



Open Innovation in Global Networks

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Introduction

Innovation has become a key factor for the economic success of OECD countries and a prerequisite for sustainable development. In a complex and highly competitive global market, companies have to innovate and develop commercially viable products and services faster than ever. To meet these new challenges, companies adopt new approaches to their innovation strategies and processes.

Confronted with increasing global competition and rising research and development (R&D) costs, companies can no longer survive on their own R&D efforts but look for new, more open, modes of innovation. Companies' innovation activities are increasingly international, and they are embracing "open innovation" – collaborating with external partners, whether suppliers, customers or universities, to keep ahead of the game and get new products or services to market before their competitors. At the same time, innovation is being "democratised" as users of products and services, both firms and individual consumers, increasingly become involved in innovation themselves.

Multinational enterprises (MNEs), in particular, have increasingly shifted R&D activities across borders within their global value chain and rely on outside innovation for new products and processes. Companies are also found to be more active in licensing and selling results of their own innovation to third parties.

But what drives these global innovation networks across different industries? And how do they relate to companies' overall strategies? This *Policy Brief* looks at the increasing importance of open innovation in companies' innovation strategies and business models and how policy makers can help ensure it strengthens growth, employment and productivity. ■

What drives open innovation?

Open innovation models have become an integral part of the innovation strategies and business models of companies in recent years. Innovation is increasingly based on knowledge assets beyond the boundaries of the company and co-operation has become an important way of tapping into knowledge resources outside in order to generate new ideas and bring them quickly to the market (the “outside-in” approach). At the same time companies may spin out technologies and intellectual property that they have developed internally but that are outside their core business and thus better developed and commercialised by others (the “inside-out” approach).

The most important benefit of open innovation to companies is that it provides a larger base of ideas and technologies. Companies look at open innovation as a close collaboration with external partners – customers, consumers, researchers or other people that may have an input to the future of their company. The main motives for joining forces between companies is to seize new business opportunities, to share risks, to pool complementary resources and to realise synergies. Companies recognise open innovation as a strategic tool to explore new growth opportunities at a lower risk. Open technology sourcing offers companies higher flexibility and responsiveness without necessarily incurring huge costs.

Open innovation is more about increasing R&D options than about replacing existing ones. The external technological collaboration is complementary to internal R&D investments. An OECD study of 59 companies in a dozen countries found that almost three-quarters of them devoted the bulk of their R&D budget – 80% or more – to in-house R&D activities. At the same time most companies are actively involved in open innovation practices: 51% of the companies allocate up to 5% of their R&D budgets to research in other companies, while 31% allocate more than 10% outside.

The trend towards more openness in innovation is not totally new. The emphasis of open innovation reflects primarily a greater awareness of the organisation of innovative activities (technological as well as non-technological) across firm boundaries with a more equal importance of internal and external sources of innovation. Recently, globalisation has significantly altered the scope for outsourcing and open innovation as it has broadened the choice of potential partners giving rise to the development of global innovation networks.

The term “open innovation” does not refer to free knowledge or technology. While “open source” refers to royalty-free technologies, “open innovation” refers to the collaborative methods applied, and may still imply the (significant) payment of license fees between companies for intellectual property. ■

How have global innovation networks developed?

In order to match the growing demand for innovation from customers, suppliers, etc. with the worldwide supply of science and technology, (large) companies increasingly adopt innovation “eco-systems” across countries. In these innovation networks, companies link up with people, institutions (universities, government agencies, etc.) and other companies in different countries to solve problems and tap into new ideas.

In this global innovation climate, it is becoming increasingly important for companies to be involved in both external and intra-firm networks. Thus global innovation networks include a company’s own R&D facilities abroad as well as collaborations with external partners and suppliers (see Box 1). Depending on their expertise, the different partners in these networks play multiple roles. The larger the role companies and their foreign R&D facilities play in global eco-systems, the more intense and more diverse the transfers of know-how will be, since they are responsible for sourcing know-how in other units of companies, including the headquarters in the case of MNEs, but also accessing external sources.

Global innovation networks significantly influence the innovation systems of countries and regions. MNEs' innovation eco-systems or networks often represent the nodes between regional or national systems of innovation across borders, and thus link various actors in the science and technology field across different countries. They often span clusters and industrial districts within specific industries over several countries, as MNEs search for new knowledge knowing that spillovers often arise because of geographical proximity. These international R&D activities, including the integration in local innovation networks in host countries, are expected to have a positive effect on the competitiveness of MNEs' activities in their home country. This is because the MNEs' activities will benefit from technology flowing back to the home country, and as any new discoveries arising from the global innovation network can also benefit the home country. ■

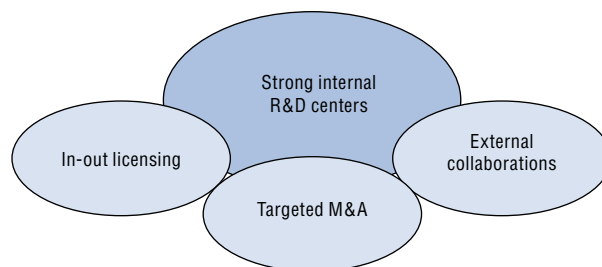
How do global innovation networks operate?

