A growing body of research shows that groups can systematically enhance their performance

The Science of Team Success

By Steve W. J. Kozlowski and Daniel R. Ilgen

The right stuff: The dramatic rescue of *Apollo 13*'s astronauts would have been impossible without the coordinated efforts of NASA engineers. Research is revealing why some groups work so well together.

"Houston, we've had a problem," were the famous words that announced a crisis onboard *Apollo 13*. Halfway through *Apollo*'s mission to the moon, one of the spacecraft's oxygen tanks exploded, putting the lives of the crew in grave jeopardy. A group of engineers from NASA was hastily assembled. Their mission: invent a way for the crew to survive and to pilot their damaged vessel back to Earth. The engineers were successful, transforming a potential disaster into a legend of effective teamwork.

NASA

As experienced members leave and new people join a group, crucial bits of collective knowledge can be lost.

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Human history is largely the story of people working together in groups to explore, achieve and conquer—and in our modern world the role of teams is only growing, spurred by globalization and the enabling factor of communications technology. Teams do not always play the role of hero, however. They have also been implicated in many political and military catastrophes, including the U.S. government's sluggish response to Hurricane Katrina, the failure to prevent the tragedy of 9/11 and the explosion of NASA's space shuttle *Columbia*.

Given the centrality of work teams, it is more than a bit remarkable how much our society's perspective is focused on the individual. We school our children as individuals. We hire, train and reward employees as individuals. Yet we have great faith that individuals thrown into a team that has been put together with little thought devoted to its composition, training, development and leadership will be effective and successful. Science strongly suggests otherwise.

We recently reviewed the past 50 years of research literature on teams and identified factors that characterize the best collaborations. It turns out that what team members *think*, *feel* and *do* provide strong predictors of team success—and these factors also suggest ways to design, train and lead teams to help them work even better.

Unfortunately, although society places a great value on teamwork, the way organizations make use of teams often runs against known evidence for what works—and even against common sense. For example, it seems obvious that teams need sufficient resources to enable members to accomplish their goals. Still, in this era of down-

FAST FACTS

Building Better Teams

1» An effective work group should be designed well from the start, bringing together people who can contribute to the right mix of knowledge, skills, tools and other resources necessary to succeed.

2» Face-to-face meetings, social interaction among members and a leader who establishes a good relationship with every worker help a team make the best use of its expertise and create a cohesive mission.

3» Generic teamwork skills such as setting goals, adapting to change, resolving conflict and providing feedback allow teams to learn from each challenge and continually improve their performance.

Organizations reward individuals based on individual performance rather than team performance.

sizing and cutbacks, one has to question the wisdom of many managers who believe that more can *always* be accomplished with less.

Consider, too, that organizations typically reward people with salaries, bonuses and promotions based on individual performance rather than team performance. These rewards can often inhibit team members' willingness to work together and help one another, even when the success of the team depends on it. Such success requires a delicate balance between meeting the goals of the team as well as those of the individuals who populate it. Research on goal setting, cooperation, competition, conflict and negotiation contributes to a better understanding of how people remain in teams and work together.

Indeed, a crucial question that should be asked before putting a team together is whether you need one at all. Some businesses recognize the importance of teams and promptly restructure every task so that it becomes a group responsibility, even when the assignment is something that could be done easily by an individual working independently. The result is a team that is more likely to impede performance than enhance it. Another question is, What type of team structure is required? The task of some teams is such that their employees can function independently for long stretches and occasionally confer and pool their results, as with a team of salespeople working in different geographic regions. Others, such as surgical teams, require a high and constant degree of coordination.

The job assigned to a team also determines the primary focus of activities, and how well the individual members complete their related duties determines the team's efficiency. That is why team studies have turned to an approach known as organizational psychology, which focuses on the task as central to understanding the dynamics of teamwork and team performance. (In contrast, a traditional social psychology perspective

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An effective group brings together people with the necessary knowledge, skills and tools to do the job.

focuses more on interactions among peers, and the work merely serves as the context for those exchanges.) As mentioned before, the task sets minimum requirements for the resource pool—the constellation of knowledge, skills, abilities and other characteristics (such as personality, values)—that is available across team members.

