

CHIEF EXECUTIVE

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Lessons from the Ant Farm

Looking for efficient solutions to tough problems? Forget corporate case studies. Embrace the offbeat.

BY CATHERINE FREDMAN

Who would have thought that ants could teach lessons in logistics? Or that invisible and intangible assets could leave such indelible marks on a company's bottom line? Yet in an economy that increasingly relies more on ideas and individuals than on traditional bureaucracy, strategies that help companies achieve and maintain competitive advantage often come from unconventional sources.

Here are four ideas—some a bit offbeat—that have

been applied to business problems successfully.

Swarm intelligence

Eric Bonabeau, chief scientist of the Icosystem, a Cambridge, Mass., concern that develops strategies and technologies for various businesses, readily admits that he was not the first to see how his work studying social insect colonies could be applied to the management of complex corporations. "When I was first approached to

draw parallels between business and insect behavior, I was very skeptical," Bonabeau recalls. "Then I realized that human behavior is highly constrained in a human organization [just like in an ant colony] and because of that, it might be possible to model human behavior with the same tools that I use to model social insect colonies."

Such collective behavior, dubbed swarm intelligence, is, at heart, a successful illustration of self-organization on a large scale. The traits that enable a colony of army ants to find food and set up supply chains to nurture the entire colony, he explained in an interview, can help complex companies find efficient solutions to difficult problems. The colony can quickly adapt to a changing environment; it can perform its necessary tasks even when one or more individual ants fails; and it needs relatively little supervision or top-down control. Bonabeau employs rigorous mathematical models that enhance these traits of flexibility, robustness and self-organization to help a company hone its competitive edge.

Logistics is a natural application of these ant-foraging algorithms. Southwest Airlines used the principles of swarm intelligence to streamline its cargo operations, saving more than \$10 million a year. Some of the airline's discoveries about itself at first seemed counter-intuitive. For example, Southwest discovered that it can be beneficial to leave cargo on a plane, even if it was initially headed in the wrong direction. If the airline wanted to send a package from Boston to Chicago, it might be more efficient to leave it on a plane heading for Atlanta and then Chicago rather than wait for a direct flight or transfer it midroute. This finding slashed freight transfer rates by as much as 80 percent at the busiest cargo hubs and reduced the workload for people who move cargo, allowing Southwest to cut back on its storage facilities and minimize wage costs. Furthermore, the resulting flexibility meant that the airline could still make money even if the planes weren't fully loaded, which opened up significant opportunities to generate new business.

Variations on the ant-foraging algorithm also helped Unilever, the multinational consumer goods company, develop decision-making software for its production facilities that was faster and more automatic than traditional efficiency methods. At one complex-liquid manu-

facturing plant, the chemical mixers, storage tanks and packaging lines each have different rates of operation, different abilities to be connected to other equipment, different capacities, different changeover times for switching from one product to another and different maintenance schedules, all occurring in a dynamic environment in which machinery can break down without warning and customer demand is increasingly volatile. Bonabeau examined how ants surmount unexpected obstacles in their relentless quest to find food and bring it back to the nest, and produced software that copes easily with changing conditions.

Insights gleaned from swarm intelligence also helped Capital One, the giant financial-services company, replace its rigid command-and-control management style with a more flexible approach better suited to a fast-growing business. Like a medium-size ant colony whose territory is invaded by a larger competitor, Capital One constantly searches out and targets new market opportunities. To encourage employees to look for opportunities outside their immediate departments, Capital One revamped its employee-evaluation system to reward people who actively search for such "food sources." The extent to which this behavior supports the business strategy was implicit in a comment in the company's annual report soon after it adopted the precepts of swarm intelligence: "Many of our business opportunities are short-lived. We have to move fast to exploit them and move on when they fade."

Networking knowledge

When you look at how organizations really work," says Bonabeau, who has written about swarm intelligence in the *Harvard Business Review*, the *Journal of Business Innovation* and in a book he co-authored, *Swarm Intelligence: From Natural to Artificial Systems* (Oxford University Press, 1999), "the hierarchical chart is very rarely the structure that people use to get their jobs done."

Karen Stephenson couldn't agree more. A professor at Harvard's School of Design and Imperial College's School of Management at the University of London as well as a software entrepreneur for NetForm International, Stephenson studies the informal pathways by which knowledge is communicated throughout an organization.

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Why is that important? Think of it this way: If the official organizational chart shows the rules of a company, the human network shows the ropes—what really makes things work and gets things done. Each person in that web represents a node, but not all nodes have the same nature. Some are what Stephenson calls “hubs,” people who become a gathering and sharing point for critical information. Some are “pulsetakers,” who carefully cultivate relationships that allow them to monitor the ongoing health and direction of the organization. And some are “gatekeepers,” information bottlenecks who control the flow of contact to a particular part of the organization. These nodes and networks house and transmit tacit knowledge, the vitally important information that gives a company its competitive edge.

Furthermore, Stephenson has identified at least six different types of networks, each of which represents a core layer of knowledge, ranging from how the company works to how innovation is sparked and nurtured to how it is disseminated throughout the company and becomes part of its *modus operandi*. Like the body’s circulation system, nervous system and skeleto-muscular system, all of these networks combine to sustain the health of an organization. Conversely, if there’s a problem with one, then the health of the entire organization is affected.

By performing the equivalent of an MRI on an organization, Stephenson helped Amgen, the world’s largest biotechnology company, reduce the rate of attrition among its research scientists, IBM re-engineer itself, Steelcase design a new furniture consultation service and J.P. Morgan smooth its merger with Chase Manhattan.

