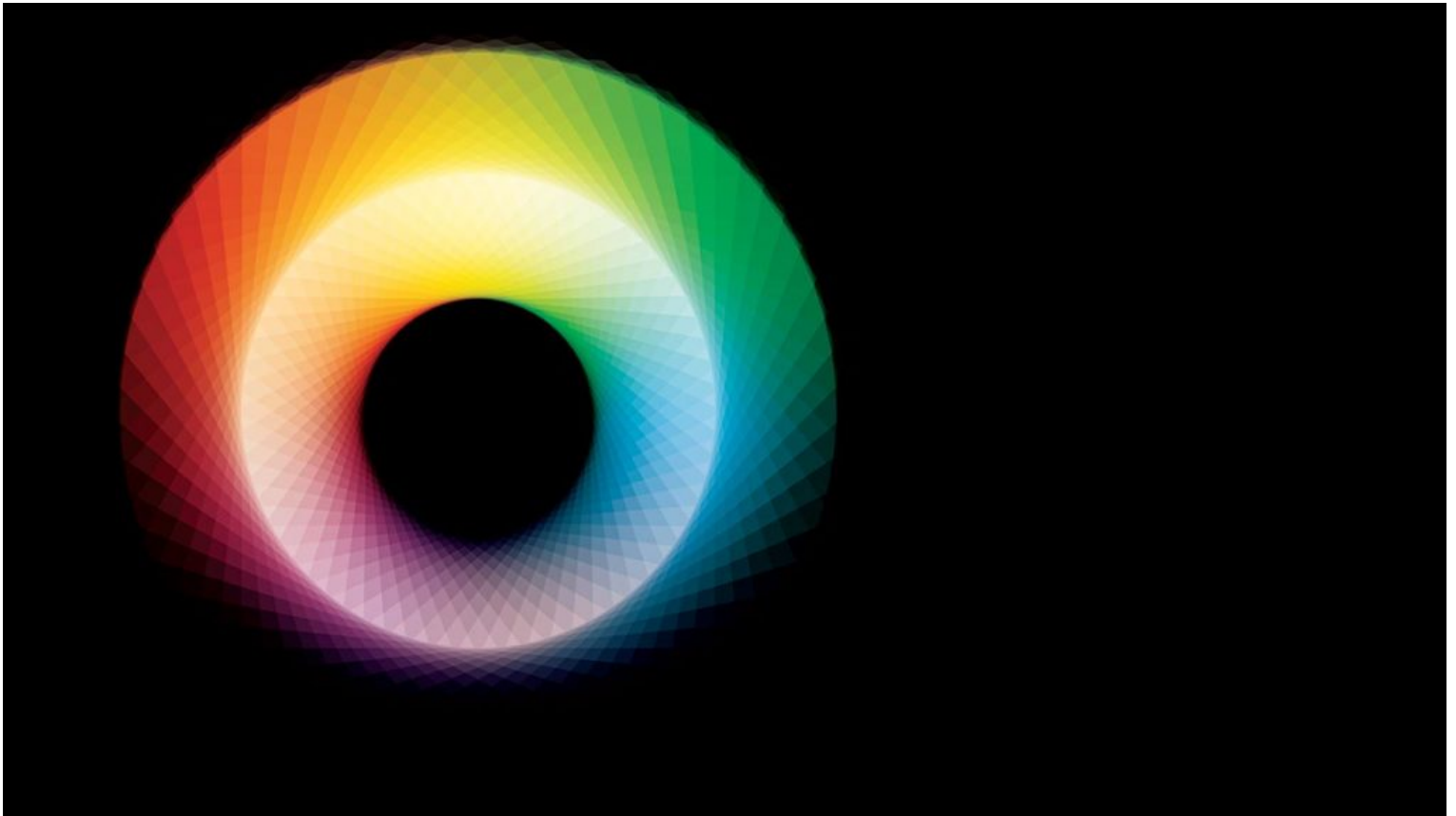


LEADING TEAMS

The New Science of Building Great Teams

by Alex "Sandy" Pentland

FROM THE APRIL 2012 ISSUE



Artwork: Andy Gilmore, Chromatic, 2010, digital drawing

If you were looking for teams to rig for success, a call center would be a good place to start. The skills required for call center work are easy to identify and hire for. The tasks involved are clear-cut and easy to monitor. Just about every aspect of team performance is easy to measure: number of issues resolved, customer satisfaction, average handling time (AHT, the golden standard of call center efficiency). And the list goes on.

