

# Sustaining open innovation through a “Center of Excellence”

Elizabeth E. Richard, Jeffrey R. Davis, Jin H. Paik and Karim R. Lakhani

In the last ten years many organizations have adopted open innovation (OI), an approach that searches outside their boundaries to find breakthrough solutions to challenging problems. Henry Chesbrough, author of several classic books on open innovation, defines it as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. [This paradigm] assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology.”[1] OI offers organizations a greater knowledge base, reduces development time and can result in significant cost savings.

While many OI pilot projects are successful, too often the efforts fizzle out after the initial burst of activity. The innovation managers get reassigned, or the operating managers cannot find resources to fund innovation programs that rely on “outsiders” for solutions. Our experience in running hundreds of challenges in partnership with several research and development organizations leads us to recommend that organizations establish a Center of Excellence (CoE). These centers are necessary to scale and sustain open innovation efforts, mitigate the risk of prematurely stopping competitions after a few pilot projects and advance a culture of innovation. We offer a roadmap to successfully scale pilot open innovation activities to sustained use that is applicable to for-profit and non-profit organizations.

The experience of the Human Health and Performance Directorate (HH&P) at NASA, which has also been captured in journals and in a Harvard Business School case, provides a successful example of moving from pilot challenges to establishing the Center of Excellence for Collaborative Innovation (CoECI) to sustain open innovation in seven years.[2][3] After conducting a thorough retrospective analysis, we suggest a process for condensing the timeline to three years.

Organizations must build upon the initial success, plan for subsequent engagements, effectively recruit champions, develop training and communications outreach and address cultural barriers. The four phases of implementation of our open innovation program are: Learn, Pilot, Scale and Sustain. We assess the time required for each phase and provide recommendations on how to utilize a CoE approach to succeed more quickly. (See [Exhibit 1: Timeline to “Accelerate innovation.”](#))

## NASA’s learning phase: 18 months

In 2007, NASA’s Space Life Sciences Directorate – renamed the Human Health and Performance Directorate in 2012 – developed a strategy to embrace collaborative innovation as a means to address human risks for space flight.[4] The concept of open innovation was adopted in 2008 after exposure to this approach at an executive education workshop on organizational change and renewal and after consultation with a number of leading researchers.[5] NASA’s HH&P conducted a workshop to identify technical

© Elizabeth E. Richard, Jeffrey R. Davis, Jin H. Paik and Karim R. Lakhani. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licences/by/4.0/legalcode>

This research was made possible by funding from Eric and Wendy Schmidt Foundation, Harvard Business School Division of Research and Faculty Development, and NASA’s Center of Excellence for Collaborative Innovation.

## Exhibit 1 Timeline to “accelerate innovation”

| <i>NASA timeline</i>   | <i>Proposed timeline</i>  |
|--|---|
| <b>Learn: 18 months (2008-2009)</b><br>Conducted OI and portfolio workshops<br>Solicited pilot funds<br>Engaged legal and procurement experts<br>Selected technical experts to run competitions  | <b>Learn: 6 months</b><br>Attend training, conduct benchmarks, review OI methodologies<br>Conduct portfolio analysis<br>Create value proposition<br>Obtain pilot funds<br>Engage HR, legal and procurement experts<br>Assess internal and external OI platforms |
| <b>Pilots: 13 months (2009-2010)</b><br>Procured pilot platforms<br>Conducted OI training<br>Conducted external challenges<br>Conducted internal challenges  | <b>Pilots: 6 months</b><br>Procure pilot platforms<br>Train workforce<br>Identify OI champions<br>Conduct internal challenges first, then external challenges<br>Plan for subsequent platform procurement<br>Communicate Pilot Phase successes                  |
| <b>Scale: 27 months (2011-2012)</b><br>Conducted leadership meeting<br>Procured longer term platform contracts<br>Harvard field study<br>Established Center of Excellence for Collaborative Innovation (CoECI)<br>Initiated the Solution Mechanism Guide (SMG) project | <b>Scale: 18 months</b><br>Execute longer term and expanded OI provider contracts<br>Execute communications plan<br>Establish CoE<br>Address OI in performance plan, reward systems and project management training   |
| <b>Sustain: 28 months (2013-2015)</b><br>Developed, tested and deployed SMG<br>Procured additional OI platforms<br>Added CoECI staff and capabilities  | <b>Sustain: 6 months</b><br>Develop comparative metrics for problem solving tools<br>Propose policy for use of prizes<br>Include OI funding line in budget<br>Develop and deploy decision support tool<br>Evolve communications                                 |
| <b>TOTAL: Seven years</b>  | <b>TOTAL: Three years</b>   |

problems that could be addressed through open innovation methodology, and 12 technical problems in human health and performance were selected.