The most relevant aspect of her work has to do with the lifeblood of companies today: innovation. At the root of all bureaucracies, she says, is an innovation that didn’t get harvested in time. At the other end of the spectrum, is an innovation that went too far, which sometimes results in fraud. And in the middle is a network that nurtures innovation appropriately so that it benefits the organization.

“There is an optimal balance between social networks and organizational hierarchy,” Stephenson says, “and there are correlations between these networks that show when an organization is ready for a change. If you’re knowledgeable about this, you can leverage your human capital appropriately.”

Grasping intangible assets

One of the confounding aspects of tacit knowledge networks is that they can be mapped and their results measured on a company’s bottom line, yet they can’t be physically grasped. Federal Reserve Chairman Alan Greenspan spoke to this issue last year when he talked about how the weight of the economy had declined. What he meant was that the economy is no longer being measured in locomotives and factories; instead, it is measured in ideas and people. Evaluating the ramifications of such intangible assets is what Jonathan Low and Pamela Cohen Kalafut of Cap Gemini Ernst & Young’s Center for Business Innovation have been puzzling over for the past five years and wrote about in their recent book, *Invisible Advantage: How Intangibles Are Driving Business Performance*.

“Intangibles are all those factors that help determine a company’s value but which are not captured in its financial statements,” Low explains. Physical assets and financial strength are no longer overwhelming guarantees of business dominance. Instead, the key sources of competitive advantage are those intangible assets and competencies that are hardest for competitors to emulate: an ability to innovate and come out regularly with new products and services; adaptability; dedicated, well-trained employees and leaders who can inspire them; a powerful brand; a sterling reputation; and systems—information systems, production systems, service-delivery systems—that provide customers with what they want when they want it, with a minimum of problems or delays.

“Intangibles matter more now because financial statements have become less and less connected to the operational performance of the company,” Low says. In a survey of institutional investors—portfolio managers who oversee at least \$1 billion in large-cap and mid-cap stocks—Low and Kalafut found that more than 35 percent of the respondents based their investment decisions on nonfinancial information, the bulk of which was not obtained from the subject company. Furthermore, the more sell-side analysts referred to non-financial factors, the more accurate were their quarterly earnings forecasts. Yet another study by Cap Gemini Ernst & Young of the 3,859 companies that went public in the United

INNOVATION

States from 1986 to 2000 found that the only significant differentiating factor between those that increased in price and those that didn't were their intangibles.

"Because financial information is so divorced from the reality of running a business, successful managers must look to intangibles to understand how they're performing vis-à-vis their competition," says Low. "It is also by looking at their intangibles that they can determine both how their traditional markets are growing—or not—and how to determine new markets for their goods and services."

Low and Kalafut's work is not limited to observation. They have constructed a value-creation index and correlated it to a company's market value. For example, compare Procter & Gamble to Unilever. Both sell products that are nearly indistinguishable. Yet Procter & Gamble, according to the index, has done a much better job of leveraging the intangible factors that are most important for manufacturers of nondurable goods: brand, employee development, alliances with customers and suppliers, new technology for supply-chain management and product development. Procter & Gamble scored 100 to Unilever's 86 on the value creation index; not surprisingly, its \$102 billion market capitalization wallops Unilever's \$60 billion. "The exciting part is the elasticity of the model," says Kalafut. "You can actually say, 'If I make a change in X intangible, here's the effect it will have on the bottom line.'"

The deviant's advantage

If Bonabeau studies the behavior that fosters innovation within an organization, Stephenson examines the way innovation achieves critical mass and Low and Kalafut measure the effects of its dissemination, Watts Wacker and Ryan Mathews of FirstMatter, a company that studies and charts the future, mine the mother lode: the actual source of innovation.

Their conclusion: Behind every bright idea is someone or something operating outside the norm. From professional wrestling to snowboarding, from Victoria's Secret lingerie to Viagra, from Elvis Presley to Sam

Walton and Richard Branson, concepts that were once considered deviant are now firmly entrenched, mass-market conventions. "Today, if you want to catch the wave of the future, you have to start surfing a lot closer to the fringe," Wacker writes in their recent book, *The Deviant's Advantage*.

Yet while most business leaders would agree that innovation is good, somehow deviance always ends up being bad. "Corporate culture works to eliminate deviant employees," writes Wacker. "Corporate culture punishes deviant behavior and attitudes. And, of course, as a result, most large companies lose the opportunity to discover the future and get there first." The challenge for business, then, is how to manage the fringe—how to recognize positive deviant ideas and move them toward the mass market.

Mathews and Wacker like to boast that "we've darkened the doors of 800 of the Fortune 1000." Joking aside, imagine what might have happened if more companies had followed Apple Computer's enjoiner to "Think different." Thinking differently is what enabled Wham-O to make millions on the Frisbee, Harley-Davidson to become the plaything of white-collar Baby Boomers, Victoria's Secret to transform trash into cash, and small companies like Tom's of Maine to compete in a commercial space dominated by Procter & Gamble, Unilever and Colgate. It's that concern that has built a client list for Mathews and Wacker that ranges from British Airways to IBM to Sara Lee and even the U.S. Navy.

Unlike those who think against the grain, Mathews and Wacker supply a model but no mathematical underpinnings. But by providing a template for understanding the full evolution of innovation, Mathews and Wacker force executives and managers to "think different." As they are fond of saying, "Resistance to deviance is futile. And acceptance of deviance is anything but fatal." ▲

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