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FUNDING

Researching outside the box

Open innovation offers scientists novel ways to apply their expertise — and sometimes provides much-needed cash.

BY CRISTINA JIMÉNEZ

In March 2008, Ahmet Karabulut was a couple of months from finishing a master's degree in molecular genetics, and was thinking about what to do next. During a coffee break, he read a news article about a company that posted other companies' unresolved scientific and business problems online. Anyone could send in a solution. Intrigued, Karabulut sought out the website and applied. He ended up successfully inventing a solution to an organic-chemistry problem on the stability of a compound in a common nasal decongestant. Karabulut used little more than his prior knowledge of the topic and access to the scientific literature. His immediate reward for a couple of days of work was US$20,000, crucial support as he was between jobs. But Karabulut says that the experience did more than earn him money — it also enriched his career.

He had answered the call of InnoCentive, an organization based in Waltham, Massachusetts, that uses the Internet to link 'seekers' — client companies struggling with pressing scientific or business problems — with 'solvers' — more than 250,000 problem-cracking minds around the globe, InnoCentive claims. The company is one of several, most of which are based in the United States, that are engaged in 'open innovation'. The motivating principle behind open innovation is that companies and other institutions should take full advantage of widely distributed knowledge in a wired world, finding products, patents and solutions — scientific, technological or social — outside the confines of their own organizations.

The trend has its own lingo: InnoCentive and others, including IdeaConnection of Vancouver, Canada, NineSigma of Cleveland, Ohio, TopCoder of Glastonbury, Connecticut, and yet2.com of Needham, Massachusetts, are known as innovation intermediaries, facilitators or technology brokers. The particulars of the organizations vary, but all pursue solutions to pressing research problems by posting challenges online, with the promise of financial awards — essentially crowdsourcing. Seekers range from drug to oil companies, and government agencies to non-profit organizations, and typically offer several thousand dollars for a project with a short turnaround. For scientists in need of a short-term financial boost or a supplemental source of income, open-innovation opportunities can offer a novel and challenging way to tackle new topics and add credentials to their CVs.

FRINGE BENEFITS

Since his first foray into open innovation, Karabulut has solved two further challenges, including developing a novel method for membrane-protein expression. He now works in drug discovery at the Fred Hutchinson Cancer Research Center in Seattle, Washington. "I was glad that I put the awards in my CV," he says, noting that he started to get many more responses to job applications once he had done so. Karabulut believes that the challenges showed that he could troubleshoot and think creatively, skills that many employers value. Henry Chesbrough, executive director of the Center for Open Innovation at the University of California, Berkeley, agrees. "Even those who do not 'win' often develop their ▶

reputation as an expert, making them more attractive within their innovation community for hire as a consultant or an employee for some future activity," he says. Chesbrough coined and promoted the term 'open innovation' in his book *Open Innovation: The New Imperative for Creating and Profiting from Technology* (Harvard Business School Press; 2003).

Scientists interested in becoming solvers can typically sign up for free on the intermediary's website. Usually facilitators don't require potential solvers to have formal qualifications, but InnoCentive estimates that 61% of their solvers hold an advanced degree. After signing in, candidate solvers can browse through numerous challenges in categories such as global health, clean technology or aerospace. InnoCentive, for example, runs about 40 challenges at a time. Solvers tend to choose to work on challenges that they think they can solve, says Lars Bo Jeppesen, an associate professor at Copenhagen Business School who has been studying the nature of innovation in a world of distributed knowledge for the past 10 years. This natural self-selecting method allows "the right people to solve the right problem at the right time", says Dwayne Spradlin, chief executive of InnoCentive. One major consumer goods product company claims that it has awarded prizes for more than half of its posted challenges. As is common practice, neither InnoCentive nor the company would provide specifics, fearing revealing too much to competitors.

So what does it take to become a successful solver? Some solvers emphasize the importance of a diverse research and training background and the ability to apply solutions and tools between fields or in a new one. "In fields that I haven't mastered, I can think outside of the box; I am not limited by the known and unknowns or the rules of the field," says Mounir Errami, a biochemist and bioinformatician at the University of Texas Southwestern Medical Center in Dallas. He has solved three challenges at InnoCentive, developing technologies for medicine and cosmetic chemistry unrelated to bioinformatics. Yury Bodrov, an organic chemist who has solved multiple challenges at InnoCentive and IdeaConnection, identifies two major assets for solvers. One is an analytical mind that can distinguish important data from noise. "The second is not a skill," says Bodrov, an independent consultant. "It's imagination."