### Accelerating innovation: reduce the learning phase to six months

In each section of “Accelerating innovation” we recommend conducting several activities in parallel.<sup>[6]</sup>

1. **Learn.** Mine published resources for insights into successes and failures in open innovation.<sup>[7]</sup><sup>[8]</sup>
  - Attend training courses and workshops in open innovation on organizational culture change, innovation strategy, portfolio analysis, challenge statement writing and platform selection.
  - Benchmark with others who have gone through the process and can provide insights into the more difficult aspects of integrating OI. While their problems may not be the same as yours, they can likely suggest ways of navigating through barriers to adoption. Learning from their successes and failures will help organizations craft an effective plan.
2. **Plan.** Develop an innovation plan aligned with key elements of the business strategy and organizational goals. Strategies should take into account the support needed for both top-down and bottom-up execution.
3. **Portfolio assessment.** Review the organization’s portfolio of work to select high-priority problems. Consider a formal portfolio analysis methodology for determining if problems are amenable to open innovation challenges.

4. **Value proposition.** Develop a value proposition to request funds for running OI pilot projects to include both internal and external challenges. We recommend conducting internal challenges first, then conducting challenges on an external platform to enhance adoption and reduce resistance to the use of this new problem-solving tool. Management should be made aware that a contest for a difficult technical problem may not deliver a complete solution, but instead increase critical knowledge, develop new professional contacts or identify emerging technologies. The value proposition should address budget and technical expertise needed to implement the innovations that are found.

5. **Platforms.** Many different platforms exist and benchmarking with other organizations may assist in selecting the platform providers to conduct the pilot.

Consider running several internal challenges and several external challenges on more than one platform. Ideally, pilot phases are the time to explore the use of different contest types and should include ideation, point solution, creative content and data science challenges. When selecting problems for pilots, the challenge owners must define the criteria for success. Organizations can also use internal ideation contests – process improvement or business ideas – as a method to launch the internal platform and encourage engagement. This preparation will greatly accelerate the pilot phase.

6. **Collaborate internally.** Technical units should collaborate with the legal, procurement and human resources functions and begin to recruit staff to serve as challenge owners and champions at the start of the project to expedite the process. Champions help validate the OI effort and are pivotal to both the success of early wins and to communicate results through peer-to-peer teaching.

### NASA's pilot phase: 13 months

After securing funds to pursue pilot projects, contracts with InnoCentive and yet2.com were established. NASA technical experts were selected to lead the pilot projects, implement any solutions found and participate in OI training delivered by the platform providers.

#### How open innovation platforms and marketplaces work

InnoCentive is a proprietary crowdsourcing platform of 500,000+ members that solves business, scientific and technical problems by connecting seekers – commercial enterprises, public sector agencies and non-profit organizations – to problem solvers. Their cloud-based technology platform hosts prize-based competitions in which organizations post their toughest challenges to diverse audiences.

Yet2.com is a technology marketplace aimed at fostering global collaboration that promotes the discovery and commercialization of new technologies. They provide a range of OI services to enable an organization to execute strategy for existing, adjacent and new technology market opportunities.

Conceptually, external platforms provide (1) a bridge between internal contest stakeholders and potential solvers, (2) refinement of the problem or task, (3) recruitment of the solvers, (4) monitoring of activity and issues during the contest, and (5) assistance in evaluation and judging of results and (6) the

handling of prize distribution. They play an integral role as coordinators of these activities.[9]

Some platforms are contest-based where the rules and regulations are posted prior to the running of these contests (such as Topcoder, InnoCentive and Kaggle), while others are network-search based (such as NineSigma and yet2.com) where matching protocols attempt to solve the problem or find an existing technology.