Why, then, did the manager at a major bank's call center have such trouble figuring out why some of his teams got excellent results, while other, seemingly similar, teams struggled? Indeed, none of the metrics that poured in hinted at the reason for the performance gaps. This mystery reinforced his assumption that team building was an art, not a science.

The truth is quite the opposite. At MIT's Human Dynamics Laboratory, we have identified the elusive group dynamics that characterize high-performing teams—those blessed with the energy, creativity, and shared commitment to far surpass other teams. These dynamics are observable, quantifiable, and measurable. And, perhaps most important, teams can be taught how to strengthen them.

Why Do Patterns of Communication Matter So Much?

It seems almost absurd that how we communicate could be so much more important to success than what we communicate.

Yet if we look at our evolutionary history, we can see that language is a relatively recent development and was most likely layered upon older signals that communicated dominance, interest, and emotions among humans. Today these ancient patterns of communication still shape how we make decisions and coordinate work among ourselves.

Looking for the “It Factor”

When we set out to document the behavior of teams that “click,” we noticed we could sense a buzz in a team even if we didn't understand what the members were talking about. That suggested that the key to high performance lay not in the content of a team's discussions but in the manner in which it was communicating. Yet little of the research on team building had focused on communication. Suspecting it might be crucial, we decided to examine it more deeply.

Consider how early man may have approached problem solving. One can imagine humans sitting around a campfire (as a team) making suggestions, relating observations, and indicating interest or approval with head nods, gestures, or vocal signals. If some people failed to contribute or to signal their level of interest or approval, then the group members had less information and weaker judgment, and so were more likely to go

hungry.

The New Science of Building Great Teams

For our studies, we looked across a diverse set of industries to find workplaces that had similar teams with varying performance.

Ultimately, our research included innovation teams, post-op wards in hospitals, customer-facing teams in banks, backroom operations teams, and call center teams, among others.

We equipped all the members of those teams with electronic badges that collected data on their individual communication behavior—tone of voice, body language, whom they talked to and how much, and more. With remarkable consistency, the data confirmed that communication indeed plays a critical role in building successful teams. In fact, we’ve found patterns of communication to be the most important predictor of a team’s success. Not only that, but they are as significant as all the other factors—individual intelligence, personality, skill, and the substance of discussions—combined.



Patterns of communication, for example, explained why performance varied so widely among the seemingly identical teams in that bank's call center. Several teams there wore our badges for six weeks. When my fellow researchers (my colleagues at Sociometric Solutions—Taemie Kim, Daniel Olguin, and Ben Waber) and I analyzed the data collected, we found that the best predictors of productivity were a team's energy and engagement outside formal meetings. Together those two factors explained one-third of the variations in dollar productivity among groups.

Drawing on that insight, we advised the center's manager to revise the employees' coffee break schedule so that everyone on a team took a break at the same time. That would allow people more time to socialize with their teammates, away from their workstations. Though the suggestion flew in the face of standard efficiency practices, the manager was baffled and desperate, so he tried it. And it worked: AHT fell by more than 20% among lower-performing teams and decreased by 8% overall at the call center. Now the manager is changing the break schedule at all 10 of the bank's call centers (which employ a total of 25,000 people) and is forecasting \$15 million a year in productivity increases. He has also seen employee satisfaction at call centers rise, sometimes by more than 10%.

Any company, no matter how large, has the potential to achieve this same kind of transformation. Firms now can obtain the tools and data they need to accurately dissect and engineer high performance. Building great teams has become a science. Here's how it works.

Overcoming the Limits of Observation

When we sense esprit de corps, that perception doesn't come out of the blue; it's the result of our innate ability to process the hundreds of complex communication cues that we constantly send and receive.

But until recently we had never been able to objectively record such cues as data that we could then mine to understand why teams click. Mere observation simply couldn't capture every nuance of human behavior across an entire team. What we had, then, was only a strong

sense of the things—good leadership and followership, palpable shared commitment, a terrific brainstorming session—that made a team greater than the sum of its parts.



