



Cooperation in technological innovation

Barriers and levers for enterprises and knowledge centres

Gert Verdonck & Liselotte Hedeboom

Paper summary

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In this paper, we describe de most relevant quantitative data on cooperation in technological innovation in Flanders and we perform a bottleneck analysis and suggest possible levers upon cooperation in technological innovation

Knowledge sources and collaboration in the case of innovation

The project on quantitative data bundles information on innovation and its relation to internal and external knowledge sources in general, and its relation to the external strategic forms of collaboration of companies and organizations in particular.

The different types of innovation often occur together: innovation of products and services, process innovation, technological innovation, changes in organizational structure and in personnel policy. 61.3% of companies and organizations implemented at least 2 different types of innovation.

There are differences among sectors with respect to innovation – relatively speaking, a greater number of government, education and social profit are innovative, while fewer companies are innovative in the construction sector – but these differences usually fade when the size of the companies and organizations is taken into account. A greater number of large companies and organizations are innovative than small companies.

The immediate external environment is most often called upon as knowledge source for innovation. 88.6% of companies and organizations appeal to nearby external sources outside the knowledge centres when innovating: customers, suppliers, other companies, or (management) consultants. Almost as many companies make use of internal sources: personnel in general and the R&D department if present, i.e. 82.0%. Professional and network organizations are in third place with 47.1%, followed by public (government) bodies with 28.6%. Finally, 21.7% of companies make use of the expertise of traditional knowledge centres such as universities, colleges, sector (cluster) related research centres and competence poles. The traditional knowledge centres are used by the least number of companies as a source of knowledge for innovation. The larger the company, the more use is made of internal and external knowledge sources. A greater number of knowledge sources increases the types of innovation implemented.

The same trend can be seen with respect to forms of collaboration. The immediate external environment of suppliers (48.2%), other companies (27.3%), (management) consultants (25.3%) are more often engaged in forms of collaboration with companies and organizations than the knowledge centres at colleges and universities (15.3%), and

other research centres, competence poles, sector clusters or government centres (17.2%). The various forms of collaboration appear more often in large companies and the differences according to sector are largely the result of the differences in average company size within the sectors. The more types of collaboration present in a company, the greater the likelihood of innovations. There is also a positive correlation between using forms of collaboration and using these contacts as a source of knowledge for innovations.

All forms of cooperation increase the likelihood of the various types of innovation. Collaboration with the traditional knowledge centres at colleges and universities, other research centres, competence poles, sector clusters or government centres has a relatively greater reinforcing effect on the various types of innovation. The forms of cooperation not linked to knowledge centres occur in more companies and organisations, but the number of companies with innovations is smaller in this case, except for the category of companies with 200 or more employees. For this group of the largest companies, little or no significant correlation was found between the nature of the cooperation with respect to the presence or absence of traditional knowledge centres and the various types of innovation. For these large companies, however, more than two thirds of companies have their own R&D departments and almost all of these have implemented at least one type of innovation.

In summary, we can conclude that in the area of innovation in companies and organisations, the forms of collaboration with traditional knowledge centres occurs relatively less often than other forms of collaboration, but there is a greater effect on innovation, certainly in the case of SMEs.

Barriers and levers for enterprises and knowledge centres

The barriers that prevent enterprises and knowledge centres from joining a network or entering into cooperation are **a complex set of small and large obstacles**. For instance, an enterprise may find the barrier between it and a knowledge centre too high because it is a SME lacking innovation as yet, because the entrepreneur or corporate culture is not open to innovation or because the knowledge centres are not known and/or not local. Knowledge centres can miss out on connections with enterprises because their staff are not sufficiently business-oriented in their thinking or the funding arrangements lack sufficient incentive. Where there is a lack of an open corporate culture and of transparency of the world of knowledge centres, the entrepreneur is unlikely to have much confidence in potential cooperation with third parties. Sometimes a single barrier can be enough to prevent cooperation, sometimes it is a cluster of barriers. However, experience shows that an initial successful cooperation breaks down barriers.

Problem areas

The barriers we could list to cooperation can be summed up as **a mismatch in terms of knowledge, culture, finance and intellectual property rights or patents**. These are four problem areas with various barriers and bottlenecks.

The variety of barriers originates from the diversity of (demands of) enterprises and (supply of) knowledge centres. The heart of the problem is the **right match between demand and supply**. All partners in the debate emphasise that it is impossible to gen-

eralise about enterprises or knowledge centres. For instance, a clear distinction must be made between enterprises **based on business size and the technological level of their activities**. There are four main categories of knowledge centres: higher education institutions, universities, strategic research centres and industry or technology specific research centres, particularly collective research centres and sector-specific (other than collective research) clusters. A major distinction between these groups lies in **targeting of the research**. Non-targeted research has an important place at universities, as it does – to a lesser degree – at strategic research centres. Professional higher education and industry or technology specific research centres conduct more targeted research. Besides these knowledge centres there are also numerous cooperation initiatives, temporary or otherwise, which often allow a knowledge centre to develop in an interdisciplinary manner.