Thirteen challenges were posted on InnoCentive and yet2.com between December 2009 and May 2010 to address the technical problems previously identified. A fourteenth challenge was conducted by Harvard on the TopCoder platform. All provided noteworthy results. In a subsequent pilot project, 20 internal challenges were conducted within NASA using the NASA@work InnoCentive platform. This latter pilot project demonstrated the concept that anyone in the NASA community could propose and solve both technical and business solutions.

### Accelerating innovation: reduce the pilot phase to six months

The pilot phase requires the organization to partner with one or more platforms to effectively run the challenges and champion the overall OI effort. Acceleration can be achieved if the necessary preparatory work described in the “Learn” phase is completed.

It is imperative that evaluation criteria and implementation strategies are outlined prior to the launch of a crowdsourcing contest and that personnel are trained in all aspects of the process and, in particular, on how to write a good problem statement.

Many challenges can be run in a few weeks.[10] To successfully accelerate the pilot phase, challenge competitions should be adequately staffed and run in parallel. This will provide a sufficient number of results for the organization to determine when and how to scale the OI capability. Both technical – is it a good idea? – and management evaluations – is it a good investment? – should be conducted on the challenge submissions. This approach produces a solid rationale for the organization to scale and sustain OI as an ongoing capability. Ideally, the overall length of the process is a few months to conduct the challenge, analyze the results and provide feedback to the organization.

Promoting the use of OI as a new tool for problem solvers and recognizing the efforts and successes of the challenge owners is important for overcoming cultural barriers to OI adoption.

### NASA’s scale phase: 27 months

After the successful pilot phase, contracts for platforms for internal (NASA@work) and external (InnoCentive and yet.com) challenges were added.

A workshop where challenge owners presented their pilot results to approximately 60 HH&P personnel was conducted in 2011. Despite the positive outcomes, the use of OI met with a great deal of skepticism from the workforce who did not see the merit in its application to their work and questioned OI’s competition for existing resources.[11]

Many expressed deep concerns about the expected shift in their roles, which threatened their identity and can be described as a change from being “problem solvers” to “solution seekers[12].” NASA work processes and project management requirements tend to be highly structured, and while the HH&P had a long history of innovating internally or teaming with familiar external partners, it had always been the NASA technical experts who were recognized as the innovators. However, by celebrating the outcome of the OI challenges

and attributing the success to an external problem solver rather than acknowledging the role of the NASA challenge owner in finding the solution, HH&P had inadvertently threatened the identity of those who saw themselves as the innovators.

HH&P had engaged in communication efforts starting in the pilot phase to increase awareness of and generate interest in OI across the directorate. However, the communications did not emphasize the critical value of the challenge owners to the successes and, as a consequence, skepticism persisted.

Despite the resistance within HH&P, the success of the OI initiative was met with great enthusiasm by NASA headquarters and many outside of the agency, resulting in press, blogs and internal memos about the “spectacular results” of the open innovation experiment. As a result, NASA developed and implemented the Center of Excellence for Collaborative Innovation (CoECI) in 2011 at the request of the White House Office of Science and Technology Policy to serve as resource to advance the use OI for the NASA community and other federal agencies.

### Accelerating innovation: reduce the scale phase to 18 months

Starting the acquisition process for longer-term platform contracts toward the end of the pilot phase will greatly reduce the time spent to scale OI capabilities across the organization. Expanding the number of platforms in scope and size from the pilot phase should be considered.

#### Managing resistance to open innovation

Consistent with the NASA experience, a University of Cambridge report in 2009 based on interviews with 36 firms identified cultural issues and resistance to change as the top obstacles to successful OI implementation. This is particularly true for the R&D and product development functions that are most often involved in OI implementation because scientists and engineers often feel threatened by OI activities.[13]

Establishing a communications plan that acknowledges the value of and need for internal technical experts to conduct portfolio analyses, define problems, evaluate solutions and implement winning solutions is essential. The tendency when running a challenge is to focus solely on the winners. However, since challenge owners have acknowledged that their groups had difficulty finding viable solutions using traditional methods, they must be recognized for their willingness to participate in this new way of working. Many inside an organization who are contemplating whether or not they should nominate a problem for a challenge will watch to see what credit will be given to the challenge owners who take this step.

