quite removed from the day-to-day work of the organizations that they lead. Consequently, observing and thoroughly understanding the current state of the work often suggests easy opportunities for improvement. We

give our students the following rule of thumb to guide their efforts: When you go see the work, if you aren't embarrassed by what you find, you probably aren't looking closely enough. Recently, we helped a team tackle the problem of reducing the time to process invoices. In walking through the process, the team observed that each invoice spent several days waiting for the proper general ledger code to be added. The investigation, however, revealed that for this type of invoice, the code was always the same; each invoice spent several days waiting for a piece of information that could have been printed on the form in advance!

Root Causes Observing the work closely often shakes loose a variety of preconceptions. The next step in filling out the A3 is to analyze root causes and engage your conscious processing by explicitly linking your observations to the problem statement.

There are a variety of techniques and frameworks to guide a root cause analysis. Perhaps most famously, Sakichi Toyoda, founder of Toyota Industries, suggested asking the “5 whys,” meaning that for each observed problem, the investigator should ask “why” five times in the hope that five levels of inquiry will reveal a problem's true cause. Later, Kaoru Ishikawa developed the “fishbone” diagram to provide a visual representation of the multiple chains of inquiry that might be required to dig into the fundamental cause of a problem.¹⁸ Since then, just about all structured problem-solving methods have offered one or more variants of the same basic method for digging into a problem's source.¹⁹

The purpose of all root-cause approaches is to help the user understand how the observed problem is rooted in the existing design of the work system. Unfortunately, this type of systems thinking does not come naturally. When we see a problem (again, thanks to pattern matching) we have a strong tendency to attribute it to an easily identifiable, proximate cause. This might be the person closest to the problem or the most obvious technical cause, such as a broken bracket. Our brains are far less likely to see that there is an underlying system that generated that poorly trained individual or the broken bracket. Solving the immediate problem will do nothing to prevent future manifestations unless we address the system-level cause.

A good root-cause analysis should build on your investigation to show how the work system you are analyzing generates the problem you are studying as a part of normal operations. If the root-cause analysis identifies a series of special events that are unlikely to happen again, you haven't dug deeply enough. For example, customer service hiccups often differ from instance to instance and are easily attributed to things that “are once in a lifetime and could never happen again.” Digging deeper, however, might reveal a flawed training process for those in customer-facing jobs or an inconsistent customer on-boarding process. A good root-cause analysis links the data obtained in your investigation to the problem statement to explain how the current system generates the observed challenges not as a special case but as a part of routine conduct.

Target Design One you have linked features of the work system to the problem you are trying to solve, use the Target Design section of the A3 form to propose an updated system to address the problem. Often the necessary changes will be simple.²⁰ In the Target Design section, you should map out the structure of an updated work system that will function more effectively. This might be as simple as saying that from now on we will print the general ledger code on the invoice form or something more complicated, such as changes to training and on-boarding programs. The needed changes will rarely be an entirely new program or initiative. Instead, they should be specific, targeted modifications emerging from the root-cause analysis. Don't try to solve everything at once; propose the minimum set of changes that will help you make rapid progress toward your goal.

Goals and Leadership Guidelines Completing the Target Design section requires two additional components. First, create an improvement goal — a prediction about how much improvement your proposed changes will generate. A good goal statement builds directly from the problem statement by predicting both how much of the gap you are going to close and how long it will take you to do it. If your problem is “24% of our service interactions do not generate a positive response from our customers, greatly exceeding our target of 5% or less,” then an improvement goal might be “reduce the number of

negative service interactions by 50% in 60 days.” Clear goals are highly motivating, and articulating a prediction facilitates effective learning.

Finally, set the leadership guidelines. Guidelines are the “guardrails” for executing the project; they represent boundaries or constraints that cannot be violated. For example, the leadership guidelines for a project focused on cost reduction might specify that the project should identify an innovation that reduces cost without making trade-offs in quality.

Execution Plan The next step is running the experiment. In the upper portion of the Execution Plan box of the A3 form, lay out a plan for implementing your proposed design. Be sure that the plan is broken into a set of clear and distinct activities (for example, have the invoice form reprinted with the general ledger code or hold a daily meeting to review quality issues) and that each activity has both an owner and a delivery date.

Now execute your plan and meet your target. But, even as you start executing, you are not done engaging in conscious learning. Instead, you want to make sure that you are not only solving the problem but also absorbing all the associated lessons. Track each activity relative to its due date and note those activities that fall behind. These gaps can also be the subject of structured problem-solving. During this phase, interim project reports should be simple: The owner of the action should report whether that element is ahead of or behind schedule, what has been learned in the latest set of activities, and what help he or she may need.

In the Track Results section of the form, measure progress toward your goal. For example, if the overall target is to reduce the number of poor service interactions by 50% in 60 days, then set intermediate goals, perhaps weekly, based on your intervention plan. Put these intermediate targets in the first column of the Track Results section and then measure your progress against them. Also, make sure that you continue to track the results for an extended period after you have met your target. You want results that stick.

Once the project is complete, document what you learned in the What Did We Learn and What’s Next section. Here you should both outline the main lessons from the project and articulate the new opportunities that your project revealed. If you

exceeded your predictions, what does that tell you about future possibilities? In contrast, falling short of your target may reveal parts of the work system that you don’t understand as well as you thought. Finally, and perhaps most importantly, what problem are you going to tackle next? A well-functioning process, whether in manufacturing, customer service, or new product development, is the product of numerous small changes, and fixing one real problem often reveals many additional pressing issues. Close out your A3 by outlining the next problem you and your organization need to solve.

A Case Study in a Hospital

How does this process work in practice? To illustrate, we describe a recent case where one of the authors, a hospital executive who had been introduced to the basics of problem formulation and structured problem-solving, used the techniques to improve organizational performance.

