Not all innovation problems are suitable for open innovation, but crowdsourcing can have remarkable success if applied wisely to the right challenges.

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Crowd Innovation:
The Philosopher's Stone,
a Silver Bullet, or Pandora's Box?

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Unconventional thinkers wanted ⨉ Solutions to some of the most challenging problems have always come from people that are neither specialists nor experts in the focal field. These people have used unorthodox reasoning and relevant knowledge previously not applied to a given problem. Box 1 describes two such examples, one dating back to the 18th century, and one from current times. An advantage of our digital age is that these innovators, problem solvers, and gifted inventors can be reached and motivated to contribute their ideas and knowledge to the most challenging problems via well-organized crowdsourcing. This term was coined in 2005 by the editors of Wired Magazine, who used it to describe how organizations can take advantage of the networked world to "tap the talent of the crowd". Crowdsourcing as a term was soon after adopted by bloggers, in the popular press, the business community, and in academia. Not only did

it become popular, it was regarded in many industry circles as the philosopher's stone of innovation. But does crowdsourcing live up to expectations? Or is working with the crowd like opening Pandora's box? It´s time to take a closer look at how crowdsourcing works and what it can actually accomplish.

Crowdsourcing can take different forms ⨉ All kinds of organizations, both public and private, have tapped into the "wisdom of the crowd" to find help in solving problems and developing innovations. According to eYeka, one of the largest crowdsourcing and co-creation platforms, 85% of the 2014 Best Global Brands have used crowdsourcing, of which the quest for innovative ideas was the most frequent application (59%), followed by marketing and communication ideas (34%) and design solutions (7%). Crowdsourcing has become so popular among companies that specialized crowdsourcing platforms and services have emerged to serve the demand. InnoCentive is probably the best known of these. It considers itself "the global pioneer in crowdsourced innovation", with a community of approximately 400,000 problem solvers from over 190 countries. More than 2,000 contests have been held and more than USD $20,000,000 has been paid out in prizes so far. Kaggle is another example. Owned by Alphabet Inc., Kaggle is an online community with more than 1 million data scientists and machine learning engineers. Kaggle runs competitions in diverse fields and disciplines, from news analytics to predict stock price performance, algorithms to understand customer loyalty, predicting customer revenues, or prices for real estate. Other areas are clinical research, health care, basic biology, criminology, and search technology. There are different forms of crowdsourcing, of which the most popular for innovation are described below.

BOX 1

Crowdsourcing then and now
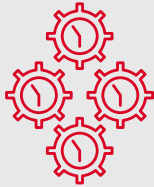
Back in the 18th century

In October 1707, four ships of a British fleet struck the rocks of the Isles of Scilly and sank. Between 1,400 and 2,000 men lost their lives. The sailing masters had miscalculated the longitude. The Scilly naval disaster led the British parliament to offer a series of rewards for anyone who could find an accurate way to determine longitude: ''...nothing is so much wanted and desired at sea, as the discovery of the longitude, for the safety and quickness of voyages, the preservation of ships, and the lives of men...'' according to the Longitude Act, 1714. For centuries, determining longitude at sea was a tough challenge for ocean navigators, and one of the toughest challenges for science as well. Even brilliant minds like Giovanni Medico Cassini or Isaac Newton could not find the answer. It was an English carpenter and self-educated clockmaker, John Harrison, who claimed the reward for determining longitude with his marine chronometer.

Fast forward to 2014

Exploration of the solar system poses a significant risk of radiation exposure both to humans and to hardware. Predicting Solar Particle Events that emit energy particles is of prime importance. Lacking an available method to predict onset, intensity, or duration of a Solar Particle Event, in 2014 NASA made an open call to invite people from all over the world to submit ideas for a solution. Over 500 problem solvers from 53 countries submitted solutions. The $30,000 reward went to Bruce Cragin, a retired radio frequency engineer from New Hampshire, who had an undergraduate degree in heliophysics. ''And it happens that when you take the math from extracting signal from noise and apply it to a heliophysics problem you get a really good prediction and this ended up being like an eight-hour prediction capability'', explains Steve Rader, from NASA Johnson Space Center.

https://www.nasa.gov/content/data-driven-forecasting-of-solar-events-challenge-0/
https://www.nasa.gov/johnson/HWHAP/crowdsourcing

> **Contests** ✕ Contests are the most common way to tap into the creativity and expertise of large crowds in the context of innovation. A company offers cash prizes to those who solve a challenging problem or submit a winning creative solution. The challenge is broadcast as widely as possible and it is open for a fixed period. Some of the toughest scientific and technological challenges have been solved through contests. Contests are also used for topics like developing new product designs, algorithms, or commercials. For instance, Swarovski organized gemstone design competitions, Netflix created a prize for collaborative filtering algorithms, and Frito-Lay launched its successful ''Crash the Super Bowl'' contest. A contest is particularly suitable when the problem is complex or novel, and when it is not obvious who might have the best solution or idea.