Recent advances in wireless and sensor technology, though, have helped us overcome those limitations, allowing us to measure that ineffable “It factor.” The badges developed at my lab at MIT are in their seventh version. They generate more than 100 data points a minute and work unobtrusively enough that we’re confident we’re capturing natural behavior. (We’ve documented a period of adjustment to the badges: Early on, people appear to be aware of them and act unnaturally, but the effect dissipates, usually within an hour.) We’ve deployed them in 21 organizations over the past seven years, measuring the communication patterns of about 2,500 people, sometimes for six weeks at a time.

BY THE SAME AUTHOR

Beyond the Echo Chamber

DECISION MAKING FEATURE by Alex “Sandy” Pentland

Anyone can become a good decision maker by seeking out a wide range of new people and ideas.

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voice they use; whether they face one another; how much they gesture; how much they talk, listen, and interrupt; and even their levels of extroversion and empathy. By comparing data gathered from all the individuals on a team with performance data, we can identify the communication patterns that make for successful teamwork.

Those patterns vary little, regardless of the type of team and its goal—be it a call center team striving for efficiency, an innovation team at a pharmaceutical company looking for new product ideas, or a senior management team hoping to improve its leadership. Productive teams have certain data signatures, and they’re so consistent that we can predict a team’s success simply by looking at the data—without ever meeting its members.

With the data we’ve collected, we’ve mapped the communication behaviors of large numbers of people as they go about their lives, at an unprecedented level of detail. The badges produce “sociometrics,” or measures of how people interact—such as what tone of

Just by looking at the sociometric data, we've been able to foretell which teams will win a business plan contest.

We've been able to foretell, for example, which teams will win a business plan contest, solely on the basis of data collected from team members wearing badges at a cocktail reception. (See "Defend Your Research: We Can Measure the Power of Charisma," HBR January-February 2010.) We've predicted the financial results that teams making investments would achieve, just on the basis of data collected during their negotiations. We can see in the data when team members will report that they've had a "productive" or "creative" day.

The data also reveal, at a higher level, that successful teams share several defining characteristics:

1. Everyone on the team talks and listens in roughly equal measure, keeping contributions short and sweet.
2. Members face one another, and their conversations and gestures are energetic.
3. Members connect directly with one another—not just with the team leader.
4. Members carry on back-channel or side conversations within the team.
5. Members periodically break, go exploring outside the team, and bring information back.

The data also establish another surprising fact: Individual reasoning and talent contribute far less to team success than one might expect. The best way to build a great team is not to select individuals for their smarts or accomplishments but to learn how they communicate and to shape and guide the team so that it follows successful communication patterns.

The Key Elements of Communication

In our research we identified three aspects of communication that affect team performance. The first is *energy*, which we measure by the number and the nature of exchanges among team members. A single exchange is defined as a comment and some acknowledgment—for example, a “yes” or a nod of the head. Normal conversations are often made up of many of these exchanges, and in a team setting more than one exchange may be going on at a time.



The most valuable form of communication is face-to-face. The next most valuable is by phone or videoconference, but with a caveat: Those technologies become less effective as more people participate in the call or conference. The least valuable forms of communication are e-mail and texting. (We collect data on those kinds of communication without using the badges. Still, the number of face-to-face exchanges alone provides a good rough measure of energy.) The number of exchanges engaged in, weighted for their value by type of communication, gives each team member an energy score, which is averaged with other members’ results to create a team score.

FURTHER READING

What Makes Teams Smarter? More Women

GENDER ARTICLE by Anita Woolley and Thomas W. Malone

If a group includes more women, its collective intelligence rises.

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Energy levels within a team are not static. For instance, in my research group at MIT, we sometimes have meetings at which I update people on upcoming events, rule changes, and other administrative details. These meetings are invariably low energy. But when someone announces a new discovery in the same group, excitement and energy skyrocket as all the members start talking to one another at once.

The second important dimension of communication is *engagement*, which reflects the distribution of energy among team members. In a simple three-person team, engagement is a function of the average amount of energy between A and B, A and C, and B and C. If all members of a team have relatively equal and reasonably high energy with all other members, engagement is extremely strong. Teams that have clusters of members who engage in high-energy communication while other members do not participate don’t perform as well. When

we observed teams making investment decisions, for instance, the partially engaged teams made worse (less profitable) decisions than the fully engaged teams. This effect was particularly common in far-flung teams that talked mostly by telephone.

