

► Innovation Value Institute at Maynooth University in Ireland worked internationally and with competing companies to develop a framework for measuring and improving IT capability, which is now used by hundreds of organizations worldwide.

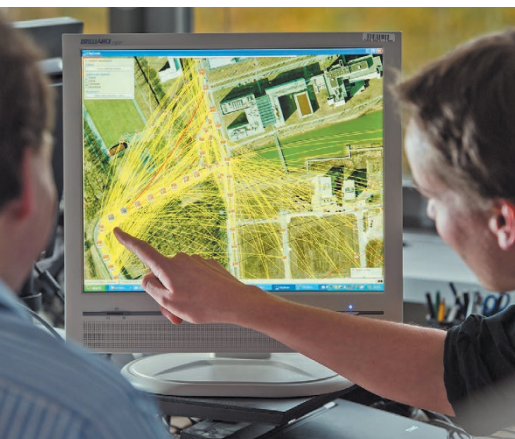
Companies are opening up their research labs. Philips has converted its research facility in Eindhoven, which had 2,400 employees in 2001, to an open research campus (High Tech Campus Eindhoven) that now houses more than 140 firms and around 10,000 researchers. Breakthrough ideas often emerge at the intersection of disciplines. For example, Keenan, an Irish agricultural-equipment supplier, and telephone company Vodafone have worked with Intel to develop an online service that uses real-time information to provide farmers with nutritional advice for livestock.

Open innovation 2.0 is neither easy nor is it a panacea. It requires courage and energy. But once a critical mass is achieved, innovation can catalyse itself<sup>3</sup>. Just as momentum is the product of mass and velocity, the ecosystem with the most participants and fastest turnover of ideas will be the most successful. Participating organizations must create synergies rather than cancel each other out. High levels of trust and conviction in the shared vision are predictors for eventual success.

A common language helps. Just as architects and engineers can refer to canonical designs when building a bridge, social and technological innovators can improve productivity by following design patterns. These heuristics summarize insights about the innovation process and can be combined (see 'Keys to collaborative innovation'). They shorten learning times and improve the results and pace of innovation.

## NEXT STEPS

We have all witnessed how the music and book industries have been transformed by companies such as Apple and Amazon through digitization. Transforming cities,



Intelligent-lighting sensors can collect useful data about urban activities for city planners.

## HOW INNOVATION MODES HAVE EVOLVED

| Closed innovation   | Open innovation    | Open innovation 2.0       |
|---------------------|--------------------|---------------------------|
| Dependency          | Independency       | Interdependency           |
| Subcontracting      | Cross-licensing    | Cross-fertilization       |
| Solo                | Bilateral          | Ecosystem                 |
| Linear              | Linear, leaking    | Nonlinear mash-up         |
| Linear subcontracts | Bilateral          | Triple or quadruple helix |
| Planning            | Validation, pilots | Experimentation           |
| Control             | Management         | Orchestration             |
| Win-lose game       | Win-win game       | Win more-win more         |
| Box thinking        | Out of the box     | No boxes!                 |
| Single entity       | Single discipline  | Interdisciplinary         |
| Value chain         | Value network      | Value constellation       |

energy grids and health-care systems will be harder. It will need technology breakthroughs, alignment of interests, investment and collaboration across many stakeholders.

Different sectors should explore how disruptive technologies can transform their domain. For example in health care, wirelessly transmitting information from electrocardiograms (a heart-activity test), and using cloud-based analytics, could detect the early onset of conditions such as cardiac fibrillation.

Governments should create innovation strategies that build capacity and focus efforts on nationally important problems. Road maps that set out a sequence of problems to be solved and the innovations required — such as the International Technology Roadmap for Semiconductors — can direct efforts efficiently. Imagine the power of a European or globally agreed road map for smarter cities, more sustainable electrical grids or health-care transformation. The risks of collaboration can be reduced by publishing model contracts for public-private partnerships. Measurement instruments such as Europe's Innovation Union Scoreboard can identify which areas of a country's innovation ecosystem need to be strengthened.

The EU should expand its ambition beyond creating a European Research Area to nurturing a European Innovation Ecosystem. It is promising that a priority for the current Dutch presidency of the EU is ensuring that all European funding instruments focus more on innovation. EU research commissioner Carlos Moedas proposed that the establishment of a European Innovation Council (EIC) would be an important intervention. The EIC could be the steward of an overall European innovation strategy and of societal-challenge road maps.

Governments should encourage the adoption of innovations as well as their creation. They should modulate spending, incentives and policy depending on technology maturity. Immature technologies with high

potential need research and pilot projects funded; more-proven prototypes require support for capital deployment cost as well as incentives such as tax credits or loan guarantees. For example, in the United States, incentive payments were used to encourage physicians to adopt electronic health records. Leaders should note the public's increasing desire to be involved in innovation efforts, as exemplified by citizen-science initiatives.

A cultural shift is at the core of open innovation 2.0. The technology is ready — are we? ■

**Martin Curley** is vice-president at Intel Corporation and director of Intel Labs Europe, based in Dublin, Ireland.  
e-mail: martin.g.curley@intel.com

1. Curley, M. & Salmelin, B. *Open Innovation 2.0 — A New Paradigm* (EU Open Innovation and Strategy Policy Group, 2013).
2. Chesbrough, H. *Open Innovation: The New Growth for Creating and Profiting from Technology* (Harvard Business School Press, 2003).
3. Curley, M. & Formica, P. (eds) *The Experimental Nature of New Venture Creation: Capitalizing on Open Innovation 2.0* (Springer, 2013).
4. Porter, M. E. & Kramer M. R. 'Creating Shared Value' *Harvard Bus. Rev.* (January–February 2011).
5. Gawer, A. (ed) *Platforms, Markets and Innovation* (Edward Elgar, 2011).
6. Keeley, L., Walters, H., Pikkil, R. & Quinn, B. *Ten Types of Innovation: The Discipline of Building Breakthroughs* (Wiley, 2013).
7. Rogers, E. M. *Diffusion of Innovations* 5th edn (Simon and Schuster, 2003).
8. Von Hippel, E. *The Sources of Innovation* (Oxford University Press, 1988).
9. Stahel, W. *The Performance Economy* 2nd edn (Palgrave Macmillan, 2010).

## CORRECTION

The Comment 'Seven chemical separations to change the world' (D. S. Sholl and R. P. Lively *Nature* **532**, 435–437; 2016) gave the incorrect units for atmospheric distillation. It should have read 230GW globally.