> **Crowd collaboration projects** ✕ Crowd collaboration projects, by contrast, do not seek the best individual solution for a problem, but try to tap into collective wisdom to aggregate knowledge and ideas into a coherent and value-creating whole. Wikipedia is probably the best-known example. Another is OpenIDEO. It was launched by the design and consulting firm IDEO as an ''open innovation platform where people from all corners of the world collaboratively tackle some of the toughest global issues through launching challenges, programs, and other tailored experiences''. Based on ''design thinking'', the IDEO community shares ideas, collaboratively refines them, and tries to solve problems like ''How might mobile technology help improve access to healthcare?''. Some companies have begun to involve large internal and external crowds

in strategy-making. IBM, for instance, invited its 150,000 employees plus externals like business partners, customers, or university researchers into its strategy process, attracting more than 46,000 ideas. The US Navy used a crowdsourcing platform in the form of a massive online war game to update its strategic plan.

> **Crowd complementors** ⤫ Crowd complementors are a third common form of crowdsourcing. With this approach, a product or platform owner invites the crowd to develop innovative solutions that create value through complementary innovations. In contrast to the other two forms, it does not seek the solution to a defined and specific problem, but new applications for many different problems. Amazon for example, allows the crowd to develop and publish skills for its virtual assistant Alexa. Using the Alexa Skills Kit, by the end of 2018 almost 60,000 skills were developed by the crowd. In 2019 Amazon went further by allowing every user to develop skills with templates and to publish them.

FIGURE 1 > Forms of crowdsourcing for innovation

	Crowd contest	Crowd collaboration	Crowd complementors
Description	The sponsor (organization broadcasts a problem and offers a prize for the contributor of the best solution	A large community works together to jointly achieve something that individuals could hardly do	The crowd develops a wide variety of solutions that enhance the value of a product or a platform
Best use	> Challenging technical, analytical, and scientific problems > Development of new designs > Creative or aesthetic challenges	> Tasks that can be modularized and have standardized routines > Accumulation and recombining ideas of a large crowd	> New solutions for open platforms > New solutions to augment value of the core product
Principle	**Diversity**: use of many different approaches, ideas, or perspectives to solve a problem	**Collective intelligence**: cross-fertilization, aggregating decentralized knowledge, tapping into the wisdom of the crowd ("With enough eyeballs all bugs are shallow")	**Differentiation**: Create a large diversity of innovative solutions for product or platform users
Examples	NASA tournament lab, idea contests on InnoCentive	Wikipedia, OpenIDEO, IBM Innovation Jam	Smartphone operating systems and apps, Amazon Alexa skills; Lego ideas platform