The most valuable form of communication is face-to-face. E-mail and texting are the least valuable.

The third critical dimension, *exploration*, involves communication that members engage in outside their team. Exploration essentially is the energy between a team and the other teams it interacts with. Higher-performing teams seek more outside connections, we've found. We've also seen that scoring well on exploration is most important for creative teams, such as those responsible for innovation, which need fresh perspectives.

To measure exploration, we have to deploy badges more widely in an organization. We've done so in many settings, including the MIT Media Lab and a multinational company's marketing department, which comprised several teams dedicated to different functions.

Our data also show that exploration and engagement, while both good, don't easily coexist, because they require that the energy of team members be put to two different uses. Energy is a finite resource. The more that people devote to their own team (engagement), the less they have to use outside their team (exploration), and vice versa.

But they must do both. Successful teams, especially successful creative teams, oscillate between exploration for discovery and engagement for integration of the ideas gathered from outside sources. At the MIT Media Lab, this pattern accounted for almost half of the differences in creative output of research groups. And in one industrial research lab we studied, it distinguished teams with high creativity from those with low creativity with almost 90% accuracy.

Beyond Conventional Wisdom

A skeptic would argue that the points about energy, engagement, and exploration are blindingly obvious. But the data from our research improve on conventional wisdom. They add an unprecedented level of precision to our observations, quantify the key dynamics, and make them measurable to an extraordinary degree.

For example, we now know that 35% of the variation in a team's performance can be accounted for simply by the number of face-to-face exchanges among team members. We know as well that the "right" number of exchanges in a team is as many as dozens per working hour, but that going beyond that ideal number decreases performance. We can also state with certainty that in a typical high-performance team, members are listening or speaking to the whole group only about half the time, and when addressing the whole group, each team member speaks for only his or her fair share of time, using brief, to-the-point statements. The other half of the time members are engaging in one-on-one conversations, which are usually quite short. It may seem illogical that all those side exchanges contribute to better performance, rather than distract a team, but the data prove otherwise.

The data we've collected on the importance of socializing not only build on conventional wisdom but sometimes upend it. Social time turns out to be deeply critical to team performance, often accounting for more than 50% of positive changes in communication patterns, even in a setting as efficiency-focused as a call center.

Without the data there's simply no way to understand which dynamics drive successful teams. The managers of one young software company, for instance, thought they could promote better communication among employees by hosting "beer meets" and other events. But the badge data showed that these events had little or no effect. In contrast, the data revealed that making the tables in the company's lunchroom longer, so that strangers sat together, had a huge impact.

A similarly refined view of exploration has emerged in the data. Using fresh perspectives to improve performance is hardly a surprising idea; it's practically management canon. But our research shows that most companies don't do it the right way. Many organizations we've

studied seek outside counsel repeatedly from the same sources and only at certain times (when building a business case, say, or doing a postmortem on a project). The best-performing and most creative teams in our study, however, sought fresh perspectives constantly, from all other groups in (and some outside) the organization.

How to Apply the Data

For management tasks that have long defied objective analysis, like team building, data can now provide a foundation on which to build better individual and team performance. This happens in three steps.

Step 1: Visualization.

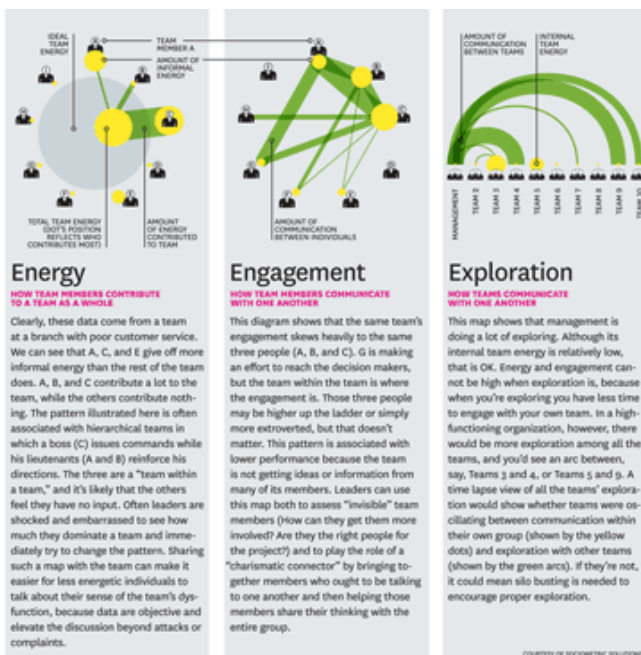
In raw form the data don't mean much to the teams being measured. An energy score of 0.5 may be good for an individual, for example, but descriptions of team dynamics that rely on statistical output are not particularly user-friendly. However, using the formulas we developed to calculate energy, engagement, and exploration, we can create maps of how a team is doing on those dimensions, visualizations that clearly convey the data and are instantly accessible to anyone. The maps starkly highlight weaknesses that teams may not have recognized. They identify low-energy, unengaged team members who, even in the visualization, look as if they're being ignored. (For examples, see the exhibit "Mapping Teamwork.")