The Collective Mind

One of the most important things a team brings to a task is what its members *think,* the relevant information they carry in their heads. This knowledge can include a mastery of the tools they use and an understanding of the task at hand, its goals, performance requirements and problems. Some knowledge may be shared by all workers, whereas particular members might have specialized skills or know-how. The ability to access and use this distributed expertise efficiently is one characteristic of successful teams.

A 1995 experiment by psychologist Diane Wei Liang, then at the University of Minnesota, psychologist Richard L. Moreland of the University of Pittsburgh and Linda Argote, professor of organizational behavior and theory at Carnegie Mellon University, nicely demonstrated how team members benefit from their collective knowledge when they learn together. These researchers trained college students to assemble transistor radios either alone or in groups of three. A week later the subjects were tested with their original group or, for people who received solo training, in newly formed groups. Members of groups that had trained together remembered more details, built better-quality radios and showed greater trust in fellow members' expertise. People in newly formed groups were less likely to have the right mix of skills to complete the task efficiently and knew less about one another's strengths.

With a different group of collaborators, Argote studied the effect of individual turnover on another chore, making origami birds. Again, groups of three trained together and were given six time periods to make as many paper products as possible. The groups with turnover produced significantly fewer folded creations than groups whose members stayed constant, suggesting aspects of group knowledge were being lost when people were replaced.

In an interesting twist, organizational behav-

Successful teams must deal with parasitic members—those who do not contribute anything to the group.

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ior expert Kyle Lewis of the McCombs School of Business at the University of Texas at Austin found that the development of a team's ability to access distributed knowledge required face-to-face interaction. In groups that communicated exclusively by phone or e-mail, this skill did not emerge—an observation of increasing importance, given the rise of teams that operate remotely and coordinate sometimes only through computer interactions. It should prompt concerted efforts to understand the reasons for such barriers and explore whether webcams, videoconferencing or other technologies that allow people to interact will help overcome this problem. For now, the best solution may be to guarantee some face time for team members throughout their project.

Beyond an understanding of the nuts and bolts of any given project, another cognitive influence on team effectiveness is the emergence of an overall objective, mission or strategic imperative of the group—something psychologists call the team climate. The powerful effect of climate on the real-world impact of teams is well established. For example, one of our groups (Kozlowski's) showed that high-tech businesses whose engineers agreed on the objective to stay technologically up-to-date showed improved performance and had more employees pursuing continuing education and displaying positive job attitudes. Several studies across many industries have shown that when a team has absorbed a mission statement that values customer service, this attribute predicts customer satisfaction. Likewise, when a team agrees that the objective is safety, the result is more safety-conscious behavior by team members and a reduction in the rate of accidents.

Ties That Bind

Climate emerges in groups with strong ties among their members. For example, team members who have a good relationship with their leader tend to share climate perceptions with their boss and co-workers. Teams that have frequent informal social interactions also show greater consensus on climate than those that do not.

Part of the glue that binds people to their bosses or to one another is emotional. Although less is understood about how emotional state affects team performance than about cognitive influences, it is clear that how teams feel can drag down productivity or boost it up—or otherwise complicate it. For example, a shared positive attitude can reduce the number of absences in teams and lower the likelihood that people will leave the group.

But there are hints that good moods do not always lead to good outcomes. Social psychologist Joseph P. Forgas of the University of New South Wales in Australia, for example, asked teams to hold a discussion after they watched happy or sad videos and found that greater divisions arose in the groups that were given a prior "feel good" stimulus.

It also appears that team members tend to change their moods in concert. Social psychologist Peter Totterdell of the University of Sheffield in England and his colleagues had nurses record their moods each day at work over a period of three weeks. They found that the mood of different teams shifted together over time. Totterdell has measured a similar convergence in the affect of teams of accountants and cricket players.

The fact that emotions move in this lockstep way has led to a concept of emotional contagion, the idea that emotions within teams are transferred from one person to others close by. In a well-controlled laboratory study, professor of management Sigal Barsade of the Wharton School of the University of Pennsylvania investigated the effect of emotional contagion on team process and performance. The research involved using a drama student posing as a research subject whom Barsade trained to participate with a happy, optimistic attitude or an unpleasant, pessimistic one. She found that this one person's behavior did lead to group-level changes in emotion, both for positive and negative affect. Although the scientific study of how mood influences performance of the individual and the team as a whole is still in its infancy, this area promises to yield important insights.

