SUMMER 2012 VOL.53 NO.4

MITSloan
Management Review

Markus Perkmann and Ammon Salter

How to Create Productive Partnerships With Universities

REPRINT NUMBER 53417

How to Create Productive Partnerships With Universities

Too often, companies pursue collaboration with university researchers in an ad hoc, piecemeal manner. But by giving more thought to the relationship structure, companies can achieve better results.

BY MARKUS PERKMANN AND AMMON SALTER

THE LEADING QUESTION

How can companies work most effectively with universities?

FINDINGS

- **Companies' relationships with universities are too important to be managed in an ad hoc fashion.**
- **When structuring a collaboration, managers should consider two key dimensions: time horizon and degree of openness.**
- **Each model of industry-university collaboration has benefits and drawbacks; the best format will depend on the goals and capabilities of both partners.**

COMPANIES INCREASINGLY recognize that to successfully innovate they cannot exclusively rely on their internal R&D. Working with external partners allows them to access different pools of knowledge and save R&D costs.[1] Universities are among the external partners that offer high promise, since they allow access to an enormous global pool of talent and skills.

Sometimes managers think dealing with universities equals only "technology transfer." While the use of university-owned intellectual property[2] has spurred much innovation in business, it is only the tip of the iceberg. Rather than merely licensing inventions, another often-underappreciated opportunity for companies is to get help from universities during the whole life cycle of their innovation projects.[3] For example, in the United Kingdom, businesses already spend more than 20 times more on university collaboration than on licensing technology from universities.[4]

However, working with universities poses considerable challenges for managers.[5] Two fundamental issues afflict collaboration. First, the open nature of academic science is at times in conflict with companies'

The pharmaceutical companies Novartis, GlaxoSmithKline, Merck and Pfizer have invested together in open science initiatives even though they are otherwise fierce competitors.

COURTESY OF NOVARTIS

need to protect technologies they use. Second, while academic research focuses on long-term challenges and thus may move more slowly, industrial R&D is driven by time-sensitive product development projects and day-to-day project solving. As a result, companies can sometimes find universities too slow and too bureaucratic to be good partners. Given that in the Organisation for Economic Co-operation and Development countries, expenditures on higher education R&D represent about $160 billion per annum, businesses that don't work with universities may be missing opportunities of significant proportions.[6]

These tensions are exacerbated by the fact that companies' collaborations with universities are often pursued in an ad hoc, piecemeal manner, led by individual initiatives rather than any corporate strategy. Managers who would never dream of leaving their customer or supplier relationships to chance may take an ad hoc approach to their university relationships, which can lead to duplication of effort, lost opportunities or squabbles over intellectual property.

Our research suggests that businesses can structure their relationships with universities in ways that make them much more valuable. (See "About the Research.") To do this, companies must actively embrace universities, using the differences between industry and academia to their advantage. As Claus Otto, program manager at Royal Dutch Shell PLC, says, "It is important to ask yourself: What can these university centers do better or different than we can?" Shell, for example, invests in university partnerships in areas where it does not yet make business sense for the company to build extensive technology capability.

To leverage value from universities, we argue that business executives need to consider two key dimensions. The first of these is the time horizon of the collaboration. Short-term collaborations are useful, common and relatively easy to facilitate if they are targeted and aligned to universities' and academics' ways of working. However, they require creative structuring, as the clock speed of academic research and business practice can be wildly divergent. Conversely, many academics think long-term, and this can be an advantage for a business as it may overcome managers' tendency to look to the next quarter. "Going long" with academics in the search for new ideas can unlock a range of possibilities and even help to create a new innovation ecosystem that will sustain the business five or 10 years into the future. However, such long-term collaborations require more patient investment and managerial attention to the design and governance of the collaboration or they can go easily awry.

The second dimension is the degree of disclosure of the results of the partnership. Openness facilitates rapid publishing, which constitutes the lifeblood of public science[7] and has the advantage of reducing transaction costs related to intellectual property. For companies, however, protection facilitates the commercialization of discoveries.

If we combine these two dimensions, we can see four different collaboration modes:

1. The idea lab, where managers put aside their desire for secrecy and work with academics to create new options and contacts.
2. The grand challenge, where managers and academics work together to create a new knowledge base that will be shared in the public domain.
3. The extended workbench, where managers work rapidly with university partners on proprietary problems and solutions.
4. Deep exploration, where the company creates rich and long-lasting relationships with university partners that, in turn, offer the business rights of first refusal to license collaboration results. (See "Four Models of University-Industry Collaboration.")

