Collective Research Centres: A Study on R&D and Technology Transfer Involvement

André Spithoven, Mirjam Knockaert and Cyriel Vereertbrugghen

R&D and innovation in Belgium
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Foreword

The economy in Belgium is gradually transforming into a knowledge-based production system. Alongside labour and capital, knowledge is identified as being a key production factor driving economic growth. Technical progress has affected all areas of life, both in the business sector and in the public sector. The science system – universities and public research organisations – is a cornerstone in these developments: producing highly skilled labour and generating knowledge through publications and other channels. Industry, on the other hand, uses this labour and knowledge to enhance its innovative capacity.

Because of the growing complexity of the innovation process, firms are increasingly reliant on various sources and partners outside the company walls. The input of clients, suppliers, competitors and other firms are gratefully used to devise new products and processes. Public knowledge-generating organisations have become instrumental for helping firms in their search for innovative activities. The innovation process is therefore characterised as becoming more "distributed" or "open". This evolution poses less of a problem for high-tech firms in emerging industries such as biotechnology, nanotechnology, microelectronics or new materials. But not all firms are able to take full advantage of technical progress and incorporate its latest insights, even when they are willing to use them in their innovations.

The increasing division of labour due to the complexity of the innovation process compels more and more firms to rely on technology intermediaries. Recently most innovation systems have seen the generation of a range of intermediaries: technology brokers, agencies, R&D consultants and others. In Belgium, however, the collective research centres are a type of technology intermediary that was created in the aftermath of World War II by firms in particular sectors of the economy to encourage scientific and technological research in their sectors so as to improve productivity, quality and production. Strangely, these collective research centres have not until now been studied in detail.

In 2005, the "generation pact" of the Federal government emphasised the importance of these collective research centres. Additionally, in the conclusions of the report of the High Council 3% (Research Series 7), a better alignment between the R&D efforts of the public and private sector was deemed necessary in order to avoid a potential knowledge paradox in which abundant expertise in knowledge generation was insuffi-

ciently translated into innovative products. The collective research centres are one way to prevent such a paradox from occurring.

This research focuses on the experience of the twelve 'De Groote' Centres or equivalent centres. Both the centres themselves and a sampling of their users have been studied. Even though collective research centres are unique actors, the results on their modus operandi when helping to build absorptive capacity can be useful for other types of technology intermediaries. Since the unit of R&D indicators had already collected data on the R&D budgets and R&D personnel of the collective centres, it was a natural choice to involve it in the project. To carry out the research, and to reflect on the quality of the available data, the research project was conducted by the Vlerick Leuven Gent Management School (M. Knockaert and C. Vereertbrugghen) with the assistance of the Université Catholique de Louvain (R. Coeurderoy).

The research and resulting report has enjoyed the collaboration of the collective research centres and their users and members. In-depth feedback and supervision of the research was done by three collective research centres in the steering committee: the building research institute (J. Venstermans – BBRI); the technology sector (J. Deleu - SIRRIS) and the road research centre (C. Van Rooten – BRRC and the president of the Union of Collective Research Centres). The public sector was represented by the FPS Economy (G. Alloo); the IWT (R. Bruynseels) and the DGTRE (D. Graitson). Their supportive feedback and input has proven to be extremely valuable during this research project.

Dr Philippe Mettens
Chairman of the Board of Directors

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1
Preface

This study on collective research centres has been conducted on behalf of Belgian Science Policy. It aims to provide an understanding of how collective research centres operate and contribute to reducing the knowledge paradox. This knowledge paradox relates to the fact that scientific knowledge is not being sufficiently translated into new products and processes that stimulate productivity (BRISTI, 2001). Belgium is also confronted with the knowledge paradox (Dosi, 2006), and the pressure to generate higher social returns on public investments in R&D has also been increasing in this country. In the conclusions of the report by the "High Level Group 3% Belgium" (Belgian Science Policy, 2005), a weak harmony between the public and private sectors is seen as one of the factors hindering knowledge transfer.

Many initiatives have been taken in order to stimulate knowledge and technology transfer. These initiatives are diverse and include the stimulation of spin-offs and start-ups, contract research, licensing of technology, consulting and mobility of researchers and graduates. In addition, different channels to develop these activities have been set up: incubators, science parks, clusters, intermediaries are a few examples of these. One of these actors are the collective research centres.

Good cooperation between R&D intensive and innovative companies and technology intermediaries (of which the collective research centres are an example) may enhance a sector's innovation capacity. Our study seeks to provide a better understanding of the engagement of collective research centres in activities of knowledge transfer and the factors that have an impact of effective knowledge transfer. By studying the way in which the collective research centres operate, we sought to arrive at policy recommendations for enhancing knowledge transfer. Furthermore, our study aimed to understand the role of the centres for their member firms. By studying both demand for and supply of the collective research centre services, we tried to understand the extent to which the knowledge paradox also affects the collective research centres.

This research project strives to underscore the role and importance of collective research centres within the innovation system. This is done by looking at their involve-

ment in R&D and contribution to the knowledge economy by transferring knowledge. According to Bozeman (2000), "technology transfer is defined in many different ways according to the discipline of the research, but also according to the purpose of the research".

This report is structured as follows. First, we provide an insight into how collective research centres emerged, and position these intermediaries in the regional context. Second, we provide general data on collective research centre resources. In a third part we describe each collective research centre and the technology transfer models they apply, based on interviews we conducted with the centres' management. Fourth, we elaborate on the differences between the collective research centres and a number of indicators for technology transfer. In a fifth part, we present the results of the member questionnaire, and elaborate on the impact of collaboration with the collective research centre on the member firm. The final part concludes and provides a number of recommendations.

The authors would like to acknowledge that it would not have been possible to implement this study without the support of the collective research centres and their members. The authors therefore thank the collective research centres and their members for their cooperation. The authors would also like to thank Belgian Science Policy for financial support and provision of data.

2
Collective Research Centres: an Introduction

2.1 Background

Collective research centres find their origin in the "De Groote" Law adopted on 30 January 1947, in the aftermath of the Second World War. During and after the Second World War the contending parties made a major scientific and technical effort to renew the production apparatus and increase the scale, scope and quality of overall production in their economies. There was a global tendency to apply scientific research in industry in order to increase its overall performance. In this respect the Belgian government founded the Institute for Scientific Research in Industry and Agriculture *(Het Instituut voor Wetenschappelijk Onderzoek in Nijverheid en Landbouw, I.W.O.N.L)*. During its existence (1944-1993), the institute fulfilled a role as integrator of the economic applications, on the one hand, and scientific research on the other. Although quite successful at that time, according to Paul De Groote (Minister of Economic Coordination and Redevelopment in the period 1946-1947), the institute lacked focus with respect to the different industry sectors. In the law adopted on 30 January 1947, the Minister provided a legal framework for the establishment of centres that would be specific to the different industry sectors. The so-called De Groote Law states that the primary focus of these centres should be on technical improvements in the respective sectors. According to the law, their main tasks include:

- promoting technical progress and redevelopment in their industry sector;
- assuring a better usage from obtained results and enabling the multiplication and efficacy of intervention of, among others, the I.W.O.N.L.;
- bringing together representatives of the different industrial and agricultural sectors and authorised academic and technical personalities;
- defining the scientific and technical needs of their respective sector.

In addition, collective research centres also carry out activities with the objective of generating and acquiring own knowledge.

The different sectors should take the initiative to establish their own centre and provide for their financing, equipment and management. The centres are allowed to demand a financial contribution from the companies in their respective sectors when a) the demanding companies represent the majority, b) the establishment of the centre

is in response to a need and c) the area in which the centres operate is clearly defined. Since the decisions made by the centres cannot be detached from their impact on workforces, the adaptations should provide for a delegation of workforce representatives in both the board of directors and the permanent committee.

Collective research centres mainly operate in traditional industrial sectors and are founded on the initiative of the industry. They are part of the private sector, but they function as non-profit organisations. They can operate at the federal or regional level. Members are companies from a specific sector (and consist mainly of SMEs). The centres receive government support from either the federal government or the regions, or both.

Nowadays, collective research centres enable research & development (R&D) for the benefit of companies in a specific sector through mutual collaboration. This type of collaboration is particularly called upon by SMEs that do not dispose of the necessary resources to pursue their own research activities.

One of the main activities of collective research centres is conducting (applied) technological research for an entire industry, hence the term "collective". In addition to their research activities, most collective research centres support technology transfer or dissemination of information through seminars, exhibitions, publications, manuals, etc. This dissemination is facilitated by technology advisors who are attached to collective research centres. These advisors function as a bridge between companies and collective research centres. They act as first points of contact for companies in a specific industry looking to resolve concrete technical problems. They also fulfil the role of information provider by communicating research findings, information about government mechanisms, new techniques, information about study days, etc.

Besides the role collective research centres play in information provision, they are also highly involved in standardisation. They promote the interests of companies in Belgium at the European level and subsequently inform them about the latest standardisation developments and help companies to implement new standards. Finally, several centres provide additional services, such as testing, technical and organisational support, training, consultancy, etc.

2.2 Institutional context

Collective research centres do not work in isolation. Although the result of private initiative, they were created – in line with interventionist policy views at the time – by a decree in 1947 in which their functioning is prescribed. To a certain extent, collective research centres are an example of a private-public partnership long before that term was commonly used. The institutional framework in which they operate is of great importance since it bears close relation to their functioning and, hence, their impact on the industrial fabric of the sector. Their functioning is, moreover, constantly affected by the changing institutional environment, which justifies the lengthy discussion in this report.

2.2.1 The federal government

Three main tasks remain under federal responsibility: pre-normative research projects; the standardisation antennas and the patent cells (FPS Economy, Annual Report, 2005).

First, standardisation is deemed extremely important for innovative activities. The "standardisation antennas" are part of the responsibilities of the federal government (FPS Economy). A key element in economic policy is standardisation, which covers different aspects: (i) standards are a technical reference and facilitate the free flow of goods and services in a unified market; (ii) standards rationalise the economic flow; (iii) standards are guarantees and give information to users and customers; (iv) standards facilitate the strategic positioning of firms through the development of new innovative products and services and processes.

The new law of 3 April 2003 on standardisation incorporates a new view of standardisation by decentralising the process. To implement this view a specialised public service, the "Belgian Standards Bureau" (NBN), has been created. The collective research centres are the most important operators of the NBN. The NBN analyses opportunities and the technical-economical feasibility of standardisation activities based on the generation of technical and economic advantages for the sector and the availability of the necessary knowledge to implement the standard. In addition, the NBN draws up a programme of standardisation from bottom-up priorities detected by the technical committees (TCs) initiated by, among others, the collective research centres. Mid-2006 was the first time this procedure was followed, involving more than 50 organisations from the private and public sectors. Once it has been decided which technical committee to choose, the assignment to a sector operator follows. The philosophy of decentralisation implies that the follow-up is in the hands of the parties involved, since they have the necessary knowledge in their sector (Belgian Law Gazette, 21 October 2004; Belgian Law Gazette, 10 November 2005). In 2003 there were 11 running and 14 new research projects involving collective research centres (respectively 1.3 million € and 1.8 million €) and 18 standardisation antennas for 864,000 €. In 2005 there were 17 new projects for which 3.96 million € was provided.

The patent cells were the initiative of the FPS Economy to enhance the knowledge and access of small and medium-sized enterprises in the field of intellectual property, patents, trade mark protection and the essential elements of the innovation process. These patent cells are members of PATLIB. These PATLIB (PATent LIBraries) are organisations bearing expertise in the protection of intellectual property by means of patenting. The denomination of PATLIB is in the hands of the European Patent Office (EPO). In the preliminary stage the FPS Economy financed the training of specialists in the field. In 2004, three collective research centres (BBRI, SIRRIS and CENTEXBEL) had such a patent cell (acknowledged by PATLIB). In 2003, 2004 and 2005 these three centres received an allowance of 495,000 €.

2.2.2 The Flemish region

The fact that science and technology policy is regionally organised has implications for the institutional organisation of collective research centres. According to the Flemish authorities, the co-operative agreement of 5 April 1995 had certain shortcomings which hindered the operation of the collective research centres: each project has to be evaluated before funding can be provided; each party in the agreement has the same decision power, in spite of the fact that the Flemish region contributes the most; only collective research centres are eligible, leaving out other initiatives such as clusters; there was a lack of a legal basis for funding the technological advisory services; the administrative procedure is cumbersome (Rekenhof, 8 July 2003, discussing the

innovation decree and the IWT-Vlaanderen). These shortcomings are addressed in the Flemish Cooperative Innovation Networks (VIS – Vlaamse Innovatie Samenwerkingsverbanden).

Despite the longstanding existence of the collective research centres, their operations have changed over time. The restructuring of science and technology policy in the Flemish region took a major step in 1999 when the "Innovation decree" was adopted by the Flemish parliament. This decree redefined the policy targets in the field of innovation and redrew the framework for financing support organisations for innovation, technological development and R&D activities (Nauwelaers, 2001). On 24 May 2002 the decree on Flemish Cooperative Innovation Networks – VIS appeared (Belgian Law Gazette, 13 December 2002, pp. 55985-55992). The Flemish government acknowledges the non-linearity of innovation and responds to the tendency towards open innovation. The VIS programme focuses on facilitating the exchange of knowledge between research centres and companies, in particular small and medium-sized ones. Targeted actors are intermediary organisations active in the area of supporting technological innovation in companies, such as the collective research centres. Due to the existence of knowledge asymmetries (or even knowledge paradox), individual companies are not necessarily aware of the most recent knowledge or technical developments in their domain. Moreover, a successful innovation requires simultaneous knowledge in different technological fields, which is often not possible for a single company.

The ideas on open innovation see successful innovation taking place with greater effectiveness and efficiency when there is a transfer of knowledge and technology. Hence, the importance the VIS programme attaches to intermediation. The VIS programme is, therefore, directed at the intermediary organisations active in the support of technological innovation in companies, including the collective research centres. All De Groote Centres and equivalents are automatically recognized as VIS.

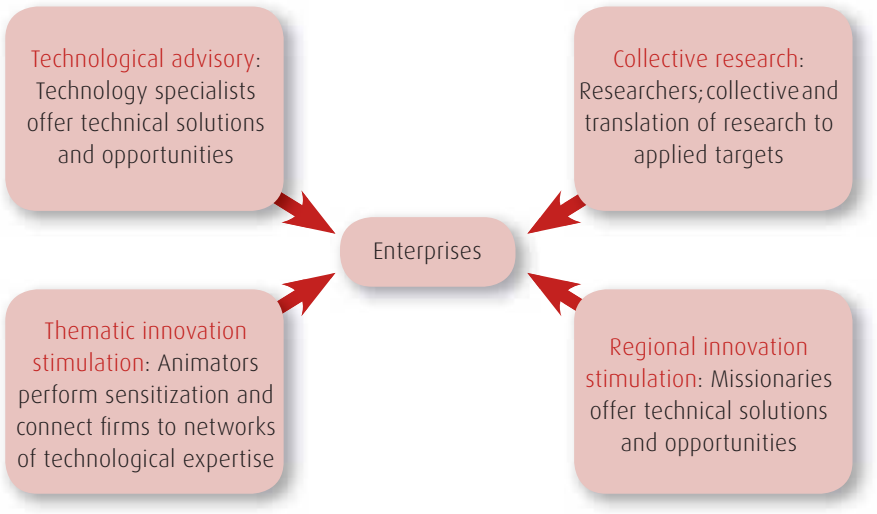
The VIS cover projects on:

- collective research aimed at acquiring, gathering and translating technological knowledge into innovative applications for a large group of companies: the research can cover the short or the long-term, concrete technology transfer activities can also take place as well as dissemination and sensitisation activities;
- technological services to companies directed at the provision of technological support by answering questions or as a reaction to trouble-shooting, but also through a more pro-active approach;
- sub-regional innovation stimulation targeted at companies in a particular area;
- thematic innovation stimulation targeted at companies that share a common theme and for which projects are financed and direct project costs can be accepted only subject to reimbursement;
- feasibility studies to prepare collective innovation initiatives like foresight exercises such as roadmapping etc.;
- co-operation projects to develop tools to increase the performance of the Flemish Innovation network.

The Flemish government supports the process of technology transfer and technology implementation via a variety of mechanisms. The Flemish Cooperative Innovation Networks is explicitly focused on knowledge diffusion and technology transfer. All types of projects are preferably directed towards small and medium-sized enterprises. Four types of projects in VIS have been created: technology advisory (TAD);

thematic innovation stimulation (TIS); regional innovation stimulation (RIS) and collective research (CO). The collective research centres have been acknowledged as being part of this agreement.

Schematically



Source: Sleeckx, E. (2007) Vlaams Indicatorenboek 2007, pp. 240-243.

Technological advisory has a long tradition (more than 20 years). The task of a technological advisor is primarily aimed at providing technological advice and stimulate innovation. These advisors are also involved in the diffusion of the research results generated within the collective research centre where the advisor is located. A full-time technological advisor visits on average 50 firms annually, during which he or she offers on average 35 technological innovation advises. More than 80% of these firms are SMEs.

Thematic innovation stimulation is targeted towards a group of enterprises sharing a common problem. The aim is to accompany the innovation process for this particular problem or theme. In 2006 an average of 82 full-time equivalents were active (part of whom in the collective research centres) for 58 projects. An important part of this work exists in the proactive stimulation of innovation, besides information diffusion and network activities. In 2006 over 3,500 enterprises were reached. These type of advisors organise, on average, five seminars or workshops. All these activities result in punctual interventions, partner matching, technical and innovation advice and innovation plans. An important element is the involvement of universities, research organisations and polytechnics in these projects. This also shows that the thematic innovation stimulation is complementary to other existing programmes in the Flemish region (e.g. SBO and TETRA projects).

Regional innovation stimulation (RIS) is directed towards supporting innovation processes of a group of firms within a certain area. The idea is to promote the regional formation or strengthening of an existing cluster of firms. The Flemish instrument of RIS has been active since 2003 and currently six projects with 5 advisors each

are active per province (two in the province of Antwerp). These advisors take a proactive approach and in 2006 each of them visited about 70 firms; for each innovation advisor about four innovation studies or innovation projects were submitted to the IWT for funding. These advisors are also active in innovation plans, and in 2006 they performed about 100 innovation audits. They also perform linking functions in networks: in 2006 they accounted for about 250 partner matchings. These matchings consist, by and large, of accompanying firms to technological knowledge centres.

The collective research (CO) programme covers activities that collect and disseminate advanced knowledge that has been developed externally, on the one hand, and the transfer of knowledge generated within the co-operative research agreements on the other. Hence this programme is intended to diffuse knowledge and technology for a group of enterprises. In 2005, 15 projects in the Flemish region were selected by the IWT, being granted a total subsidy of 3.98 million Euro. In 2006, 16 projects were approved (6.08 million Euro) and in 2007, 18 projects were selected (totalling 8.47 million Euro).

Summarising the above shows that technological advisory is directed towards individual firms both at their request and proactively; thematic and regional innovation stimulation proactively covers interventions, partner matchings, technological and innovation advice for a group of firms; and collective research is focused on the dissemination of in-house generated knowledge and externally collected knowledge towards a group of firms.

2.2.3 The Walloon region

Since the regionalisation of collective research centre funding and the set-up of the new accreditation scheme, the Walloon region is mainly in charge of three key activities: the accreditation of collective research centres, the funding of collective research projects, and the funding of technological guidance in accredited collective research centres.

As such, following the criteria set by the Walloon government, 23 collective research centres have been accredited by the region (from 2001 on). The first aim of these research centres as defined in the regional decree of 11 November 2002 on accreditation is to boost the innovation and growth capabilities of companies in the region. This entails nurturing scientific and technological expertise; sustaining technological watch and guidance; setting up equipment and laboratories in line with companies needs; and managing a portfolio of collaborations with industrial partners. All of these requirements are compulsory in order to get accreditation and thus to access dedicated fundings. The accreditation is a quality label and provides to the collective research centres a key role in stimulating technological developments. An accreditation is valid for five years.

Among the 23 accredited collective research centres, 10 are De Groote Centres or equivalent. Eight collective research centres ("centres Objectifs 1") were set up with European structural funds – FEDER or FSE – in the Hainaut province. The list is composed of Natiss, Biovallée, Cenaero, Certech, Cetic, CTP, Materia Nova and Mulititel. Initiatives were proposed by the universities to develop other new technologies or activities than those already developed by the De Groote Centres. They were created between 1994 and 2002. They do not exhibit the same degree of involvement with companies. Some collective research centres were supported by the European funds in

the "Objectif 2" framework. The rest of the financing was provided by the Walloon region and private sources. They had to be located in the Liège area (CRM, Centexbel). The financing was used to acquire large-scale equipment and hire scientific staff.