Knowledge gap and transparency

A knowledge gap can arise in two ways: there is a difference in knowledge levels or there is a lack of transparency where the knowledge lies. The difference in knowledge levels may involve overspecialisation or interdisciplinary material which cannot be absorbed by the partner. In theory, this problem can arise in both enterprises and knowledge centres. Research groups at universities or strategic research centres with little contact with specific segments of the economy will find it difficult to understand the problems and issues with which such enterprises are faced. It is difficult for professional higher education to follow up all developments if the research groups are too small or if teaching commitments leave too little time for this. Although, due to their objectives and targeted research, strategic research centres and industry and technology specific knowledge centres are more attuned to the issues facing businesses, the barriers are still sometimes too high for small enterprises. Enterprises that do not invest in knowledge retention experience problems absorbing technological developments in their specialist area. In practice, this problem arises more often with entrepreneurs of relatively small businesses in less innovative sectors. As entrepreneurs they are responsible for marketing strategy and sales as well as product and production-related technical aspects. Small enterprises, as well as those without their own research(ers), find it difficult to approach the knowledge centres because their landscape is not very transparent. Where does what knowledge lie? Whom to approach? Can anyone be found who understands the problem? Will it be possible to understand the knowledge? There may be a real knowledge gap, but a false perception of a gap can also represent a potential barrier.

Culture gap and market principles

The culture gap originates from the different market principles behind the research of the parties involved and problems of scheduling and time-frame. The personalities of the entrepreneur and the researcher are a factor here. Non-targeted research generally covers a long time-frame whereas targeted research is aimed at solving an immediate problem and often covers a shorter time-frame. Non-targeted research is less directly market-orientated, while the results of targeted research are soon apparent. Enterprises are market and commercially driven and demand quick solutions. For knowledge centres, non-targeted research is less market driven or commercial, if at all. It is not necessary to adopt the same market driven or commercial principles in order to close the gap. However, it is necessary to follow one another's logic and be familiar with one

another's different points of view. For higher education institutions and universities, research is just one of their tasks, together with education and services. These tasks may conflict with each other when priorities need to be set. Since lecturers and researchers will be guided by the assessment criteria, businesses' research questions may find themselves competing with publications or teaching commitments, for example. In educational institutions, researchers are also tied to academic years and terms. Strategic research centres and industry and technology specific knowledge centres are more closely attuned to demand from enterprises for targeted research and are less tied to strict schedules and timings. However, strategic research centres play an important role in conducting non-targeted research with an international scope, which may be part of the reason why they are less well-known among small enterprises. Industry and technology specific knowledge centres are linked to a single economic activity or a cluster of these and, besides non-targeted research specific to the industry or cluster, also have a wider direct problem-solving role. This means that they tend to be more closely attuned to enterprises as their activities range from services to a broad spectrum of research. Although this allows them to respond more quickly, it is still difficult to find a solution to tomorrow's problems yesterday. The entrepreneur and the researcher both play crucial roles in resolving this and the previous problems. Entrepreneurs, particularly those with small businesses, are still all too often reluctant to cooperate with knowledge centres or are not open enough to outsiders. Researchers at knowledge centres are sometimes focussed too exclusively on their research and/or lack the necessary business sense to understand enterprises' questions. Cooperation, or lack of it, among knowledge centres is also a factor in the culture gap. Both similar knowledge centres and centres with fairly complementary disciplines can find it difficult to get along.

Financial obstacles

Financial obstacles originate from the funding arrangements for the research tasks or projects of the knowledge centres and their cooperation with enterprises. Knowledge centres are funded in different ways, through various channels, impacting on the possibilities for conducting research on behalf of or in cooperation with third parties. Where there is insufficient basic funding it is difficult to develop internal specialisation. For enterprises, there must be sufficient scope to release staff and research funding and bear the administrative cost of project research. Project funding must cover sufficient costs to be able to act as a trigger. Paying for research by knowledge centres meets with resistance if it is insufficiently clear why it needs to be paid for, where there is a lack of insight into the funding mechanisms of the knowledge centres or when the added value of the contract research for the enterprise is unclear. Funding of cooperation for its own sake is often necessary in order to convince enterprises and knowledge centres to share their knowledge. Both basic and project funding of knowledge centres is often complex and makes research work more difficult or more costly. Short-term research may come into competition with long-term research, making it unattractive financially. Funding of contract and project research for problem-solving research is sometimes diverted to non-targeted research in order to retain the knowledge where there is a lack of basic funding.