1. Open, Short-Term: Idea Labs In this type of collaboration, businesses engage university partners to work on problems that are relatively short-term, while providing the option for the academics to openly publish results. At first glance, this type of collaboration seems to provide little benefit to companies, given that they are not able to exclusively appropriate research outcomes. However, open exploration has a series of advantages. First, it can act as a "honey pot," helping to attract academics to the problems and challenges of the business. As these projects are well aligned to academic norms, many scientists find ways of drawing academic capital even from incremental, applied research. Second, not unlike speed dating, open ex-

ABOUT THE RESEARCH

This article draws on a series of research projects the authors carried out in recent years. Two waves of a mirrored survey were conducted in 2004 and 2009, collecting responses from hundreds of companies collaborating with universities and thousands of academic scientists.[i] The authors also conducted hundreds of formal interviews of at least an hour's duration with company executives, entrepreneurs and academic scientists in Europe and North America. They analyzed this material using inductive research techniques, including a study of how academic scientists generate academic capital from working with industry,[ii] an in-depth study of the Structural Genomics Consortium and a comparative study of university-industry centers. Finally, the authors draw on extensive secondary material, stemming from a systematic literature review of all peer-reviewed articles published between 1990 and 2011 on academic scientists' engagement with industry.

ploration allows companies the chance to build and test relationships. These projects are usually small scale and, given the absence of delicate intellectual property issues, easy to set up and administer. One successful example of this approach is HP Laboratories' Innovation Research Program.[8] Every year, HP Labs solicits ideas from academics on selected research topics with the aim of building new research collaborations. The proposals are reviewed by HP and selected on the basis of their alignment with HP's interests and needs. Although the size of the grants is modest ($50,000–$75,000), HP receives around 500 proposals per year, selecting close to 50. To manage intellectual property for these projects, HP Labs uses a standardized collaborative research agreement that entitles academics to publish their results, but it also provides HP with the nonexclusive right to use the findings. Another example is Bayer AG's "Grants4Targets" program, which provides grants ranging from $5,000 to $125,000 to researchers wishing to explore and validate drug targets.[9] The bureaucracy is consciously kept to a minimum, and successful applicants are allocated a Bayer scientist as project partner.

These types of programs allow companies to test a professor's aptitude to work on industry-related projects and his or her ability to manage projects in a timely manner. To this purpose, companies should choose projects that are relatively low risk and that do not result in major opportunity costs or other damage if they fail. Often, this type of project is about testing ideas that company R&D personnel may have but that do not yet warrant a major investment within the company. Open collaborations can also provide a vehicle to take out options on different futures. Claudio Marinelli, director of open innovation and academic research at Nokia Corp.'s Nokia Research Center, suggests that the value of most of these collaborations lies mostly in concepts rather than ready-made solutions. Establishing small-scale collaborations with a number of players, possibly internationally, constitutes a cost-effective way to test the waters in a variety of emerging research areas. IBM Faculty Awards, for example, is a program that allows IBM to gain insights into the cutting edge of research from across the world at a modest cost.[10] IBM employees nominate individuals to foster collaboration and promote educational development. The awards are small ($40,000) and not contractual. No intellectual property is stipulated as part of the award, and IBM strongly encourages the research results to be published. In 2010, there were 105 awards

FOUR MODELS OF UNIVERSITY-INDUSTRY COLLABORATION

Each of the four models of industry-university collaboration discussed in this article has benefits and drawbacks. The best format for your company will depend on both your goals and your capabilities — and the goals and capabilities of your academic partners.

	IDEA LAB	GRAND CHALLENGE	EXTENDED WORKBENCH	DEEP EXPLORATION
What do you want to achieve?	•Attract new partners •Build relationships •Generate options	•Shape innovation ecosystem •Develop research agenda •Meet societal challenges •Hire talented graduates	•Solve near-term problems •Gain advice and support	•Tackle fundamental challenges •Access new areas of expertise •Access pipeline of discoveries •Hire talented graduates
How can you structure the collaboration?	•Simple and standardized contracts •Open calls •Outline research priority areas •Internal selection	•Special-purpose vehicles •High-leverage industry consortia •University endowments or centers	•Consulting agreements with individual academics •Contract research agreements with university •Student projects	•University center sponsorship •Framework agreements allocating decision rights to downstream intellectual property
Examples	•HP Labs Innovation Research Program •IBM Faculty Awards	•Structural Genomics Consortium •Shell Grand Challenge	•Nokia applied research contracts •Often practiced within larger collaborations	•Pfizer-Scripps partnership •Rolls-Royce University Technology Centers

at over 70 different institutions in 20 countries.