Most companies use a mix of approaches to innovation. Some technologies may be purchased from other companies, others may be acquired through licenses, partnerships and alliances, and still other critical technologies are developed internally. Innovation strategies of companies combine characteristics of both innovation models and the degree of 'openness' differs between companies depending on factors such as the importance of the technology, the strategy of the firm, the characteristics of the industry, etc.

The attractiveness of (global) open innovation depends on the technological and industrial context in which the companies are operating. The open innovation model is perhaps most evident in the information and communication technology (ICT) and pharmaceuticals-biotechnology sectors, but it is also increasingly important in the automotive and aerospace industries. Four key factors determine the potential for open innovation on a global scale for a company or industry. The first is how easy it is to innovate, either radically or incrementally – the “opportunity conditions”. The second is how easy it is to protect innovation – the “appropriability conditions”. The third is “cumulativeness” – to what degree the innovations of today are the basis for innovations of tomorrow and the final element is the degree of multidisciplinary and cross-functional complexity of knowledge.

Box 1. GLOBAL OPEN INNOVATION IN NOVARTIS

The innovation strategy of Novartis (one of the 59 company case studies included in the OECD project) is built around strong internal R&D centres complemented by inward-outward licensing, targeted mergers and acquisitions (M&A) and external collaborations. The R&D centres of Novartis are concentrated in Switzerland, the United Kingdom, France, the United States, Japan and India; overall Novartis has more than 8000 associate R&D personnel in 59 countries worldwide. In biotechnology, Novartis has set up external collaborations with 120 companies and 280 academic centres, representing more than 30% of the R&D budget. In addition, Novartis has financed 150 entrepreneurial ventures over the last five years.



In industries characterised by rather short technology life cycles, *e.g.* the ICT, electronics and telecommunications industry, companies have sought external partners in order to keep up with new developments in and around their industry. In industries characterised by rather long technology life cycles and strong protection of intellectual property rights (IPR) (*e.g.* pharmaceutical, chemical and materials industries), companies mainly look outside the firm to keep up with research. In industries in which patents are important but can be more easily circumvented (*e.g.* the transport equipment industry and the fast-moving consumer goods industry), companies set up collaborations to keep pace with new developments. They seek technologies or products that have proven their market potential, which they can improve, scale up and commercialise.

Companies use different methods to source external knowledge. The two traditional models are partnerships with external parties through alliances, joint ventures and joint development; and acquiring or selling knowledge through contract R&D, purchasing, or licensing. Open innovation, however, has been increasingly realised through “corporate venturing” – equity investments in university spin-offs or in venture capital investment funds. Companies also use venturing to look for external partners for commercialising their innovations that are not used internally (divestments, spinning out, spinning off). Spin-off companies are increasingly used as a means of externalising projects. Some case study companies examined in the OECD work had set up a corporate venture capital fund to develop new projects or companies based on ideas originating within the company.

Table 1.
COMPANIES
COLLABORATING IN
INNOVATION ACTIVITIES,
BY PARTNER, 2002-04¹

	Suppliers	Customers	Competitors	Consultants and private R&D institutes	Universities and other higher education	Government and public research
Belgium	73%	59%	27%	42%	37%	26%
Czech Republic	80%	68%	40%	39%	34%	19%
Denmark	66%	65%	35%	44%	32%	16%
Germany	44%	51%	27%	18%	53%	26%
Ireland	72%	78%	19%	31%	31%	18%
Greece	46%	32%	47%	27%	27%	10%
Spain	52%	23%	17%	23%	26%	28%
France	65%	50%	36%	32%	26%	18%
Italy	56%	39%	37%	50%	36%	11%
Luxembourg	79%	73%	49%	36%	33%	27%
Hungary	71%	53%	37%	34%	37%	14%
Netherlands	75%	55%	31%	38%	31%	24%
Austria	43%	45%	22%	42%	58%	30%
Poland	67%	39%	20%	19%	15%	21%
Portugal	71%	60%	35%	45%	39%	25%
Slovakia	84%	80%	56%	49%	39%	30%
Finland	92%	93%	77%	74%	75%	59%
Sweden	75%	65%	25%	46%	41%	15%
United Kingdom	74%	73%	36%	41%	33%	25%
Iceland	68%	68%	48%	23%	17%	45%
Norway	70%	67%	36%	61%	45%	49%

1. Or nearest available years.

Source: OECD (2008b).