Todd Astor and his team transplant human lungs at Massachusetts General Hospital in Boston, Massachusetts. Although the lung transplant procedure is highly complex, its complexity pales in comparison to managing the recipient’s health after the transplant. The human body often responds to the transplanted organs in dangerous ways. A big part of Todd’s job is staying in close contact with his patients and carefully managing the complicated suite of medicines needed to suppress the body’s natural immune response.

Several times a week Todd’s lung transplant unit has a clinic in which transplant recipients come to be evaluated and receive any necessary adjustments in their treatment. Each clinic session lasts for three hours and utilizes three dedicated exam rooms. Based on the evaluation criteria of Todd’s hospital, that should allow him to see 27 patients (three per hour in each room). But at the outset of the project, the team was able to see an average of seven patients per clinic session. Running the clinic at less than 30% of its ideal capacity potentially compromised care — patients might have to wait longer to be evaluated — and had significant revenue implications for the hospital. With a few iterations, Todd’s challenge led to the following problem statement and supporting background:

The post-lung transplant outpatient clinic session has an average volume of 7 patients, even

though the clinic has the recommended space capacity for up to 27 patients (20 minutes per patient) per session.

The “gap” between the actual and ideal utilization of clinic space (26% of ideal utilization) has resulted in a delay in timely access to care for many lung transplant patients and a loss of potential revenue/profit for the outpatient clinic and the hospital.

After adding some additional background information about the problem to the A3 form, Todd went to understand the work. (To see Todd’s completed A3 form, visit the online version of this article at <http://sloanreview.mit.edu/x/58330>. See “Additional Resources.”) He tracked 71 patients over nine sessions as they flowed through the clinic day. Todd discovered huge variability in both the patient arrival rates and the time that patients spent in the various stages of a clinic visit. A little digging into the root causes revealed numerous ambiguities and departures from the way the system was supposed to work. Patient arrival times were highly variable, due both to a lack of clarity on appointment details and to traffic patterns around the hospital; lab testing times varied depending on the time of day; different versions of the pulmonary function test (PFT) were conducted; there was often little coordination between the doctors and the nurse practitioners; and large amounts of time were spent checking each patient’s medication list.

Todd made two key decisions in analyzing the root causes and proposing changes. First, despite variability at all stages of the visit, he scoped down the problem to focus only on processes occurring in the clinic area. He and his team had more direct control over these processes (compared with those occurring in the laboratory, radiology area, etc.), and were more able to make changes. Second, Todd included every member of the team, from the administrative staff to the physicians, in analyzing the root causes and proposing changes. Widespread inclusion allowed every individual to think about specific ways to address the problem in his or her own assigned area.

The root-cause analysis led to several proposed changes. The administrative assistant would call

patients both a week and a day in advance to remind them about their appointments and provide advice on managing traffic and parking. The PFT test was standardized with a clear rule for when a more detailed test was needed. When possible, the medication list reconciliation would happen the day before the clinic via the telephone. And, finally, the nurse practitioner and the doctor would coordinate their exams to eliminate asking the patient for the same information twice. With these changes, Todd set a target of adding two patients per clinic session until the clinic reached a throughput of 18 patients. Todd further outlined a clear set of guidelines, the most important being that quality of patient care could in no way be sacrificed during the project.

The results were impressive. In seven weeks, the throughput moved from the average of seven to a high of 17 in week seven, not quite meeting Todd’s target of 18, but more than doubling the existing patient flow. After the initial project was completed, the lung transplant clinic subsequently did reach a maximum flow of 18 patients per session.

The increased throughput had several positive benefits. The clinic was able to provide better, more timely care to its patients. Surveys suggested that despite the higher volume, patient satisfaction improved, due to shorter wait times and the perception that they were getting better, more consistent care. Revenue also improved significantly. Less obvious but equally important, improved throughput created space for more patients, thereby matching the growth in the transplant program. Finally, Todd’s team got to control their work and improve it, generating clear gains in motivation and engagement.

From Reorganization to Real Learning

We always ask executives in our MIT Sloan classes: “How many of your companies reorganize every 18 to 24 months?” Typically, more than half of the people in the class raise their hands. Change has become a big business, and any number of consultants will be more than happy to assist your company in your next reorganization. But be careful. Changing everything at once takes a lot of time and resources, and big initiatives often collapse under their own weight as senior executives, tired of waiting for the results, move on to the next big idea. By focusing

ADDITIONAL RESOURCES

To view a completed A3 form for Todd Astor’s patient flow project as well as read an additional case study about structured problem-solving in another setting, visit the online version of this article at <http://sloanreview.mit.edu/x/58330>.

your scarce resources on those issues that really matter and enabling rapid learning cycles, good problem formulation and structured problem-solving offer a sustainable alternative to the endless stream of painful reorganizations and overblown change initiatives that rarely deliver on their promises.

Nelson P. Repenning is the School of Management Distinguished Professor of System Dynamics and Organization Studies at the MIT Sloan School of Management in Cambridge, Massachusetts, as well as chief social scientist at the consulting firm ShiftGear Work Design LLC. **Don Kieffer** is a senior lecturer in operations management at the MIT Sloan School and managing partner of ShiftGear Work Design. **Todd Astor** is the medical director of the lung and heart-lung transplant program at Massachusetts General Hospital and an assistant professor of medicine at Harvard Medical School in Boston, Massachusetts. Comment on this article at <http://sloanreview.mit.edu/x/58330>, or contact the authors at smrfeedback@mit.edu.