How should companies undertake such short-term open explorations? First, it is important for companies to explain the problems in a way that will help academics work toward useful solutions. Second, contracts with the university should be kept as simple as possible. Third, the emphasis in managing the project should not be on timely delivery, but on the results. Academics also appreciate it when the project is not overly specific, leaving them with discretion as to the methods and objectives.

Obviously, there are risks associated with this type of collaboration. From a company's perspective, outcomes are likely to be highly skewed, with a number of projects that will yield some results but that will not necessarily produce eureka moments, and a number of failures. However, if a series of projects are pursued in a portfolio, this risk can be mitigated, in part because the cost of each project is rather low. An executive at a major oil company told us that he was happy if 20% of such exploratory projects resulted in some positive output after two years. The unsuccessful 80% are terminated.

Every year, HP Labs solicits ideas from academics on selected research projects with the aim of building new research collaborations.

A further risk is that a company may fail to absorb the lessons from these kinds of projects, as in many cases follow-on projects are required to gain the full benefit of the research. To ensure that these risks are overcome, managers should seek to deepen and extend the most promising relationships by assigning an internal champion to work alongside the external academic partner and creating a more long-term arrangement.

2. Open, Long-Term: Grand Challenges Working on open and long-term "grand challenges" is the sweet spot for most academics, who often thrive on big problems. Companies, too, can capitalize on this kind of collaboration, provided the objectives are well defined and the interaction is carefully governed. For instance, the Structural Genomics Consortium is an initiative by pharmaceutical companies GlaxoSmithKline, Merck and Novartis to carry out basic research on proteins relevant to drug discovery.[11] Yet all results from this research are placed in the public domain with no restrictions.

What do companies gain from sponsoring such open innovation projects? For companies, it can make sense to fund open, long-term research even though they may forfeit the ability to appropriate the results in a legal sense. One situation in which this makes sense is when leading industry players become aware that collective action is needed to address fundamental challenges experienced by the entire industry.[12] In pharmaceuticals, for example, executives are well aware that the cost of developing drugs is constantly rising while research productivity is declining. In this situation, Malcolm Skingle, director of academic liaison at GlaxoSmithKline, believes it may make sense to invest collectively in building an industry commons to instigate a game change in the speed of new knowledge creation. His counterparts at Merck, Novartis and Pfizer agree and have invested together in open science initiatives even though they are otherwise fierce competitors.

Second, companies may seek to create new fields and markets by funding new research programs. Such research is bound to diffuse more quickly and widely than results from more protected initiatives, and it allows companies therefore to shape emerging fields. For instance, IBM has funded major research initiatives in service science, allowing it to shape problems and agendas of this newly emerging discipline.[13] Open research programs can attract follow-on research by academics that may not have been part of the original initiative. Such follow-on knowledge creation can be a powerful mechanism for shaping open source platforms, attracting others to certain norms and standards and thereby seeding a new innovation ecosystem.[14] For example, after Arup Group Ltd., a leading engineering firm, decided to launch a new fire engineering service group in the late 1990s, it invested in a long-term program with universities to generate a new innovation ecosystem around building fire safety. (See "How Arup Fire Invested in a New Innovation Ecosystem.")

A further rationale for funding open, long-term university initiatives is to address fundamental challenges that are of high social relevance, such as the environment or energy. For instance, oil companies have funded large programs on various forms of alternative energy or carbon abatement. One example is a five-year grand challenge on cleaner fossil fuels between Royal Dutch Shell and Imperial College London. Launched in 2007, the project focuses on

COURTESY OF HEWLETT-PACKARD COMPANY

developing technologies that reduce the carbon impact of extracting hydrocarbons.[15]

For companies, a crucial advantage of open, long-term research projects is that they can leverage additional funds from the public or third-sector sources. Such leverage may compensate for the lack of ability to appropriate the returns of the initial investment. Particularly high leverage ratios can be achieved if projects are pursued in consortia with other firms from the same sector.