Companies traditionally seek to retain their core capabilities, directly determining what to outsource or with whom to collaborate. Core competences (in technology and markets) of companies are developed as much as possible internally. In contrast, open innovation may be a faster and less risky alternative than internal development for diversification, in technology, markets or both. The innovation model stays relatively more open for non-core technologies and markets. Since not all required knowledge is available in-house, companies actively search for all the expertise necessary to bring the new technology or product to the market and realise a competitive advantage. ■

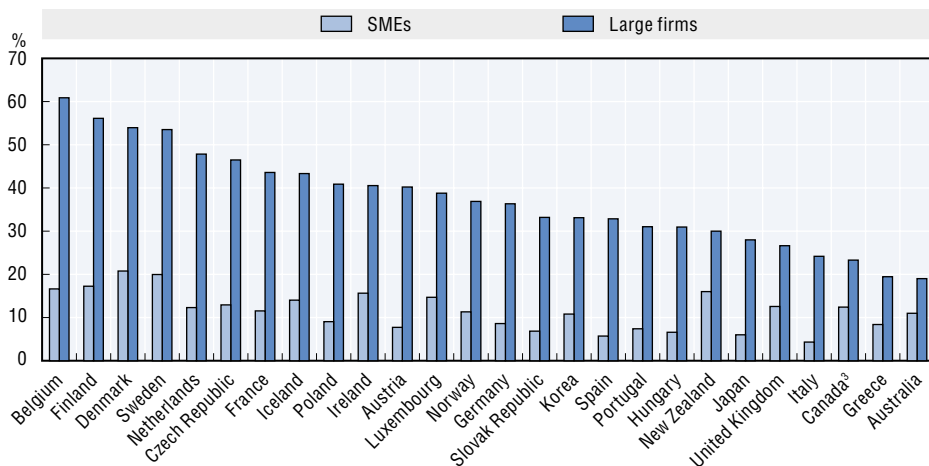
How big are global innovation networks?

How widespread are open innovation global networks? Existing data on R&D, innovation, patenting and licensing can provide some answers. Companies collaborate in innovation most frequently with suppliers and customers while co-operation with competitors and private R&D labs and consultants seems to be somewhat less important. While universities and government research institutes are generally considered to be an important source of knowledge transfer for the innovation activities of companies, the collaboration with public research organisations (higher education or government research institutes) is less frequent (Table 1). This may be because public research focuses more on upstream research and exploration activities which may have only a modest impact on innovation.

Large companies are four times more likely to collaborate in innovation than small and medium-sized enterprises (SMEs). Large companies are also much more active in public research although there is much more cross-country variation for large firms than for SMEs. Nevertheless it should be kept in mind that the data only reveal the existence of some sort of collaboration, not its type or intensity (Figure 1).

While international technology collaboration is found to play a prominent role in the innovation process of companies, firms seem to favour innovation partners that are geographically close. Again, no qualitative information on international collaborations is available, but companies seem to enter such arrangements only if they are strongly motivated, since international partnerships are more costly and difficult to manage. The company case studies indicated that having technology partners in the same geographical area is highly beneficial since such proximity causes fewer confidentiality problems.

Figure 1.
COMPANIES COLLABORATING IN INNOVATION ACTIVITIES, BY SIZE¹, 2002-04²
As a percentage of all companies



1. SMEs: 10-249 employees for European countries, Australia and Japan (persons employed); 10-99 for New Zealand, 10-299 for Korea, 20-249 for Canada.
2. Or nearest available years.

Source: OECD (2008).

What are the challenges for global innovation networks?

The empirical evidence also shows that markets for technology licensing are large and growing. Separate studies have demonstrated that licensing is growing rapidly in the United States and Europe as well as Japan, notwithstanding some regional differences. International licensing in particular appears to be on the rise, although much of this reflects transactions among affiliated businesses. ■

Since innovation has increasingly become the basis for the competitive advantage of companies, the growing number of interactions with external parties such as customers, suppliers, universities, etc., has important repercussions for the protection and safeguarding of intellectual assets and intellectual property – patents, trademarks, trade secrets, etc. Open innovation may increase the risk of leakage of proprietary knowledge and involuntary spill-overs. Other potential disadvantages are the extra costs of managing co-operation with external partners, the loss of control, the adverse impact on the flexibility of the company, the dependence and possible over-dependence on external partners, and the potential opportunistic behaviour of partners.