Conflicts surrounding intellectual property rights

Intellectual property rights and patents are experienced as barriers instead of advantages where there is a lack of knowledge and trust in cooperation between knowledge centres and enterprises. Although unequivocal (EU) regulations exist for most situations, this is not well known. Small businesses in particular find this area too complicated. This results in a problem of perception and mistrust. The opportunity to regulate rights in this area via an agreement is all too frequently missed. Since intellectual property rights and patents play an important role in non-targeted research, they are also a major concern for universities, strategic research centres and some industry or technology specific knowledge centres. The issues involved cannot be summarised in a few guidelines, as the solutions must be adapted to the nature of the activities, products, production processes and services.

Analysis of barriers and levers

There are various barriers and levers to cooperation between knowledge centres and enterprises. It is impossible to present a comprehensive list, either in the information dossier, or in this summary. These barriers were presented to us in the course of many discussions with knowledge centres, intermediary organisations and enterprises. In the course of the discussions, levers were also presented and suggestions provided as to how to remove barriers. Some already work in practice, while others are new or require improvement. We include them all in our analysis of barriers and levers.

The innovative entrepreneur

Several barriers to networking and cooperation with knowledge centres arise from the characteristics of enterprises. This is more difficult for small businesses than for large ones. In high-tech sectors, innovation is more or less a given in most enterprises, unlike in the food or agricultural sectors, for instance. However, examples from our research among small businesses in the same sectors show that innovation can be high on the agenda there too. The entrepreneur plays a leading and facilitating role in innovation in general and in cooperation with knowledge centres in particular. **Entrepreneurs with few contacts and networking connections tend to be closed and less open to cooperation.** In innovative businesses, management is open to the exchange of knowledge and cooperation, there is a willingness to invest in the retention of knowledge and innovation is a strategic management priority. Entrepreneurship is what makes the difference. The personality of the entrepreneur is a major factor – some are born networkers, others are reticent about making contacts.

Entrepreneurship can be learnt. Education is the starting point, followed by professional associations and interest groups, e.g. business coaches from UNIZO (Organisation for the Self-employed and SMEs). Intermediary organisations help to stimulate innovation with tools such as strategic management audits by provincial innovation centres. Internal and external bridges with knowledge centres can motivate entrepreneurs and lead to innovation. Initiatives by professional associations and interest groups can support entrepreneurship, lowering the barrier for SMEs in particular.

Entrepreneurs at knowledge centres

Researchers at knowledge centres also experience problems contacting and communicating with enterprises. Scientific language often needs translating into business jargon. Not all researchers have a feel for targeted research, let alone a market strategic approach to developing products and production processes.

Promoting openness and flexibility among researchers at knowledge centres lowers barriers to cooperative ventures. **Researchers can be assisted in this by front offices**, such as the technology transfer offices to the Flemish associations, SME units at strategic research centres and advisers and trouble shooters at industry and technology specific knowledge centres. The interviewees in our survey do not expect research groups to adopt the culture of the enterprises without question. However, familiarity with the culture, values and norms remains very important. Cultural differences lie in the ultimate objective. Enterprises are commercially orientated and researchers will adopt a market-oriented approach for targeted research. The ultimate objective of non-targeted research is different. Creative solutions must be found to circumvent the fact that research groups work within a different time-frame and schedule than enterprises. Some situations also call for greater transparency: where does what knowledge lie and how can the knowledge be translated into business terms. Front offices also play a major role here, as do other intermediary organisations and networking activities. For enterprises, a major opportunity lies in organising company visits, internships and other opportunities to share knowledge. Workshops at enterprises where researchers learn about the market strategic approach within the business in a confidential setting are triggers for greater involvement of researchers in future-oriented projects.

The FRIS database as a source of knowledge

It is often not obvious where which knowledge lies or where to go to with technical problems. Although knowledge centres make efforts to raise their profile, this is not enough to achieve a rapid match between demand for innovation in enterprises and supply in the knowledge centres. The Flanders Research Information Space (FRIS) – a research portal – is designed to provide support in this area. Examples in this survey show that this has great potential. **The bottleneck is that the FRIS research portal is not well-enough known and used by enterprises and researchers at the various knowledge centres.** All research from all knowledge centres is not yet included. The information is not yet transparent.

Expanding and raising the profile of the FRIS research portal can support innovation in Flemish businesses and within the knowledge centres. Although, as far as possible, the expansion will include clearer, more accessible terminology, it will be impossible to make it accessible to every enterprises or to non-specialist staff of enterprises. The intermediary organisations can also help to make this translation successful.