An additional potential advantage of open programs is a drastic reduction in transaction costs arising from lengthy negotiations with universities. As Stuart Feldman said when he was vice president for computer science at IBM's research laboratories: "Universities have made life increasingly difficult to do research with them because of all the contractual issues around intellectual property.... We would like the universities to open up again."[16] While this may sound self-serving, it is true that open initiatives force firms *and* universities to relinquish their rights to control intellectual property rights. Open programs sometimes pitch academic scientists against their own universities if the latter focus on capturing returns from intellectual property while the scientists would rather proceed with their research.

Open, long-term grand challenges need to be carefully governed. Some successful initiatives were built with special-purpose vehicles to take on both strategy and day-to-day management. When GlaxoSmithKline helped start the Structural Genomics Consortium, the partners set up the consortium as an independent entity — a not-for-profit company headquartered in Toronto, governed by a board of directors composed of members of the participating pharmaceutical companies and other funders, including the Wellcome Trust. Aled Edwards, a life sciences professor who is also the founder of a biotech company and hence commanded respect in both the academic and commercial realms, was recruited as CEO. Led by a CEO with a wide-ranging mandate, special-purpose vehicles can be an effective way to overcome the paralysis that often afflicts bilateral or multilateral committees.

Setting the research objectives for open, long-term projects requires a careful balancing of the sponsors' need for practical relevance and academics' orientation toward the scientific commons.

HOW ARUP FIRE INVESTED IN A NEW INNOVATION ECOSYSTEM

When Arup Group Ltd., a world-leading engineering firm, decided to launch its new fire engineering service group in the late 1990s, the company realized it had a problem. Fire engineering — the design of buildings to make them safe under extreme events — was a new field, with little or no public or professional credibility. Traditionally, fire abatement strategies in buildings were regulated by fixed codes. However, fire engineering showed that flexible, performance-based fire control strategies were often more efficient than code-based regulation, especially in complex buildings. To convince regulators, firefighters and developers that buildings not conforming to the code were safe, Arup invested in a long-term program with universities to generate a new innovation ecosystem around fire safety in buildings. The firm supported conferences, doctoral students, individual professors, collaborative research projects, industry standards and common software platforms. This program of investment created a pool of knowledge about fire engineering, development codes and standards about alternative safety solutions. It also generated a stream of talented engineers trained in the latest tools of fire engineering. The company has also gained: Arup Fire grew from a team of four in 1998 to more than 200 in 2011.[iii]

Large sponsored programs are sometimes perceived by academics as just another resource pool for pursuing their narrowly defined pet projects. Therefore, company sponsors not only need to be present at a strategic level but also need to be involved on a technical level. Successful programs often have a two-level governance structure, with a high-level board setting the general direction and a technical or scientific committee defining individual project objectives and monitoring them on an ongoing basis. Company sponsors should be involved in both these bodies. An additional benefit of being closely involved on a technical level is being better able to absorb the outcomes of the research.

Intel Corp., for example, has structured its Science and Technology Centers and International Institutes with engagement at both levels.[17] Responsibility for the research agenda is placed equally in the hands of a university principal investigator, an Intel principal investigator and an Intel program director. Each program is also staffed with up to four Intel researchers in residence who collaborate on a technical level. Christopher Ramming, director of Intel Labs' university collaboration office, says, "With highly active Intel personnel we can present industry context, understand the strengths and weaknesses of a new idea, and help translate the research outcomes into corporate impact." Even though open initiatives do not involve intellectual property ownership, presence on the board and active collaboration provide a window of attention

that competitors are likely to miss in the short run. Moreover, large, open collaborations do not preclude the launch of more specific point projects that can follow other models, if necessary.

Even when an initiative is open, companies need to be careful that proprietary information is not released into the public domain. To maximize sponsor influence, and minimize knowledge leakage, the Structural Genomics Consortium devised a mechanism whereby sponsors' requirements were kept confidential, both within the organization and from the outside world. The SGC management was a "trusted broker" that carefully managed information flows and prevented leakage.

