Open innovation: Using research from everywhere for new product and service development
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Executive Summary – The broad availability of useful knowledge has made the vertical control of research and development (R&D) obsolete. The proliferation of players and better communication have opened up new opportunities for creating value and have challenged institutions that seek exclusivity or lag in exploiting their own discoveries. Joint ventures, spin-offs and better integration of university research into industrial research are all providing new routes to creating new products and services.

In this Executive Technology Report, Peter Andrews interviews Henry Chesbrough, an assistant professor of business administration at the Harvard Business School and author of a book published in March 2003 entitled “Open Innovation: The New Imperative for Creating and Profiting from Technology.” Henry holds a joint appointment in the Technology and Operations Management (TOM) and Entrepreneurial Management (EM) areas at the school. He received his Ph.D. in Business Administration from the University of California-Berkeley in May of 1997, in the area of Business and Public Policy. He also holds an MBA from Stanford University, where he was an Arjay Miller Scholar. He holds a BA from Yale University in Economics (with an Engineering minor), where he graduated summa cum laude and was elected to Phi Beta Kappa.

In his own words, “I am a disk drive industry retread, from Quantum Corporation, and now I am a professor at Harvard Business School. I study the management of technology and innovation. I sometimes think of this work as ‘why bad things happen to good technology.’”

Peter Andrews  Your research has taken you to a concept you call open innovation. Could you tell me a bit about it?
Henry Chesbrough  Sure. The basic insight of open innovation is that useful knowledge these days is widely diffused. No one has a monopoly on knowledge the way that, say, IBM had in the 1960s in computing, or that Bell Labs had through the 1970s in communications. When useful knowledge exists in companies of all sizes and also in universities, non-profits and individual minds, it makes sense to orient your innovation efforts to accessing, building upon and integrating that external knowledge into useful products and services.

The other half of the concept is that your own ideas can no longer languish on the shelf. If you don’t utilize your own ideas readily, chances are they will diffuse out to the wider environment anyway. So, it is folly to restrict ideas to yourself if you have
no plans to use them, and it is wiser to monetize those ideas through external licensing, joint ventures or spin-offs.

**Peter Andrews**  What created this change?

**Henry Chesbrough**  I think there are a few key things – which I call "erosion factors" – that diminished the ability of large corporate R&D structures to contain their useful knowledge. One factor is the growing mobility of people, who leave one company and go to another, taking a great deal of useful knowledge with them. A second factor is the growing competence of the university research system. A third is the growth of federal support for research after WWII, support that went mostly to universities rather than just to government labs. A fourth is the rise of the private equity market, particularly venture capital. A final factor is the loss of U.S. technological hegemony in many technological fields, such that today, many of the smartest people work outside the U.S. All of these erosion factors combine to spread knowledge very widely and defeat attempts by companies to control this knowledge.

**Peter Andrews**  Has the new level of connectivity, thanks especially to the Internet, played a role?

**Henry Chesbrough**  I would not say that this erosion began with the Internet, because I think some of the pivotal events happened a long time ago. Think of MCI coming up with microwave relay transmission technology in the 1970s, thus beginning the end of AT&T's monopoly. Think of the rise of Intel and Microsoft in the 1980s in the personal computer industry and the effects that had on IBM's position. Or think of the Human Genome Project, which started in 1990 and is transforming the science base of the pharmaceutical industry. Certainly, though, the Internet and the widespread use of e-mail have further accelerated the diffusion of knowledge.

**Peter Andrews**  How do businesses need to change their behavior to respond to the new research environment?

**Henry Chesbrough**  First, I think the role definition for "research" has to change. Research used to be defined to mean "internal search and discovery," while activities that sought connections to outside knowledge sources were downplayed. Today, I think research must be more broadly defined, to include internal discovery, but also to admit external knowledge as an equal part of the task. A second change is that businesses need to think less about the “piece parts” and more about the integration of the parts into a system. Less depth and more breadth, you could say. As many well understand, he who defines the architecture, rules and interfaces that connect the pieces together, is well placed to profit from that architecture.

**Peter Andrews**  So there are ways to position yourself for success.
Henry Chesbrough  Oh, yes. I think that in a world of widely available knowledge, it makes less sense to reinvent the wheel, and it makes tremendous sense to figure out new ways to build vehicles using perfectly good wheels from elsewhere.

Peter Andrews  Is open innovation going to affect the quality of innovation we see? Or the rate at which it occurs?

Henry Chesbrough  That’s an interesting question. I think it will increase the amount of recombination of existing technologies into different configurations. And certainly, the rate of new products being introduced has accelerated tremendously.

If I may indulge in a bit of disk drive history, Quantum began by shipping 8” hard disk drives (HDDs) to be sold into minicomputers and workstations. The shipping life for our 8” drives was five years (this was in 1982). When we made 3.5” drives for PCs, we had to churn out new drives as fast as every six months (this was in the early 1990s)! As for the quality of the innovation, I think that will need to be judged by the usefulness of the systems architecture used to organize the technical innovations that constitute the system.

Peter Andrews  Could you compare and contrast the development of technology under the old regime and development using open innovation?