REFERENCES

1. R. Gibbons and R. Henderson, "What Do Managers Do? Exploring Persistent Performance Differences Among Seemingly Similar Enterprises" in "The Handbook of Organizational Economics," ed. R. Gibbons and J. Roberts (Princeton, New Jersey: Princeton University Press, 2013), 680-731.
2. N.P. Repenning and J.D. Sterman, "Nobody Ever Gets Credit for Fixing Problems That Never Happened: Creating and Sustaining Process Improvement," *California Management Review* 43, no. 4 (summer 2001): 64-88.
3. A study by Towers Watson reported that only about one in four change efforts are effective in the long run. See Towers Watson, "How the Fundamentals Have Evolved and the Best Adapt: 2013 - 2014 Change and Communication ROI Study," (December 2013), www.towerswatson.com. Others have reached similar conclusions; for example, see J.P. Kotter, "Leading Change" (Boston, Massachusetts: Harvard Business School Press, 1996); and M. Beer, R.A. Eisenstat, and B. Spector, "Why Change Programs Don't Produce Change," *Harvard Business Review* 68, no. 6 (November-December 1990): 158-166.
4. A. Mangi and N.P. Repenning, "Dynamic Work Design Decreases Post-Procedural Length of Stay and Enhances Bed Availability," manuscript available from the author; S. Dodge et al., "Using Dynamic Work Design to Help Cure Cancer (And Other Diseases)," MIT Sloan School of Management working paper 5159-16, June 2016, www.mitsloan.mit.edu.
5. For very readable summaries, see D. Kahneman, "Thinking, Fast and Slow" (New York: Farrar, Straus, and Giroux, 2011); and J. Haidt, "The Happiness Hypothesis: Finding Modern Truth in Ancient Wisdom" (New York: Basic Books, 2006). For recent overviews of scholarly work, see J. St. B.T. Evans and K.E. Stanovich, "Dual-Process Theories of Higher Cognition: Advancing the Debate," *Perspectives on Psychological Science* 8, no. 3 (May 1, 2013): 223-241; and S.A. Sloman, "Two Systems of Reasoning, an Update" in J.W. Sherman, B. Gawronski, and Y. Trope, "Dual-Process Theories of the Social Mind" (New York: Guilford Press, 2014), 107-120. For a collection of reviews, see Sherman, Gawronski, and Trope, "Dual-Process Theories of the Social Mind."
6. K.E. Stanovich, "Rationality and the Reflective Mind" (New York: Oxford University Press, 2011).
7. G.A. Klein, "Sources of Power: How People Make Decisions" (Cambridge, Massachusetts: MIT Press, 1998).
8. J. Singh and L. Fleming, "Lone Inventors as Sources of Breakthroughs: Myth or Reality?" *Management Science* 56, no. 1 (January 2010): 41-56.
9. C. Perrow, "Normal Accidents: Living With High-Risk Technologies" (Princeton, New Jersey: Princeton University Press, 1999).
10. A. Dijksterhuis and L.F. Nordgren, "A Theory of Unconscious Thought," *Perspectives on Psychological Science* 1, no. 2 (June 1, 2006): 95-109; and A. Dijksterhuis, "Automaticity and the Unconscious," in "Handbook of Social Psychology," 5th ed., vol. 1, ed. S.T. Fiske, D.T. Gilbert, and G. Lindzey (Hoboken, N.J.: John Wiley & Sons, 2010), 228-267.
11. J. W. Forrester, "Industrial Dynamics" (Cambridge, Massachusetts: MIT Press, 1961), 449.
12. E.A. Locke and G.P. Latham, "Building a Practically Useful Theory of Goal Setting and Task Motivation," *American Psychologist* 57, no. 9 (September 2002): 705-717.
13. G. Oettingen, G. Hönig, and P. M. Gollwitzer, "Effective Self-Regulation of Goal Attainment," *International Journal of Educational Research* 33, no. 7-8 (2000): 705-732.
14. T.M. Amabile and S.J. Kramer, "The Power of Small Wins," *Harvard Business Review* 89, no. 5 (May 2011): 70-80; and T.M. Amabile and S.J. Kramer, "The Progress Principle: Using Small Wins to Ignite Joy, Engagement, and Creativity at Work" (Boston, Massachusetts: Harvard Business Review Press, 2011).
15. For a summary, see J. Sterman, "Business Dynamics: Systems Thinking and Modeling for a Complex World" (Boston, Massachusetts: Irwin/McGraw-Hill, 2000).
16. K.E. Weick, "Small Wins: Redefining the Scale of Social Problems," *American Psychologist* 39 (January 1984): 40-49; Kotter, "Leading Change"; and T.M. Amabile and S.J. Kramer, "The Power of Small Wins."
17. J. Shook, "Toyota's Secret: The A3 Report," *MIT Sloan Management Review* 50, no. 4 (summer 2009): 30-33.
18. "Fishbone Diagram (Ishikawa) — Cause & Effect Diagram I ASQ," <http://asq.org>.
19. For a summary of root-cause analysis techniques, see en.wikipedia.org/wiki/Root_cause_analysis.
20. In other work, we have proposed four principles for effective work that may be helpful in more complex situations. See Dodge et al., "Using Dynamic Work Design."

Reprint 58330.

Copyright © Massachusetts Institute of Technology, 2017.
All rights reserved.

The Smart Way to Respond to Negative Emotions at Work

Many executives try to ignore negative emotions in their workplaces — a tactic that can be counterproductive and costly. If employees' negative feelings are responded to wisely, they may provide important feedback.

BY CHRISTINE M. PEARSON

“Our company was acquired and our workforce was cut by 70%. We’re each carrying about twice the workload now, with a fraction of the resources. Employees at all levels are frustrated, angry, and anxious about their futures, and not one of our new executives seems to care. Pride in the organization has dried up. People are too stressed to do anything but keep their heads down and pound out their work. Morale is at an all-time low. You can feel it when you come in the door. Yet our new leaders are stunned when they learn someone else is quitting.”

— Manager, global services organization

IT IS IMPOSSIBLE to block negative emotions from the workplace. Whether provoked by bad decisions, misfortune, or employees' personal problems, no organization is immune from trouble. And trouble agitates bad feelings. However, in many workplaces, negative emotions are brushed aside; in some, they are taboo. Unfortunately, neither of these strategies is effective. When negative emotions churn, it takes courage not to flinch. Insight and readiness are key to developing effective responses.