One person's behavior leads to group-level changes in emotion, both negatively and positively.

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If teamwork skills were ubiquitous, there would be **enormous benefits** to students and society.

Works Well with Others

Finally, whatever the task, the way people perform, or *do,* the work as a team makes a profound difference. The important elements here appear to be general teamwork skills that are not specific to any particular task. Some of the research in this area centers on bad behaviors that degrade team performance and spirit—dealing with "free riders," for example, who rely on other team members to do their job and thus contribute less than their fair share. This type of disruptive behavior can be limited by requiring that contributions be visible and members accountable.

There are also many positive ways in which the best teams act that give them an advantage: individuals are aware of one another's performance, provide backup coverage for members, set goals, coordinate their actions, communicate effectively, make decisions, resolve conflicts, and adapt to changing circumstances and new ideas. A key point is that this learning process can be a dynamic one that helps to shape and improve the team over time—and team leaders can play a major role. Prior to action, for example, the leader can help set team learning goals commensurate with current team capabilities. During action, the leader monitors team performance (and intervenes as necessary). As the team disengages from action, the leader diagnoses performance deficiencies and guides process feedback. This cycle repeats, and the complexity of learning goals increases incrementally as team skills accumulate and develop. This kind of feedback loop has been shown to reliably improve team thinking and performance.

Work from Kozlowski's group, however, has found a trade-off in the type of feedback provided and the resulting performance. Feedback directed to individuals yields higher individual performance at the expense of team performance; team feedback yields better team performance at the expense of individual performance. If both types of feedback are provided, both levels of performance cannot be maximized. The findings indicate that team designers need to be mindful of

On-the-job training: every task a team undertakes is a chance to learn new skills and to learn how to work together more effectively.

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precisely what they want to be salient to team members and should design supporting goal and feedback systems accordingly. Such systems may need to be adaptive, shifting the balance depending on current needs.

One reason that achieving the right level of feedback is so important is that teams learn best while doing. In some cases, notably in the military and in aviation, this on-the-job training can be supplemented with sophisticated and realistic simulations of combat missions or of takeoffs and landings. This virtual training approach is starting to find applications elsewhere, such as in medicine, although in most cases the best place to develop team skills is on the job itself. General teamwork proficiency turns out to be one area where classroom training appears to make a strong difference, perhaps because these are generic skills not related to a specific job. Accordingly, semester-long college-level programs that significantly improve students' knowledge of generic teamwork competencies have been developed. Nevertheless, encouraging work by one of our teams (Ilgen's) has demonstrated that knowledge of these team competencies can improve significantly with only 30 minutes of individual training.

Leaders play a crucial role in developing group skills by setting goals, monitoring performance and giving feedback.

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Missed Opportunities

Although these skills can be taught, they rarely are—and few formal experiences to impart generic team-process and leadership experiences are available. If such courses are provided at all, they tend to be very late in the educational process—in college courses or in professional programs such as business school, for example—and these courses are usually geared toward imparting factual knowledge rather than building skills. We sampled a number of well-known M.B.A. programs and found that fewer than half listed a course devoted primarily to leadership or teams.

Furthermore, although it is not uncommon for educators from elementary school through college to include assignments organized around group projects in which students may display teamwork and leadership behaviors, attention is usually on the group's output—a report, for example—with little or no attention placed on guiding the nature and effectiveness of the team process.

If teamwork were taught along with reading, writing and mathematics, and if these skills were ubiquitous, there would be enormous benefits to students and society alike. For now, though, it is often only after a great triumph or tragedy that the importance of teamwork is drawn into the spotlight. Ironically, these occasions focus largely on singling out individuals for reward or to assign blame, as the case may be. Despite literally thousands of studies that show much can be done to design teams properly and to ensure they do their jobs well and get better as time goes on, the question rarely turns to how the successes can be replicated or problems avoided the next time around. We think it is just a matter of applying the science. M

(Further Reading)

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