3. Protected, Short-Term: Extended Workbench

University researchers can be particularly capable partners for non-routine problems because they have access to the brainpower of highly specialized research groups and bring a different perspective than that in corporate environments. They usually are also less vested in commercial interests compared to suppliers, vendors and consultants, who may have their preferred solutions to problems.

For example, an international engine manufacturer we studied experienced some unexpected problems with an innovative prototype engine. The engine performed wonderfully in most aspects, but occasionally it blew up. Company R&D engineers were at a loss to explain these failures and decided to turn to their university partners for help. For the company, this was a burning short-term problem that required highly developed analytical capabilities. The university researchers took on the challenge and were able to find the underlying reason within six weeks.

Managers need to overcome two concerns to create successful short-term, protected collaborations with universities. For academics, such projects are often relatively unattractive. They provide little or no opportunity for publication and force them to shift their work from their research efforts toward short-term goals. From their point of view, the opportunity cost can be high. In addition, these projects are usually highly confidential, and the business needs to protect the problem *and* the solution. This limits the academic partner's ability to extract academic capital by publishing the results.

The trick is to make these projects more attractive to academics by making them part of a longer-term relationship. Short-term, confidential arrangements are often best pursued when a wider collaboration is already in place. In the above example, the engine manufacturer already had long-term relationships with the research groups, and it was therefore easier to persuade them to engage in "firefighting." A former global head of university partnerships at a major defense company explained that traditionally it was difficult to recruit academics for short-term contracts. This changed when he started a company-wide university partnership program that weeded out nonproductive relationships and put the successful ones on a stronger footing. Relationships forged on the anvil of a pressing problem may generate the trust to enable richer and deeper future research collaborations. Academics may also find that such projects provide a stimulus to their own research questions, framing an interesting problem for them to later investigate with greater theoretical and empirical precision.

The benefit of these types of projects for companies is that they can set objectives for collaboration and expect delivery on these objectives as they would from a commercial organization. Such projects allow companies to quickly expand their existing stock of expertise and skills and produce tangible outcomes, focused around a live problem or issue in the company. This helps to ensure that there is a high chance of implementation of the academic's work. They also allow the business to keep the nature and solution to its problems confidential, excluding others from the potential solution. Nondisclosure agreements, embedded in a trusted relationship, are usually sufficient to maintain confidentiality.

Although short-term, protected collaboration can be highly attractive and remain a common form of collaboration, such projects rely on businesses to have a rich Rolodex of academic contacts whom they trust and can work with, and whose research areas are closely matched to the business's problems. Some companies have developed a university engagement database, similar to a customer relationship management database, to track, assess and value different university contacts. Businesses may want to put selected academics on consulting retainers so that they are well positioned to attend to problems as they

emerge rather than arriving after the problem has already taken hold. Some companies use open "idea lab" projects to form new contacts.

While it is important to seek out and maintain relationships with individual academics, they are bound by university policies, and it is a good idea to ensure that all activities are aligned with the relevant outreach entity. For instance, many universities have consultancy service offices that are experienced in drawing up contracts and offer professional indemnity insurance coverage. For larger projects, most universities have business partnership units or industry liaison programs that take care of the contractual and administrative side of collaborations, help recruit sponsors and liaise with academics and departments, acting as a centralized point of contact for the university and its industrial partners. These outreach offices have helped to professionalize the nature of university engagement with companies, often facilitating and catalyzing connections. In many cases, such activities are pursued from within the technology transfer offices[18] that will also be responsible for dealing with any intellectual property arising from their projects.[19]

Despite this, contract research agreements with universities can be complicated to set up.[20] Sometimes the communication between academic teams and the outreach offices is less than ideal, rendering the process bureaucratic and slow. Universities can also be overly optimistic about the value of the intellectual property that may arise from the collaboration, even though only a minority of collaborative university-industry projects results in patentable output.[21]

In order to avoid such conflicts, managers should proactively seek to build relationships with university outreach offices. One approach that can help avoid protracted negotiations is to invest in framework agreements with key university partners. These agreements offer a set of model contracts and a rapid-fire system for launching contract research agreements. An example of this approach can be seen in Procter & Gamble's collaborative agreements with the University System of Ohio in the United States, Durham University in the United Kingdom,

and The Hebrew University of Jerusalem in Israel. To address a related challenge, Intel has recently been working with a nonprofit entity called University-Industry Research Corp. as the single contracting and funding intermediary between industry sponsors and universities in its larger centers and institutes. This allows the company to provide a more scalable approach to adding new sponsors and universities to its large institutes, while enforcing a consistent governance model and avoiding an undue administrative burden for its partner universities.