In terms of funding, the Walloon region has established a rule limiting its share to 50% of the total budget. In 2007, the ordinary budget provides 13 million Euro for the collective research centres. Each year the region launches a call for collective research projects. They must involve two or more collective research centres. In 2007, the total financing for collective research projects was 4.5 million Euro. In this case, the collective research centres must finance 50% of expenditures from its own funds. Furthermore, the "First Doca" scheme, aimed at training PhDs in collective research centres, was supported. During FP6, the Walloon Region has supported collective research centres participating in European project consortia for up to 25% of their budget share. The region is also involved in Eureka and ERA-NET (European Research Area Network). The third call for FEDER financing will open new opportunities of funding. All collective research centres are allowed to apply.

The Walloon region is also active in the support of guidance activities. Each accredited collective research centre must explicitly develop precise guidance actions. The region can help the collective research centres to define the nature and the content of guidance missions. The Walloon region is involved in the selection and the monitoring of guides. Every two years an assessment of actions is implemented. Their performance is a key concern for the Walloon region. About 40 persons are directly in charge of guidance.

Through the "Marshall plan" focused on supporting competitiveness, the region also backs up the development and initiatives of collective research centres.

A new regional decree is currently being drafted that will make it possible to support collective research centres for up to 75% of their research projects costs.

2.2.4 The Brussels-Capital region

The Brussels-Capital region is Belgium's smallest region. This has repercussions on its involvement in science policy due to the lack of funding possibilities. Three key events have characterised the science policy in the Brussels-Capital region: (i) the creation of an advisory body – the Council for Science Policy – in 2000 to support the regional government in creating science policy instruments; (ii) the 2001 declaration of financial support measures for scientific research and technical innovation; (iii) the creation of the IRSIB-IWIOB – the Institute for the Encouragement of Scientific Research and Innovation of Brussels – in 2003, a public agency that executes the policy measures adopted by the government (Nauwelaers, 2005). This is mainly done by the funding of research projects both from firms and the higher education institutes located in the region.

The IRSIB-IWIOB, which became operational in July 2004, is an especially important instrument with regard to the collective research centres. With respect to the support measures provided for the private sector, the IRSIB-IWIOB supports both applied industrial research projects (applied but generic research) and pre-competitive development projects (e.g. prototypes). This support is given by means of grants or refundable advances. The IRSIB-IWIOB also funds technical feasibility studies and co-finances the costs for filing and maintaining patents that are the result of projects that where originally funded by the region (IWIOB, 2007).

Several agencies are active to support the development of entrepreneurship. First, the BEA (Brussels Entrepreneurship Agency) is the one-shop stop for the development of firms in the region. Second, an incubator devoted to biotechnology, EEBIC (Erasmus European Business & Innovation Center), is present in the region. Third, an organisation encouraging technology transfer in the agricultural food sector, BRUFOTEC (Brussels Food Technology Association), has been set up. Fourth, the region hosts several science and technology parks (Nauwelaers, 2005).

The Brussels-Capital region, through the IRSIB-IWIOB, also launched the so-called 'sectoral' support (IWIOB, 2007). Here, several collective research centres – SIRRIS and BBRI – besides BRUFOTEC have been active participants in the past. SIRRIS-Brussels was created in 2004 and concentrates on the area of software engineering, since one-third of the employment in the ICT sector in Belgium is found in the Brussels-Capital region. SIRRIS also received funding to launch a project to help identify innovative potential, especially among SMEs. The BBRI received funding to conduct technical guidance on ecological buildings and the sustainable development of Brussels SMEs that are active in the construction sector. BRUFOTEC supports the introduction of standards on security and safety, on the one hand, and environmental issues on the other.

The Brussels-Capital region has also launched an impulse programme (Nauwelaers, 2005; IWIOB, 2007) where the involvement of the collective research centres depends on the acceptance of the domains selected by the Brussels government. Currently, three domains have been selected: ICT, life science and the environment. SIRRIS coordinates, together with partners from universities, one of the projects in the ICT domain.

Of course, the Brussels-Capital region has more instruments in its science policy, but these do not affect the operation of collective research centres in a direct way (e. g. the project 'Research in Brussels' seeks to attract foreign researchers and eminent scientists; the project 'Prospective research in Brussels' aims to develop specific research domains that might prove relevant for the region, such as mobility, the international image of Brussels, etc.).

2.2.5 Implications of the regionalised organisation of science policy

As indicated earlier, since the mid-1990s science policy in Belgium has been regionalised to a large extent. Part of science policy has remained federal, however. Relating to the collective research centres, pre-competitive research, standardisation and patent cells are issues that are dealt with at the national level; whereas the public funding for projects, technological guidance, etc. have become regionalised matters. In the case of the collective research centres, this implies that they have had to adjust to this new institutional landscape. The institutional setting is reflected in the operation and funding of the collective research centres. First, reflecting the private initiative of these centres, a share of their funding derives from either compulsory (in the case of the De Groote Centres) or voluntary membership contributions. In addition, a multitude of technological services and research activities are also financed exclusively by enterprises. Second, reflecting the recognition of the public sector to enhance competitiveness by stimulating R&D and technology transfer, funding is obtained from the different authorities according to the region in which the centre is located. Table 1 looks at the regional presence of the collective research centres.

Table 1:
Regional presence of collective research centres

Collective Research Centre	Regional presence		
	Brussels-Capital region	Flemish region	Walloon region
CENTEXBEL- Textile	X	X	X
CRIC- Cement	X		
BCRC- Ceramics			X
SIRRIS- Technology	X	X	X
BRRC- Road	X	X	X
BBRI- Building	X	X	X
CTIB-TCHN- Wood	X		
WTOCD- Diamond		X	
CoRI- Coating			X
CRM- Metallurgy		X	X
BWI- Welding	X	X	X
BPI- Packaging	X	X	

Funding from the federal government – in particular the FPS Economy – is directed to standardisation issues and patent cells, and is spread uniformly over the whole territory. The regions are competent for (among other things) the technology advisors and cover 80% of the costs involved.

Another consequence of this changing policy environment is a need for coordinating the growing number of technological intermediaries, also because of the growing need for interdisciplinarity and networking. Table 2 gives an overview of the most important memberships of the collective research centres.

Table 2:
Multi-memberships of collective research centres

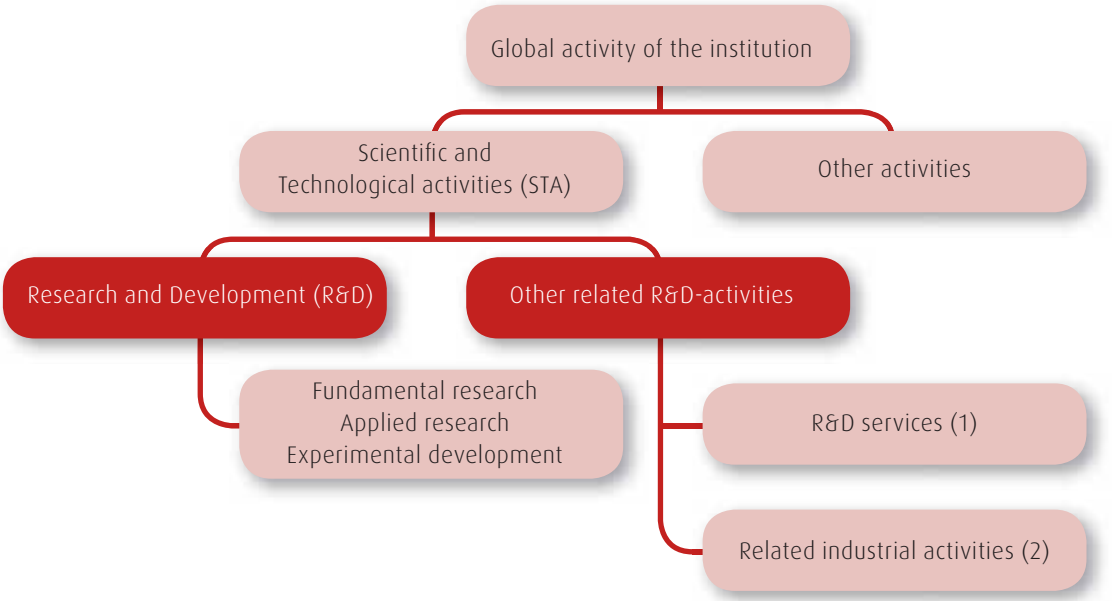
Collective Research Centre	Membership		
	UCRC	VLOOT	ACCORD
CENTEXBEL- Textile	X	X	X
CRIC- Cement	X		X
BCRC- Ceramics	X	X	X
SIRRIS- Technology	X	X	X
BRRC- Road	X	X	X
BBRI- Building	X	X	X
CTIB-TCHN- Wood	X	X	X
WTOCD- Diamond			
CoRI- Coating	X	X	X
CRM- Metallurgy	X	X	X
BWI- Welding	X	X	X
BPI- Packaging			

Again, the regional differences are clear. Membership in the non-profit organisation VLOOT in the Flemish region and ACCORD in the Walloon region ensures that the collective research centres are part of the technological landscape of the regions. Both VLOOT and ACCORD (since the decree of 13 November 2002) are focused on creating a network of research centres to facilitate synergies and technology transfer.

The Union of Collective Research Centres (UCRC) acts as a body in which the compulsory and voluntary centres are united, and this UCRC weighs in on policy matters on the federal and regional levels.

2.3 Types of activities

The R&D survey is a bi-annual survey organised by the regions and the federal government. The collective research centres, in addition to other R&D active actors and bridging institutions, also complete the survey, which makes a distinction between types of activities. We will use a similar method in what follows. The distinction is based on the so-called 'Frascati Manual' for the statistical measurement of R&D activities, put forward by the OECD in order to facilitate international comparisons (OECD, 2002). The distinction takes the following form:



(1) consisting of provision of information, collection of data of common interest, testing and standardisation, feasibility studies, IPR advice, policy and operational studies etc
(2) consisting of pre-production activities, production and distribution of goods and services, technical services that relate to the activities of companies

This research focuses on the global activity of the institution, and will therefore consider R&D activities by collective research centres, other related R&D activities and other activities. The main point of interest however is on R&D and other R&D related activities. Given the Frascati Manual's definition of the latter, these activities are expected to comprise knowledge transfer activities carried out by the collective research centre.

According to the OECD's Frascati Manual, R&D is defined as:

- the creative work that takes place systematically in order to increase the general knowledge, including the knowledge relating to man, culture and society;
- the use of this knowledge for new applications.

R&D activities can be distinguished from non-R&D activities by the fact that in R&D activities a noticeable element of newness is present (OECD, 2002: 30). Given that R&D related activities comprise to a large extent activities of knowledge transfer carried out by collective research centres, we provide an overview of activities that are included in these R&D related activities according to the Frascati Manual.

Figure 1:
Overview of R&D related activities according to the Frascati Manual

- Scientific and technical information services:

  - Collecting
  - Coding
  - Recording
  - Classifying
  - Disseminating
  - Translating
  - Analysing
  - Evaluating

  by

  Scientific and technical personnel
  Bibliographic services
  Patent services
  Scientific and technical information extension and advisory services
  Scientific conferences

- General purpose data collection
- Testing and standardisation
- Feasibility studies
- Specialised health care
- Patent and licence work (including administrative and legal work)
- Policy-related studies
- Routine software development

It should be noted that the manual states that all of the above-mentioned activities which are directly connected with R&D projects are regarded as R&D. For instance, feasibility studies on research projects are part of R&D, patent work connected directly with R&D projects is R&D.

3
An overview of descriptives of collective research centres

In this part, we focus on the descriptives of the twelve collective research centres taken into consideration, in particular the employment they generate and their involvement in R&D. This information was obtained from the Belgian Science Policy and is based on information collected by the Federal Co-operation Commission, CFS/STAT, in 2006, covering information on 2003-2005, and served as background for the interviews carried out with the collective research centres over the period March-October 2007. A summary of the Belgian Science Policy information used was sent to the interviewed collective research centres for their approval. In addition, we requested that the collective research centres provide us with information on 2006 and 2007 figures. These figures will also be/were already provided to the CFS/STAT. Not all collective research centres provided us with this data. In the cases where no data was provided, we asked Belgian Science Policy to provide the data. For BPI, we only received the information on total FTEs. Since BPI provided neither us nor Belgian Science Policy with data, we use the 2005 figures for 2006 and 2007. Even though this is not optimal, we believe the impact to be minor, given the relatively small size of the centre, and give the relative stability shown by the 2003-2005 figures. The table below indicates the source of the data.

Table 3:
Overview of data sources

	2003	2004	2005	2006	2007
CENTEXBEL- Textile	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
CRIC- Cement	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
BCRC- Ceramics	CFS/STAT	CFS/STAT	CFS/STAT	CFS/STAT	CFS/STAT
SIRRIS- Technology	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
BRRC- Road	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
BBRI- Building	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
CTIB-TCHN- Wood	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
WTOCD- Diamond	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
CoRI- Coating	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
CRM- Metallurgy	CFS/STAT	CFS/STAT	CFS/STAT	Own	Own
BWI- Welding	CFS/STAT	CFS/STAT	CFS/STAT	CFS/STAT	CFS/STAT
BPI- Packaging	CFS/STAT	CFS/STAT	CFS/STAT	No data	No data

Source: CFS/STAT via Belgian Science Policy. Own means data that was provided by the collective research centres.

It should be noted that, during the data collection process, it appeared that collective research centres faced difficulties in classifying their activities and resources into the categories set forth in the Frascati Manual. In order to ensure comparability of the information provided, a table classifying collective research centre activities into Frascati activities was drawn up together with the management of a number of collective research centres and sent to the other centres in order to facilitate the data provision process. The translation of Frascati activities into collective research centre activities is shown in the following table.

R&D			R&D related		OTHER
		High degree of newness	Low degree of newness		
		existing knowledge in new products, processes, ...R&D components or within R&D tasks	existing knowledge in existing products, processes,... no R&D component, not within R&D tasks		
Frascati: fundamental and applied research	**Frascati: Experimental development**	**Innovation**		**Other**	**Other**
R&D	Technical advisory	Standardisation antennas (often R&D)		Information on intellectual property	Administration
Collective Research	Small Scale In Depth Advice	Thematical innovation stimulation TIS		Audits & consulting	HR
SME programme	Technical advice	info EU-RTD		Info letters, website, ...	Maintenance
DWTC - BELSPO	EU platform	Technical library (often R&D)		Partner matching	IT
TETRA	Company using testing installations of centre	Standardisation support		Information on EU-R&D projects	Sales of equipment
Feasibility studies	Technical certification	Certification		Right to use inventions	Reception
PN research		Technology watch (often R&D related)		Routine testing	CEO
EU projects		Technical advice (often R&D related)		Organisation of study days and workshops in general	
Testing out of research project		audits (ISO9000 f.i.) & counselling (often R&D related)			
Organisation of study days and workshops					
as part of R&D					
Troubleshooting					

3.1 Employment

First, we analyse the employment that is created by the collective research centres, and the type of activities their personnel are involved in.

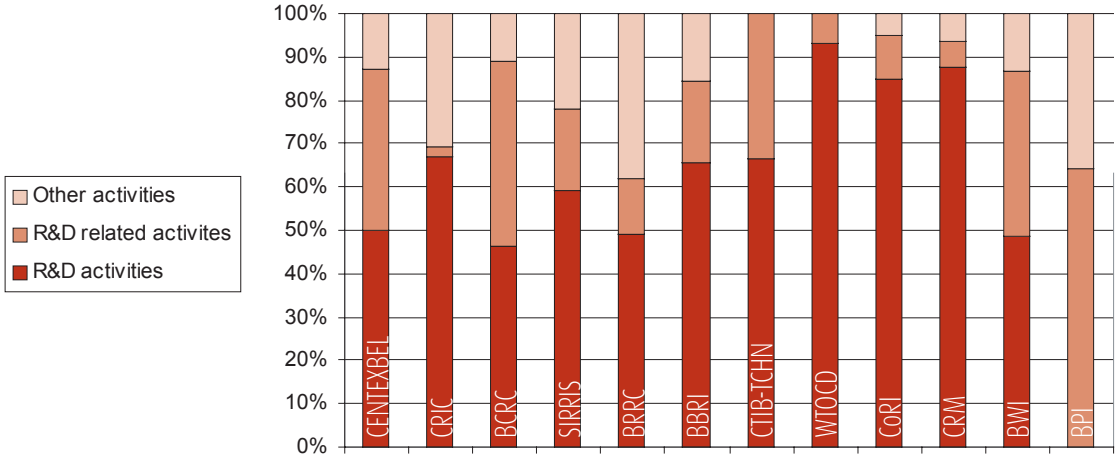
Table 4:
Overview of employment at the collective research centres, 2003-2007 (FTE)

	2003	2004	2005	2006	2007
CENTEXBEL- Textile	105	100	107	113	110
CRIC- Cement	40	38	38	39	43
BCRC- Ceramics	21	22	23	24	26
SIRRIS- Technology	143	143	131	135	139
BRRC- Road	101	104	109	101	97
BBRI- Building	193	193	199	204	207
CTIB-TCHN- Wood	18	17	18	18	18
WTOCD- Diamond	19	14	15	15	14
CoRI- Coating	22	22	16	16	20
CRM- Metallurgy	139	138	134	128	128
BWI- Welding	17	14	15	19	19
BPI- Packaging	13	13	13	14	14
Total	***831***	***818***	***824***	***828***	***835***

In total, the collective research centres employed 901 persons in 2005, of whom 824 full-time equivalents (FTEs). This number grew to 835 FTEs by the end of 2007. The largest centre in terms of employment is BBRI, employing 207 FTEs in 2007. The figure shows that the size of the collective research centres is very diverse, with four centres employing over 100 FTEs, and the smallest centres employing only 14 FTEs.

The figure below provides insight into the involvement of personnel in R&D activities, R&D related activities and others (as percentage of total FTEs). The first two activities will be discussed in detail in the following sections.

Figure 2:
Overview of activities carried out at the collective research centres (2007)



The figure shows that collective research centres are very different and are involved in diverse types of activities. Whereas some centres, such as CRIC, Sirris, BBRI, CTIB-TCHN, WTOCD and CoRI, dedicate the majority of their personnel for R&D activities, other centres such as BPI are mainly involved in R&D related activities. Some centres, such as BPI and BRRC, report that they are highly involved in other activities. We will analyse the type of activities in which they are involved in each of the collective research centres' descriptions. In total, 60% of the personnel employed at the collective research centres are involved in R&D, 24% are involved in R&D related activities, and another 16% are involved in other activities.

3.1.1 Personnel involvement in R&D related and other activities

First we describe the involvement of the collective research centre's personnel in R&D related activities and other activities. The former comprise to a large extent knowledge transfer activities, such as provision of information, testing and standardisation activities, information on patenting procedures, etc.

Of the 835 FTEs employed by the collective research centres in 2007, 163 were involved in R&D related activities, and another 146 were involved in other activities.

Below we provide an insight into the evolution in the involvement of collective research centres in R&D related activities. We comment on the involvement in "other activities" in the sections describing the collective research centres in detail.

Table 5:
Overview of employment in R&D related activities at the collective research centres, 2003-2007 (FTE)

	2003	2004	2005	2006	2007
CENTEXBEL- Textile	63	60	64	39	41
CRIC- Cement	16	14	14	1	1
BCRC- Ceramics	5	5	5	10	11
SIRRIS- Technology	48	48	48	23	26
BRRC- Road	25	18	18	12	12
BBRI- Building	36	35	33	36	39
CTIB-TCHN- Wood	8	5	5	6	6
WTOCD- Diamond	3	1	1	1	1
CoRI- Coating	2	1	1,5	2	2
CRM- Metallurgy	9	9	9	8	8
BWI- Welding	7	6	6	7	7
BPI- Packaging	3	3	3	9	9
Total	***193***	***198***	***200***	***154***	***163***

The data show a significant decline in the FTEs in R&D related activities in 2006 compared to 2005, whereas the total number of FTEs had grown significantly over the previous years, which can be explained primarily by the new regulations concerning personnel costs for R&D personnel in Flanders (Minister Moerman).

3.1.2 R&D employment

Below we describe the extent to which collective research centre personnel are involved in R&D and we study the evolution of this involvement over a number of years.