Savvy managers and executives quickly learn to cultivate sunny emotions at work. Practical recommendations and abundant research accentuate the benefits of encouraging positivity in the workplace.¹ Reinforcement is often immediate. The swell of good feelings is palpable when executives successfully cheerlead for



THE LEADING QUESTION

How should executives handle negative emotions in the workplace?

FINDINGS

- ▶ Many managers don't know how to respond to employees' negative feelings.
- ▶ Promptly stepping up to face emotions like anger, sadness, and fear can stem interpersonal turbulence and keep satisfaction, engagement, and productivity intact.



stretch goals, muster enthusiasm about new products, or celebrate team successes. Sometimes, these efforts are irrefutably tied to greater improvements, providing additional opportunities for positive emotional crescendos from leaders.

Steering toward positive emotions is the norm. But there are reasons for negative emotions in the workplace — from erosion of the implicit work contract between bosses and employees, to ever-growing demands to do more with less, to relentless rapid change. Today, it takes both positive and negative emotional insight for organizations and individuals to function effectively over the long term. Negative emotions, it turns out, not only punctuate obstacles but also unleash opportunities.² Negative emotions can provide feedback that broadens thinking and perspectives, and enables people to see things as they are. When executives step up to deal with rising anger among employees, they may discover exploitations of management power. Similarly, managers who address signals of employee sadness may learn that the rumor mill is spreading false news about closures and terminations.

For more than two decades, I have studied workplace circumstances that evoke negative emotions. (See “About the Research.”) My research, often conducted with colleagues, explores the darker side of work — from exceptional, highly dramatic organizational crises (such as workplace homicide or product tampering) to the everyday problem of disrespectful interactions among coworkers (a phenomenon for which my coauthor Lynne Anderson and I coined the term “workplace incivility”³). Via surveys, focus groups, and interviews, thousands of respondents have described their experiences with causes, circumstances, and outcomes that involved negative emotions.⁴ A crucial finding across our studies is that few leaders handle negative emotions well.

When it comes to managing negative emotions, most executives respond by pressuring employees to conceal the emotions. Or they hand off distressed employees to the human resources department. A small proportion consider emotions detrimental to operations and assert that feelings should be kept out of the workplace. Some blame their own bosses’ compulsions for unbroken cheeriness, which obliges them to tamp down negative sentiments of their own and those of their subordinates. A general

manager I interviewed voiced a typical rationale: “Our CEO doesn’t want to hear anything negative. Not a word about dissatisfaction.”

Many executives complain that dealing with employees’ negative sentiments drains too much time and energy. Some express concern that their interventions might exacerbate rather than improve circumstances, or that addressing concerns might unleash stronger reactions than they could handle. Additionally, executives worry that uncorking employees’ negative emotions might trigger an unwelcome flood of their own bad feelings.

Many executives report they’ve had no training about handling negative emotions effectively and a dearth of role models for doing so. One of my recent studies validates this claim. I asked 124 managers and executives about their personal experiences of negative emotions at work. About 20% reported that they have never, in their entire careers, had a single boss who managed negative emotions effectively.⁵ Every respondent was readily able to name bosses who had mismanaged relevant issues and to describe specific opportunities that had been missed, as well as associated organizational costs.

Most managers admit that they simply do not know how to deal with negative emotions. I would like to change that. The advice here is based on research by my coauthors and me about workplace crises and incivility, as well as our observations of the impacts and responses engendered by both. Within these contexts, my fellow researchers and I have studied how organizations handle negative emotions. We asked about what works and what doesn’t. Some recommendations here flow directly from data collected for our studies. Others are based on lessons I have learned while shadowing and consulting to employees at all levels as they prepared for, managed, and learned from crises and instances of incivility. Additionally, in light of sensitivities toward negative emotions, I turned to clinical psychologists who work with managers and executives to validate the following recommendations.

Facing Negative Emotions

In the short term, ignoring or stifling negative emotions is easier than dealing with them. However, my research with colleagues has shown that discounting or brushing aside negative emotions can cost

ABOUT THE RESEARCH

This article draws on a stream of research that the author, in collaboration with coauthors, has carried out for more than two decades to understand how managers and employees handle the dark side of workplace behavior — from exceptional incidents involving organizational crises to commonplace uncivil interactions among employees.¹ All of the studies examined some aspect of the role of negative emotions.

In our crisis management research, my coauthors and I have worked directly with senior executives and observed, interviewed, and surveyed managers as they prepared for, dealt with, and learned from crises and near misses in their organizations. In our foundational research into workplace incivility, we

collected survey data from thousands of employees at all organizational levels. We deepened and broadened our understanding through further studies, in hundreds of interviews and additional surveys, and in scores of focus groups with employees, managers, and executives. Insights across studies also reflect consulting and collaboration with organizational leaders as they attempted to assess and improve their capabilities for dealing with crises and incivility.

At the heart of this article is an ongoing, multifaceted study to understand the management of negative emotions in the workplace. To date, the research reported here has been developed with the active engagement of more than 350 managers and executives from more than 200 organizations and three dozen

countries. We have gathered data from focus groups, in-depth interviews, surveys, observation, and other field research. In many cases, we began our inquiries by asking participants to describe a critical incident that evoked their negative emotions at work and to base their responses and recommendations on that situation. Information such as the causes, contexts, and consequences of the negative emotional experiences, as well as the nature and effectiveness with which the negative emotions were managed, were assessed through simple content analysis of the open-ended data. Our respondents represent a cross section of industries (public and private companies, government, and nongovernmental organizations), job types, and management positions.

organizations millions of dollars in lost productivity, disengagement, and dissipated effectiveness.