4. Protected, Long-Term: Deep Exploration

Long-term, deep and protected collaborations with universities enable companies to not only create new knowledge, but also to gain competitive advantage from the outputs of these research efforts. Such efforts usually involve major investments in labs or centers, where the industrial sponsor has the right of first refusal to an exclusive license to patentable ideas emerging from the lab. This approach allows the researchers to do the long-term work they do best, and the company to preempt its competitors from accessing the downstream application of these ideas.

The Rolls-Royce University Technology Centres allow Rolls-Royce to maintain centers of excellence that are more resourceful and specialized than it would be able to justify internally.

Rolls-Royce Holdings PLC is an example of a company that has applied the "deep exploration" approach. Twenty years ago, the company established the first Rolls-Royce University Technology Centres with universities in Britain. Today, Rolls-Royce runs about 30 such centers around the globe, from the United States to China. Each of the centers focuses on a specialized area of technological expertise, such as combustion, aerodynamics, noise and vibration or manufacturing technology. This allows the company to maintain centers of excellence that are more resourceful and specialized than it would be able to justify internally. Each of the centers is funded for five-year intervals, and renewals are common provided specific performance milestones are met.

For companies, the attractiveness of such "deep explorations" is that they allow the business to exert some control over the direction of the research program, guiding researchers into areas that are more relevant and useful to the company. Such agreements also ensure a strong alignment between the company's R&D strategy and research, helping to overcome the tendency toward agenda drift associated with more open "grand challenges." Through the intellectual property provisions in such relationships, companies can also mitigate the danger of knowledge leakage by their university partners. Moreover, they can invest more deeply in the collaboration, disclosing critical ideas to their external partners to learn more effectively together.

This approach is, however, not cheap. Often, the price of exclusivity is high and requires parallel investments from the business to make it work successfully. It also requires careful attention to the direction of the collaboration. A typical mechanism for deep explorations is to set up a medium-term agreement (often more than three years) with an academic partner to establish a new center or invest in an existing center.

Governance is also critical to this model's success. Within the agreement, it is important to specify the relationship between the company and research organizations and how payments may be tied to specific milestones or achievements. In addition, intellectual property terms in deep explorations should be well specified in the pre-contract phase. For example, Pfizer's 2006 agreement with The Scripps Research Institute[22] provided $100 million of research funding for five years. In exchange for the support, Pfizer claimed the right of first refusal to license almost half of the discoveries Scripps makes. As part of the agreement, Pfizer has to decide within one or two months whether to exercise its licensing option on a discovery. Pfizer agreed to ensure that Scripps will receive a share of future royalties arising from the licensed discoveries. If Pfizer does not exercise its option, Scripps can seek alternative industrial partners to exploit the idea.

Although deep exploration has many advantages for companies, risks remain. Businesses may find that academics promise one thing and deliver another. In one university-industry research center we studied, we found that the same project had been "sold" to the industry partner twice. Fundamentally, agreements like deep explorations create incentive problems for academics, since many of them seek to publish and diffuse their work rather than produce innovations that will be exclusively licensed by a corporate sponsor. These differences can manifest themselves in tensions between junior and senior researchers, as junior scholars are seek-

COURTESY OF ROLLS-ROYCE

ing to make their mark in the research community and senior scholars may wish to sustain a lab.

An additional risk factor that companies face is a possible public relations backlash fueled by allegations that industry funds may bias independent university research and capture open science agendas.[23] Managers in some industries, such as pharmaceuticals and oil, have to be particularly careful in this respect. When the agribusiness arm of Novartis entered into a landmark $25-million contract with the Department of Plant & Microbial Biology at the University of California, Berkeley, in 1998, it seeded a controversy revolving around the appropriation of open research by private interests and led to an external review.[24] Concerns were also raised when Exxon Mobil Corp. and other firms signed a 10-year, $225-million deal with Stanford University to fund the Global Climate and Energy Project.