Table 6:
Overview of R&D employment at the collective research centres, 2003-2007

	2003	2004	2005	2006	2007
CENTEXBEL- Textile	26	25	35	61	55
CRIC- Cement	8	8	8	27	29
BCRC- Ceramics	11	13	14	10	12
SIRRIS- Technology	58	58	51	84	82
BRRC- Road	35	35	41	48	48
BBRI- Building	129	127	133	126	136
CTIB-TCHN- Wood	4	3	3	12	12
WTOCD- Diamond	16	13	14	14	13
CoRI- Coating	16	16	13	13	17
CRM- Metallurgy	116	116	114	112	112
BWI- Welding	6	7	8	9	9
BPI- Packaging	2	2	2	0	0
Total	***466***	***436***	***452***	***517***	***525***

The figures in Table 6 show that the majority of collective research centre personnel is involved in R&D. However, with respect to R&D personnel, we again find large differences between centres. In total, 517 FTEs, or 60% of total personnel, were employed in R&D functions over 2007. BBRI employs the largest number of R&D personnel. Again we notice the significant change between the 2005 and 2006 figures, in the opposite direction to the change in R&D related personnel.

3.2 Expenses

Below we analyse what activities collective research centres spend their money on. The table below provides an overview of the expenses reported lasting recent years. These expenses include personnel expenses, expenses for operations and movables and investments.

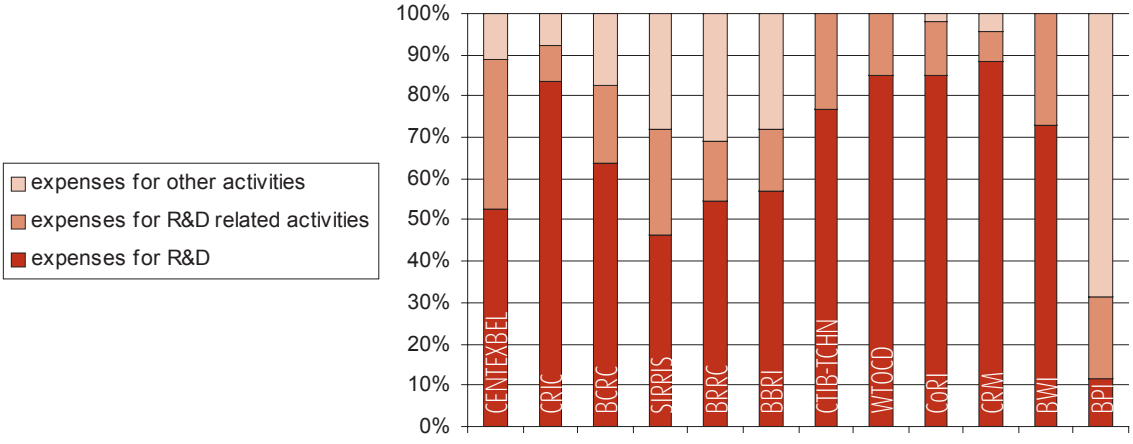
Over 2007, the collective research centres spent in total nearly 92 million Euro.

Table 7:
Overview of expenses incurred by collective research centres, 2003-2007

	2003	2004	2005	2006	2007
CENTEXBEL- Textile	8 221 347	9 186 076	9 488 393	9 048 471	9 126 375
CRIC- Cement	3 743 000	3 863 224	3 491 680	3 848 000	4 476 000
BCRC- Ceramics	1 583 617	1 839 674	2 320 173	1 819 356	2 150 598
SIRRIS- Technology	15 242 135	15 562 070	15 995 637	19 840 943	19 531 764
BRRC- Road	10 549 635	9 755 247	9 411 514	9 635 079	9 546 057
BBRI- Building	20 393 476	23 091 953	23 688 695	24 841 143	26 651 735
CTIB-TCHN- Wood	1 571 723	1 677 272	1 653 307	1 766 006	1 831 504
WTOCD- Diamond	1 691 585	1 555 423	1 399 125	1 364 053	1 414 054
CoRI- Coating	1 581 201	1 429 096	1 360 681	1 228 900	1 443 022
CRM- Metallurgy	13 664 694	14 002 250	13 704 949	12 520 000	12 200 000
BWI- Welding	1 837 361	1 469 000	1 508 150	1 934 175	2 113 861
BPI- Packaging	1 069 337	1 091 782	1 122 200	1 122 200	1 122 200
Total	***81 437 586***	***85 002 892***	***85 745 927***	***88 968 326***	***91 607 170***

As the figure below shows, we again find large differences with respect to the destination of these expenses. Most of the collective research centre expenses goes to R&D activities, except for Sirris and BPI. Total expenses for R&D related activities were 17 million Euro over 2007, far below the 56 million Euro that was spent on R&D activities. Other activities accounted for 19 million Euro of expenses over the same year.

Figure 3:
Division of expenses at the collective research centres by destination (2007)



Below we look at the amount that collective research centres spend yearly on R&D activities. These include investments in R&D and so-called "intramuros" expenses or in-house R&D.

3.2.1 R&D expenditure

Table 8:
Overview of R&D expenditure, 2003-2007

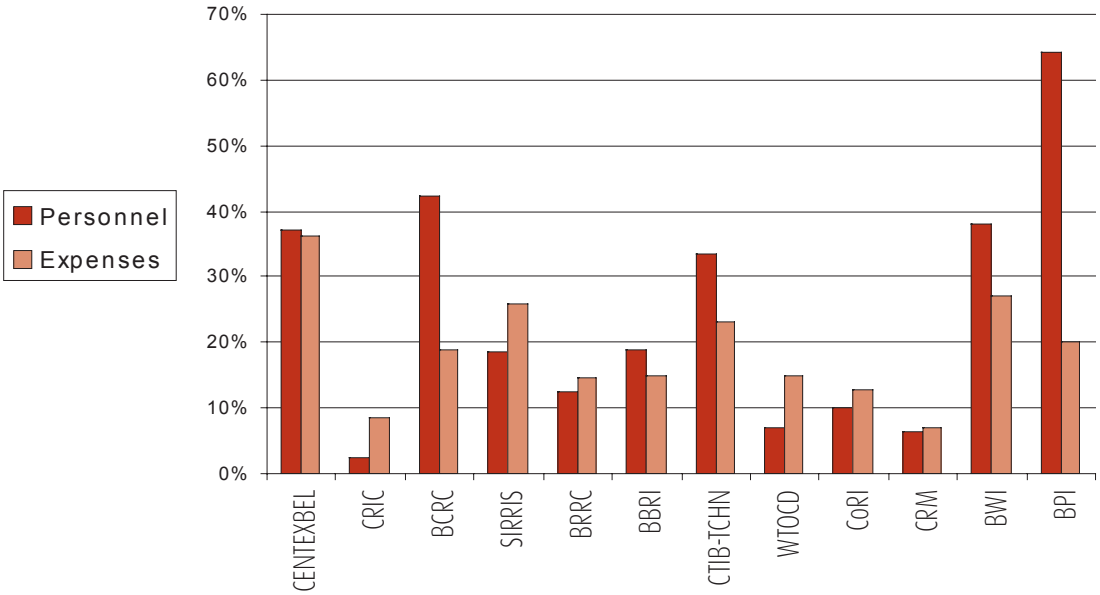
	2003	2004	2005	2006	2007
CENTEXBEL- Textile	4 932 810	5 511 646	2 900 000	4 723 870	4 823 531
CRIC- Cement	911 000	1 133 646	724 150	3 245 000	3 738 000
BCRC- Ceramics	1 024 949	1 131 466	1 367 549	1 190 251	1 371 336
SIRRIS- Technology	7 621 021	7 780 988	7 997 770	9 569 616	9 026 075
BRRC- Road	4 267 834	4 179 973	4 187 795	5 125 551	5 197 099
BBRI- Building	13 428 677	16 379 527	16 989 565	13 131 366	15 241 924
CTIB-TCHN- Wood	291 515	249 000	270 000	1 346 715	1 408 137
WTOCD- Diamond	1 362 975	1 243 810	1 121 599	1 159 445	1 201 946
CoRI- Coating	1 280 772	1 157 568	1 102 151	995 409	1 226 658
CRM- Metallurgy	13 664 694	14 002 250	13 704 949	11 000 000	10 800 000
BWI- Welding	669 515	881 375	905 125	1 441 743	1 542 873
BPI- Packaging	122 157	124 721	128 196	128 196	128 196
Total	***50 632 148***	***55 114 948***	***55 654 864***	***53 057 162***	***55 705 775***

In total, the collective research centres spent over 55 million Euro on R&D in 2007. Again we find large differences between the collective research centres, with BBRI spending nearly 15 million Euro on R&D over 2005, and BPI spending hardly 0.1 million Euro on R&D in the same year.

3.3 R&D related intensity

Below we analyse how intensively the collective research centres are involved in R&D related activities by analysing the proportion of personnel that is involved in these activities and the proportion of expenses that is dedicated to these activities.

Figure 4:
R&D related intensity (%) (2007)

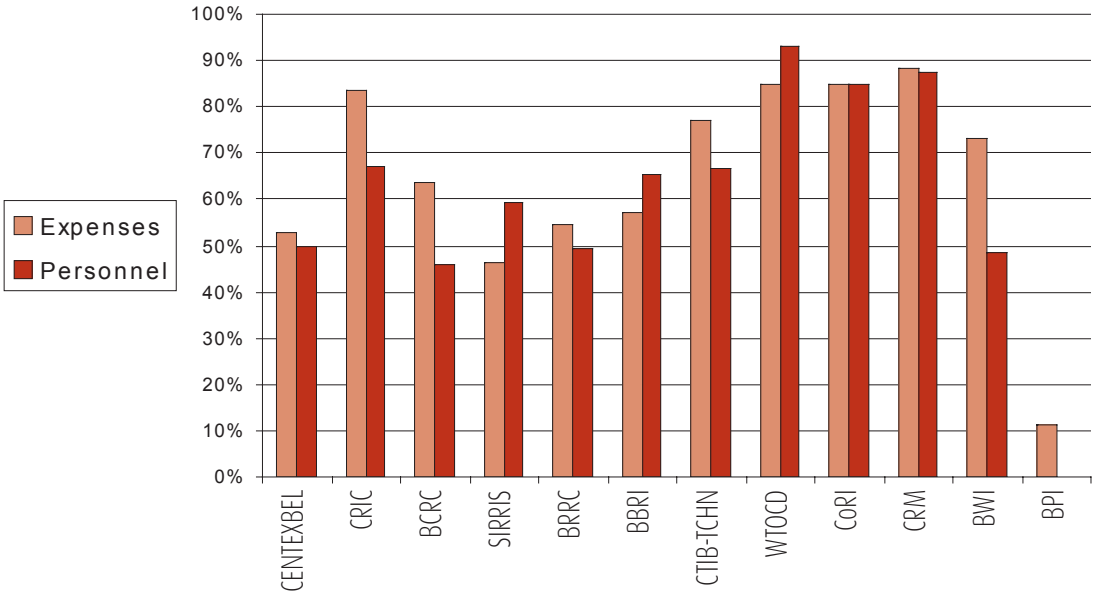


Even though only one collective research centre (BPI) spends the majority of its financial resources on R&D related activities that are highly linked to knowledge transfer activities, it is clear that most of the centres - except for CRIC, BRRC, WTOCD, CoRI and CRM - spend considerable amounts of money on R&D related activities. Below we analyse the extent to which the collective research centres are involved in R&D activities and are R&D performers themselves.

3.4 R&D intensity

Below we analyse how intensively the collective research centres are involved in R&D activities by analysing the proportion of personnel that is involved in R&D and the proportion of expenses that is used for R&D purposes.

Figure 5:
R&D intensity (%) (2007)



Again we find large differences between collective research centres, highlighting their heterogeneity, and therefore also the need to look at each of them in isolation (see further). While some centres spend most or all of their resources on R&D (WTOCD, CoRI and CRM), others hardly spend any resources on R&D (such as BPI).

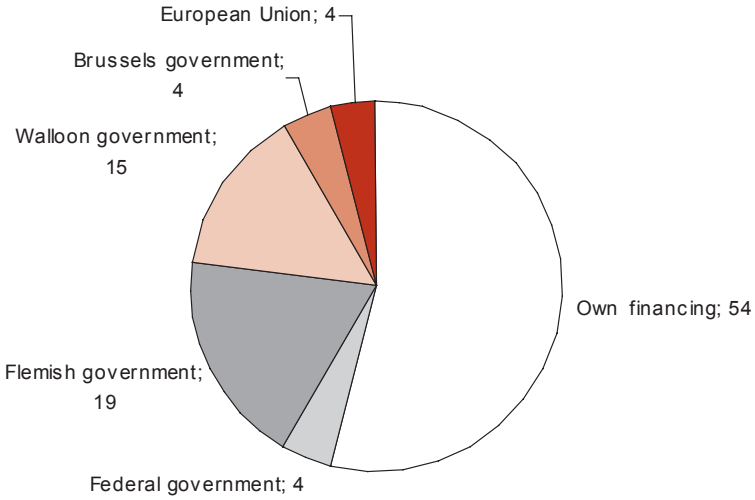
3.5 Sources of finance

We analyse what sources of finance collective research centres call upon for financing knowledge transfer and R&D activities.

3.5.1 Sources of finance for R&D related activities

R&D related activities are mainly financed by companies. They may finance the collective research centre through member fees or by paying for the collective research centre's services. Other important financing bodies are the regional governments and, to a lesser extent, the European Union and the federal government.

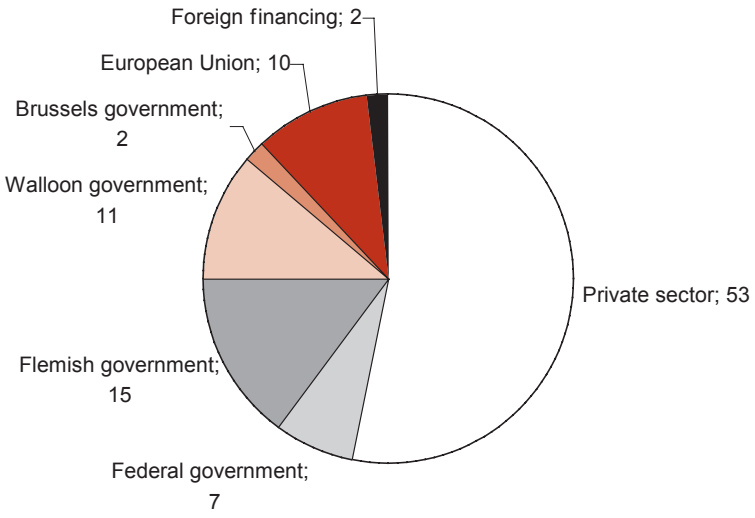
Figure 6:
Sources of finance for R&D related activities (%) (2007)



3.5.2 Sources of finance for R&D activities

The following figure provides insight into the distribution of financial resources for the collective research centres. In 2007, the collective research centres disposed of 56 million Euro for R&D. The majority of these resources (53%) came from companies. Other important financing sources are the European Union (10%), the federal government (7%), and regional governments (28%). However, the distribution of income is highly variable between the different collective research centres. We therefore elaborate on the origin of income when discussing each collective research centre separately.

Figure 7:
Distribution of R&D income resources for all collective research centres (%) (2007)



Corroborating Figure 7, more than 60% of the funding of collective research centres for R&D stem from private companies. This includes the contribution fees, the revenues from contract research, etc. Collective research centres are clearly well and truly versed in the business environment, even though they are, strictly speaking, non-profit organisations. The governments finance the collective research centres as well. Federal government funding pertains largely to the tasks of standardisation (FPS Economy); whereas regional government funding is directed towards R&D projects and fostering industrial technology partnerships (IWT, DGTRE).

4
The collective research centres: description and technology transfer models

In what follows, we focus on the individual collective research centres and describe their activities and technology transfer model. For each centre we study the extent to which they engage in the distribution of existing knowledge on the one hand, and the generation of knowledge, on the other. For each type of activity we study the resources that are dedicated to that activity. In addition, we study how knowledge is transferred, and, for those activities where it is generated, how it is generated and transferred to the member companies. Since the classification of the Frascati Manual does not make it possible to uniformly categorise activities into "knowledge transfer" or "knowledge generation" activities (for instance: information on patenting can be both R&D and R&D related activities, depending on what the information is used for), we distinguish in the following between knowledge transfer activities and R&D activities. We use the BBRI definition of "knowledge transfer activities". These activities comprise technical advice, study days and education, publications, databases, projects of thematic innovation stimulation (TIS), standardisation antennas, technological consultancy, studies and sensitisation.

4.1 Belgian Textile Research Centre – Centexbel

Centexbel is the scientific research centre for the textile industry in Belgium and was established in 1950, spurred by the Belgian organisation Febeltex (now Fedustria). The collective research centre is a De Groote Centre of which all textile companies in Belgium are joint (mandatory) members. In 2006, the collective research centre had about 900 members, including all Belgian textile companies and associated members. Centexbel has offices in Gent and Verviers, with about 30 and 80 people, respectively.

Centexbel is involved in three main activities: research projects, testing and services (including standardisation and certification).

4.1.1 Knowledge transfer activities

Alongside research activities, Centexbel is involved in testing as well as providing services to the industry. These services include technological consultancy, product certification, application platforms for the development of new products and/or processes, training and publications.

Of Centexbel's 110 FTE employees, about 35 are engaged in knowledge transfer activities.

First of all, Centexbel has built up a technological advisory service that supports companies in solving technical problems, responding to technological challenges, searching for partners or suppliers of technology, machinery and products and developing specific products or processes. Second, it offers small-scale, in-depth technological consultancy (GTA), for a maximum budget of 7,500 Euro, that makes it possible to bring new understanding to bear on technological problems. Over 2006, 29 of these studies were carried out for Flemish companies (co-financed by IWT), and about 10 others were started in the same year. Third, Centexbel is involved in standardisation and the standardisation antennas. The centre is on the Board of the Belgian Standards Bureau (NBN) and has set up four standardisation antennas. These are vehicles, financed by the federal government, designed to make standards public and help SMEs apply them. Centexbel is also part of the standardisation committees and reports back to its members for decisions at the meetings and through the monthly newsletter CENTEXBEL INFO and the website. Fourth, Centexbel helps members with intellectual property issues. It provides information about the procedures to apply for patents, existing patents, registration of trade marks, designs and models and counterfeiting. Fifth, Centexbel certifies several textile products. Sixth, the collective research centre provides consulting and performs audits for companies, for instance in the areas of quality assurance, environment, innovation and production processes. Seventh, Centexbel has four laboratories at the disposal of members for carrying out tests. Over 2006, these laboratories realised total revenues of close to 2.4 million Euro. In addition, the centre has pilot platforms which it makes available to members and researchers.

Knowledge transfer is strongly interwoven with the different activities of the centre. Already during research, knowledge is transferred as textile companies participate in user groups which follow collective research on a regular basis. These companies have the right of first use of research results and test runs are often performed at companies. Knowledge acquired via research is also combined, adapted and applied in companies through its technological advice and thematic innovation stimulation. In addition, it has a monthly publication called CENTEXBEL INFO and it organises seminars, training and collective company visits on a regular basis.

With respect to research projects, Centexbel is active in three main technological fields, namely

- health, safety and security;
- materials; and
- processes.

The centre is involved in private research, collective research, European research and, to a lesser extent, strategic research.

With regard to private research, the research is carried out on behalf of one or more companies and is governed by a bilateral contract. As the company is the sole

owner of the knowledge generated, it is the company that decides whether or not the results can be published and/or disseminated.

In the case of private research projects, the company usually applies for a subsidy from the IWT (Flanders) or DGTRE (Wallonia), although in some cases the company pays for the services entirely from its own funds.

During collective research projects, Centexbel initiates and carries out R&D projects within specific technology areas and addresses a problem or technology of interest for a large target group of companies. This type of research forms the basis for further development of Centexbel's services, and is often co-financed by IWT, DGTRE, the Brussels-Capital region or the federal government. Projects have an average duration of two years and are open to all members. Collective research can be split up into collective research with an economic objective (ranging from strategic fundamental research to translation research) and research of a pre-normative nature (providing the scientific and technical basis for standards). The property rights from collective research belong to Centexbel, but the centre has an obligation to commercialise the research results.

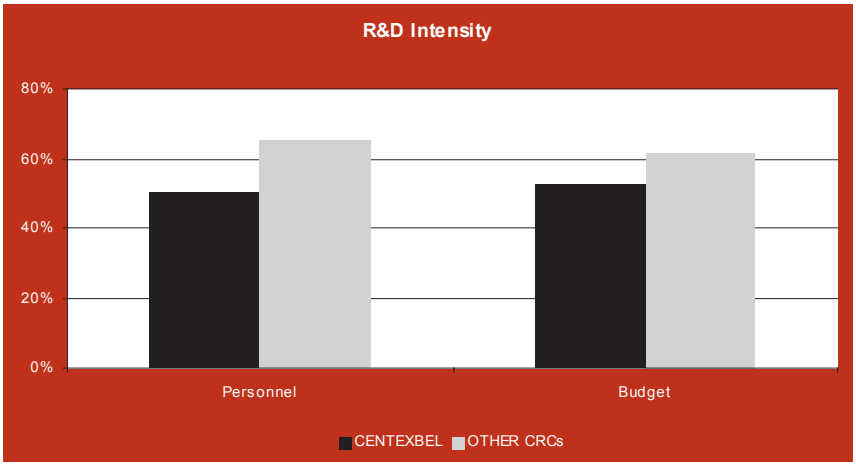
Strategic fundamental research lies between fundamental general research aimed at extending knowledge (conducted at universities and research centres) and more specifically-applied research (carried out by the industry).