In a study of 137 managers enrolled in an executive MBA program, Christine Porath of Georgetown University and I found that negative emotions led them to displace bad feelings onto their organizations, either by decreasing their effort or time at work, lowering their performance or quality standards, or eroding their commitment to their organizations.⁶ Employees who harbor negative sentiments lose gusto and displace their own negative emotional reactions on subordinates, colleagues, bosses, and outsiders. They also find ways to stay clear of coworkers and circumstances that they associate with their negative feelings, which can short-circuit communication lines and clog resource access.⁷ Consider these pricey consequences as incentives to face, rather than avoid, darker workplace emotions.

Look yourself in the mirror. If you lack emotional self-awareness, your own concerns will inhibit your abilities and color the emotions that you tune into.⁸ Next time your own negative emotions are rising, reflect. Recognize and harness your own emotional triggers. Which conditions or individuals provoke emotional reactions from you? Note circumstances and your typical responses. Ask trusted colleagues and friends for their observations of your behavior.

Stay calm, breathe deep, and model behavior. When your negative feelings stir in the workplace, take a slow and deliberate account of what is going on. Our earliest studies of incivility uncovered a

typical escalating cycle of tit-for-tat behavior when emotions were high.⁹ Rather than fueling that cycle, let agitation serve as a signal to step back.

Instead of engaging in reciprocal behavior, practice overcoming physiological signals that could draw you into the drama. For example, when you feel your emotions rising, pause and take a focused deep breath rather than bursting forth with a knee-jerk reaction. That momentary delay can help reason rather than instinct drive your response. Think broadly, and aim to spread composure by modeling it. Build a habit of passing on fewer negative emotions than you receive, regardless of the circumstances.

Fine-tune your radar. Watch facial expressions and body language, especially when nonverbal behaviors don't seem to match what you are hearing. To build this skill, practice observing and interpreting emotional actions and reactions at meetings and in public settings. As the chief legal officer of an international chemical company said, "The greatest benefit of preparing for crises as a team is learning the 'tells' that the other leaders exhibit when their negative emotions rise. Over the years, those subtle signals have helped me determine when to step in and how to frame my suggestions, especially when crises are brewing." Take account of the context and the stakes for individuals. Afterward, check your accuracy by seeking others' perspectives about what occurred.

When you're listening, listen fully. This requires much more than simply focusing on the speaker. If you are checking email on your phone or laptop, you're not listening fully. If your internal dialogue is

blaming or criticizing, you're not listening fully. If you're jumping to solutions or thinking about the story that you will share when it's your turn to talk, you're not listening fully. Cease these behaviors to demonstrate that you care. You will catch signals earlier and interpret their meanings more astutely.

Stepping Up to Negative Emotions

When managers fail to notice or respond to negative emotions, they subsequently encounter increases in rifts, resentment, and dissatisfaction among employees.¹⁰ When negative emotions are allowed to brew, physiological predisposition can cause coworkers to mimic the movements, postures, and facial expressions of those feeling bad.¹¹ Notably, this synchronization happens automatically, so others may mirror negative expressions without awareness that they are doing so. Unconsciously passing on negative emotions can erode productivity and cooperation. In the worst cases, managers have described a cloud of negative emotions that can spread throughout the workplace, making it more difficult to recruit and retain the best employees.

Leaders can be strategically shortsighted when they ignore or miss negative emotions in the workplace. In a recent study exploring negative incidents at work, 99 managers at an international Fortune 100 manufacturer shared examples of early warning signals that were missed prior to negative incidents, despite employee concerns.¹² In some of the cases, larger problems grew in the interim, and delays complicated rectifying or learning from difficult circumstances.

The benefits of addressing negative emotions can be significant. Promptly stepping up can stem interpersonal turbulence and keep satisfaction, engagement, and productivity intact. Moreover, those who take the initiative to step up often experience personal gratification from helping others in meaningful ways.

How to Step Up

Tend to signals of negative emotions early. Watch for warning signs across your team. Are individuals putting in fewer hours or less effort? Has engagement dwindled? Are fewer employees showing up for discretionary activities such as celebrations or noncompulsory meetings? In our research and practice, these behaviors have signaled underlying negative emotions. Take a close look at hard data and trends that can be signs of

dissatisfaction and withdrawal, such as late arrivals, absenteeism, and voluntary turnover.

Even small supportive gestures from managers can improve employees' ability to cope. Anticipate that employees facing tough times will have negative feelings. Discuss and determine what employees need and what you are able to offer. Convey frank optimism and confidence that they can manage the challenges. Find ways to offer additional support and resources to help them.

Seek out troubled employees. When behaviors seem emotionally charged, it can be challenging to understand what is happening. Start by gathering data. Ask simple, neutral questions to get a conversation going, such as "How are you doing today?" or "Everything OK?" Then, tune in sharply to the response, taking stock of subtle indicators like volume, pitch, and speed of speech. Consider whether an employee's behaviors and expressions are unusual or out of sync with the rhythm of your conversation. Listen for veiled references to negative emotions. Employees may not be comfortable saying they are sad, but they might tell you they feel discouraged or disappointed.

Resist the urge to fix others' problems for them. Be quick to listen and offer support but slow to advise. As a senior production manager in a manufacturing company explained, "What works for me is to voice my concerns, lightly, and then wait for the response. I'm also really careful not to jump into the role of being the parent." Ask questions to help employees determine what the best approaches would be. Help employees map out specific individuals in their network who could provide the support they need.

When negative emotions are rooted in conflicts among employees, strive to get adversaries to work together to resolve their differences. Urge them to prepare for a discussion together and, in that discussion, to stick to the issue at hand. To drive reconciliation, help them understand the personal costs and larger stakes if they cannot move past their differences.

Sometimes, individuals cannot get unstuck from their negative emotions. If troubled employees are unwilling to consider alternative perspectives or approaches, accept that for the time being. Rather than push harder, take a step back, observe, and remain available, as appropriate.