To address both the technical and cultural issues associated with scaling OI, we recommend establishing a Center of Excellence. The CoE can provide workforce support, guidance and training, and can standardize the development of effective OI challenges.[14] Alternatively, a way of sustaining OI without a CoE includes engaging a third-party consulting service (such as Deloitte Pixel) that performs similar functions.

Human resources functions should be engaged to propose modifications of performance plans and reward systems to address OI process requirements and to recognize and reward employees for finding solutions obtained externally as well as internally. Finally, we recommend training in writing effective problem statements and other OI processes so that the workforce becomes familiar and comfortable with using them, and OI becomes part of the problem-solving “toolkit” for the organization.

**“The experience of the Human Health and Performance Directorate (HH&P) at NASA provides a successful example of moving from pilot challenges to establishing the Center of Excellence for Collaborative Innovation (CoECI) to sustain open innovation.”**

#### **NASA’s sustain phase: 28 months**

Based upon a staff request for more guidance on how and when to use OI, NASA developed a decision-support tool called the Solution Mechanism Guide (SMG) which was intended to address all available problem-solving mechanisms and provide a way to incorporate use of OI into ongoing work processes. An alpha version was developed by a working group that included HH&P technical and business experts and tested with focus groups.

Initial feedback was positive, and a beta version was developed through a series of competitions on the Topcoder platform. The tool was deployed in 2015 and is used for technical project management decision making.<sup>[15]</sup>

CoECI expanded the number of OI platforms to ten in 2015, enhancing the capability to run a diversity of challenge types, and added staff to conduct awareness and training workshops across NASA to further OI adoption. CoECI now has a challenge success rate of over 90 percent and have conducted more than 300 challenges for NASA and other federal agencies.

#### **Accelerating innovation: reduce the sustain phase to six months**

Organizations should assess development or acquisition of a decision support tool and plan for testing and deployment to enhance OI adoption and greatly accelerate this phase.

Requiring the consideration of OI in performance plans or establishing the use of OI as policy may enable faster adoption across the organization. Senior management support can include the provision of a budget line item for running OI challenges so that project managers and problem owners do not have to revise existing budgets.

By developing a cadre of OI champions to conduct peer-to-peer communications that highlight the successes of those technical experts who have embraced becoming solution seekers, organizations can advance a culture of open innovation.

Finally, the organization should consider developing comparative metrics for success, cost and return on investment for OI challenges versus other commonly used tools for problem solving. Going beyond the traditional “make” or “buy” paradigm, OI processes and products will come with a different cost and evaluation structure and new ways of thinking about this approach need to be adopted. OI challenges hold the promise of faster execution, lower cost and higher success rates.

#### **Sustaining success**

We strongly recommend establishing a Center of Excellence to apply this methodology successfully. It can provide an infrastructure to address administrative, technical and cultural issues and accelerate the adoption and success of OI as an organizational problem-solving tool.