There are ways to overcome many of these problems. First, because many academics work with industry primarily to further their academic research programs, it is important for businesses to offer academics access to interesting problems, data or equipment. Providing them with interesting clues or problems will often result in solutions that interest both the business and the academic community.[25] Second, any decision to patent a discovery or restrict publications due to confidential information in a deep exploration partnership requires fast approval processes so that academics are not left waiting to know whether they may publish or not. Businesses must agree with their academic partners on a streamlined system for managing disclosures, whereby academics are allowed to publish important but noncritical findings around an invention. Academic scientists also need access to protected inventions to develop follow-on applications and discoveries. It is also possible to create incentives within the collaboration that more directly align with academic motivations. For example, rewarding inventors with academic prizes for major discoveries, such as endowed chairs or multiyear fellowships, may help motivate, recruit and retain junior faculty.

At the same time, it should be stressed that some academics have impressive track records in commercialization.[26] While these researchers do not need to be given incentives to work on commercially oriented projects, companies need to ensure that contracts are clear regarding who will have what rights to any arising intellectual property, how royalties from licenses are to be distributed and how the project relates to the scholar's other commercial activities and ventures.

Crafting the Right Partnership

The university sector is large and complex, with a wide range of institutions. Some universities are highly skilled at working with industrial partners, collaborating frequently with industry — whereas others have limited experience. Managers should carefully assess the level of collaborative capability of their potential university partners, avoiding costly and time-consuming setup costs and the possibility of later disputes over the ownership of ideas. Another factor to consider: Differences across countries in university rules can, in some cases, be substantial. For example, in most countries, the inventions of academics are owned by their universities. But in Sweden and Italy, "professor privilege" still operates, meaning that academics own their inventions.

When determining the best model to follow with a university partner, managers should carefully assess the nature of the university they are working with. For instance, many top engineering universities routinely engage in applied research that has direct commercial applications, and hence these institutions are often well prepared for what we call "deep exploration." More generally, university relations are too important to be left to chance. By balancing considerations such as time horizon and degree of openness, managers can turn universities into valuable partners in both the short and long run — provided the relationships are designed in advance to meet both organizations' goals.

Markus Perkmann *is a senior research fellow and* ***Ammon Salter*** *is a professor of technology and innovation management at Imperial College Business School, Imperial College London. Comment on this article at http://sloanreview.mit.edu/x/53417, or contact the authors at smrfeedback@mit.edu.*

ACKNOWLEDGMENTS

We acknowledge support from the U.K. Economic and Social Research Council via the Advanced Institute of Management Research (RES-331-27-0063 and EP/C534239/1), the U.K. Engineering and Physical Sciences

Research Council via the Innovation Studies Centre (EP/F036930/1) and the UK Innovation Research Centre (RES-598-28-0001), which is funded by the ESRC, the National Endowment for Science, Technology and the Arts, the U.K. Department for Business Innovation & Skills and the Technology Strategy Board.

REFERENCES

1. H. Chesbrough, "Open Innovation: The New Imperative for Creating and Profiting From Technology" (Boston: Harvard Business School Press, 2003).

2. Patents represent the commercially most important type of intellectual property for universities.

3. W.M. Cohen, R.R. Nelson and J.P. Walsh, "Links and Impacts: The Influence of Public Research on Industrial R&D," Management Science 48, no. 1 (January 2002): 1-23.

4. See official U.K. figures at www.hefce.ac.uk/econsoc/buscom/hebci.

5. R. Wright, "How to Get the Most From University Relationships," MIT Sloan Management Review 49, no. 3 (spring 2008): 75-80.

6. Calculated from OECD figures, according to which, in the OECD area, higher education expenditure on R&D (HERD) equaled 0.4% of GDP in 2009. See OECD, "OECD Science, Technology and Industry Scoreboard 2011" (Paris: OECD Publishing, 2011).

7. D. Partha and P.A. David, "Toward a New Economics of Science," Research Policy 23, no. 5 (September 1994): 487-521.

8. See www.hpl.hp.com/open_innovation/irp.

9. See www.grants4targets.com.

10. See www.ibm.com/developerworks/university/facultyawards.

11. See www.thesgc.org.

12. C. Sheridan, "Industry Continues Dabbling With Open Innovation Models," Nature Biotechnology 29, no. 12 (December 2011): 1063-1065.

13. See www.ibm.com/ibm/ideasfromibm/us/compsci/20080728/index.shtml.

14. K.J. Boudreau and K.R. Lakhani, "How to Manage Outside Innovation," MIT Sloan Management Review 50, no. 4 (summer 2009): 68-76.