Do not assume that negative emotions have dissolved when hard times seem to have passed. The full

significance of negative circumstances may not become evident to those affected until later. For example, although you may be relieved by employees' initial acceptance of organizational shakeouts, don't miss or ignore what often follows. Sadness can emerge as reality sets in about losing colleagues or routines. During this time, don't dispassionately direct employees to put the past behind them. The impact can be depleting. As an information technology (IT) manager who survived layoffs explained, "The new leaders keep warning us, 'It's time to move on.' I resent it. They make it seem like having legitimate concerns is a personal shortcoming."

Dealing With Anger, Fear, and Sadness

Anger, fear, and sadness are three primary negative emotions commonly encountered in the workplace. Knowing more about these specific emotions can increase your skill at handling them and build the confidence you need to take effective action.

Anger This may be the most prevalent negative emotion at work. It is certainly the most acceptable. As I have observed in field research and found across surveys and interviews, displays of anger can be so common and powerful in some organizations that employees sometimes learn to habitually use anger to get their way.

Working with and around angry people is exhausting: It wears others out, undermines their drive, and suppresses their cognitive abilities. When individuals dare to respond to anger, brain chemistry can cause them to have difficulty communicating well or thinking clearly.¹³ Unfortunately, inferior responses can strengthen angry employees' self-serving biases about being right, stoke their confidence, and reinforce their use of anger.

Angry encounters can spin into long-lasting resentment and unhappiness. Based on thousands of survey responses regarding incivility, research colleagues and I found that (1) employees who are treated angrily typically seek retribution, harbor animosity, or both; (2) some employees who simply witness or hear about others' angry outbursts may seek recourse; and (3) employees in anger-tainted workplaces find ways to get even with offenders and with their

organizations.¹⁴ The following guidelines are imperative for effective managerial response to anger.

Don't let yourself get sucked in. When anger is stirring, expect your own anger or fear to rise. Whether you are the target of anger or a referee among angry employees, aim to slow down the situation. Do what you can to quiet yourself and the environment. Remain still. Listen carefully. Aim to project a composed, neutral demeanor by speaking calmly, clearly, and deliberately, but do not be condescending. When you are the target of anger, do not attempt to justify yourself or argue the point. Rather, strive to contain your own negative emotions.

When dealing with anger in the workplace, calmly try to unknot and understand the full situation without being absorbed by it. Speak with individuals one-on-one to ascertain their perspectives. Help angry employees consider appropriate ways of handling heated issues, by discussing problems and developing plans to deal with similar challenges more effectively in the future. When anger is directed at you, fully evaluate whether complaints are justified. If so, apologize and take action promptly to correct the problem. If not, aim to remain respectful and carry on.

Don't side with an employee you think has been wronged. Doing so can harden negative attitudes, making the situation more brittle and more resistant to improvement. Instead, aim to speak from a position of neutrality. Resist the temptation to empathize with negative comments about any individual or the circumstances. Do not attribute harmful intentions, even if they seem obvious. As an executive at a public-sector organization recommended, "Create an environment where employees understand the personal costs if they're not pulling for the team. Help angry employees consider and initiate forward-focused thinking and action in a solutions-based environment, rather than dwelling on the negative."

Fear Full-scale organizational crises, dismal quarterly results, and even off-the-cuff negative comments by those in charge can kick-start fear in a workplace. When fear strikes, the physiology of survival readies individuals to fight, flee, or freeze. However, organizations expect employees to carry on, even when employees' perceptions of personal or

professional risks are acute and realistic. Even in the midst of unthinkable crises, workers are expected to continue to meet their typical performance targets. The prevalence and strength of this workplace norm cause employees to be very reluctant to admit that they are afraid.

Nonetheless, it is essential to address fear at work because this negative emotion packs a wallop. Fear seizes individuals' attention while simultaneously diminishing their objectivity. Being afraid can erode employees' decision-making abilities and confidence. Fear stimulates catastrophic thinking, leading employees to replay the past, fret about the future, and disengage from the present. Being scared undermines employees' tolerance for ambiguity and complexity, a crucial success factor for today's competitive environment. Further, the negative impact of fear can linger long after dangers prove unfounded. In the meantime, studies I've worked on show that worried employees may attempt to unload their concerns on colleagues, setting off additional negative emotions across the workplace.¹⁵

When fear is engendered by coworkers or bosses, employees trim their time at work, accept fewer responsibilities, and accomplish less. When their fears are ignored, employees take action to protect themselves from the dangers that they recognize or imagine. Rather than striking out at the individuals who scare them, employees often displace their negative reactions onto the organization that has failed to protect them.

If fear lingers, employees start looking for new jobs. In fact, of the negative emotions that Porath and I have tracked for more than two decades, fear is the emotion most likely to cause employees to quit, although they are unlikely to cite fear as the catalyst for their departure.¹⁶

As individuals are unlikely to report their fears in the workplace, the burden is on executives to address this commonplace challenge. Nonetheless, some executives choose to ignore the problem of frightened employees or even deny or minimize the situation engendering fear in the first place. Others may recognize the cause of fear but leave the burden of dealing with it to those who are afraid, despite costly outcomes. The following two actions are essential when fear churns.

Deal with employee fear head-on. Action is a powerful antidote to fear. Our research suggests that being frank and providing reasonable, realistic reassurance can signal that someone is in control. This awareness can help employees who are afraid. One executive described how he successfully approaches fear in the workplace: "I allow fearful employees to vent, and I try not to let their fear spiral out of control. I assure them as much as I can. I listen carefully to their concerns and honestly provide whatever facts I can."

Help employees avoid exaggerating perceived dangers. To keep fear from spinning out of control, be honest and up front about challenges while infusing authentic enthusiasm about realistic opportunities and benefits that may lie ahead. Share your own concerns reasonably to ease others into discussing theirs. Encourage employees to gather facts and help them face their individual fears rather than slipping into the victim's role, a perspective that engenders hopelessness and unhappiness.