adapted from Boudreau & Lakhani, 2013

Why crowdsourcing works ⨯ What makes crowds attractive as innovation partners? And why are strangers and anonymous experts often the ones who come up with the most original or simplest solutions? Research has identified four basic explanations.
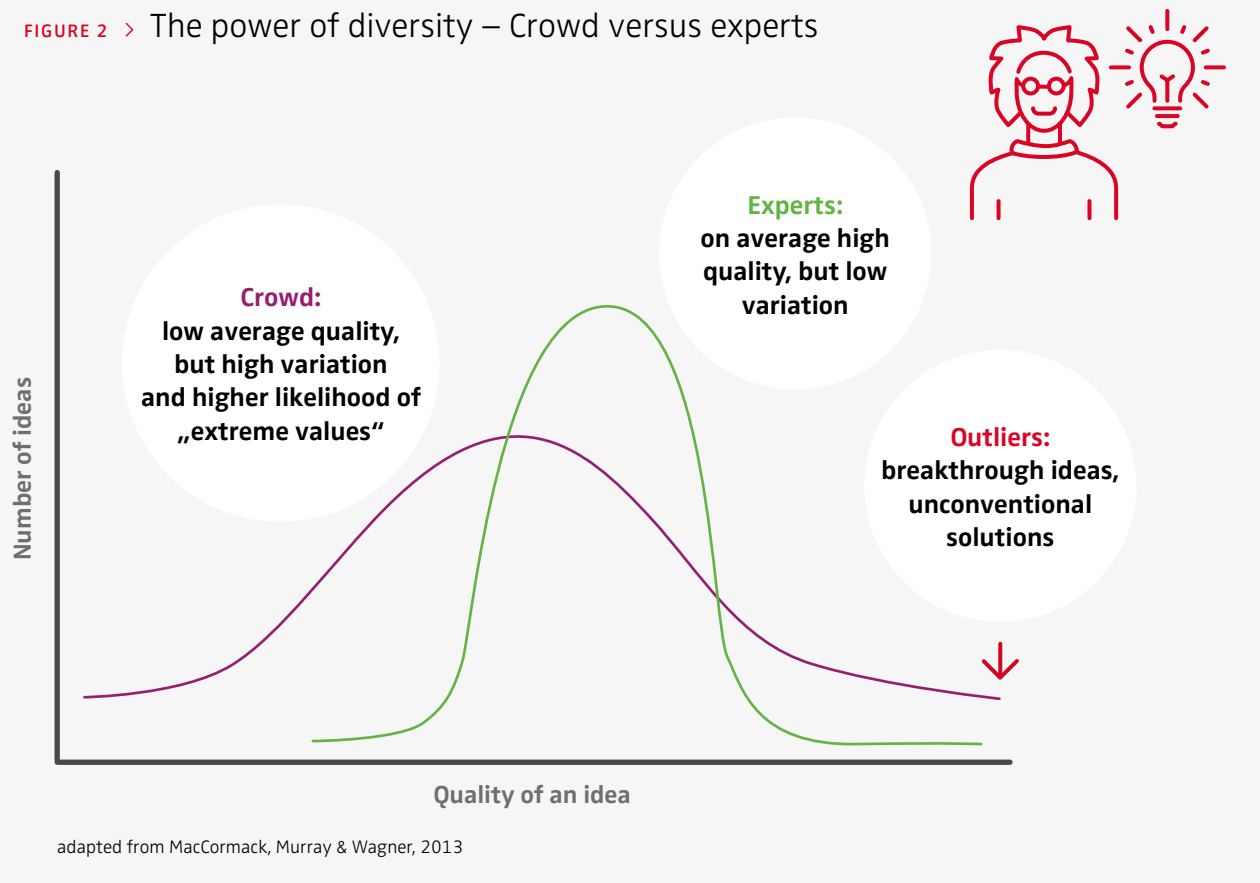
> **Marginality** ⨯ Marginality refers to the distance between the solver's field of technical expertise and the focal field of the problem. Karim Lakhani, professor at the Harvard Business School and one of the foremost experts in crowdsourcing, has spent years conducting and studying hundreds of crowdsourcing projects. In the case of the crowdsourcing platform InnoCentive, he found that topical distance was positively related to higher rates of winning solutions. Technical and social marginality can be a source of different perspectives, and heuristics and can play an important role in explaining individual success in problem-solving. Experts, industry specialists and professionals tend to generate many good ideas, but with little variation. Due to specific education, formal training, work experience, and regular practical application, experts accumulate knowledge in their specific domain. They develop routines to solve frequently encountered problems and converge on conventional cognitive frameworks. Crowdsourcing, on the other hand, attracts a diverse audience and a variety of nontraditional problem solvers.

> **The Bell Curve** ⨯ Karim Lakhani's second observation regarding the Bell Curve of ideas is simple but compelling. Innovative ideas tend to be normally distributed. There will be a few "low quality" ideas, many average ideas, a few good ones, and with luck, one or two that are exceptional. To develop groundbreaking innovations, companies seek those exceptional ideas or, statistically speaking, outliers. Outliers are extremely rare in small samples, however. When it comes to innovation, whether strategic, technological, or new products, we care about "extreme values",

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and to get those we need large samples. The Austrian crystal producer Swarovski, for instance, invited more than 1,700 participants to submit over 3,000 pieces of jewelry during a jewelry design competition. Among the participants were both professional designers and amateurs or hobbyists. Submitted designs were evaluated by all users, with the top designs generating more than 4,400 evaluations. Statistical analysis revealed the bell-curve pattern depicted in Figure 2: Designs by professionals, on average, received the highest ratings, their variance on quality was the lowest. Non-professionals submitted low average quality, but with high variance. And the designs evaluated exceptionally highly – representing the "extreme values" – came from the non-professionals!