4.1.2 R&D activities

4.1.2.1 R&D intensity

Centexbel employed 110 FTEs in 2007, of whom 55 were involved in R&D. The total expenses for R&D amounted to 4.8 million Euro in 2007. About 50% of the resources for personnel at Centexbel are dedicated to R&D. R&D expenses account for about 53% of the total expenses of Centexbel.

Figure 8:
Comparison of Centexbel's R&D intensity and the other collective research centres (2007)

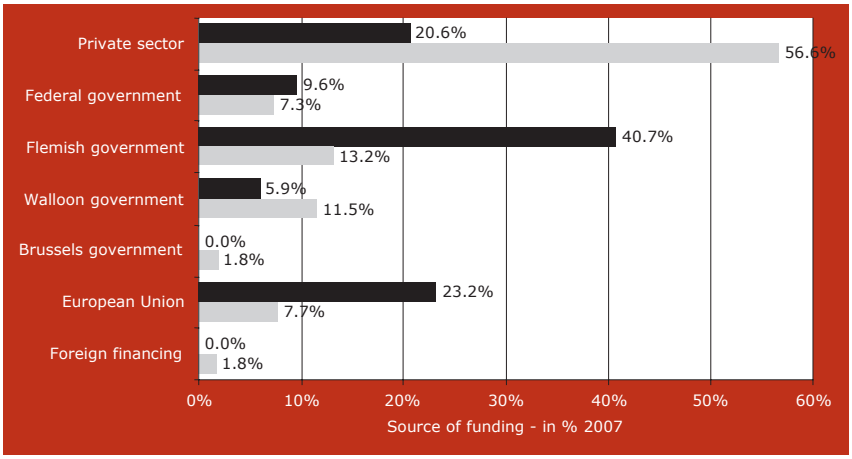


Source: Centexbel -2007

4.1.2.2 *Sources of finance for R&D*

The following figure provides an overview of the financial resources for R&D over 2007. Most of the R&D financing comes from the Flemish government (41%). The European Union and the private sector account respectively for 23.2 and 20.6% of R&D financial resources. The remainder of R&D activities is financed by the federal government (9.6%) and the Walloon government (5.9%). R&D at Centexbel seems to be, compared to other collective research centres, to a much larger extent financed by public sources, such as the Flemish government, and to a much smaller extent by private sector financing.

Figure 9:
Overview of R&D resources at Centexbel and the other collective research centres (2007)

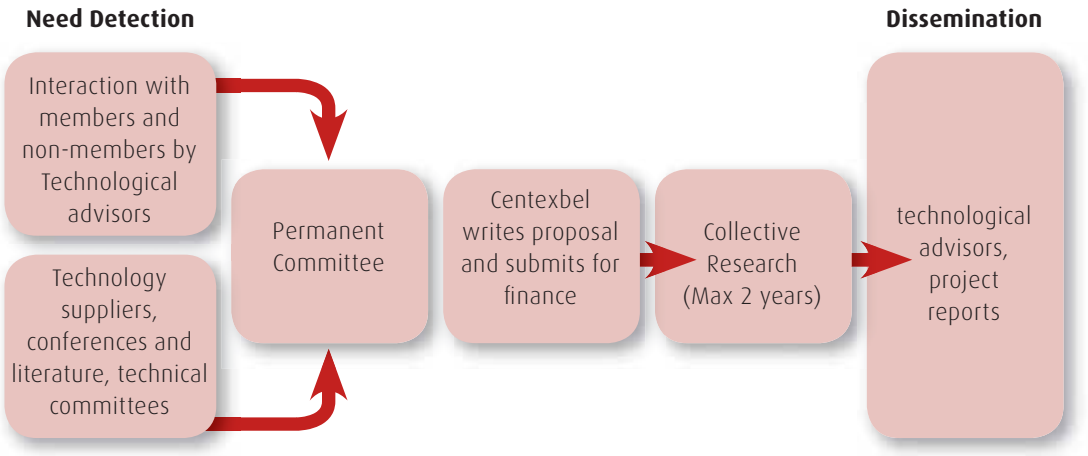


Source: Centexbel - 2007

4.1.3 Technology transfer model

Below we analyse how the centre detects the need for research within the industry, how it carries out this research, and how it transfers the knowledge that it generates through R&D projects to its members

4.1.3.1 *Collective research: model and measures*



The ideas for collective research projects come from two sources and are validated by the permanent committee. First, through discussion with the members, in either informal or formal discussions at technical meetings and via the TAD/TIS advisors who pinpoint questions that are regularly asked by members. Second, ideas come from technology suppliers, often in other sectors, such as the chemical industry, ICT, machinery or are detected at conferences, within the literature or during technical committee meetings with a limited number of members. Collective research projects are to a large extent financed by IWT (in practice about 80%) and federal budgets. A small proportion is financed by European funds.

Collective research projects have a maximum duration of two years. Interestingly, the members are rarely direct partners in the project, but they follow the research work very closely through participation in user committees. These companies also have the first right of use of the results. In many cases Centexbel works together with universities, research centres or other collective research centres in collective research and research in general. Especially when working with universities, the research focuses on making technology and knowledge suitable for Centexbel and their members in an industrial setting.

The property rights of the collective research belong to Centexbel. Centexbel disseminates the results directly to the members involved in the project through project meetings and reports. Research results and knowledge acquired during research is also applied in industry through consultancy where TAD-TIS people adapt this know-how to the needs of the company.

The centre submits about four to five projects per year, involving in total about 60 companies.

4.1.3.2 *Contract research*

About 25 to 30 projects per year are carried out by Centexbel on behalf of members. The company owns the property rights.

4.1.3.3 European projects

Centexbel participated in about eleven FP6 –projects, of which the majority are IPs for SMEs. A minority of these projects are collective research projects, STREP, coordinated actions or CRAFT, etc. Centexbel takes care to involve textile companies in these research projects. On average, 30 companies are involved in these projects.

4.1.3.4 Strategic fundamental research

A very small part of the research budget of Centexbel is dedicated to strategic research. The research is either financed by the Belgian Science Policy (100% funding) or the European Commission (50% funding). The results often lead to specific, bilateral contract research on behalf of the members in order to test the applicability of the results in their organisation.

4.1.3.5 Pre-normative research

This is research that results in standards, and that are presented to the European standardisation bodies. Centexbel conducts pre-normative research on a regular basis. In these research projects there is also a strong involvement of industry.

4.1.3.6 Patents, licensing and spin-offs

The property rights from collective research belong to Centexbel. However, the collective research centre does not have a real patent strategy. Many research projects are launched in cooperation with a technology supplier that has already patented the technology, which would prevent Centexbel from filing a patent application. In total, since 1950, Centexbel has filed four or five patents, but the centre does not use them for its own commercial purposes. Most of the time, these patents are only taken for a limited period of time, and the right of use is given to the members. This can be explained by Centexbel's policy and goals, which is dissemination of information and not the development of a patent portfolio. The patent cell that is installed at Centexbel is therefore mainly involved in providing information about patentability and patent procedure to its members.

4.2 Belgian Research Centre for the Cement Industry – CRIC

The CRIC (Belgian Research Centre for the Cement Industry) is a De Groote Centre and was established in 1959. The centre has three compulsory members (CBR, CCB and Holcim), which are subsidiaries of large multinationals. Because of the high level of concentration in this industry, there are no SMEs. The General Council and the Permanent Committee are the statutory managing organs. Under the de Groote Law, these organs are set up by the representatives from the industry, the universities, the Belgian Federation of Enterprises (FEB), the unions and the regulatory authorities (FPS Economy and the Regions).

4.2.1 Knowledge transfer activities

The activities of the CRIC are divided along five lines: research (see below), testing, metrology, standardisation and product certification.

Apart from research, one mission of the CRIC is testing and metrology for the industry. CRIC puts its laboratories and the competence of its personnel at the disposal of its customers: expert reports, tests and analyses on concrete and mortar, their components and their applications, on-site testing. The Metrology Section of CRIC offers a complete metrological assistance to its customers who perform laboratory or on-site measurements. These activities, for which traceability to national and international reference standards is ensured, contribute to the optimisation and rationalisation of the client laboratory's quality management. The calibrations, controls and verifications cover the domains of force, mass, temperature and relative humidity, dimensions and surface characteristics and other specific characteristics of testing equipment. They are conducted on site, at the customer's premises, or in CRIC's laboratories. This activity is considered to be a useful tool for maintaining qualified staff.

Another activity was developed more recently and is dedicated to certification (cement and other materials). In 1982, the BIN-IBN (Belgian Institute for Standardisation) commissioned CRIC as certification body for the BENOR mark in the cement branch. Certification bodies such as CRIC attest to the conformity of a product with the requirements of a standard or a technical specification. This conformity is materialised in a so-called "mark". The original mandate as certification body issued by IBN for the BENOR certification was extended to the branches of ready mixed concrete, masonry mortar and their constituents. CRIC also plays a part as an inspection body and testing laboratory. CRIC has been notified by Belgium to the European Commission as an attestation body for the CE marking within the framework of the mandates M 114 (cement and lime), M 116 (masonry), M 125 (aggregates) and M128 (constituents of concrete).

Since September 2007 CRIC has been mandated by the NBN, the new Belgian Standards Bureau, as sectoral operator for the standardisation of cement, aggregates, concrete and other components of concrete.

In addition to the above-mentioned activities, CRIC provides its customers with general information concerning its activities through a 24h/24h accessible website.

The first activity (research) represents 25% of the total turnover; the second one (testing) 40% and the last one (certification) 35% of turnover.

Because of the qualification as a De Groote Centre and the quality of the activities managed in-house, the CRIC enjoys a good reputation in the industry.

The centre does not have any TAD, which can be explained by the high concentration in the industry.

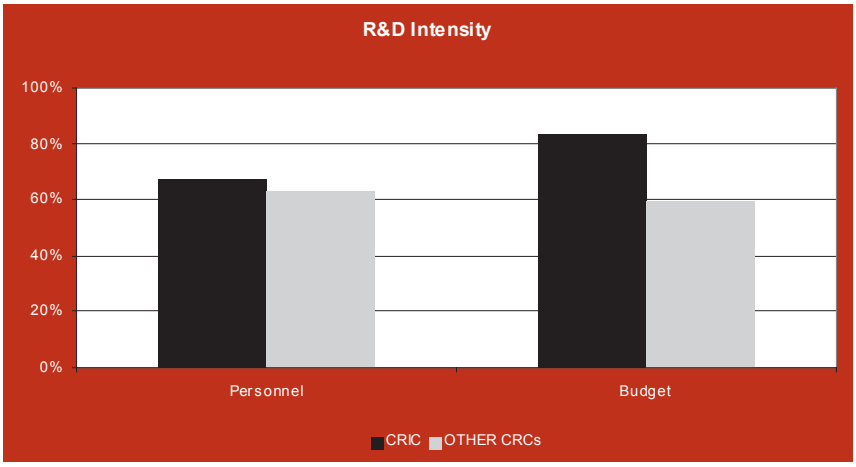
4.2.2 R&D activities

4.2.2.1 R&D intensity

One key mission of the CRIC is to develop research serving the industry. From the beginning, it was decided by the members that research undertaken by the CRIC should be "non-competitive". This means that product developments are excluded from the activities of the CRIC. Research activities are oriented towards applications which are useful for each member.

The CRIC employed 43 people in 2007 (FTEs). Most of the staff has a scientific background. Total R&D expenditure amounted to 3.74 million Euro in 2007. Of the 43 employees, 29 FTEs were involved in R&D in the same year. About 67% of the personnel and 84% of total expenses are dedicated to R&D, which indicates a high R&D intensity compared to the other collective research centres.

Figure 10:
Comparison of CRIC's R&D intensity and the other collective research centres (2007)

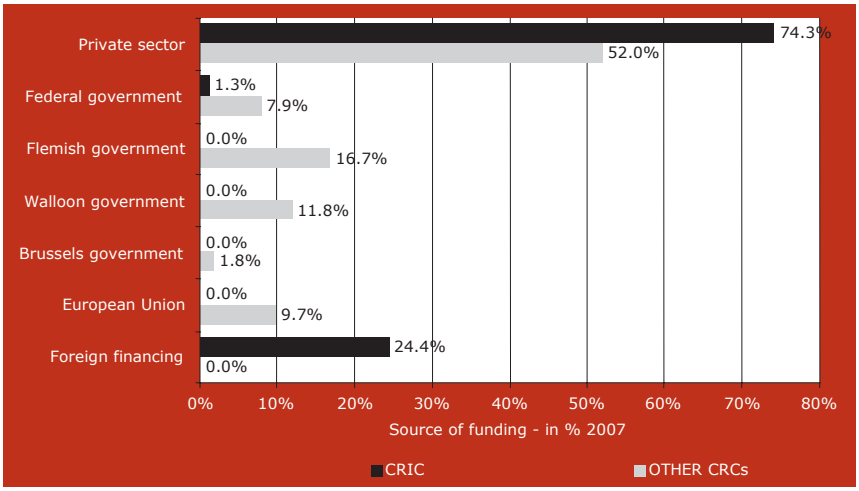


Source: CRIC - 2007.

4.2.2.2 Sources of finance for R&D

About 74.3% of the R&D funds come from the industry. An additional 1.3% is provided by federal government subsidies and the remaining 24.4% is constituted by foreign financing.

Figure 11:
Overview of R&D resources at the CRIC and the other collective research centres (2007)



Source: CRIC - 2007

4.2.3 Technology transfer model

4.2.3.1 Collective research: model and measures

As explained earlier, research activities by CRIC are purely "defensive" or "demand driven". The research activities are mainly on applications to increase the market size. Currently, they are focused on environmental issues and durability. CRIC also develops research on pre-normative topics. For instance, CRIC is involved in programmes focused on optimising formulations for concrete.

Currently, the centre is running about six collective research projects involving the three corporate members.

4.2.3.2 Contract research

Currently, the centre is running 23 bilateral research projects (with members or non-members).

4.2.3.3 Patents, licensing and spin-offs

No activities.

4.3 Belgian Ceramic Research Centre – BCRC

The Belgian Ceramic Research Centre originated from the merger of two non-profit institutions:

- the INISMa (Institut National des Silicates, sols et Matériaux), a non-profit organisation founded in 1973 at the initiative of the Faculté Polytechnique de Mons, the University of Mons-Hainaut, the IDEA (intermunicipal) and a group of industrial ceramists (INS);
- the CRIBC-CWOBKN (Centre de Recherches de l'Industrie Belge de la Céramique - Centrum voor Wetenschappelijk Onderzoek van de Belgische Keramische Nijverheid), collective research organisation created by decree-law in 1948, in application of the de Groote Law.

4.3.1 Knowledge transfer activities

Alongside research activities, the BCRC has two main lines of activities: expertise and tests and analyses. The first, expertise, is oriented towards companies (SMEs) which need to implement a new technology. If the cost of the expertise cannot be financially borne by the company, the BCRC can help in setting up a technical proposal (package for SMEs only) which is submitted for funding to the regional Authority (DGTRE or IWT, depending on the location of the SME). The second activity, tests and analyses, is carried out in the following areas: physics and structures; chemistry and optics; glazing and components; environment and air; and construction. Tests and analyses account for 4 million Euro of revenues. The other two activities are financed by membership fees.

In each subfield (including research) there are senior staff members who are contact persons for the companies. They nurture the corporate link.

BCRC has developed a relatively intense activity of knowledge support to companies. In 2006, the BCRC performed 470 consulting and follow-up interventions in more than 160 enterprises. Most of the companies are Belgian, although there is no exclusivity. Among Belgian companies, 67% were from Wallonia, 25% from Flanders and 8% from Brussels. In particular, the BCRC can help companies to efficiently implement a new technology. It also helps them to adopt a helicopter view and to deal with other dimensions entailed by the new technology (quality management, environment, organisation, etc.).

Knowledge transfer activity is also facilitated by the BCRC through technology watch. It is supported by the updating of a technical library (with around 50 scientific and technical journals and more than 1000 ceramic and refractory works) and documents relevant to the industry. The coordinates of all these works can be found in an online catalogue and they can be borrowed via its loan service. The BCRC also offers access to scientific data servers such as ESA/IRS (EU) and ORBIT (USA).

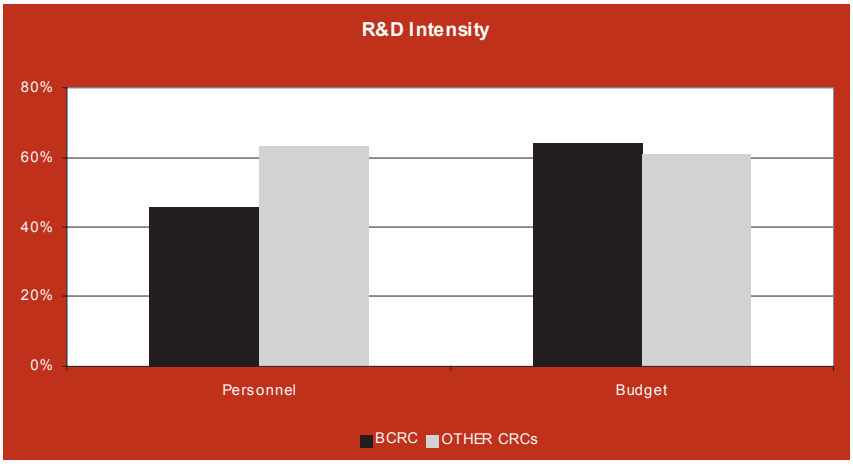
4.3.2 R&D activities

4.3.2.1 R&D intensity

According to BCRC, it has 50 members, of which 37 are compulsory members. BCRC has 87 full-time equivalents and a total turnover of 6.4 million Đ. The deviation of the data reported to the CFS/STAT might be due to the fact that INISMa is included in the former. Since INISMa is, to our knowledge, not acknowledged to be a federally recognised collective research centre, the analysis pertains to the CFS/STAT data. Of the 26 FTEs the BCRC employed in 2007, 10 were involved in R&D activities. A total of 1.4 million Euro was spent on R&D, or 64% of the total expenses.

In terms of research and industrial support, the work of the research department covers the general field of ceramics as inorganic materials. The purpose of the research department is to contribute to the development of new products and technologies. It is applied research focused on the link between manufacturers and users of ceramic materials. The research department also provides guidance in solving problems for companies in the business.

Figure 12:
Comparison of BCRC's R&D intensity and the other collective research centres (2007)

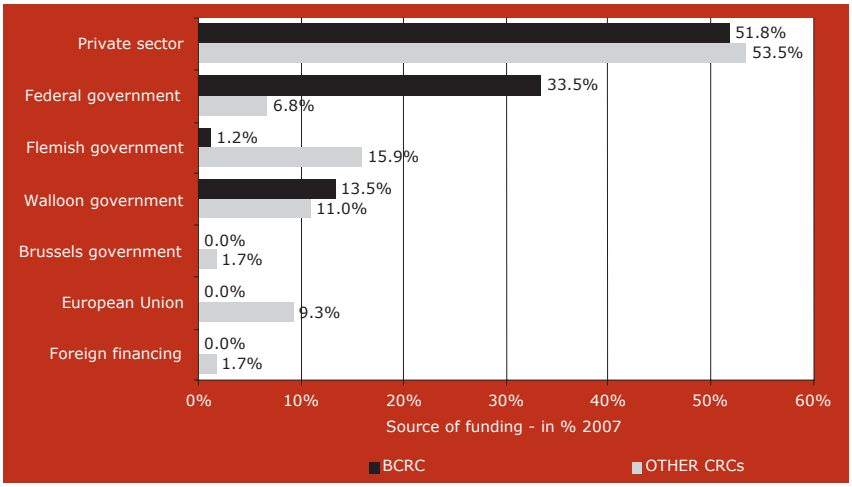


Source: CFS/STAT, 2008 – Calculations Belgian Science Policy.

4.3.2.2 Sources of finance for R&D

52% of the financing of R&D activities in 2007 was financed by own sources (membership fees). The remainder was provided by the Walloon government (13%), the Flemish government (1%) and the federal government (33%).