A common source and stimulant of workplace anxiety is the rumor mill. My fellow researchers and I have observed managers and executives attempt to mitigate fear by withholding details of changes on the horizon. Rather than assuaging concerns, however, lack of information leads to speculation, often with worse outcomes than reality would hold. To ward off fear and avert this problem, overcommunicate and find ways to recognize or reward those who persist despite their fears.

Sadness Sadness may be the most unwelcome emotion at work. Working with sad people crushes enthusiasm, drains productivity, and dulls esprit de corps. Sad employees display low energy and lose interest in what once engaged them.

According to our survey and interview data, sad employees tend to show up later, leave earlier, avoid potentially unpleasant meetings, seek offsite assignments, and seize opportunities to work remotely.¹⁷ Those deeply saddened become apathetic. Some sad employees give up and quit. Despite such costly consequences, however, executives will find scant research or recommendations about dealing with sadness. To improve this, I offer the following suggestions based on my research and consulting.

Be present. Sadness is often accompanied by feelings of isolation. As I have observed in crises and less extreme negative circumstances, executives who remain accessible impart strength, as well as a sense of communal concern and connection, to their followers. However, while engaging with sad employees, resist the temptation to push for higher spirits or to provide advice about how an individual should cope with sadness. Specifically, do not tell sad employees that you know how they feel — you couldn't. Do not compare their sad situations with your own: Your examples may seem insensitive and irrelevant.

With dramatic loss, employees may seem detached or disoriented, behaviors that can increase a manager's reluctance to intervene. Nonetheless, practical approaches from managers and executives can help lighten the burden. If employees have experienced a serious personal loss, help them temporarily make work a lower priority so that they can focus on dealing with their grief. Allow employees to overcome their sadness at their own pace. Help them connect with their natural support systems. Some options to temporarily relieve the full burden of work include providing time off or a few days of shortened work hours, permitting affected employees to work remotely, identifying avenues for transferring some of their responsibilities to colleagues, and encouraging them to postpone or cancel work travel.

A senior manager who faced family trauma described the relief, gratitude, and impact she experienced after receiving compassionate treatment at work. "My boss's immediate response was that now was not a time to be concerned about work," she said. "He acknowledged, without flinching, just how traumatic my personal loss was and that it had implications for me personally and professionally. He did what he could to help me delegate my obligations so that I could spend more time with my family. When I returned to work, my colleagues accepted that I would be working in a haze of sadness for quite a while. All of this helped a lot. I was always dedicated to my work and to my workplace. This experience deepened my connection to both."

Support from business leaders during a tough time can have an immense impact on an employee's morale. The founder and former president of a very prosperous network services organization

credited empathy during times of duress as a key contributor to his company's extraordinary success. As he put it, "We were especially intent on supporting people through difficult experiences. All of us go through them. It's the right thing to do. What we learned over time was that our employees, even those who simply knew about the company's responsiveness and were not direct beneficiaries, more than reciprocated with unflagging loyalty."

In times of loss and sadness, seize opportunities to demonstrate character. Many managers confess that they become befuddled when employees cry. Of course, this is not a helpful reaction. To improve, begin by accepting that crying is a legitimate way to display negative emotions (even if you prefer to express sadness or frustration in a different way). Allow employees some time to work through their initial reactions to an upsetting circumstance. If needed, offer a dignified, temporary exit with respectful cues like, "This has been a long day. Shall we wrap up for now and reconvene tomorrow morning?"

Study participants who speak or write about their personal experiences of sadness at work tend to focus on their bosses' attitudes and behaviors. They attribute courage for "normalizing the emotions," "dealing with the situation rather than allowing the negative to fester," and demonstrating "grit." They portray bosses who stayed in the moment, reset priorities, and gently guided forward movement. In the best cases, they tell us that bosses who faced into emotional adversity inspired them to behave similarly, to contribute more, and to grow professionally. Some point to organizational impact when their bosses' willingness to address negative emotions helped others find the strength to endure and succeed through grueling circumstances. One executive told us how his employer had provided support to employees who were terminally ill: "He watched, monitored, observed each individual's needs, and adjusted his support accordingly. His ability to cope with adversity and the pressures it puts on his business will always be inspiring to me."

The Benefits of Acknowledging Emotions

When negative emotions are acknowledged openly, I have found that employees learn to anticipate and

interpret their colleagues' reactions to difficult circumstances more astutely. They grow to understand their own reactions better, too. With these improvements, appropriate responses to challenging situations can be made earlier, when adjustments are generally easier, more effective, and less expensive.

In good times, it's easy to celebrate success and happiness. In darker times, those who respond to negative emotions effectively stand out as they manage their own reactions to stress, deal with the negative emotions of others sensitively and effectively, and face reality — seeing things as they fully are.

Christine M. Pearson is a professor of global leadership at the Thunderbird School of Global Management at Arizona State University in Glendale, Arizona. Comment on this article at <http://sloanreview.mit.edu/x/58305>, or contact the author at smrfeedback@mit.edu.