INNOVATION COMPENSATION

Compensation ranges from $5,000 to $50,000, depending on the type of challenge. Sometimes, a few days' work can earn the solver several thousand dollars. At other times, however, the reward may not be worth the time and effort. Errami says that in the case of one challenge he took on, the amount of work needed has not been in line with the potential compensation. For past efforts, he says, he has typically required a short time to devise a solution, followed by a bit more to sort out technical aspects with a collaborator. "If the solution takes more than a couple of days, I avoid competing because the odds of winning are slim," he says. At InnoCentive, if a solution meets only some of the seeker's criteria, a client-services team judges how close it is. The seeker then decides whether to issue a full or partial award, or none at all.

"Even those who don't 'win' develop their reputation as an expert, making them more attractive for hire."
Henry Chesbrough

But the benefits transcend money and CV augmentation. Winning a challenge can boost a solver's confidence in his or her problem-solving skills, a benefit for those aspiring to academia or entrepreneurship. Simone Sergi, a telecommunications engineer and network system administrator at a bank in Reggio Emilia, Italy, with a doctorate in digital communications, won an InnoCentive challenge on reorganizing communications among satellites. He says that it gave him the confidence to consider a long-time dream of launching a wireless-technologies start-up company. Sergi says that he does not enjoy his job, and relished the opportunity to take on a new challenge.

Scientists who moonlight as solvers can use novel means to explore long-standing problems. Chris Wilmer, a PhD student in chemical and biological engineering at Northwestern University in Evanston, Illinois, solved a challenge that involved the lack of access to clean water in poor villages of developing countries. He found inspiration in the success of a mobile-phone business run by the Grameen Bank in Dhaka, Bangladesh. The bank would lend phones to a local entrepreneur in a poor village, who would pay back the loan by charging others in the village to use a phone. It was a profitable and self-sustaining model. Wilmer described how a similarly structured safe-water business could yield humanitarian benefits. "I enjoy solving social problems, so it was fun," says Wilmer, who has also won a second challenge involving programming a software tool to help characterize synthetic DNA strands.

For some, pursuing open innovation is a way to achieve career independence and flexibility. Grace Kepler, part-time associate research professor at the Center for Research in Scientific Computation at North Carolina State University (NCSU) in Raleigh, sees the challenges as well suited to scientists who, like her, are not employed full-time and have family responsibilities — as well as those who need more money or are unencumbered by intellectual-property issues. She applied her mathematical and statistical skills to a computational-biology challenge, and now also works as a scientific consultant, helping the company that posed the challenge to model crops. But scientists employed full- or part-time should tread carefully. When Kepler first started to work as a solver for InnoCentive, she had to obtain a waiver from NCSU stating that the university had no claim on the intellectual property in her solution, and that she had not designed it in the context of her work at the university. Seeker companies are careful to avoid revealing much to competitors — solvers often don't even know which company they're working for.

Open innovation could also offer scientists in lesser-known locations or institutions the power to break down barriers. Intermediaries solicit ideas from scientists all over the planet and from all sorts of backgrounds; an Internet connection is typically the only requirement, says Karim Lakhani, a professor of technology and operations management at Harvard Business School in Boston, Massachusetts. He calls solvers the "unusual suspects" — scientists and others with a potentially unconventional perspective.

NEW FUNDING MODEL

It is not just individuals who stand to benefit from an open-innovation funding stream; universities seeking a bit of extra money could also reap rewards. The National Physical Laboratory (NPL) in Teddington, UK, discovered open innovation while investigating alternative funding paths. "For the past three years, we've been trying to reduce our reliance on traditional government-funded routes for collaborative R&D," says Matt Smith, business development manager at the NPL, adding that the laboratory has earned more than £300,000 (US$467,000) through NineSigma, which focuses on pairing organizations — whether inventors, start-ups or universities — that possess innovative technology with companies that can commercialize those inventions. And when the National Aerospace Laboratory of the Netherlands (NRL) in Amsterdam was undergoing budget cuts, it secured a lucrative industrial research project through NineSigma to develop a life-assessment model for gas turbines. "The project lasted for 15 months and was worth several hundred thousand euros," says Arjen Vollebregt, a department manager at the NRL. He thinks that companies such as NineSigma could help labs to get extra funding with relatively little effort.

J. BLOCK

"Companies need to adapt to work with external ideas and inventors."
Wim Vanhaverbeke

Even a government agency, steeped in bureaucracy and decades of tradition, may have something to gain from open innovation — and

researchers eager to work with that agency could benefit. Bodrov solved a challenge for NASA on keeping food fresh in space, and he is now an independent scientific consultant for the chemical industry. He is also an entrepreneur: the approximately $160,000 that Bodrov earned from solving 16 challenges at InnoCentive and IdeaConnection has helped him to launch a start-up that develops nanomaterials for drug delivery in Saint Petersburg, Russia.