> **Cross-fertilization** ⨯ In collaborative crowdsourcing projects, new and better ideas emerge when crowds share information freely, when they can build on other ideas, when they can accumulate and recombine ideas. Many software solutions for crowdsourcing allow participants to post ideas, view other ideas, discuss them, and rate them. With its I-Prize, Cisco gave innovative thinkers, entrepreneurs, students, and inventors worldwide access to an expanded portfolio of collaboration solutions with the idea of breaking down communication barriers and helping participants to share ideas and collaborate effectively. For instance, a social video community allowed participants to record, edit, and share videos, and to comment, rate, and tag content of interest. Further, a speech-to-text translation facilitated video search and viewing. A search platform helped contest participants locate experts and connect with them. An online meeting platform for audio and web conferencing was also provided. The evaluation took place in an idea market where contest participants could buy and sell ideas with a "virtual currency". This allowed participants (and Cisco) to establish the value of an idea.

> **Self-selection and intrinsic motivation** ⨯ Problem-solving in most organizations follows a conventional path: select people, assign roles and responsibilities, incentivize with salary and bonus, and hope that skills and competencies will solve the problem. Crowdsourcing is different. People select themselves into problems based on their interests and competence; they are intrinsically motivated by the task, and in contests hundreds or thousands of people compete to win a prize. In contrast to the conventional approach, organizations pay only for the solution and not for the ideas that aren't used.

FIGURE 2 > The power of diversity – Crowd versus experts

Experts:
on average high quality, but low variation

Crowd:
low average quality, but high variation and higher likelihood of „extreme values"

Outliers:
breakthrough ideas, unconventional solutions

Number of ideas

Quality of an idea

adapted from MacCormack, Murray & Wagner, 2013

How crowdsourcing can be a success ⨯ The articles in this issue all discuss critical factors that make crowdsourcing successful. Ivo Blohm and colleagues (pp. 18) explore the topic of different platform types and discuss efficient governance principles for each. Linus Dahlander and Henning Piezunka (pp. 24) look at critical success factors of innovation contests and present ideas to motivate crowds to deliver the right kinds of contributions. Johann Füller and coauthors (pp. 30) explain conditions under which innovation contests are likely to fail and how companies can keep a crowd motivated. Julia Hautz and coauthors (pp. 36) investigate the special case of crowdsourcing for corporate strategy and demonstrate the utility of involving internal and external crowds in that effort. Another special application is presented by Thomas Kohler and Henry Chesbrough (pp. 42). They demonstrate how crowdsourcing can be applied for social benefit. In an interview, Ryon Stewart (pp. 48) shares what NASA has learned from almost 400 crowd-sourced projects, some of them highly unusual. Finally, Silvan Brauen presents a case study of how Swiss beverage manufacturer Rivella applied crowdsourcing (pp. 54). He does not overlook the problems encountered, which leads us to our next topic.

The dark side of crowdsourcing ⨯ A multitude of success stories show how outsiders can solve challenges and how crowds can outperform specialists. But not all projects are successful. When things turn out to be more complicated than envisioned, companies may feel they have opened a Pandora´s Box that they should have left closed. Below is what can go wrong or turn out differently than planned, and what to do about potential pitfalls.

> **Don't underestimate the cost** ⨯ It sounds compelling. Frame the problem, set a prize, broadcast the challenge, and wait. But successful crowdsourcing needs preparation and management. The effort needed to select the winning idea alone can be enormous, as the process must be fair and effective. With its Innovation Jam, IBM learned that most ideas submitted were not new, and many were completely impractical or irrelevant. When 40,000+ ideas are submitted, identifying good ideas can be like finding a needle in a haystack. Managers spent weeks sifting through Gigabytes of Jam conversations. Cisco received over 1,200 distinct ideas from more than 2,500 participants in 104 countries in its $250,000 I-Prize competition for ideas that could