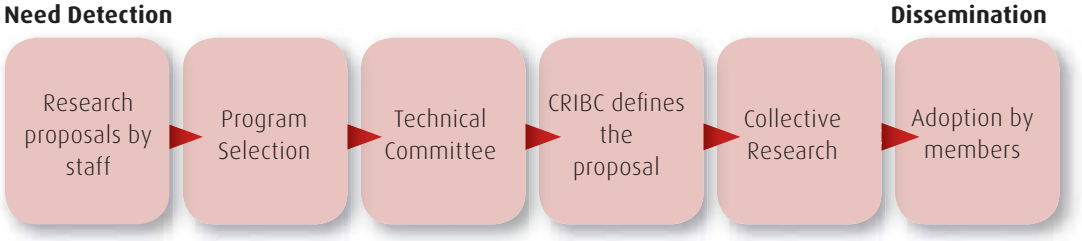
Figure 13:
Overview of R&D resources at the BCRC and the other collective research centres (2007)



Source: CFS/STAT, 2008 – Calculations Belgian Science Policy.

4.3.3 Technology transfer model

4.3.3.1 Collective research: model and measures



The research projects, of a collective and pre-competitive nature, are chosen with the Technical Committee of the CRIBC (part of BCRC), representative of the various ceramics subsectors of the Féderation des Industries Céramiques de Belgique (Fedicer). The preparation and implementation of these projects are entrusted to the CRIBC, which received this mission when it was set up.

With regard to the collective research of a pre-normative nature, only the CRIBC and the Federal Public Service Economics intervene financially (50/50). The CRIBC is also in charge of cooperative research of an international and trans-sectoral nature (e.g. GROWTH, CRAFT research of the European Community). The R&D activity of the INISMa covers regional (TechCeram) and border zone (Stimat) actions and bilateral projects (confidential) for an industrial partner or an institution.

Currently, the centre is running about 6 collective research projects.

4.3.3.2 Contract research

Currently, the centre is running 23 bilateral research projects (with members or non- members).

4.3.3.3 Patents, licensing and spin-offs

Owing to the collective character of the research projects, the decision to take a patent is in the first instance left to the industrial partners involved.

4.4 Belgian Technology Industry – SIRRIS

SIRRIS, the former WTCM-CRIF, was established in 1949. It is the knowledge centre for the technology industry in Belgium. The main objective of the centre is to help its members, mainly industrial SMEs, to improve their competitive position through technological innovation. The members of the centre belong to the following sectors: automotive, electrical engineering, mechatronical engineering, metals, materials and plastics. The centre supplies information on new technologies to its members, assists them in the implementation of new technology in products, processes and services and provides practical solutions to complex organisational issues.

The centre was founded by Agoria (formerly FABRIMETAL), which represents companies in Belgium active in the technology industry. The board consists of members closely linked to the industry and the CEO of Agoria.

The centre has about 2500 members, of which 95% are SMEs (500 of the members are located in the Walloon region). It is a De Groote Centre, therefore industrial companies have to become members, but this obligation only holds for companies that employ at least 10 people. The centre has offices in Brussels, Gent, Leuven, Hasselt (2), Charleroi and Liège. It employs 140 people. The location of the offices is historically located close to universities or on the campus itself. Although the centre is geographically decentralised, it has adopted a clear federalised structure. Each region has its own director with final responsibility, but the sites are not independent as such.

The federalised structure of SIRRIS consists of SIRRIS Wallonia, SIRRIS Brussels and SIRRIS Flanders. SIRRIS collaborates with universities, research centres, companies, associations and institutions in Belgium and Europe. While SIRRIS is historically anchored in the academic environment, it tends to adopt a more industry-oriented than university-oriented approach. SIRRIS plays a role of interface or bridging organisation between academic and industrial environments. Adopting one name for Belgium as a whole helps provide a better global image in the industry –particularly abroad.

The main activities of the centre include contract research, technological advice, technology watch and brokering and collective research.

4.4.1 Knowledge transfer activities

Alongside research activities, which will be discussed in a later section, the collective research centre interacts to a high degree with industry through a number of activities, including technological advice, training and IP advice.

First, the centre engages in about 5000 projects or advisory missions with individual companies per year, consisting for about 70% of free advice. Such advisory missions typically take between two hours and two days. The nature of these questions often has to do with product innovation, meaning that companies which are producing or developing new products call upon the help of the centre for product development. Second, the centre is involved in technology watch and technology brokering. It has its own portal, called Techniline, through which it disseminates information to its members. The portal provides information on the technology watch database, technological innovations achieved by the centre, articles and trends. As for technology brokering, the centre is a member of MIT and members often go there to stay abreast of the latest technological developments. It gets information from MIT on new programmes. Third, the centre provides training and IP advice. It is not involved in patenting on its own behalf. The centre used to be quite active in standards and standardisation, but only carries out these activities nowadays if the member does not find alternative institutes that can carry out the task. About 20 technological advisors work at SIRRIS.

4.4.2 R&D activities

About 60% of the collective research centre's activities are dedicated to applied R&D, mainly consisting of collective and contract research projects. The centre is not involved in fundamental research, given the close link with universities.

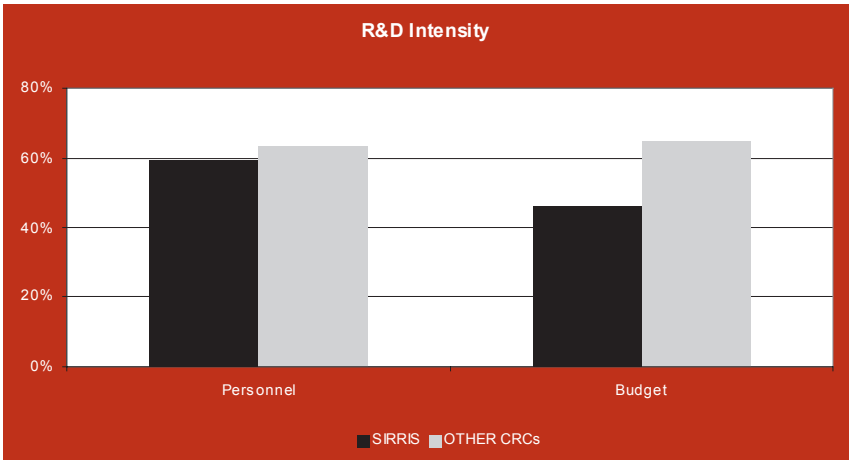
4.4.2.1 R&D intensity

SIRRIS employed 139 FTEs in 2007, of whom 82 were involved in R&D. The total expenses for R&D amounted to 9 million Euro in 2007. About 60% of the resources for personnel at SIRRIS are dedicated to R&D. R&D expenses account for about 46% of the total budget of SIRRIS.

The centre's main research activities include:

- development projects or contract research, during which a new product/concept or production technique is elaborated for one specific member. About 500 of these projects are carried out on a annual basis. For this type of project the collective research centre is paid by the member. It is up to the member to decide whether or not it will apply for grants, for instance with IWT, DGTRE or IWOIB/IRSIB.
- collective research, including
  - o collective research (carried out by SIRRIS and a number of knowledge centres on proposal by companies)
  - o networked research (support for companies for their technological developments)

Figure 14:
Comparison of SIRRIS' R&D intensity and the other collective research centres (2007)

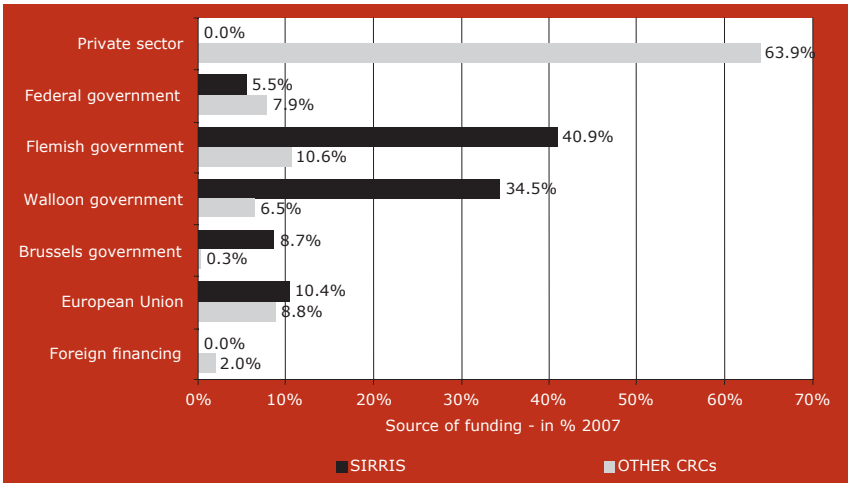


Source: SIRRIS - 2007

4.4.2.2 Sources of finance for R&D

In 2007, SIRRIS didn't draw on resources from the private sector (membership fees or others). This seems to be very specific for 2007. For instance, in 2005, the majority of R&D funding (56%) came from private companies, about 44% of the funding was provided by governments, of which 8% came from the European Commission. Of the private company funding, half can be attributed to membership fees, and the other half to consulting fees for advice.

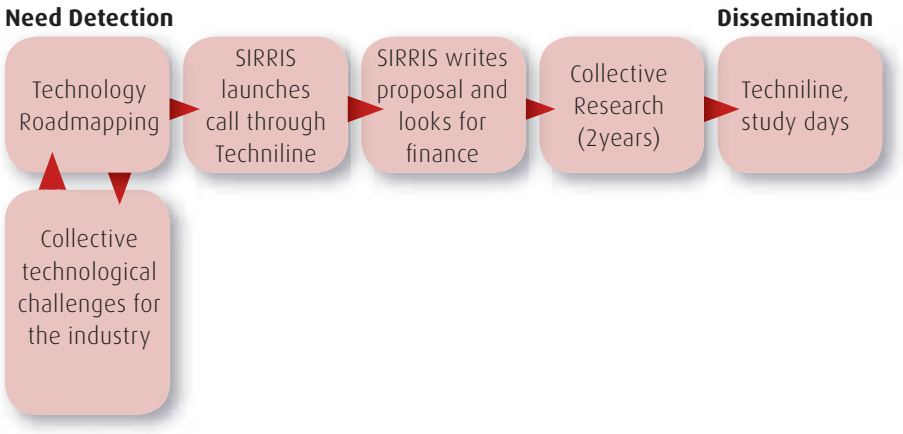
Figure 15:
Overview of R&D resources at SIRRIS and the other collective research centres (2007)



Source: SIRRIS - 2007

4.4.3 Technology transfer model

4.4.3.1 Collective research: model and measures



Collective research often originates from technology roadmapping by SIRRIS staff members. These roadmaps start from analysing the future needs and trends within a specific industry, and identifying the technologies that can help to meet these future needs. After this identification exercise, SIRRIS looks into whether the development of these technologies has already started at other research centres such as IMEC, VITO and the universities. If not, it may decide to launch its own collective research project. The launching of a new collective research project is made public through Techniline and through individual contact with companies. Members can decide to subscribe to the project. SIRRIS writes the proposal and looks for financing from regional agencies, for instance IWT, DGTRE or IWOIB/IRSIB. Besides the members, knowledge centres and foreign research centres are also involved. During the collective research project, the 10 to 15 members that are involved have access to the information of the project. When the collective research project has been completed, the results are disseminated through Techniline or during study days. One specific type of collective research project is the networked research project, during which several companies decide to conduct part of their research together and not as separate companies. However, such research still has to be beneficial to all members of the centre. SIRRIS has about 20 to 30 collective research projects per year. These projects often result, after dissemination, in contract research projects with members.

Because the centre began to receive more and more requests from members that did not want to carry out research that would be beneficial to all members, but only to a limited set of non-competitors, in 2004 FMTC was established by 15 SIRRIS members. FMTC (Flanders Mechatronics Technology Centre) was established in close collaboration with the Catholic University of Leuven. Currently the centre employs 30 people, but is planning to expand to 50 in the short term. Yearly, the centre organises a survey among the 15 members for future research topics. Every topic raised by at least three members gets included in a shortlist. The FMTC carries out three types of projects:

- long-term research ("strategic basic research") is carried out in close collaboration with the universities: the FMTC pays for PhD scholarships in the department of Prof. Van Brussel at the Catholic University of Leuven
- collective research projects: about 15 per year, which are paid for up to 50% by the 15 members. The other 50% is paid by the "competency pole", financed by the Flemish government. The "competency pole" attracts financing for 5 years, and therefore no research proposals have to be handed in and evaluated each time, which makes the functioning more effective. The results of this collective research are disseminated through SIRRIS to other than the 15 members after completion of the research.
- Individual projects on behalf of one of the 15 members or foreign companies (only on approval of the 15 members). In this case, the individual member pays 100% of the costs.

This system is working very well, given that all members are involved in machinery development, but are in different sectors, and therefore are not competing.

About 20 to 30 projects are carried out on a yearly basis, each time involving about 15 members and other knowledge centres.

4.4.3.2 Contract research

Every year, SIRRIS carries out about 500 projects on behalf of the members.

4.4.3.3 Patents, licensing and spin-offs

SIRRIS does not hold any patents, since that is not its policy. Property rights are in the hands of the companies. The main objective is to provide individual technological advice to the technology industry of Belgium.

4.5 Belgian Road Research Centre – BRRC

The BRRC (Belgian Road Research Centre) is a De Groote Centre, established in 1952. The centre has about 1000 members which work in the road construction sector. Any company that ever carried out an assignment in road construction automatically becomes member and pays 0.8% of the total revenue of the contract to the BRRC. This is quite high in comparison to the resources that other collective research centres have available. A majority, 800 of the 1000 members, are very small. The research that the BRRC performs not only has to be beneficial to the members, but also to the principal on whose behalf the member carries out the road works. The research often leads to a "code of good practice", and should be beneficial to both the members and its clients.

The main activities consist of:

- pre-normative research, often collective research;
- advice to the sector; and
- dissemination of information, organisation of study days, participation in standardisation

The BRRC has identified priority topic areas, namely mobility, traffic and safety, environmental issues and recycling, concrete roads and pavings, asphalt roads and other bituminous applications, and road asset management.

4.5.1 Knowledge transfer activities

The centre is involved in a wide range of knowledge transfer activities. These include training courses, workshops, specific studies, tests and analyses and assistance. In addition, the centre is deeply involved in standardisation. In this respect, a number of employees are involved as members of CEN work groups or the Belgian steering groups. The centre has its own quarterly publication, called OCW Mededelingen/Bulletin CRR, which it distributes to Belgian and foreign actors.

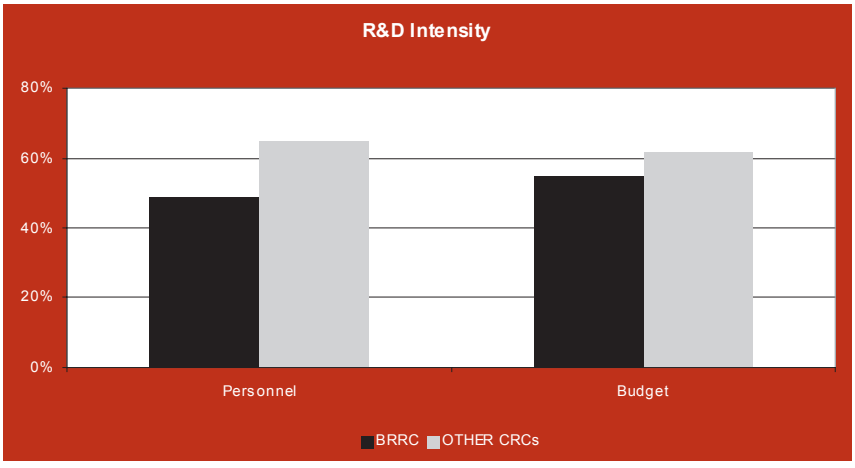
The centre employs four technological advisors, who mainly solve specific problems of members and disseminate research results. The centre estimated that about 12 FTEs are involved in knowledge transfer activities.

4.5.2 R&D activities

4.5.2.1 R&D intensity

With respect to R&D, the centre is primarily involved in collective research, which is often pre-normative. Of the 97 employees in 2007, 48 were active in R&D. The R&D expenses over 2005 amounted to 5.2 million Euro, or 55% of the total expenses.

Figure 16:
Comparison of BRRC's R&D intensity and the other collective research centres (2007)

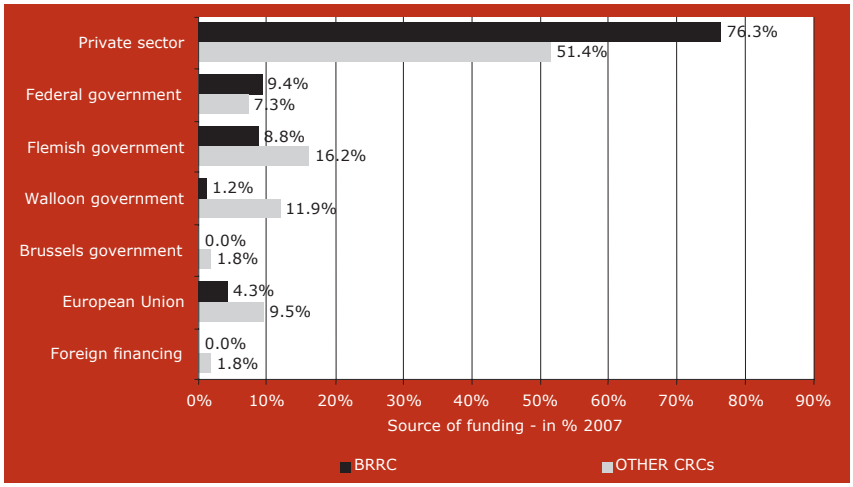


Source: BRRC - 2007

4.5.2.2 *Sources of finance for R&D*

The private sector finances up to 76.3% of the R&D expenses. Other financing sources are the federal government (9.4%), the Flemish government (8.8%), the Walloon government (1.2%) and the European Union (4.3%).

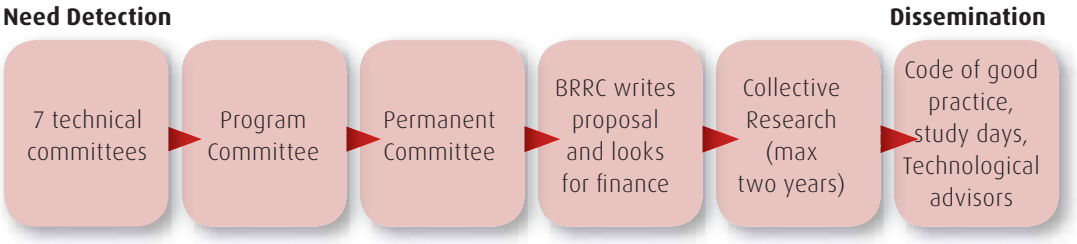
Figure 17:
Overview of R&D resources at BRRC and the other collective research centres (2007)



Source: BRRC - 2007

4.5.3 Technology transfer model

4.5.3.1 *Collective research: model and measures*



Most of the time, collective research is financed 50% by the BRRC and 50% by subsidies. For instance: one project concerns the recycling of glass in road construction. It is difficult to convince the road constructors to cooperate and finance such a project, given that they feel they are already paying a lot in membership fees and their sense that they are paying to solve someone else's problem (the glass industry).

The collective research carried out at the BRRC is often pre-normative. The research topics are determined by seven technical committees, consisting of mem-

bers and non-members. The technical committees are centred around the following topics: mobility, traffic and safety, environmental issues and recycling, concrete roads and pavings, asphalt roads and other bituminous applications, road asset management and geotechnics and road bases. The suggestions for research made by these committees are evaluated by the programme committee. This committee, in its turn, advises the permanent committee which approves the programme. After approval, the BRRC writes a proposal for the financing of the collective research with DGTRE or IWT. The BRRC is the only player involved in the research, implementing it alone. The results are disseminated through study days and publications and often result in a "code of good practice", which finds its way into the call for tenders in the building industry. It is of little use for members to be involved in an early phase in the collective research, given that there is no use being more aware of technological evolutions than the competition as long as they are not incorporated into the "code of good practice". Only from the moment that these evolutions are incorporated into calls for tender does it becomes useful to be aware of them and to know how to satsify the requirements contained in the call.

The people employed in R&D mainly source their knowledge through conferences and a network of 30 European institutes that the BRRC belongs to. It cooperates less with universities, since they dispose only to a limited extent of the kind of information required by the BRRC.

Each year the centre runs about 20 collective research projects.

4.5.3.2 Contract research

Now and then the centre also becomes involved in contract research. In this case, the BRRC submits a proposal for financing to IWT/DGTRE, and the member pays the other half of costs. In this case, a confidentiality agreement is concluded with the member, and the result belongs to the member. In many cases, it only becomes advantageous to the member to have the results if it eventually becomes part of a call for tenders, and other parties have to rely on this specific member for delivering the product or service. A maximum of 1 project per year is carried out.