15. See www.imperial.ac.uk/energyfutureslab/research/grandchallenges/cleanfossilfuels.

16. S. Lohr, "IBM and U.S. Universities Work to Open Up Software Research," International Herald Tribune, Dec. 14, 2006.

17. See http://techresearch.intel.com/istc.aspx.

18. Association of University Technology Managers, "The AUTM Transaction Survey: FY 2009" (Deerfield, Illinois: 2011).

19. On technology transfer, see D. Mowery, R. Nelson, B. Sampat and A. Ziedonis "Ivory Tower and Industrial Innovation: University-Industry Technology Transfer Before and After the Bayh-Dole Act" (Palo Alto, California: Stanford University Press, 2004); and M. Wright, B. Clarysse, P. Mustar and A. Lockett, "Academic Entrepreneurship in Europe" (Cheltenham, U.K.: Edward Elgar, 2007).

20. W.C. Johnson "The Collaborative Imperative," in "Universities and Business: Partnering for the Knowledge Society," eds. L.E. Weber and J.J. Duderstadt (London: Economica, 2006): 99-111.

21. National Council of University Research Administrators, "Guiding Principles for University-Industry Endeavors" (Washington, D.C.: 2006).

22. See www.scripps.edu.

23. S. Krimsky, "Science in the Private Interest: Has the Lure of Profits Corrupted Biomedical Research?" (Lanham, Maryland: Rowman & Littlefield, 2004).

24. E. Press and J. Washburn, "The Kept University," Atlantic Monthly 285, no. 3 (March 2000): 39-54.

25. P. D'Este, and M. Perkmann, "Why Do Academics Engage With Industry? The Entrepreneurial University and Individual Motivations," Journal of Technology Transfer 36, no. 3 (June 2011): 316-339. Our research suggests that it is premature to assume that academic research teams increasingly act as "quasi-firms": see H. Etzkowitz, "Research Groups as 'Quasi-firms': The Invention of the Entrepreneurial University," Research Policy 32, no. 1 (January 2003): 109-121.

26. L.G. Zucker and M.R. Darby, "Star Scientists and Institutional Transformation: Patterns of Invention and Innovation in the Formation of the Biotechnology Industry," Proceedings of the National Academy of Sciences 93, no. 23 (Nov, 12, 1996): 12709-12716.

i. For results of a survey of U.K. physical and engineering scientists, see D'este and Perkmann, "Why Do Academics Engage With Industry?"; for results of a survey of companies collaborating with U.K. scientists, see J. Bruneel, P. D'este, A. Neely and A. Salter, "The Search for Talent and Technology: Examining the Attitudes of EPSRC Industrial Collaborators Towards Universities" AIM Academic Publication. (London: Advanced Institute of Management Research, 2009). See also A. Salter, V. Tartari, P. D'este and A. Neely "The Republic of engagement: exploring UK Academic Attitudes to Collaborating with Industry and Entrepreneurship," Advanced Institute of Management Research and U.K. Innovation Research Centre, August 2010, downloadable from www.aimresearch.org/publications/academic-publications; and J. Bruneel, P. D'este and A. Salter, "Investigating the Factors That Diminish the Barriers to University-Industry Collaboration," Research Policy 39, no. 7 (September 2010): 858-868.

ii. M. Perkmann and K. Walsh, "The Two Faces of Collaboration: Impacts of University-Industry Relations on Public Research," Industrial and Corporate Change 18, no. 6 (December 2009): 1033-1065.

iii. M. Dodgson, D.M. Gann and A. Salter, "In Case of Fire, Please Use the Elevator: Simulation Technology and Organization in Fire Engineering," Organization Science 18, no. 5 (September-October 2007): 849-864.

Reprint 53417.

MITSloan
Management Review

PDFs ■ Permission to Copy ■ Back Issues ■ Reprints

MIT Sloan Management Review articles, permissions, and back issues can be purchased on our Web site: *www.pubservice.com/msstore* or you may order through our Business Service Center (9 a.m.-7 p.m. ET) at the phone numbers listed below. Paper reprints are available in quantities of 250 or more.

Customer Service
MIT Sloan Management Review
PO Box 15955
North Hollywood, CA 91615