## Notes

1. Chesbrough, H., Vanhaverbeke, W. and West, J. (Eds) (2006), *Open Innovation: Researching a New Paradigm*, Oxford University Press, Oxford.
2. Davis, J.R., Richard, E.E. and Keeton, K.E. (2015), "Open innovation at NASA a new business model for advancing human health and performance innovations," *Research – Technology Management*, No. 3, pp. 52-58.
3. Tushman, M., Lifshitz-Assaf, H. and Herman, K. (2014), "Houston we have a problem: NASA and open innovation (A)," *Harvard Business School Case Collection*.
4. Richard, E.E. (2007), *NASA Space Life Sciences Strategy for Human Space Exploration*.
5. Dr. Karim Lakhani taught a business case (Lakhani, K.R. and Kanji, Z. (2008), "Threadless: The Business of Community," *Harvard Business School Case Collection*.) and Prof. Gary Pisano discussed his paper (Pisano, G.P. and Verganti, R. (2008), "Which Kind of Collaboration is Right for You?" *Harvard Business Review*, December: 78-86.) with HH&P personnel.
6. In the NASA OI program many of these activities were conducted sequentially.
7. A rich literature exists on this topic: (Guinan E.C., Boudreau, K.J. and Lakhani, K.R. (2013), "Experiments in Open Innovation at Harvard Medical School," *MIT Sloan Management Review*, 54: 45-52; King, A. and Lakhani, K.R. (2013), "Using Open Innovation to Identify the Best Ideas," *MIT Sloan Management Review*, September: 55: 41-48; Lakhani, K.R. (2008), Case Study: "InnoCentive (A)," *Harvard Business School Case Collection*.; Lakhani, K.R., K. Hutter, K. Pokrywa, S.H. and Fuller, J. (2015), "Open Innovation at Siemens," *Harvard Business School Case Collection*; O'Reilly, C.A. and Tushman, M.L. (2016), *Lead and Disrupt*. Stanford: Stanford University Press.; Tushman, M., Lakhani, K.R. and Lifshitz-Assaf, H. (2012), "Open Innovation and Organizational Design," *Journal of Organizational Design* 1 (1) 24-27. The Laboratory for Innovation Science at Harvard has recently opened a literature repository of OI cases and methods.
8. Henry Chesbrough is the author of several classic OI books: *Open Business Models: How to Thrive in the New Innovation Landscape* (Harvard Business School Press, 2006) and *Open Innovation: The New Imperative for Creating and Profiting from Technology* (HBSP, 2003).
9. Tong, R. and Lakhani, K.R., "Public-Private Partnerships for Organizing and Executing Prize-Based Competitions," Berkman Center Research Publication No. 2012-13.
10. InnoCentive Report (2010), "Investigation of the Challenge Driven Innovation Platform at NASA."
11. Davis, J.R., Richard, E.E. and Keeton, K.E. (2015), "Open innovation at NASA: a new business model for advancing human health and performance innovations," *Research – Technology Management*, pp. 52-58.
12. Lifshitz-Assaf, H. (2016), "Dismantling knowledge boundaries at NASA: from problem solvers to solution seekers."
13. Centre for Technology Management, Institute for Manufacturing (2009), "How to Implement Open Innovation, Lessons from studying large multinational companies," University of Cambridge.
14. Ringel, M. et al. (2018), *Report: The Most Innovative Companies 2018*, The Boston Consulting Group.
15. Keeton, K.E., Richard, E.E. and Davis, J.R. (2017), "Strategic Innovation at NASA: the solution mechanism guide," *Journal of Business Inquiry: Research, Education & Application*, Vol. 16, pp. 50-59.

## Authors:

Elizabeth E. Richard is founder of EER Strategies, LLC ([elizabeth.richard@eerstrategies.com](mailto:elizabeth.richard@eerstrategies.com)) and Executive-in-Residence at the Laboratory for Innovation Science at Harvard. She was a senior strategist for NASA's Human Health and Performance Directorate and was instrumental in the establishment of the NASA Center of Excellence for Collaborative Innovation (CoECI).

Jeffrey R. Davis is founder and CEO of Exploring 4 Solutions, LLC ([jeffdavis@exploring4solutions.com](mailto:jeffdavis@exploring4solutions.com)) and Executive-in-Residence at the Laboratory for Innovation Science at Harvard. He served as the Director, Human Health and Performance and the Chief Medical Officer for the NASA Johnson Space Center and the deputy director for CoECI.

Jin H. Paik is the Program Director and Senior Researcher at the Laboratory for Innovation Science at Harvard ([jpaik@hbs.edu](mailto:jpaik@hbs.edu)).

Karim R. Lakhani is a Professor of Business Administration at Harvard Business School and the founder and co-director of the Laboratory for Innovation Science at Harvard ([klakhani@hbs.edu](mailto:klakhani@hbs.edu)).

### Corresponding author

Elizabeth E. Richard can be contacted at: [elizabeth.richard@eerstrategies.com](mailto:elizabeth.richard@eerstrategies.com)

---

For instructions on how to order reprints of this article, please visit our website:  
[www.emeraldgrouppublishing.com/licensing/reprints.htm](http://www.emeraldgrouppublishing.com/licensing/reprints.htm)  
Or contact us for further details: [permissions@emeraldinsight.com](mailto:permissions@emeraldinsight.com)