Intellectual property theft is typically identified as the most important risk of global innovation networks. Unique knowledge may be revealed to external partners who could later become competitors or who could make better use of the fruits of the venture or the know-how. Working closely with external partners can create uncertainty about how the benefit of technology collaboration is to be appropriated. SMEs may be confronted with larger risks in collaborating with larger companies because of their typically smaller resources and limited expertise in intellectual property rights (IPR) issues.

The effective management of intellectual property (IP) is therefore crucial, not only in identifying useful external knowledge but especially to capture the value of a firm's own IP rights. In the past, IP management was often relatively closed since intellectual property was mainly created and used internally, and intellectual property protection was used to prevent or block off competitive moves. Patents were especially important for protecting companies' inventions from imitation. The sometimes low utilisation rate of IP assets in the commercialisation of products and services was a direct consequence of this closed IP management. Most patents did not directly generate revenue for patent owners via their incorporation into products, processes and services or through licensing revenues.

Companies engaged in open innovation practices now often organise licensing activities and strategic alliances for a pro-active intellectual property strategy that aims at sharing technologies rather than keeping IP as a defence mechanism. Patent licensing has been found to generate significant financial benefits for patent holders. Furthermore, companies increasingly create cross-licensing agreements and other collaborative mechanisms in order to facilitate technology collaboration.

Successful open innovation also depends on trust and the open character of the business model. As knowledge has become companies' key resource, open innovation needs to be embedded in an overall business strategy that explicitly acknowledges the potential use of external ideas, knowledge and technology in value creation. Owing to the integration of different technologies, industry borders are shifting or even disappearing, necessitating new business models and organisational structures, including the effective management of human capital (open culture, diversity, etc.). ■

What role for national policy?

The emergence of global innovation networks implies that science, technology and innovation policies can no longer be designed solely in a national context. As a country's attractiveness as a location for R&D and innovation activity becomes more

important, framework conditions that affect the location of production as well as costs (production, labour, tax) become critical. Appropriate structural policies, such as labour market and competition policies, as well as a good public infrastructure for innovation and a highly skilled workforce, are of growing importance.

In addition, global innovation networks have some more specific policy implications:

- Universities and public research organisations increasingly play a significant role in the open innovation strategies of firms both as a source of basic knowledge and as potential partners. Given the scarcity of public resources and competition to attract R&D-related foreign direct investment (FDI), countries should balance their research efforts and investments in specific fields with the need to be open and develop sufficient absorptive capacity in a wide range of fields.
- World-class clusters and networks remain important but integration across fields and borders may require different interfaces and competencies. The potential for innovation depends on how well knowledge circulates and how well the system is connected: policies to foster or enable the development of world-class clusters and networks are thus of growing importance.
- Sharing intellectual property may require different kinds of management tools in firms and public research organisations. Companies participating in national R&D programmes may need to share IP with foreign subsidiaries and partners or seek to commercialise it in foreign markets, but may be constrained by national regulations.
- Investing in people and fostering cross-functionality and mobility and a “culture of innovation” is crucial, as open innovation implies that people must be able to work in networks and across borders, sectors and at the interface of converging technologies. It also requires openness to a geographically mobile workforce.
- Open innovation involves a wide range of innovation. Much public support for innovation still focuses on R&D and technological innovation and less on non-technological innovation or other forms of user-driven innovation. While open innovation involves service firms, much public support for innovation still targets manufacturing firms. Policy attention also still focuses mostly on the supply side of innovation and less on building market demand for innovation (e.g. through public procurement).
- National R&D programmes need to be more open to foreign participation while ensuring benefits via reciprocity and cost-sharing agreements. Also arising from open innovation is the question of capturing national benefits from cross-border spillovers of the ecosystems of innovative firms. Potential national benefits must be communicated and demonstrated to public stakeholders.
- Building a strong knowledge base is necessary to develop next-generation innovation policies and best practices. A strong knowledge base will be necessary to identify policy implications and develop next-generation innovation policies and best practices.
- OECD work over the coming years will seek to address these and other issues. ■

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**For further
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For further reading

OECD (2007), **Staying Competitive in the Global Economy: Moving up the Value Chain**, ISBN 978-92-64-03425-9, € 24, 126 pages.

OECD (2008a), **The Internationalisation of Business R&D: Evidence, Impacts and Implications**, ISBN 978-92-64-04405-0, € 24, 108 pages.

OECD (2008b), **Open Innovation in Global Networks**, ISBN 978-92-64-04769-3, € 16, 128 pages.

OECD (2008c), **The Global Competition for Talent: International Mobility of the Highly Skilled**, ISBN 978-92-64-04774-7, € 21, 165 pages.

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