Mapping Teamwork

Concerned about uneven performance across its branches, a bank in Prague outfitted customer-facing teams with electronic sensors for six weeks. The first two maps below display data collected from one team of nine people over the course of different days, and the third illustrates data collected on interactions between management and all the teams.

When we spot such people, we dig down into their individual badge data. Are they trying to contribute and being ignored or cut off? Do they cut others off and not listen, thereby discouraging colleagues from seeking their opinions? Do they communicate only with one other team member? Do they face other people in meetings or tend to hide from the group physically? Do they speak loudly enough? Perhaps the leader of a team is too dominant;

By looking at the data, we unearthed a divide between teams at the “Soviet era” branches of the bank and teams at more modern facilities. Interestingly, at the Soviet-era branches, where poor team communication was the rule, communication outside teams was much higher, suggesting that those teams were desperately reaching out for answers to their problems. Teams at the modern facilities showed high energy and less need to explore outside. After seeing initial data, the bank’s management published these dashboard displays for all the teams to see and also reorganized the teams so that they contained a mix of members from old and new branches. According to the bank, those measures helped improve the working culture within all the teams.



it may be that she is doing most of the talking at meetings and needs to work on encouraging others to participate. Energy and engagement maps will make such problems clear. And once we know what they are, we can begin to fix them.

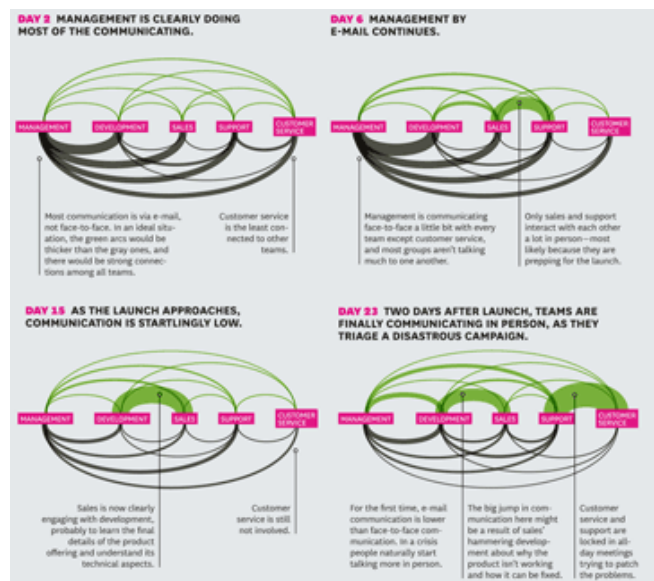
Exploration maps reveal patterns of communication across organizations. They can expose, for instance, whether a department’s management is failing to engage with all its teams. Time-lapse views of engagement and exploration will show whether teams are effectively oscillating between those two activities. It’s also possible to layer more detail into the visualizations. We can create maps that break out different types of communication among team members, to discover, for example, if teams are falling into counterproductive patterns such as shooting off e-mail when they need more face time. (For an example, see the exhibit “Mapping Communication over Time.”)

Mapping Communication over Time

The maps below depict the communication patterns in a German bank’s marketing department in the days leading up to and immediately following a major new product launch. The department had teams of four members each in customer service, sales, support, development, and management. Besides collecting data on in-person

interactions with sociometric badges, we gathered e-mail data to assess the balance between high-value face-to-face communication and lower-value digital messages.