4.5.3.3 Patents, licensing and spin-offs

The BRRC does not focus on taking patents or publishing in scientific journals. The CEO calls the BRRC a "result provider", not a "research provider". The BRRC holds one patent, which was obtained despite the objectives of the BRRC, and is based on a machine to study the aging of asphalt which has become the equipment of reference in EU standards.

4.6 Belgian Building Research Institute – BBRI

The BBRI (Belgian Building Research Institute) is a private research institute founded in 1959 on the initiative of the National Federation of Belgian Building Contractors. It is a research centre regulated by the de Groote Law.

In application of the law, membership is compulsory for companies in the business. Currently, there are around 74,000 Belgian construction companies (general contractors, carpenters, glaziers, plumbers, roofers, floorers, plasterers, painters,

etc.). More than 99% of these companies are SMEs and more than 56,000 are craftsmen. Membership fees are fixed proportionally to revenues or staff size in each company. For most of the members, i.e. the craftsmen, the fee is around 100 Euro.

BBRI employed 207 FTEs in 2007. Most of the employees have a university education or have graduated from technical polytechnics. Because of the diversity of skills required in the building industry, BBRI has to manage multi-disciplinary teams as required by the problems to be dealt with. 53% of the staff works in the Research & Innovation department, 30% in the Information Department, 7% in the Development & Valorisation department and the remaining 10% in the BBRI general administration.

4.6.1 Knowledge transfer activities

As defined in its statutes, BBRI has the following three main missions: (i) to perform scientific and technical research for the benefit of its members; (ii) to supply technical information, assistance and consultancy to its members; (iii) to contribute in general to innovation and development in the construction sector, in particular by performing contract research at the request of the industry and the authorities.

In the building industry, a large majority of companies are not involved in R&D at all. They can therefore be called "innovation consumers" mainly and not innovation leaders. This means that BBRI has a key role in detecting innovation for the members, guaranteeing their stakes with respect to technical standardisation issues and regulations, and developing research projects and disseminating research results and technical information amongst its members.

Technology transfer is considered as a key mission by BBRI management. As stated before, members are "primarily" consumers of technology and mostly not directly involved themselves in the innovation processes. For that reason, the information mission is not limited to explaining "what" the benefits of innovation are, but also "why" there is a need for innovation in the industry.

The 70 people in the information department contribute extensively to this type of technology transfer. BBRI has a 24h/24h accessible website which provides links to all BBRI documentation (and which has proven to be very effective) and newsletters (WTCB Contact). In addition, there are a number of technology transfer services provided by BBRI: technical advice, transferring research into practice, visiting construction sites (over 1,100), answering technical questions by phone (over 20,000) and mail/letters/ faxes (6,000). BBRI provides access to various databases such as TechComm (which gives a global overview of the Belgian market for construction materials) and Diffudoc (which provides over 78,000 references for national and international technical construction literature). The centre provides standardisation antennas (specific websites) which inform SMEs on the most recent European and Belgian standardisation and rules. It conducts contract research and supports innovation in a wide range of fields (construction acoustics, geotechnics, recycling and many more). The centre supports customers with the management of projects and helps them to assemble and configure their IT infrastructure. The centre advises customers with respect to technical approvals, quality labelling, standardisation and certification. All of these services are backed by a large number of courses and seminars (mainly evening sessions, about 750 per year).

People from BBRI also attend numerous congresses and conferences.

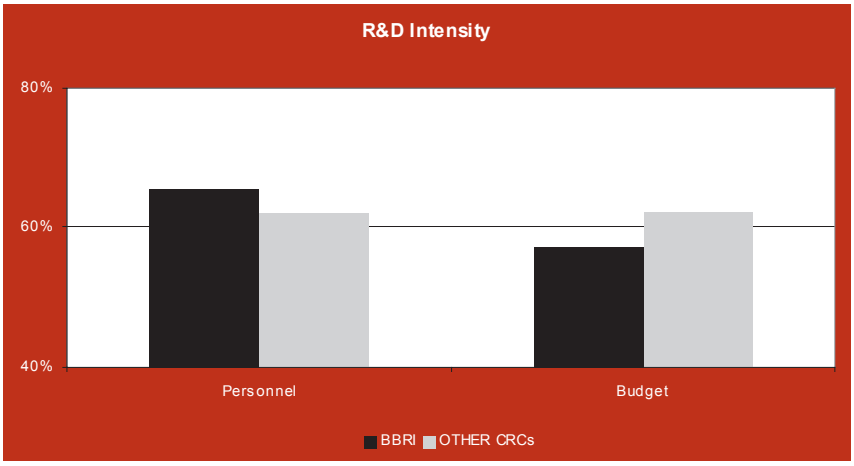
About 25 people are directly involved in technology transfer through technological guidance. These technological advisors stimulate innovation and help members to benefit from technological progress.

4.6.2 R&D activities

4.6.2.1 R&D intensity

The total R&D budget is 15 million Euro. This is equal to about 57% of the total budget of the collective research centre. Of the 207 FTEs that were employed in 2007, 136 were involved in R&D, equivalent to an R&D intensity at the human resources level of 66%.

Figure 18:
Comparison of BBRI's R&D intensity and the other collective research centres (2007)

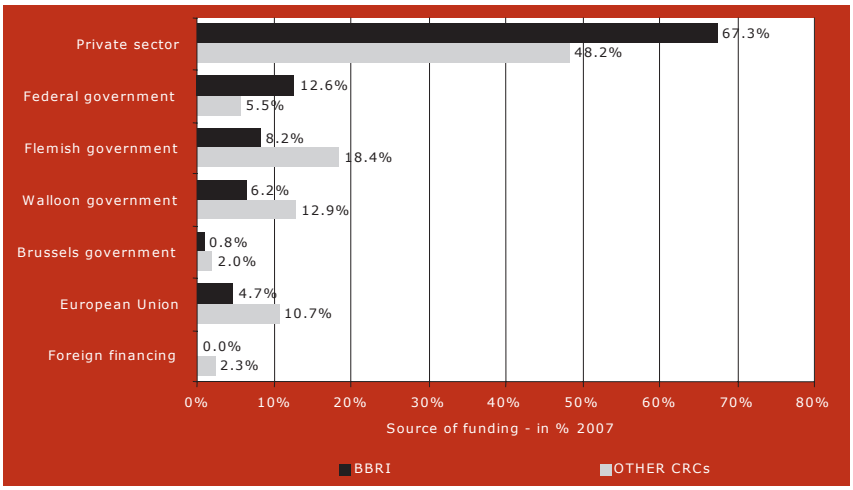


Source: BBRI - 2007

4.6.2.2 Sources of finance for R&D

The majority of R&D funds is provided by the private sector (67.3%). The rest is provided by the European Union (4.7%), the Walloon government (6.2%), the Flemish government (8.2%), the Brussels government (0.8%) and the federal government (12.6%).

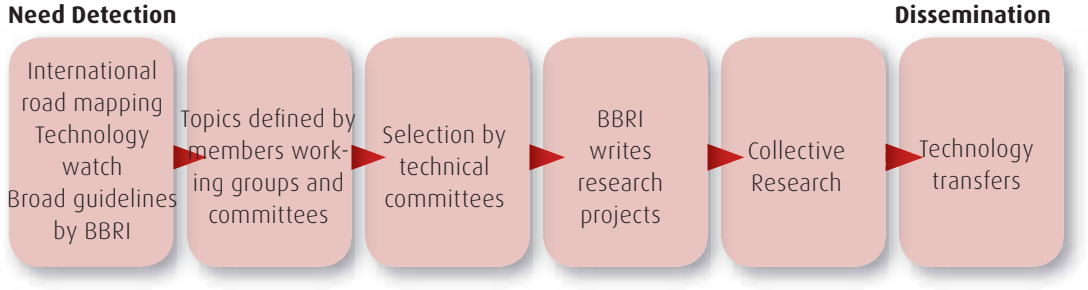
Figure 19:
Overview of R&D resources at BBRI and the other collective research centres (2007)



Source: BBRI - 2007

4.6.3 Technology transfer model

4.6.3.1 Collective research: model and measures



Collective research in the Belgian building industry is a mix of top-down and bottom-up approaches. Within the framework of EU cooperation, BBRI is actively involved in the prospective effort for anticipating the future of the building industry in Europe. A report with broad guidelines was released a couple of years ago ("2030 vision"). These broad guidelines – even if they cannot be imposed – provide landmarks for collective research projects.

Within these broad guidelines, collective research is mainly initiated bottom-up. There are several technical committees, by professions (vertical committees) or across professions (horizontal committees). These committees are composed of experts from diverse origins (BBRI and members, but also complementary expertise provided by experts, academics or public authorities). People in these committees make suggestions and select new collective research projects. Afterwards, they supervise the progress of the research project (on average, twice a year) under-

taken by BBRI. Parallel to this, a follow-up committee is set up for each research project. It is in charge of operational management of the research project (on average, one meeting every 3 months).

Another key source of information is the department of information and technical assistance. A group of people provide answers to about 27,000 questions every year regarding technical problems on site, and all interventions are entered in a database. In this way, it is possible to detect recurrent concerns and upcoming new issues in the industry which require a response.

The centre runs 90 to 100 collective research projects per year, involving on average 3 parties.

4.6.3.2 Contract research

The BBRI manages a large number of research contracts with commercial parties. In 2007, 48 contracts > Đ 5,000 were run (for a total of 2.64 million Euro) and 1500 smaller contracts (mainly for testing) for 2.3 million Euro. These contracts are support services for members when they request specific tests, technical accreditations or contract services with public institutions. These research contracts are complementary to direct assistance to members, covered by the membership fees.

4.6.3.3 Patents, licensing and spin-offs

The mission of BBRI is to disseminate information/knowledge to its members. There are no patents or licensing contracts.

In its statutes, the BBRI explicitly mentions the possibility of launching spin-offs. The main purpose of these spin-off initiatives is to boost the commercialisation of research outcomes. So far, the BBRI has been involved in the following initiatives:

- S.A. Ecopla (partner: OVAM) : production of degradable ground covers ;
- Asbl BCDI (partners: Sirris, Electrabel) : Belgian centre for domotics; and
- immotics (for business users)
- Asbl BCQS (partner: SECO) : information and advice to help members and related parties implement management tools (quality, safety, environment) ;
- Asbl Centrum Duurzaam Bouwen (partners: Heusden-Zolder, OVAM): information centre for sustainable building;
- SA Cobomedia (partner: BCDI) : information centre disseminating scientific, technical and administrative information on building;.
- SA Cobonet (partner: Confédération de la Construction) : website of the building industry / site portal de la construction sur le réseau internet
- Asbl CiWaCo (partner: Conf. Constr. Wallonne) : Walloon innovation centre for the building industry;
- Giei INIVE : Association of European centres to collect and diffuse knowledge on technology for buildings;
- Giei EUROKOBRA : Association of European centres to develop databanks on thermic bridges;

- Giei ENBRI-Development : Association of European centres having the mission to support business activities of members, in particular in the field of research and innovation ;
- Asbl Recywall : (partnership with 7 other research centres): recycling of solid waste.

4.7 Belgian Institute for Wood Technology – CTIB-TCHN

The CTIB-TCHN was established in 1947 and employed 18 FTEs in 2007. It was set up in order to provide technical and scientific support to the wood and, recently, furniture industry. Membership is compulsory (De Groote Centre), but it is not known exactly how many members the centre has, since the CTIB-TCHN receives it funds from the "fonds van bestaanszekerheid" (social security fund) that collects contributions from members. In 2006, the sector had 17,500 companies. Many of them are small and very small companies, and so far, about 700 companies have worked together with the centre.

The centre is primarily involved in the following activities:
- advice to industry;
- product certification, which is charged to the client at market price; and
- collective or bilateral research.

Research was one of the first activities of the centre and remains one of its most important activities. It is this research that helps the centre to maintain and develop useful information for the firms in the sector.

4.7.1 Knowledge transfer activities

The main activities at this level are advice to the industry and product certification. The centre estimated that about 11 FTEs are involved in knowledge transfer activities.

Advice to industry includes helping members with specific problems, carrying out of tests and giving advice on new product development, standardisation activities (representing the Belgian industry in European committees and disseminating standards to the industry) and keeping the industry informed on the current state of the art through articles and the organisation of seminars. Most of the advice to industry is short-term advice, whereas longer-term advice is offered as small-scale, in-depth technological consultancy (GTA).

A second activity is product certification. The centre certifies all products based on wood, both in the furniture industry and woodworking. The main issues that are taken into account are quality, safety, environment and regulation.

Among other methods, the centre disseminates information through the quarterly magazines, of which "Houtnieuws/Courrier du Bois" are examples, in which the centre prints technical articles. In addition, the centre publishes the monthly newsletter "CTIB-TCHN News".

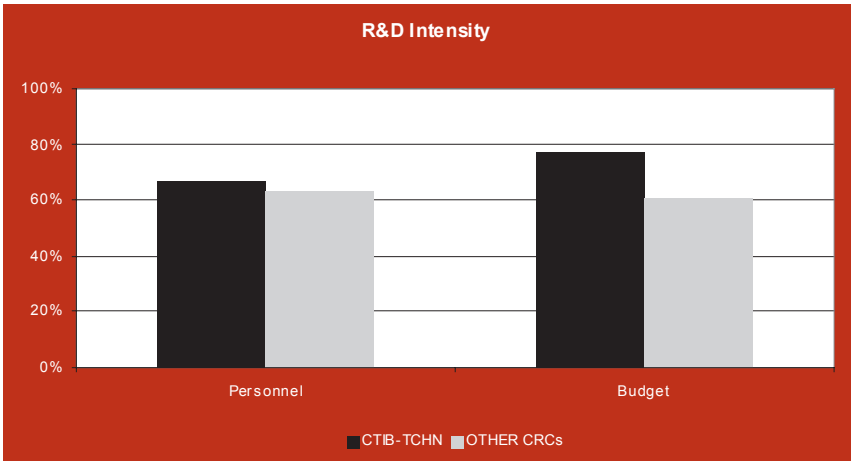
The centre has two technology advisors, one financed by IWT and one financed by DGTRE. They organise seminars and training courses, mainly based on questions coming from the industry.

4.7.2 R&D activities

4.7.2.1 R&D intensity

In 2007, 12 of the 18 FTEs were employed in R&D. Total R&D expenses amounted to 1.4 million Euro. Most of the resources (67% of personnel and 78% of the expenses) were dedicated to R&D activities.

Figure 20:
Comparison of CTIB-TCHN R&D intensity and the other collective research centres (2007)

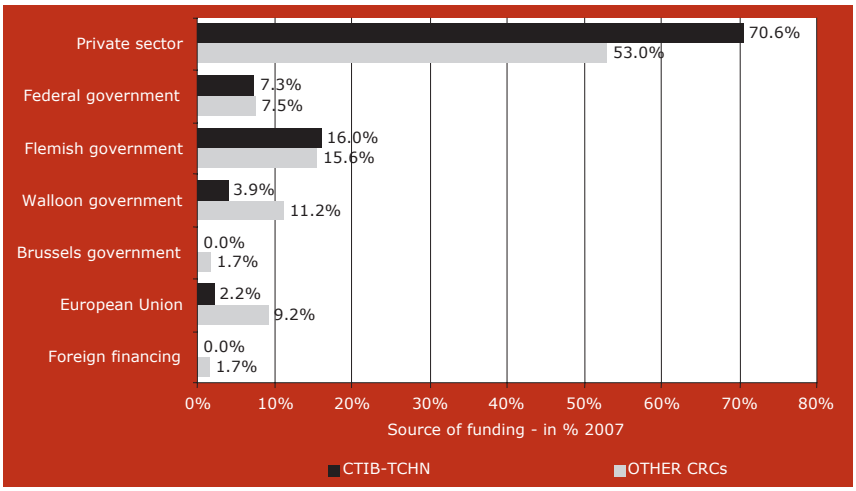


Source: CTIB – TCHN - 2007

4.7.2.2 Sources of finance for R&D

The majority of R&D sources are provided by the private sector (70.6%), and the rest comes from the federal government (7.3%), the European Union (2.2%), the Flemish government (16.0%) and the Walloon government (3.9%).

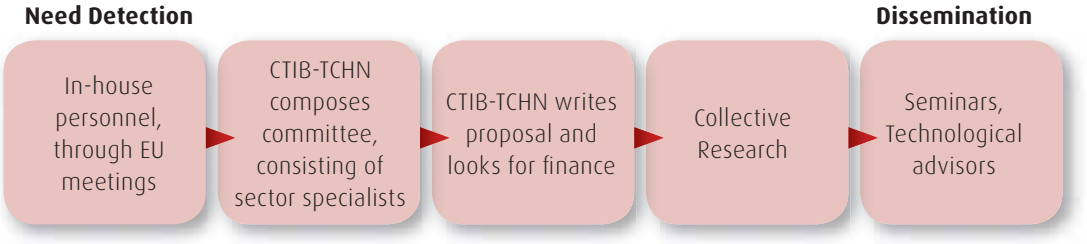
Figure 21:
Overview of R&D resources at CTIB-TCHN and the other collective research centres (2007)



Source: CTIB – TCHN - 2007

4.7.3 Technology transfer model

4.7.3.1 Collective research: model and measures



Collective research is primarily initiated by the CTIB-TCHN's own people, who get their ideas largely through contacts in the sector at the European level (especially meetings). For each new research project a committee is composed consisting of people from the industry. The collective research centre looks for financing from e.g. IWT or DGTRE and finances the other 50% itself. At the end of the research, the results are disseminated through seminars, or by the technology advisors.

The centre runs about five of these collective research projects a year.

4.7.3.2 Contract research

It is difficult to quantify the amount of contract research (some are very small, some more important). The centre implements about one of these contract research requests per week. The results are kept confidential for the party applying for the research. The objective of much of this research is to provide innovation or product certification.

4.7.3.3 Patents, licensing and spin-offs

The centre does not hold any patents or have any spin-offs.

4.8 Diamond Research – WTOCD

The WTOCD (Scientific and Technical Research Centre for Diamond) was established in 1977. The main objective of the centre is to give scientific and technological assistance to the diamond gemstone sector in Belgium.

The research activities are concentrated in Lier, and primarily concern applied research. In addition, the WTOCD is involved in services to the diamond sector. The WTOCD is a De Groote Centre and all companies with more than five employees are members of the WTOCD. Three parties provide assistance to the diamond industry in Belgium: AWDC (Antwerp World Diamond Centre), Hoge Raad voor Diamant (HRD) Antwerp NV and WTOCD. Antwerp World Diamond Centre (AWDC) is the official representative of the Belgian diamond sector. HRD Antwerp nv is a commercial subsidiary of AWDC and is active in the field of certification of polished diamonds, education and diamond equipment. The WTOCD is mainly involved in applied research and in some cases the outputs of this research are commercialised by HRD Antwerp NV. The WTOCD is to a large extent financed by the diamond sector through AWDC.

The centre currently employs 15 people, who are mainly involved in R&D activities and have an engineering or IT background. A minority of the staff is involved in administration. A limited number of resources are dedicated to knowledge transfer activities.

4.8.1 Knowledge transfer activities

The activities of the WTOCD comprise three types of R&D related activities, including knowledge transfer activities. These are: technological services, patent services and testing. The technological services are aimed at all Flanders-based diamond companies and offer solutions to technological problems and cover innovative aspects of a technology. These services include short-term advice, the organisation of seminars, project work (more extensive studies) and small-scale, in-depth technological consultancy (GTA). The second service, patent service, include patent searches and sharing knowledge on "state of the art" technology and designs, IP strategy advice and initial application drafting. The third service includes testing and the provision of a report on the properties of a polished stone.

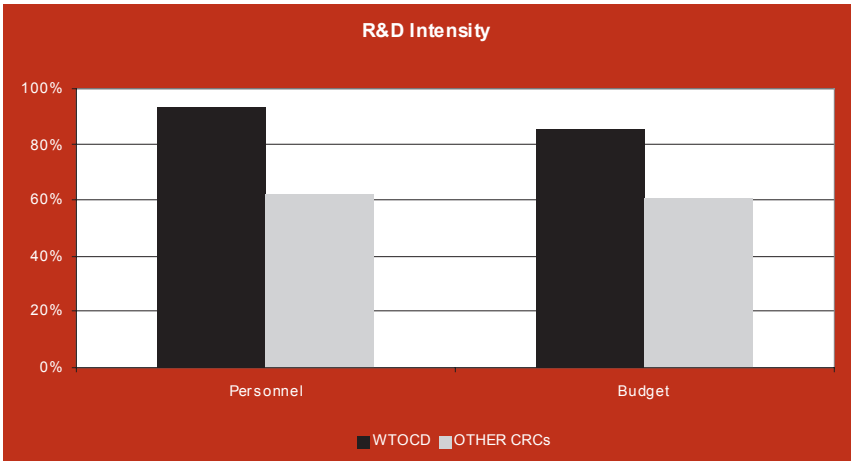
One advisor (TAD) is involved in technological advice and counselling. This person receives questions from members, which may take between a quarter of an hour up to five days to answer. The members do not pay for small questions. About 150 questions are handled on a annual basis. The centre estimated that the number of people engaged in knowledge transfer activities amounts to 1 FTE.