Henry Chesbrough  At the risk of being simplistic, I shall try. The old regime sought "the best and the brightest" Ph.D.s from the best universities, and hired them to do basic research that could be published in leading scholarly journals. It was accepted that this work would be many years away from the market (and some work may never get to market at all), and that these ideas, once discovered, could be owned and controlled by the company who paid for the researchers to find them in the first place. These ideas were thrown "over the wall" from research into development. The development folks struggled to use these ideas because they were often rather academic in their character and hadn’t been "shaken down" for use in a manufacturing setting – work that was regarded as trivial by the researchers, or "fire fighting." The development people wanted to wait until the technology had been better characterized and involved fewer risks. So there was a disconnect and a lot of potentially useful ideas piled up “on the shelf,” in between R&D.

In the new regime, business planners would share their needs with the internal research people, but both groups would actively solicit inputs and proposals from external research providers (such as universities) as well. They might even check in with emerging startup companies to see what they were doing and whether that might fit with their needs. Internal projects would be started to fill in the gaps, or to define the architectures that could connect the disparate external threads into a coherent whole. Meanwhile, ideas that were on the shelf would be periodically offered to external parties, so that they too would find some application in the market.
Peter Andrews I get the sense that this is still evolving. Can you tell me some of the techniques people have come up with along the way to leverage options created by the new, open environment?

Henry Chesbrough I agree; it is evolving. I only came upon these ideas from observing the individual practices of different companies, including IBM, Intel, Lucent, Xerox, Procter & Gamble, Merck, Pfizer and Millennium, to name the most important sites. In watching these firms, I have seen a variety of fascinating practices. At this stage, it is premature to claim that they are all "best practices" because some may prove to be noble failures. But, they are all very interesting at the least. They include corporate venture capital, internal spin-off programs, external licensing programs, "use it or lose it" initiatives, programs to license in technologies, portals to outplace technologies and other portals to solicit input technologies.

Peter Andrews The role of government, which has driven lots of investment and policy in research, must be changing in this new context.

Henry Chesbrough Absolutely. The old thinking followed some early economic theory. If research was in part a public good, free enterprise would not produce a socially optimal amount of it, and therefore the government should subsidize research. The new thinking doesn't disagree with this directly, but looks far more closely at how the government supports research rather than the dollar amount of the support. It is best for the government to be open in awarding research grants on meritocratic grounds to a wide variety of research providers, rather than concentrating on a few "big science" projects at the government's own labs. It is also vital that the government acts as rule maker and referee in the assignment of intellectual property rights, so that firms can buy and sell each other's ideas. These were minor considerations at best, in the old regime.

Peter Andrews As you've been looking at this, what has been the biggest surprise to you?

Henry Chesbrough One surprise is the resolute persistence of the "not invented here" (NIH) syndrome – we only reward people for being the first to discover something new. We don't reward people for finding something important that someone else did. If a researcher makes a patentable discovery, for example, there is usually some reward. If someone identifies and accesses an outside solution, there is no reward of any kind, even though this too may be very useful to the company.

One more surprise: It is how the universities themselves are often guilty of their own NIH thinking, as individual academic departments are driven by disputes over academic turf. Our incentives as faculty really discourage collaboration and integration of others' work into our own work.

Peter Andrews What's the biggest mistake you see happening today in industrial research?
Henry Chesbrough  I may surprise you here. The biggest mistake, I think, is to assume that researchers cannot and indeed should not be knowledgeable about the company’s own business and the business model that enables the company to convert ideas into economic value. It does not diminish excellent research to have it examine questions that are of vital commercial importance to the company. It is just as much work to research a problem of little commercial value as one of high commercial value. And researchers may be surprisingly astute observers of new business trends and opportunities. It may even pay to connect them to - gasp! - customers.

Peter Andrews  What would be your three top recommendations for a business executive?

Henry Chesbrough  
1. Identify the sources of the most important ideas in your industry over the past five years. How many came from inside your company? From inside other current industry participants? From outsiders?

2. Identify what percentage of your own pipeline of future projects come from outside versus within. How does that ratio compare with the first ratio?

3. Adopt a nearby faculty member at a local university who is working on ideas related to your own business. Fund a graduate student for a summer. Invite the professor to give a talk at your company. Have lunch with faculty and students there, and talk about your problems.

Peter Andrews  Thank you, Henry, for sharing your views on the potential rewards of practicing open innovation.

About this publication
Executive Technology Report is a monthly publication intended as a heads-up on emerging technologies and business ideas. All the technological initiatives covered in Executive Technology Report have been extensively analyzed using a proprietary IBM methodology. This involves not only rating the technologies based on their functions and maturity, but also doing quantitative analysis of the social, user and business factors that are just as important to its ultimate adoption. From these data, the timing and importance of emerging technologies are determined. Barriers to adoption and hidden value are often revealed, and what is learned is viewed within the context of five technical themes that are driving change:

Knowledge Management: Capturing a company’s collective expertise wherever it resides -- databases, on paper, in people’s minds -- and distributing it to where it can yield big payoffs

Pervasive Computing: Combining communications technologies and an array of computing devices (including PDAs, laptops, pagers and servers) to allow users continual access to the data, communications and information services
Realtime: "A sense of ultracompressed time and foreshortened horizons, [a result of technology] compressing to zero the time it takes to get and use information, to learn, to make decisions, to initiate action, to deploy resources, to innovate" (Regis McKenna, Real Time, Harvard Business School Publishing, 1997.)

Ease-of-Use: Using user-centric design to make the experience with IT intuitive, less painful and possibly fun

Deep Computing: Using unprecedented processing power, advanced software and sophisticated algorithms to solve problems and derive knowledge from vast amounts of data

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