Jeffrey Davis, director of NASA's Space Life Sciences Programme at the Johnson Space Center in Houston, Texas, says that the agency liked Bodrov's food-packaging idea because it used a flexible graphite material — a solution perhaps familiar to materials scientists, but one that the food industry would not have generated. NASA is now looking at creating its own problem-solving framework, blending open-innovation challenges with traditional grants, contracts and small-business proposals, says Davis.

Davis says that accessing open-innovation channels was easy. "But there was a psychological barrier to admitting we couldn't find the answers ourselves," he says. This is not uncommon. Hesitation to accept outside inventions — a 'not-invented-here' stigma — is one of the major obstacles for open-innovation mechanisms, says Wim Vanhaverbeke, a professor of business studies at Hasselt University in Diepenbeek, Belgium. Companies must confront the same barrier. "They need to forget the idea that their only mission is to protect inside inventions and adapt to work with external ideas and inventors," says Vanhaverbeke.

The open-innovation approach continues to evolve. IdeaConnection, formed in 2007, is attempting to form teams of solvers using the extensive information collected in their online applications; each team member receives equal compensation if they win the challenge. Although teams composed of members with complementary backgrounds might have a better chance of solving challenges, efficiently communicating ideas between disparate members can be a challenge — something team facilitators attempt to address. InnoCentive, meanwhile, is creating a sort of 'dating site' for scientists, so that they can choose who they want to work with.

Karabulut says that the open-innovation strategy still has plenty of room to grow, "I don't know any better way for 'seekers' to find global talent for very specific challenges," he says. The thrill of winning continues to be a big part of the appeal. "It is one thing to win a cash reward," says Errami. "But it is quite a feeling to win a challenge." ■

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COLUMN

Confessions of a procrastinator

Everyone puts off big tasks with smaller ones, and the only solution is to fight fire with fire, says **Fabio Paglieri**.

In a memorable passage from Jerome K. Jerome's 1889 novel *Three Men in a Boat*, the narrator diagnoses himself with nearly every possible ailment after leafing through a medical book found in the British Museum. Psychology researchers such as myself are prone to a special brand of hypochondria: like Jerome's character, I cannot help but wonder whether I suffer from some of the psychological shortcomings that I observe each day in the lab.

My work studying how people schedule various tasks over time (usually inefficiently) has shown me the error of my own organizational ways, and now I know the name of my terminal illness: procrastination. I am always struggling to stick to multiple deadlines on the most disparate jobs. For every project with a deadline that I manage to meet, there are two more that I am forced to postpone. I am a pathological procrastinator.

For some time I thought I was alone in my depravity, and I laboured to keep it hidden from family, friends and co-workers. Then it dawned on me: procrastination is no exotic malaise, but rather a pandemic virus, one possessed of alarming virulence in the research community. Colleagues never tire of mentioning 'bottomless to-do lists', 'overwhelming commitments', 'busy schedules' and 'pressing deadlines'. Such symptoms can result in students failing to deliver data, a co-author unable to complete a paper or a publisher postponing a manuscript's publication. Clearly I am in no position to judge, as I myself have committed similar misdeeds. I take some heart in sharing the guilt with so many others.

How might young scientists manage to avoid wrecking their careers despite such a character flaw? Procrastination often stems from over-commitment, so simply taking on fewer obligations might solve the quandary. But this is easier said than done, especially for a postdoctoral researcher. One never knows which project might turn out to be a means to new career avenues or to tenure. And by the time one realizes that a new task is just another time-consuming burden, it is often too late to retreat without repercussions.

I was about to give in to despair and start roaming the self-help aisle of my favourite bookstore in search of a cure when I found a possible solution at structuredprocrastination.com. On the site, John Perry, a professor of philosophy at Stanford University in California, notes that procrastinators are never really idle; instead, they work on something in order to put off doing something else. According to Perry, you can make procrastination work for you. Just convince yourself that there is something really complex and important that you intend to do (say, write a full monograph on your favourite research topic), and your procrastination instinct will immediately drive you to do other tasks as a way of putting off working on your big project. The trick is to make sure that these other tasks are productive and not a waste of time. The bigger your ultimate aim, the more likely you are to take part in useful procrastination chores such as running experiments, tutoring students, writing articles or going to conferences.

If Perry is right, you don't have to conquer your base procrastination impulse to progress in your professional life. True, a modicum of self-deception is required for the strategy to work. But fortunately, procrastinators are skilled self-deceivers anyway.

Will it work? It has for me so far. I have managed to diligently complete many small but important tasks as a way of putting off other impending obligations. And, unfortunately, the alternative is to conquer procrastination by sheer willpower, which is something that humans just aren't very good at. ■

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