We did not provide iterative feedback in this project, but if we had, by the end of week one, we would have pointed out three negative trends the group could have corrected: the invisibility of customer service, overreliance on e-mail, and highly uneven communication among groups. If these issues had been addressed, the problems with the product might have surfaced much earlier, and the responses to them would probably have improved.



How to read these maps

THICKNESS OF ARCS INDICATES THE AMOUNT OF COMMUNICATION BETWEEN GROUPS.

GREEN INDICATES

Step 2: Training.

With maps of the data in hand, we can help teams improve performance through iterative visual feedback.

Work we did with a multicultural design team composed of both Japanese and American members offers a good example. (Visual data are especially effective at helping far-flung and multilingual groups, which face special communication challenges.) The team's maps (see the exhibit "Mapping Communication Improvement") showed that its communication was far too uneven. They highlighted that the Japanese members were initially reluctant to speak up, leaving the team both low energy and unengaged.

Mapping Communication Improvement

Our data show that far-flung and mixed-language teams often struggle to gel. Distance plays a role: Electronic communication doesn't create the same energy and engagement that face-to-face communication does. Cultural norms play a role too. Visual feedback on communication patterns can help.

For one week we gathered data on a team composed of Japanese and Americans that were brainstorming a new design together in Japan. Each day the team was shown maps of its communication patterns and given simple guidance about what makes good communication (active but equal participation).

Day 1: The two Japanese team members (bottom and lower left) are not engaged, and a team within a team seems to have formed around the member at the top right.

Every day for a week, we provided team members a visualization of that day's work, with some light interpretation of what we saw. (Keep in mind that we didn't know the substance of their work, just how they were interacting.) We also told them that the ideal visualization would show members contributing equally and more overall contributions. By day seven, the maps showed, the team's energy and engagement had improved vastly, especially for the two Japanese members, one of whom had become a driving force.

The notion that visual feedback helps people improve quickly shouldn't be surprising to anyone who has ever had a golf swing analyzed on video or watched himself deliver a speech. Now we have the visual tools to likewise improve teamwork through objective analysis.

Step 3: Fine-tuning performance.



Day 7: The team has improved remarkably. Not only are the Japanese members contributing more to energy and engagement (with the one at the bottom becoming a high-energy, highly engaged team member) but some of the Day 1 “dominators” (on the lower right, for example) have distributed their energy better.



We have seen that by using visualizations as a training tool, teams can quickly improve their patterns of communication. But does that translate to improved performance? Yes. The third and final step in using the badge data is to map energy and engagement against performance metrics. In the case of the Japanese-American team, for example, we mapped the improved communication patterns against the team’s self-reported daily productivity. The closer the patterns came to those of our high-performance ideal, the higher productivity rose.

We’ve duplicated this result several times over, running similar feedback loops with teams aiming to be more creative and with executive teams looking for more cohesiveness. In every case the self-reporting on effectiveness mapped to the improved patterns of communication.

Through such maps, we often make important discoveries. One of the best examples comes from the bank’s call center. For each team there, we mapped energy and engagement against average handling time (AHT), which we indicated with color. (See the exhibit “Mapping Communication Against Performance.”) That map clearly showed that the most efficient work was done by high-energy, high-engagement teams. But surprisingly, it also showed that low-energy, low-engagement teams could outperform teams that were unbalanced—teams that had high energy and low engagement, or low energy and high engagement. The maps revealed that the manager needed to keep energy and engagement in balance as he worked to strengthen them.

Mapping Communication Against Performance

Visualizations can be used to compare energy and engagement with established performance metrics. The map below plots the energy and engagement levels of several teams at a bank call center against the center's metric of efficiency, average handling time (AHT).

The expected team efficiency is based on a statistical analysis of actual team AHT scores over six weeks. Blue indicates high efficiency; red low efficiency. High-energy, high-engagement teams are the most efficient, the map shows. But it also indicates that low-energy, low-engagement teams outperform teams that are out of balance, with high energy and low engagement, or low energy and high engagement. This means the call center manager can pull more than one lever to improve performance. Points A and B are equally efficient, for example, but reflect different combinations of energy and engagement.