FIGURE 3 > Why crowdsourcing can be powerful

Marginality of problem solvers	The Bell-Curve	Cross-fertilization	Intrinsic Motivation
Individuals not affiliated with the problem field approach the problem with different perspectives and heuristics	Individuals with diverse backgrounds generate a large number of ideas with large variation	Individuals with different backgrounds contribute different knowledge; they accumulate and combine their ideas	Individuals self-select themselves into crowd-sourcing projects based on their interests and skills
Problems that cannot be solved with conventional methods are more likely solved by unconventional thinkers	„Big ideas" are statistical outliers: The more ideas and the greater the variation, the more likely they are to surface	New solutions emerge in a combinatorial feedback process: the more that is known, the more new combinations of solutions are possbile	A large number of highly motivated individuals compete and collaborate to develop the best solution

generate new businesses. Analyzing the entries and selecting a winner took six people working full-time for three months. To avoid "expert biaswf Cisco's inhouse evaluators and handle the quantity, comments and votes from idea contributors were also considered. Cisco then assigned a mentor to the 40 semifinalists to help them refine their ideas, eliminate weaknesses, and develop a business plan. In the next round, 10 ideas were selected, and contributors were invited to present their ideas.

> **Don't blindly follow the crowd** × To handle the massive amount of ideas and suggestions, many companies let participants and consumers rate the ideas. However, research has shown that user ratings are not good predictors of idea quality. Reto Hofstetter and his team studied idea contests on Atizo, a major European crowdsourcing platform. The results showed no correlation between consumers' votes in the contest and the market success of the eventual products as rated by managers. Other studies confirmed that in crowdsourcing contests, consumers tend to propose ideas high in novelty and originality but low in feasibility.
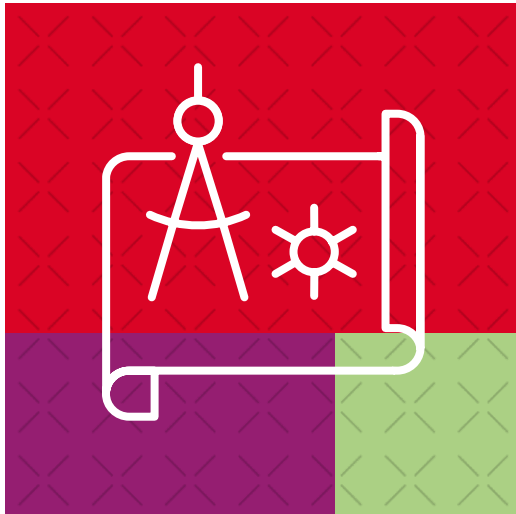
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*Crowdsourcing is not
the answer to every
innovation requirement.*
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Crowdsourcing – a silver bullet if you know how to shoot and what to aim at ✕ Crowdsourcing can be a powerful tool. It can dramatically enhance a company's innovativeness. Nevertheless, it is not the philosopher´s stone of innovation. And even if things go wrong and produce distress instead of groundbreaking innovation, it isn´t Pandora´s Box either. Crowdsourcing is simply not the answer to every innovation requirement. Managers must analyze carefully what kinds of solutions they seek and whether their problems can be solved with crowdsourcing. They need to consider the cost and the potential downsides when evaluating its benefits. If the balance of advantages and downsides points to the wrong side, there remains a range of traditional approaches to pursue. Applied wisely to the right challenges, crowdsourcing might indeed be a silver bullet.   ✕

> **Take a closer look at the crowd's voting behavior.** ✕ Another finding of Hofstetter's study was that social ties on crowdsourcing platforms can dramatically skew results as happened at Rivella (see article on pp. 56). In their study of more than 30,000 ideas submitted in 87 crowdsourcing projects, the researchers found that participants tend to reciprocate in a *quid pro quo* – if you vote for my idea, I will vote for yours.

> **When the crowd goes mad** ✕ An otherwise smoothly running contest can take a wrong turn. Some participants might even 'hijack' the contest. Instead of offering sincere suggestions, participants may seize the chance to ridicule a company, an effect investigated by Peter C. Verhoef and his colleagues. In the box on page 32 in this issue there are descriptions of incidents with notebook brand Moleskine and the German detergent brand Pril; but the list of companies that are seriously challenged by their crowds is still growing. So, be aware that crowds can be difficult to control, especially if a company has outstanding customer issues that haven't been dealt with, or if the terms of the contest aren't fair.

> **Not invented here.** ✕ Finally, don't forget that one of the major challenges in crowdsourcing comes after the solution has been found. It is the ''not invented here'' syndrome, a strong internal corporate bias against ideas from the outside. If crowdsourced ideas are not accepted internally, they will not be implemented. Crowdsourcing is a cultural change and a change in the role of R&D people who have vested interests in the company direction with respect to their own roles and inventions. Concerted listening to employees can anticipate and avert potential resistance and bring them on board.

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FURTHER READING

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