4.8.2 R&D activities

4.8.2.1 R&D intensity

WTOCD employed 14 FTEs in 2007, of whom 13 were involved in R&D. The total expenses for R&D amounted to 1.2 million Euro in 2005. About 93% of the resources for personnel at the WTOCD are dedicated to R&D. R&D expenses account for about 86% of the total expenses of the WTOCD.

Figure 22:
Comparison of WTOCD's R&D intensity and the other collective research centres (2007)

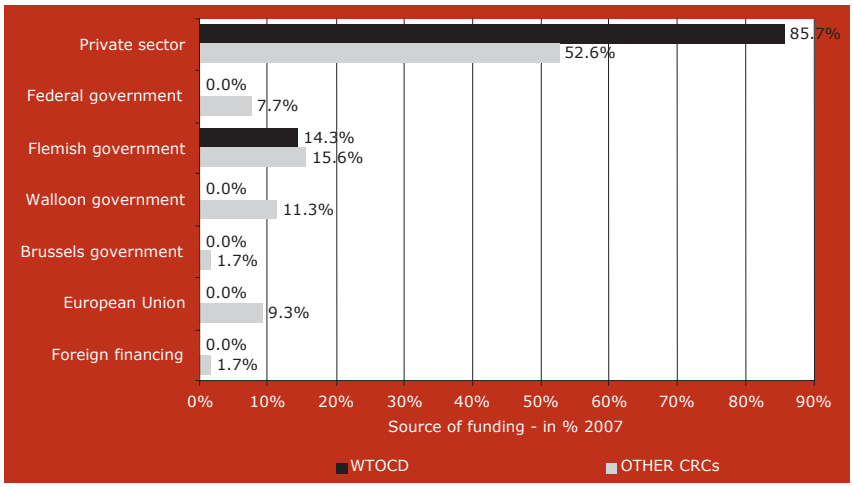


Source: WTOCD - 2007

4.8.2.2 Sources of finance for R&D

The following figure provides an overview of the financial resources for R&D over 2007. Most of the R&D financing comes from the private sector (85.7%). The Flemish government accounts for the remaining 14.3% of the R&D budget.

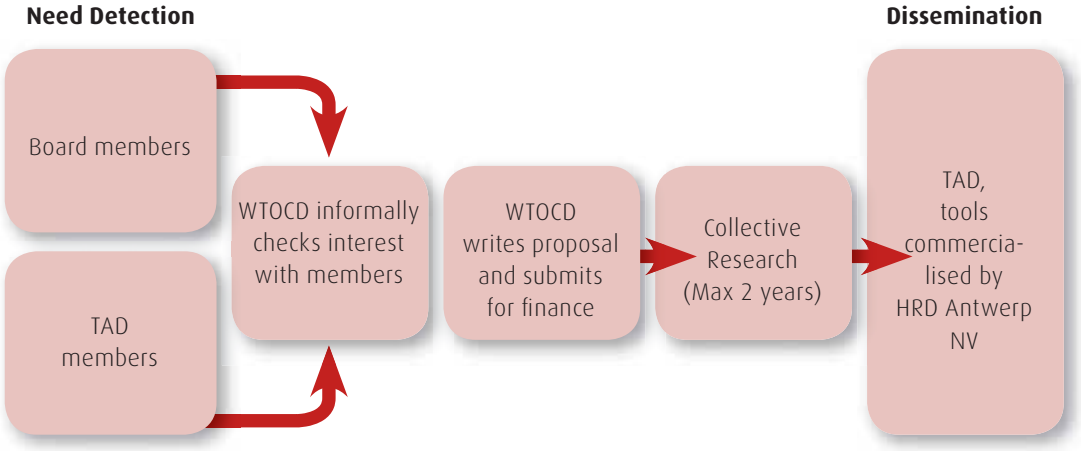
Figure 23:
Overview of R&D resources at WTOCD and the other collective research centres (2007)



Source: WTOCD - 2007

4.8.3 Technology transfer model

4.8.3.1 Collective research: model and measures



The WTOCD is extensively involved in collective research. 15% of this research is financed by government, the rest is financed by the diamond sector, and mainly the "Hoge Raad voor Diamant" (HRD). The initiative for performing collective research comes from (i) board members who are active in the sector and have a specific question, (ii) technological guidance, TAD, through company visits, or by accessing information about a new technology, and (iii) members that are confronted with specific problems. If a new question is raised or a new topic suggested, it is informally tested with the members. If the members are interested, the WTOCD

writes a proposal and requests funding from the Flemish intermediary organisation entrusted with allocating grants, the IWT. No members are involved, and the collective research centre carries out the research on its own. This is due to the low affinity and interest from members in technology, especially in an early stage of development. The WTOCD does virtually no work together with universities during collective research, given that the questions within the diamond industry are very specific and no university departments are working on this type of research. Given that the results of the R&D often are too difficult for the members to interpret, the WTOCD often translates the research into concrete applications. In the case of tool development, it is the HRD Antwerp NV which commercialises the results. The results are usually equipment or techniques. The research normally takes about 2 years, after which a prototype is developed.

The centre runs about nine collective research projects per year, but not all of them are extensive types of projects. No members are involved and the WTOCD carries out the research on its own.

4.8.3.2 Contract research

The WTOCD does virtually no contract research on behalf of its members. This is due to the fact that the affinity by the diamond industry for technology is very low, and requests for contract research are hardly ever raised. Moreover, the research would be very specific and probably too costly for any member to carry on its own.

4.8.3.3 Patents, licensing and spin-offs

The sector faces severe competition from China and Thailand. It has therefore become increasingly important to protect the technology developed within the WTOCD. Patents have been applied for in about five cases. The main reasons for patenting are: 1) PR, 2) commercialisation of the research, even though not done by the WTOCD itself, and 3) protection of IP, even though the tools and equipment requires very specific knowledge and are therefore difficult to copy or reverse-engineer. No licenses on these patents have been given, since the commercialisation of intellectual property in itself is not the major objective, but rather the development of useful tools for the industry based on R&D.

4.9 Coating Research Institute – CoRI

The CoRI (Coating Research Institute) is a private collective research centre which was established in 1957. It was created at the initiative of more than 50 companies active in Belgium in the coatings industry. It is run as a De Groote Centre, even though formally it is not one, hence it is classified as a 'free' centre: membership is voluntary. It has about 40 members. Its mission is to contribute to the development of scientific and technological knowledge in the coating industry.

Full members are coatings manufacturers with production in Belgium (50%). The members of the board of directors are elected from amongst the full members. The general policy of CoRI, and in particular its research programmes, is defined by the full members. They are provided with the results of the collective

research and receive the annual report of activities. They have access at a reduced rate to the analysis, testing, technological guidance, library and technical information services, as well as the seminars and courses organised by CoRI.

CoRI also has associate members. These are coating manufacturers without production in Belgium, industrial users, applicators, raw materials suppliers. Associate members are provided with the collective research results and receive the report of activities.

4.9.1 Knowledge transfer activities

The activities of the research centre are defined along three lines: research projects (50% of total turnover) are the core activities of the centre. But it also contributes to technology advice and research projects (more than 50%). The aim of the technology advice is to stimulate innovation, especially in SMEs, and to provide technical assistance to companies in various areas such as raw materials, coating formulations, properties and applications, painting systems and "environmentally friendly" paints. The centre seeks to cooperate with SMEs on short-term technical projects, transfer the results of research and development, assist companies with their quality and control procedures, and collect and distribute information on safety, health and the environment.

When it comes to testing, CoRI has state-of-the-art equipment for chemical and physical testing on liquid and applied paints at its disposal. CoRI can execute simple technological tests in accordance with international standards (ISO, ASTM), studies using sophisticated scientific methods, and all chemical and physical analyses on wet paints, paint films, inks and raw materials.

CoRI is accredited according to ISO 17025 for several tests and for the determination of the amount of volatile organic compounds (VOCs) in paints.

CoRI also organises training courses on various subjects on a regular basis. Subjects vary from corrosion, colour-matching, mechanical properties, stresses and thermal analysis to rheology or adherence. It also organises seminars.

CoRI is the editor of an academic journal: Progress in Organic Coatings, published by Elsevier.

The centre estimated that about five FTEs are engaged in knowledge transfer activities.

Nobody assumes the formal role of technology transfer officer (TTO), but there is one manager who is responsible for guidance projects, and this person's function is close to that of a TTO. Four persons are working in the technological guidance activity (TAD), where they help to develop innovations in companies.

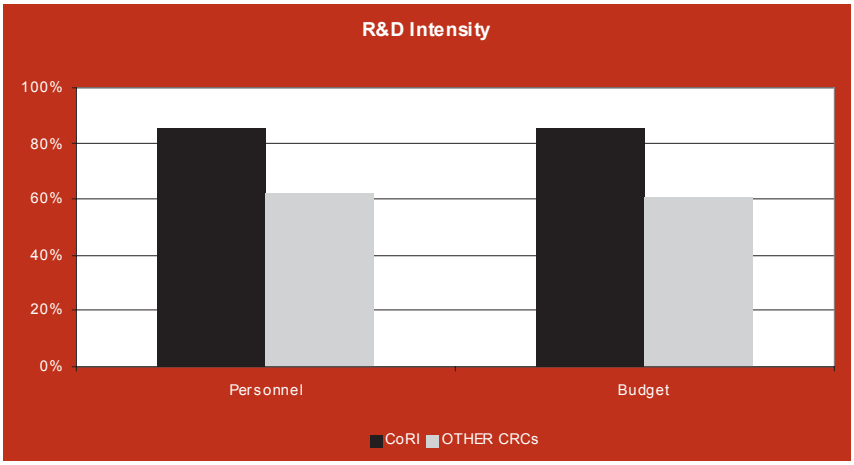
Other connections and exchanges with industry help transfer technology (guidance schemes are sometimes regarded as "TTO vertical" and limit some information exchanges).

4.9.2 R&D activities

4.9.2.1 R&D intensity

In 2007 CoRI employed 20 FTEs, 17 of whom were involved in R&D activities. A total amount of about 1,200,000 euros was spent on R&D in 2007.

Figure 24:
Comparison of CoRI's R&D intensity and the other collective research centres (2007)

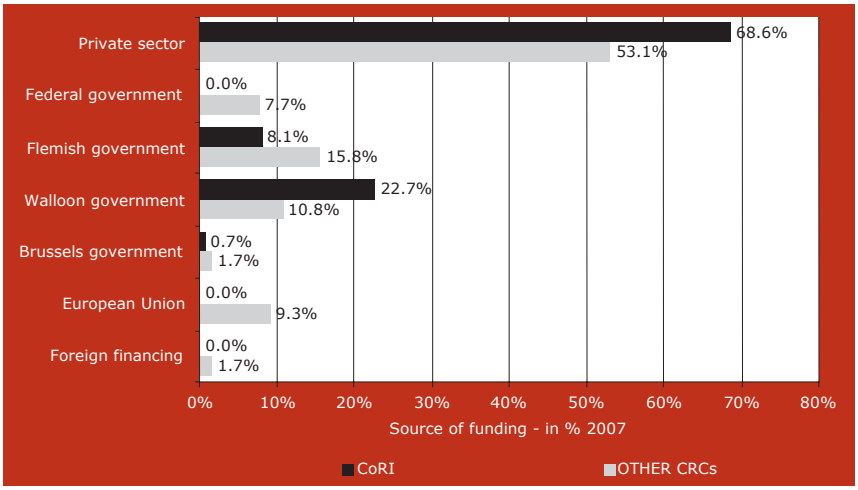


Source: CoRI - 2007

4.9.2.2 Sources of finance for R&D

The 1.2 million Euro of R&D expenses is mainly financed by the private sector (68.6%). Other financial resources are provided by the Flemish government (8.1%), the Walloon government (23%) and the Brussels region (0.7%).

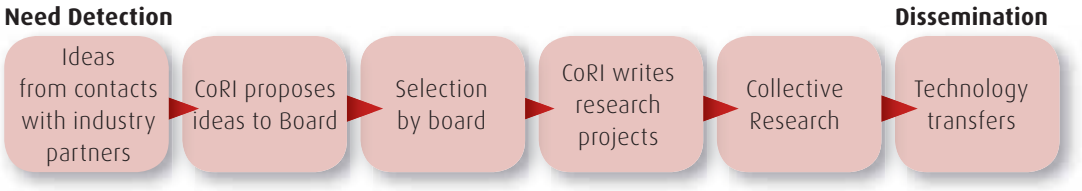
Figure 25:
Overview of R&D resources at the CoRI and the other collective research centres (2007)



Source: CoRI - 2007

4.9.3 Technology transfer model

4.9.3.1 Collective research: model and measures



Collective research is regarded as key for CoRI. It is through this type of research that CoRI builds up its expertise in the field. This expertise is directly used by the members or disseminated through private contracts. The level of research in collective projects is more generic and is intended to fill the needs of several members (a condition sine qua non for acceptance). CoRI jointly runs several collective research projects in order to fulfil as much as possible the expectations of all of the members.

Research topics are officially selected by the Board of Administrators, but they actually come from upstream contacts with the industry and are then adopted by the Board. In general, research issues are detected by staff members of CoRI – in particular people involved in research or guidance. The issues are discussed in house and with industrial partners. They then turn these issues into research proposals to be submitted to the Board. In this way, the link between research and business is secured.

New ideas can also come from other sources: sometimes researchers propose new projects. In general, if the Board of Administrators is convinced, a one-

year research project is undertaken. There are also research projects involving multiple research centres. They are generally supported by public authorities. In that case, the research topic can come from another research centre, just as well as from CoRI itself.

Currently, the centre is running about five collective research projects, involving on average ten partners.

4.9.3.2 Contract research

Currently, the centre is running more than ten bilateral research projects (with members or non-members) and four contracts with universities. CoRI gets these contracts mainly because of its reputation and expertise in the field of organic coatings. For that reason, collective research and private research are joint at CoRI.

4.9.3.3 Patents, licensing and spin-offs

In the case of collective research or contracts, members or corporate partners receive the intellectual property rights on inventions. These are generally not transformed into patents, which are not considered to be very useful because the technology is not really imitable. CoRI has one patent and some licensing revenues from one invention: the CoRI Stressmeter is an apparatus for the study of stresses in organic coatings, produced under license by Elcometer.

4.10 Centre for Research in Metallurgy – CRM

The CRM (Centre for Research in Metallurgy) is a so-called 'free' collective research centre which was established in 1948. The centre has two active members (ArcelorMittal and Corus), and their subsidiaries in the iron and steel industry. In addition, it has 30 associate members which are (i) metallurgical companies; (ii) firms providing the metallurgical industry with raw materials, equipment, fluids or services; or (iii) firms transforming metallurgical products. Considering the high concentration of the steel industry, the CRM has deliberately diversified the research partnerships upstream and downstream and progressively reduced its dependency on the steel companies. In 2000, 95% of R&D was performed with steel members. This is expected to be only 70% for 2007. Each member pays a fee, on average between 5,000 and 10,000 Euro.

4.10.1 Knowledge transfer activities

The CRM has been entrusted with the mission of developing new products, new processes for producing them, and new surface qualities and functionalities. The CRM is involved in a large-scale project striving to reduce CO2 emissions in the steel industry. This project has been submitted with a request for funding in the European Commission's Sixth Framework Research Programme.

The main activities currently consist of:

- R&D development (80% of revenues);
- advice to the sector (5%); and
- technical assistance (6-7%).

The CRM researchers regularly take part in international conferences. The CRM is managed as a profit centre, even if it is a non-profit organisation. The organisation of CRM is divided between activity and resource departments. Activity departments are focused on: (i) Product Technology; (ii) Surface Engineering; (iii) Sustainable Production; (iv) Advanced Techniques; and (v) Metal Application. The resource departments are dedicated to (i) Metal Science; and (ii) Engineering.

One person is officially TTO. Five persons work with him to advise companies ("guidance"). Moreover, all of the department heads are responsible for commercialising research outputs and thus are directly involved in technology transfer. The centre estimated that eight FTEs are involved in knowledge transfer activities.

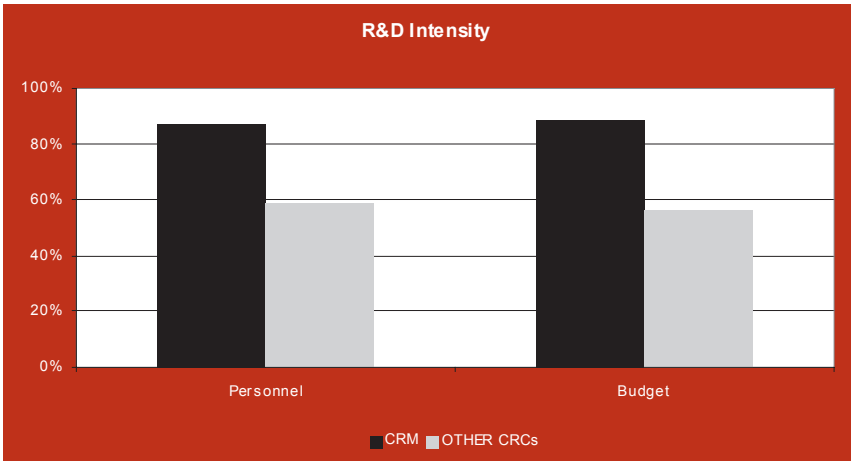
Even if the turnover of the CRM is mainly sourced in R&D developments, the objective of the centre is to be recognised in the markets as "a seller of ideas and skills". This implies closely monitoring the implementation of innovations inside a company (in order to ensure a good satisfaction rate). That is the reason why team managers are active in both research development and technology guidance.

4.10.2 R&D activities

4.10.2.1 R&D intensity

The centre employed 128 people in 2007, of whom 112 active in R&D projects. The majority of the budget of 12.2 million Euro was spent on R&D activities in 2007. The centre has an R&D intensity of 88% for personnel and 89% for budget, which seems high in comparison to the average collective research centre.

Figure 26:
Comparison of CRM's R&D intensity and the other collective research centres (2007)

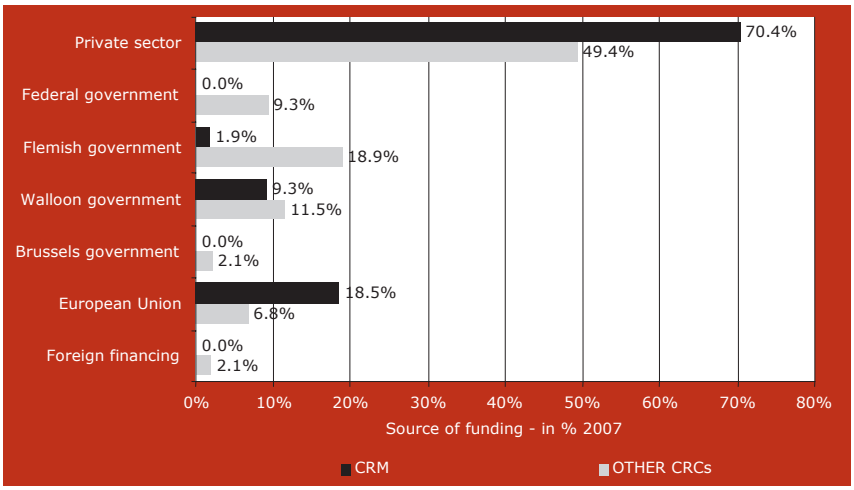


Source: CRM - 2007

4.10.2.2 Sources of finance for R&D

Of the 12.2 million Euro that was spent in 2007, 70.4% was provided by the private sector (own revenue from membership fees, revenues from companies for research, services, testing, etc.). About 18.5% of the funds were provided by the European Union. The remainder came from the Walloon government (9.3%) and the Flemish government (1.9%).

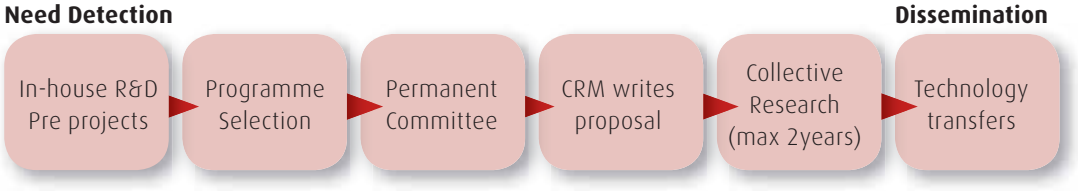
Figure 27:
Overview of R&D resources at CRM and the other collective research centres (2007)



Source: CRM - 2007

4.10.3 Technology transfer model

4.10.3.1 Collective research: model and measures



Each department must achieve a target in terms of turnover. A list of potential customers (companies) is regularly updated. They are ranked by priority criteria.