Knowledge retention is the future

It can be difficult for knowledge centres to develop expertise in a specialist field if their funding is overly dependent on contract research and other self-funding from services. **Knowledge retention is only possible if sufficient funding is made available.**

Basic funding of knowledge centres can cover knowledge retention if this is relatively independent of resources arising from their assignments for external partners. Relative in the sense that basic funding is not squeezed if contract research lasts a year less or if certain projects fail to materialise. In educational establishments this involves funding of non-targeted research as part of the educational remit. For other knowledge centres, this depends on the nature of their mission. For industry and technology specific centres, the situation is different than for strategic research centres. There are no comprehensive solutions.

Strong, transparent intermediaries to close the gap

In certain situations there is a **gap between knowledge centres and enterprises** in the area of knowledge and culture and a **lack of information** about project funding and intellectual property rights in case of cooperation. Highly innovative businesses and knowledge centres specialising in targeted research find it relatively easier to get along. Once the parties have got to know each other, they can move on to cooperation more quickly and find it easier to find new partners. Enterprises and knowledge centres with experience of cooperation projects experience few problems in finding their way in the landscape of (project) funding in cooperation. Less innovative businesses, particularly SMEs, do not find it so easy to approach knowledge centres and cooperation projects.

In order to close the gap, knowledge centres have their own internal departments which seek to commercialise their own research. A supply or demand-oriented approach can be adopted. As external intermediary services, provincial innovation centres – established specifically to promote innovation in enterprises – play a key role. There are also many other initiatives designed to close the gap between enterprises and knowledge centres. The large number of initiatives creates an urgent **need for greater transparency**. Sufficient expertise must be available for both internal and external intermediary services. Experience and expertise to match supply and demand and offer information and support for cooperative ventures between enterprises and knowledge centres. **Transparency, experience and expertise in the role of intermediary can only be developed where sufficient continuity of operation is ensured**. The interviews and discussions for this survey revealed that this last condition is still far from being met.

Broad definition of innovation and project funding

In the past, projects were rejected because they were more concerned with improving a product than with innovation. This put off enterprises, causing them to miss out on the first springboard to innovation. The complexity of some subsidy dossiers has a similar effect. **A narrow definition of innovation and a complicated subsidy dossier are barriers for SMEs in particular**. The result is that enterprises are put off from trying again. This is less demotivating for large enterprises than for SMEs, which are generally convinced of the added value of cooperative projects and are also quicker to see the advantages.

A **broad definition of innovation and transparent subsidy dossiers**, with project follow-up so as not to lose enterprises after an initial cooperation, can serve as **an initial springboard for enterprises**. **Rewarding knowledge centres for cooperation** and incorporating this in project funding wins over knowledge centres when they realise what's in it for them. Further cooperation is more likely to follow a positive initial experi-

ence, although customer-oriented subsidy dossiers remain very important in order to involve small enterprises in innovation projects as well.

Networking works

Lack of time and lack of interest compete with each other as causes of **non-attendance by entrepreneurs at networking events**. Time is relative and also conceals a lack of a sense of urgency. Interest is sometimes not generated because the title or subject is worded in a too complex or abstract way. The result is that fewer personal contacts are made, with colleagues or knowledge centres.

Networking offers a springboard to cooperation. Powerful tools here include all kinds of one-to-many events and physical networks, whether or not they are subject or technology specific. Interest groups, such as professional and industry associations, offer additional contact opportunities through membership or other services. It is easier to generate interest if the subjects are practical and the time and place are geared to the target group. Networking can be organised locally by park management of business parks and their immediate vicinity.

Cooperation with competitors and colleagues

There is a great **need for cooperation, not only between knowledge centres and enterprises, but also among enterprises and knowledge centres**. This involves colleagues and increasingly competitors, where competition is not the only factor and complementarity also produces a win-win situation. Complementarity presents different problems than cooperation with competitors. The main problems remain barriers to getting along with one another, trusting one another and sharing new knowledge.

Complementary and interdisciplinary cooperation between and among knowledge centres and businesses demands transparent models for open innovation. There is a **need for information and inspirational examples of open innovation**.

Streamlining contract research

Particularly among small enterprises, there is a certain **reluctance to get involved in contract research**. This is partly due to a lack of confidence combined with bias against paying for contract research.

Information about how and why contracts are drawn up and costs are calculated and the advantages involved is important to win over enterprises. **Streamlining contract research and the use of model contracts are desirable where similar situations apply**.

Intellectual property rights

Where intellectual property rights are protected by patents, the primary intention is to protect rights and to avoid conflicts of interest. **Due to a lack of information or misinformation, distrust and misconceptions arise**. In that case intellectual property rights act as a brake to cooperation.

Information and communication about intellectual property rights and (European) patent regulations are factors that help to dispel distrust and misconceptions. With pro-

fessional assistance where necessary and cooperation agreements as an alternative to patents where possible, barriers to cooperation in this area can be removed.

Each of the points discussed above is open to further exploration and expansion. The contributions and critical reflections of those involved in the field provide added value.

More information

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