REFERENCES

1. S. Achor, "The Happiness Advantage" (New York: Random House, 2010); E. Denier and R. Biswas-Denier, "Happiness: Unlocking the Mysteries of Psychological Wealth" (Malden, Massachusetts: Blackwell Publishing, 2011); J. Pryce-Jones, "Happiness at Work" (West Sussex, U.K.: Wiley-Blackwell, 2010); and M. Seligman, "Flourish: A Visionary New Understanding of Happiness and Well-Being" (New York: Free Press, 2011).
2. B. Ehrenreich, "Bright-Sided: How Positive Thinking Is Undermining America" (New York: Henry Holt and Co., 2009); and T. Kashdan and R. Biswas-Diener, "The Power of Negative Emotion: How Anger, Guilt, and Self-Doubt Are Essential to Success and Fulfillment" (London: One-World Publications, 2015).
3. L.M. Andersson and C.M. Pearson, "Tit-for-Tat? The Spiraling Effect of Incivility in the Workplace," *Academy of Management Review* 24, no. 3 (July 1999): 452-471.
4. C.M. Pearson, L.M. Andersson, and J.W. Wegner, "When Workers Flout Convention: A Study of Workplace Incivility," *Human Relations* 54, no. 11 (November 2001): 1387-1419; and C.M. Pearson and C.L. Porath, "The Cost of Bad Behavior: How Incivility Is Damaging Your Business and What to Do About It" (New York: Penguin/Portfolio, 2009).
5. C.M. Pearson, "Finessing Negative Emotions Ad Hoc," working paper, Thunderbird School of Global Management, Glendale, Arizona, 2016.
6. C.L. Porath and C.M. Pearson, "Emotional and Behavioral Responses to Workplace Incivility and the Impact of Hierarchical Status," *Journal of Applied Social Psychology* 42 (December 2012): 326-357.
7. Pearson and Porath, "The Cost of Bad Behavior."
8. P. Hays, "Addressing Cultural Complexities in Practice," 2nd ed. (Washington, D.C.: American Psychological Association, 2010), 51-71; and G. Parry, "Coping with Crises" (London: Routledge, 1990), 70-73.
9. Andersson and Pearson, "Tit-for-Tat?"
10. Pearson, Andersson, and Wegner, "When Workers Flout Convention"; and C.M. Pearson and C.L. Porath, "On the Nature, Consequences, and Remedies of Workplace Incivility: No Time for 'Nice'? Think Again," *Academy of Management Executive* 19 (February 2005): 7-18.
11. E. Hatfield, J.T. Cacioppo, and R.L. Rapson, "Emotional Contagion" (New York: Cambridge University Press, 1994).
12. C.M. Pearson, "Individual, Team and Organizational Ramifications of Stifling Negative Emotions at Work," working paper, Phoenix, 2016.
13. J. LeDoux, "The Emotional Brain," (New York: Simon & Schuster, 1996); H. Lerner, "Fear and Other Uninvited Guests" (New York: HarperCollins, 2004), 53-58.
14. C.M. Pearson, "Research on Workplace Incivility and Its Connection to Practice," in "Insidious Workplace Behavior," ed. J. Greenberg (New York: Routledge, 2011), 149-174; Pearson, Andersson, and Wegner, "When Workers Flout Convention"; and Porath and Pearson, "Emotional and Behavioral Responses."
15. Pearson and Porath, "On the Nature, Consequences, and Remedies"; and Porath and Pearson, "Emotional and Behavioral Responses."
16. Porath and Pearson, "Emotional and Behavioral Responses."
17. Pearson and Porath, "The Cost of Bad Behavior"; Pearson and Porath, "On the Nature, Consequences, and Remedies"; and Porath and Pearson, "Emotional and Behavioral Responses."
- i. These studies include: C. Porath and C. Pearson, "The Price of Incivility," *Harvard Business Review* 91, no. 1-2 (Jan.-Feb. 2013): 115-121; Porath and Pearson, "Emotional and Behavioral Responses"; C.M. Pearson and A. Sommer, "Infusing Creativity into Crisis Management: An Essential Approach Today," *Organizational Dynamics* 40, no. 1 (Jan.-March 2011): 27-33; Pearson, "Research on Workplace Incivility"; Pearson and Porath, "The Cost of Bad Behavior"; C. Pearson, "Leading through Crisis: 21st Century Global Challenges," in "Crisis Leadership," ed. E. James and L. Smith (Charlottesville, Virginia: Darden Business Publishing, 2005), 13-22; C.M. Pearson and C.L. Porath, "On the Nature, Consequences, and Remedies"; C.M. Pearson, L.M. Andersson, and C.L. Porath, "Workplace Incivility," in "Counterproductive Workplace Behavior: Investigations of Actors and Targets," ed. S. Fox and P. Spector (Washington, D.C.: American Psychological Association, 2005), 177-200; Pearson, Andersson, and Wegner, "When Workers Flout Convention"; C.M. Pearson, L.M. Andersson, and C.L. Porath, "Assessing and Attacking Workplace Incivility," *Organizational Dynamics* 29, no. 2 (November 2000): 123-137; Andersson and Pearson, "Tit-for-Tat?"; and C.M. Pearson, "Organizations as Targets and Triggers of Aggression and Violence: Framing Rational Explanations for Dramatic Organizational Deviance," in "Research in the Sociology of Organizations," vol. 15, ed. P.A. Bamberger and A. Peter (Stamford, Connecticut: JAI Press, 1998), 197-223.

Reprint 58305.

Copyright © Massachusetts Institute of Technology, 2017.
All rights reserved.



PDFs ■ Reprints ■ Permission to Copy ■ Back Issues

Articles published in MIT Sloan Management Review are copyrighted by the Massachusetts Institute of Technology unless otherwise specified at the end of an article.

MIT Sloan Management Review articles, permissions, and back issues can be purchased on our Web site: sloanreview.mit.edu or you may order through our Business Service Center (9 a.m.-5 p.m. ET) at the phone numbers listed below. Paper reprints are available in quantities of 250 or more.

To reproduce or transmit one or more MIT Sloan Management Review articles by electronic or mechanical means (including photocopying or archiving in any information storage or retrieval system) **requires written permission.**

To request permission, use our Web site: sloanreview.mit.edu
or

E-mail: smr-help@mit.edu

Call (US and International): 617-253-7170 Fax: 617-258-9739

Posting of full-text SMR articles on publicly accessible Internet sites is prohibited. To obtain permission to post articles on secure and/or password-protected intranet sites, e-mail your request to smr-help@mit.edu.