The manager wanted to raise energy and engagement in lockstep. We suggested instituting a common coffee break for each team at the call center. This increased the number of interactions, especially informal ones, and raised the teams' energy levels. And because all team members took a break at once, interactions were evenly distributed, increasing engagement. When we mapped energy and engagement against AHT afterward, the results were clear: Efficiency in the center increased by 8%, on average, and by as much as 20% for the worst-performing teams.

If a hard metric like AHT isn't available, we can map patterns against subjective measures. We have asked teams to rate their days on a scale of "creativity" or "frustration," for example, and then seen which patterns are associated with highly creative or frustrating days. Teams often describe this feedback as "a revelation."

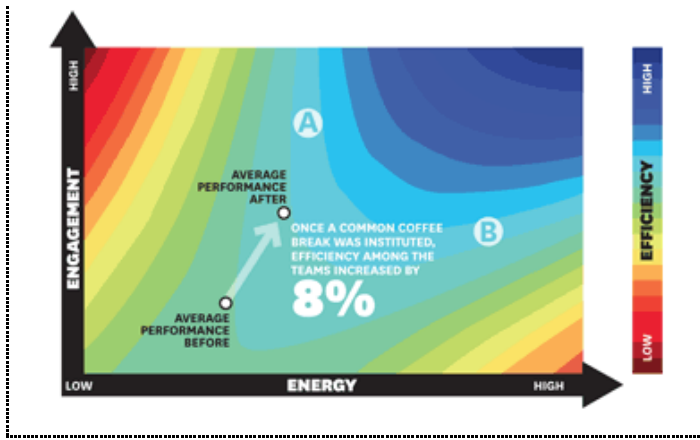
Successful tactics.

The obvious question at this point is, Once I recognize I need to improve energy and engagement, how do I go about doing it? What are the best techniques for moving those measurements?

Simple approaches such as reorganizing office space and seating are effective. So is setting a personal example—when a manager himself actively encourages even participation and conducts more face-to-face communication.

Policy changes can improve teams, too.

Eschewing Robert's Rules of Order, for example, is a great way to promote change. In some cases, switching out team members and bringing in new blood may be the best way to improve the energy and engagement of the team, though we've found that this is often unnecessary. Most people, given feedback, can learn to interrupt less, say, or to face other



people, or to listen more actively. Leaders should use the data to force change within their teams.

The ideal team player.

We can also measure individuals against an ideal. In both productivity-focused and creativity-focused teams, we have discovered

the data signature of what we consider the best type of team member. Some might call these individuals “natural leaders.” We call them “charismatic connectors.” Badge data show that these people circulate actively, engaging people in short, high-energy conversations. They are democratic with their time—communicating with everyone equally and making sure all team members get a chance to contribute. They’re not necessarily extroverts, although they feel comfortable approaching other people. They listen as much as or more than they talk and are usually very engaged with whomever they’re listening to. We call it “energized but focused listening.”

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The best team players also connect their teammates with one another and spread ideas around. And they are appropriately exploratory, seeking ideas from outside the group but not at the expense of group engagement. In a study of executives attending an intensive one-week executive education class at MIT, we found that the more of these charismatic connectors a team

had, the more successful it was. Team building is indeed a science, but it's young and evolving. Now that we've established patterns of communication as the single most important thing to measure when gauging the effectiveness of a group, we can begin to refine the data and processes to create more-sophisticated measurements, dig deeper into the analysis, and develop new tools that sharpen our view of team member types and team types.

The sensors that enable this science are evolving as well. As they enter their seventh generation, they're becoming as small and unobtrusive as traditional ID badges, while the amount and types of data they can collect are increasing. We've begun to experiment with apps that present teams and their leaders with real-time feedback on group communications. And the applications for the sensors are expanding beyond the team to include an ever-broader set of situations.

We imagine a company's entire staff wearing badges over an extended period of time, creating "big data" in which we'd find the patterns for everything from team building to leadership to negotiations to performance reviews. We imagine changing the nature of the space we work in, and maybe even the tools we use to communicate, on the basis of the data. We believe we can vastly improve long-distance work and cross-cultural teams, which are so crucial in a global economy, by learning their patterns and adjusting them. We are beginning to create what I call the "God's-eye view" of the organization. But spiritual as that may sound, this view is rooted in evidence and data. It is an amazing view, and it will change how organizations work.

A version of this article appeared in the April 2012 issue of *Harvard Business Review*.

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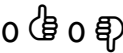
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