In general, experts in the field test new ideas for R&D development with potentially interested companies. For this purpose, it is important to be able to maintain a stream of exploratory research projects ("pre-projects") financed by own funds (not private financing). These research projects last between 6 months and one year.

In most cases (3/4ths), the research is initiated top-down. Less often (1/4th of all cases) the initiative comes from the members themselves.

Today, the CRM is running about 60 collective research projects involving more than two partners (and financed by membership fees).

4.10.3.2 Contract research

Today, the CRM runs about 25 bilateral research projects (with members or non-members)

4.10.3.3 Patents, licensing and spin-offs

The CRM has an intense patenting activity. The CRM has developed and is currently running a portfolio of 357 patents, a large number compared to the other collective research centres. This effort is directly in line with the global strategy of the CRM. People from the CRM describe the future of the centre as "being a seller of ideas and outcomes". Even if the CRM is a non-profit organisation, it is moving towards a managerial mode close to that of a profit centre. This evolution involves strict rules on ownership and cost control. In particular, in many cases the CRM keeps the ownership of in-house inventions through patenting when research projects are self-financed. Sometimes this leads to licensing selling. So far, the revenues from the licensing activities have remained modest (royalties of EUR 0.4M for total revenues of EUR 12.5M), but the share of licensing revenues is expected to increase in the coming years.

This requires intellectual property protection expenditures (around 1% of revenues). So far there are about ten licensing contracts.

4.11 Belgian Welding Institute - BWI

The BWI (Belgian Welding Institute (BWI) - Belgisch Instituut voor Lastechniek (BIL) or Institut Belge de la Soudure (IBS)) is headquartered in Brussels and has its research centre in Gent, where it is attached to the University of Gent. The BWI was established in 1942 by Professor Soete, the research centre was established in 1972. BWI is currently setting up another research centre in Liège. The BWI uses the laboratory facilities of the university for research, development, testing and failure investigation as well as demonstrations and training in welding and joining technology. The board of the institute consists to a large extent of industry people.

The BWI has 350 members. Given that it is not a De Groote Centre, membership is not compulsory.

4.11.1 Knowledge transfer activities

Besides R&D activities, which form the bulk of the activities, activities include:

- consultancy and technology transfer;
- testing and failure investigations;
- standardisation and certification; and
- education and training.

For the consultancy services, the institute has two technological advisors, who are 80% financed by the Flemish government (IWT). These advisors provide free advice to members on condition that no additional research is necessary.

Five to six hundered questions per year come from industry, and are handled by the two TAD advisors. These questions include small-scale in-depth technological consultancy (GTA), innovation audits and standardisation antennas. Most of the questions come from SMEs. About 50% of the questions come from SIRRIS members. Study days are organised in order to transfer technology and knowledge.

The BWI has its own section in the magazine for the metallurgic industry, MeTallerie. In addition, the centre has a standardisation antenna and represents the centre in committees on standardisation.

4.11.2 R&D activities

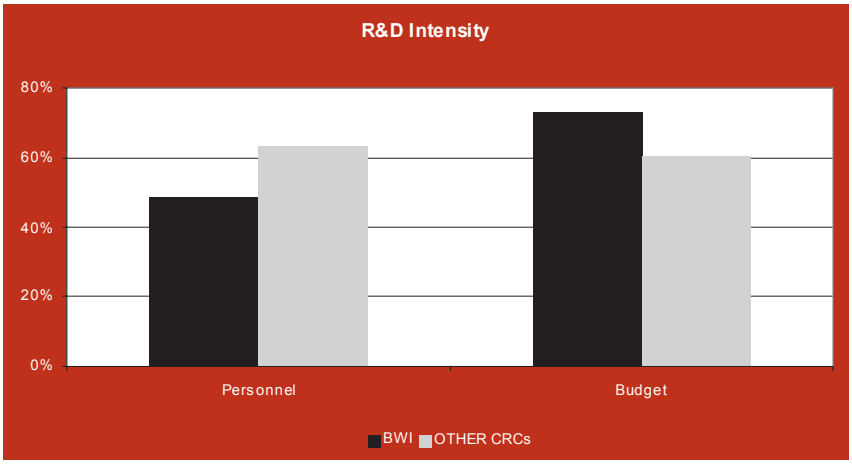
With respect to R&D, BWI is involved in the following activities:

- Collective research, uniting small and large companies (50% financed by public money);
- EU projects: collaboration between BWI, research centres and foreign companies;
- Contract research on behalf of the industry;
- Transfer of knowledge to the industry via the journal 'MeTallerie" and through workshops and seminars.

4.11.2.1 R&D intensity

The BWI employed 19 FTEs in 2007, of whom 9 were involved in R&D. The total expenses for R&D amounted to 1.5 million Euro in the same year. This leads to an R&D intensity of 47% in personnel and 71% in budget.

Figure 28:
Comparison of BWI's R&D intensity and the other collective research centres (2007)

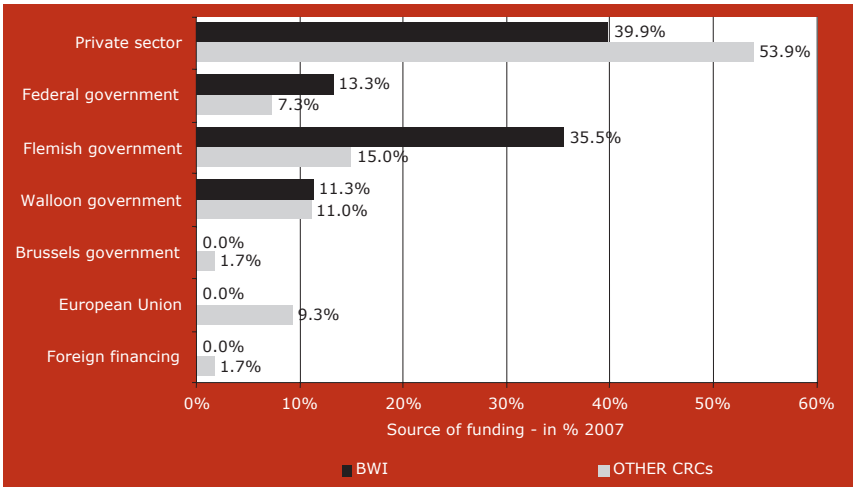


Source: CFS/STAT, 2008 – Calculations Belgian Science Policy.

4.11.2.2 Sources of finance for R&D

The following figure provides an overview of the financial resources for R&D over 2007. Important sources of finance are private companies (membership fees and payments for specific R&D questions; 39.9%). Other important financing sources are the Flemish government (35.5%), the federal government (13.3%) and the Walloon government (11.3%).

Figure 29:
Overview of R&D resources at BWI and the other collective research centres (2007)

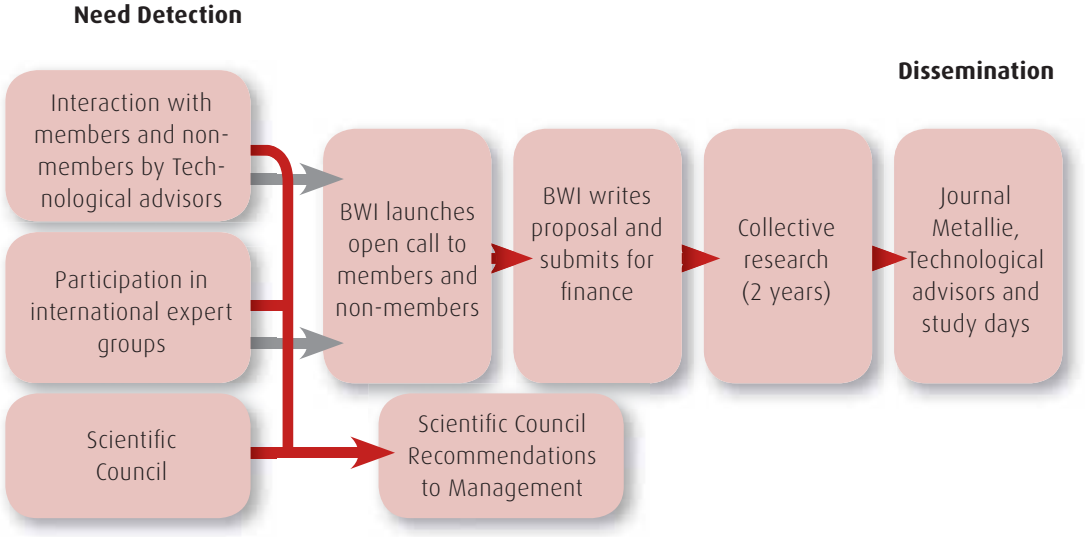


Source: CFS/STAT, 2008 – Calculations Belgian Science Policy.

4.11.3 Technology transfer model

4.11.3.1 Collective research: model and measures

The following figure provides an overview of how collective research at the research centre originates, and how the results are disseminated towards members and non-members.



Needs for R&D are detected by the technology advisors who are in touch on a daily basis with members and non-members. In addition, new trends are detected in international expert groups. Based on these two types of input, it is decided to launch collective research projects. An open call is launched towards members and non-members, and the BWI writes up the proposal and submits it to the government for finance (on average, 65% of a project is financed by government). After the collective research, the results are disseminated through its own journal and study days. The interview indicated that it is not easy for the BWI to assess the extent to which research results are used in practice. Only TAD advisors can observe during their visits with members and non-members whether the results are being used in practice. Moreover, it often takes a long time before the results of R&D are translated into a commercial product or process. The BWI works in close cooperation with SIRRIS, which transfers a part of its membership fees to BWI for the performance of welding research. As of 2009, companies which become a SIRRIS member will automatically become a BWI member as well.

The results of the collective research are owned by the consortium, which makes patenting very difficult or impossible.

On average the BWI launches four projects a year, involving 15 to 20 companies per project and on average about two other research institutes. The BWI has about 10 current projects with average lengths varying between two and three years. Since it often takes a while to get a project up and running, BWI prefers longer projects from three years and up.

4.11.3.2 Contract research

Contract research is carried out on behalf of the company involved. This type of research is often financed through IWT-SME innovation studies. In this way, often up to 100% of the costs of the project are publicly funded. The results are owned by the company. BWI is only aware of one case where the research resulted in a patent.

On average, 100 projects a year are carried out, of which about 90% with companies (the smaller projects) and 10% with public research organisations (the larger projects).

4.11.3.3 Patents, licensing and spin-offs

The BWI does not hold any patents. Most of the research is carried out during collective research projects, with the results owned by the consortium. For contract research projects, the results are owned by the company. Therefore there are no licensing activities or spin-off activities at the centre.

4.12 Belgian Packaging Institute - BPI

The BPI (Belgian Packaging Institute) – BVI (Belgisch Verpakkingsinstituut) – IBE (l'Institut Belge de l'Emballage) was established in 1954 as a non-profit organisation. Following a renewed legislation on non-profit organisations, it was split up into two new entities in 2000: a non-profit organisation employing 3 people and a company with limited liability employing 9 people.

4.12.1 Knowledge transfer activities

The non-profit organisation is involved in the organisation of study days and seminars and passing information on to its members. These members (about 200) are not obliged to become members, since the centre is not a De Groote Centre, and consists of federations (e.g. Agoria), producers of packaging and users of packaging. The Ltd is involved in commercial activities, mainly consisting of testing certification. The demand for such testing has increased since packaging has become an important topic in the ecological debate. This has given rise to the establishment of new EU guidelines, requiring certification of testing. At present, the BPI performs certification for the following types of activities/packaging:

- flexible intermediate bulk containers;
- material and packaging testing;
- dangerous goods; and
- consumer food packaging.

Other activities of the BPI include previews and feasibility studies, identification and preparation of projects and programmes, organisation of education and training, creation and/or reactivation of packaging labs and services and technical audits and evaluations. The centre has an infocentre, providing 50 specialised magazines, furnishing information on legislation and standardisation and address listings.

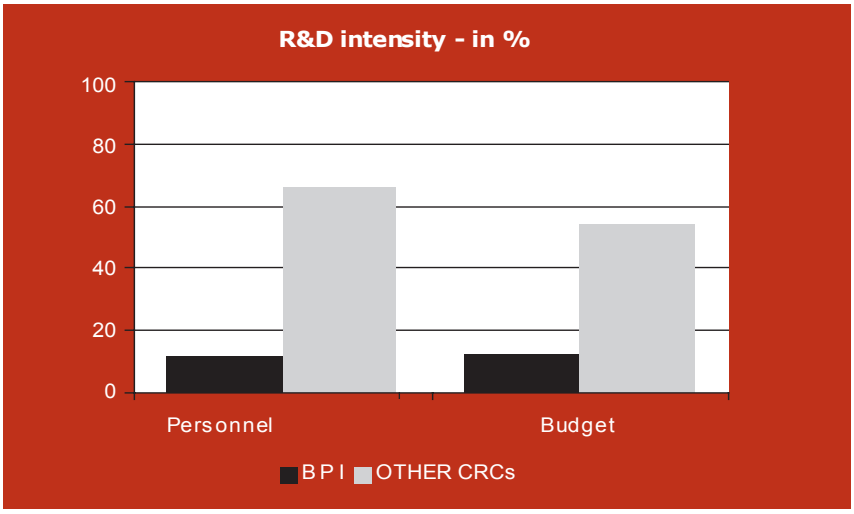
Even though R&D is considered important by the BPI, it has devoted little time and resources to R&D in recent years. This is mainly due to the overload of work generated within the Ltd caused by the changing legislation, at both the national and international levels. No collective or contract research is carried out, as the first priority of the members and clients of the centre seems to be the testing certification (packaging in itself cannot be certified by the collective research centre yet). No formal TAD is active within the centre. Because of its limited resources, the BPI is currently unable to actively initiate R&D projects.

4.12.2 R&D activities

4.12.2.1 R&D intensity

Since we do not have data on BPI available for 2006 and 2007, we analyse the last data provided by CFS/STAT concerning 2005. BPI employed 12 FTEs in 2005, 2 of whom were involved in R&D. The total expenses for R&D amounted to 0.12 million Euro in 2005. Even though these are the official figures, it is clear that the involvement of the centre in R&D is low.

Figure 30:
Comparison of BPI's R&D intensity and the other collective research centres (2005)



Source: CFS/STAT, 2006 – Calculations Belgian Science Policy.

The following figure provides an overview of the financial resources for R&D over 2005. The majority of R&D funding comes from private companies (68%), the federal government provides 9% of R&D budgets, the provinces another 9%, and foreign sources account for 14% of R&D funding. However, the total R&D budget is limited.

5
Cross-centre analysis with respect to R&D and knowledge transfer: mapping heterogeneity

In what follows we elaborate on a number of indicators for knowledge transfer activities that were collected from the collective research centres. First, we provide an overview of the information retrieved during the interviews, specifically the information on membership, involvement in collective and contract research and patenting. Second, we provide an analysis of the data collected using questionnaires which formed an integral part of the interview process.

5.1 Number of members

Table 9:
Overview of membership of the collective research centres

Collective research centre	Number of members	De Groote Centre? (Y/N)
Centexbel- *Textile*	900	Y
CRIC- *Cement*	3	Y
BCRC- *Ceramics*	50	Y
SIRRIS- *Technology*	2,500	Y
BRRC- *Road*	1,000	Y
BBRI- *Building*	74,000	Y
CTIB-TCHN- *Wood*	UNKNOWN	Y
WTOCD- *Diamond*	UNKNOWN	Y
CoRI- *Coating*	40	N
CRM- *Metallurgy*	32	N
BWI- *Welding*	350	N
BPI- *Packaging*	197	N

The table above shows that there is a wide variance in the number of members belonging to a collective research centre. This seems to be correlated to the size and nature of the industry. For instance, the CRIC has only 3 members since the industry is dominated by 3 large players, and hardly consists of SMEs. By contrast, collective research centres like Centexbel and BBRI have over 95% SMEs as members. Nor

do we find a significant correlation between the R&D budget and the number of members. Interestingly, 2 collective research centres (WTOCD and CTIB-TCHN) indicated that the number of members is unknown since they receive the member fees or their financing through other institutions.

5.2 Indicators for knowledge transfer activities: number of short-term technical questions answered

Table 10:
Overview of short-term technical questions per collective research centre

	Number of questions per year
Centexbel- *Textile*	
CRIC- *Cement*	
BCRC- *Ceramics*	470
SIRRIS- *Technology*	5,000
BRRC- *Road*	
BBRI- *Building*	27,000
CTIB-TCHN- *Wood*	
WTOCD- *Diamond*	150
CORI- *Coating*	500
CRM- *Metallurgy*	
BWI- *Welding*	500
BPI- *Packaging*	650

Even though not all centres could provide us with this information, it is clear that there is a lot of difference in the number of short-term technical questions that each collective research centre receives on an annual basis. This is most probably related to the industry, on the one hand, and the number of members on the other.

5.3 Indicators for knowledge transfer activities: number of FTEs in knowledge transfer and number of technological advisors

No official data exist on knowledge transfer activities. In what follows, we try to provide insight into the involvement in knowledge transfer by analysing the number of technological advisors and the number of FTEs in knowledge transfer, information which was provided by the collective research centres. Again, we find major differences in the number of people engaged in knowledge transfer activities, which seem to be highly related to collective research centre size.

Table 11:
Overview of number of technological advisors and FTEs in knowledge transfer per collective research centre

	Number of technological advisors (FTEs)	FTEs in knowledge transfer
Centexbel- *Textile*	8	35
CRIC- *Cement*	0	n/a
BCRC- *Ceramics*	n/a	n/a
SIRRIS- *Technology*	20	n/a
BRRC- *Road*	4	12
BBRI- *Building*	25	45
CTIB-TCHN- *Wood*	2	11
WTOCD- *Diamond*	1	1
CORI- *Coating*	2,85	5
CRM- *Metallurgy*	5	8
BWI- *Welding*	2	n/a
BPI- *Packaging*	0	n/a

5.4 Involvement in collective research

We assessed the involvement by the collective research centres in collective research by asking for the number of projects each centre engages in and the number of companies that are involved in the project.

Table 12:
Overview of involvement in collective research projects by collective research centres

	Number of projects per year
Centexbel- *Textile*	4
CRIC- *Cement*	6
BCRC- *Ceramics*	6
SIRRIS- *Technology*	20 to 30
BRRC- *Road*	20
BBRI- Building	40
CTIB-TCHN- *Wood*	5
WTOCD- *Diamond*	9
CoRI- *Coating*	5
CRM- *Metallurgy*	60
BWI- *Welding*	4 to 5
BPI- *Packaging*	0

The data reveals large differences between the CRCs in the number of projects they execute on a yearly basis. The centres have different methods of engaging in this type of research, however. For instance, the WTOCD is involved in collective

research projects, but mainly implements these projects itself, given that the members are not really interested in them. This indicates that there is a wide heterogeneity between CRCs: while some CRCs involve their members in collective research, others refer to "collective research" as research carried out within the CRC, but with a focus on being beneficial to all member firms, and therefore being "collective".

5.5 Involvement in contract research

Table 13:
Overview of involvement in contract research by collective research centres

	Number of projects per year
Centexbel- *Textile*	25 to 30
CRIC- *Cement*	10
BCRC- Ceramics	23
SIRRIS- *Technology*	500
BRRC- *Road*	1
BBRI- *Building*	40-50*
CTIB-TCHN- *Wood*	50
WTOCD- *Diamond*	0
CoRI- *Coating*	More than 10
CRM- *Metallurgy*	25
BWI- *Welding*	100
BPI- *Packaging*	0

*>€5,000

Again, we find large differences between collective research centres that may be related to the number of members. The more members the collective research centre has, the higher the involvement of the collective research centre in contract research. However, the R&D budget does correlate with the number of projects that are carried out. This may indicate that R&D budgets are to a large extent based on membership fees (that may be proportional to the size of the member) and payments for other services, such as advice and training. Here again, we should note that the interpretation of "contract research" may differ from one centre to another. For some centres, small questions for which a contract is drawn up or a payment received count as "contract research", whereas others count only the larger projects.

5.6 Patents

Table 14:
Overview of patent portfolio held by collective research centres

	Number of patents in portfolio
Centexbel- *Textile*	5
CRIC- *Cement*	0
BCRC- *Ceramics*	2
SIRRIS- *Technology*	0
BRRC- *Road*	1
BBRI- *Building*	0
CTIB-TCHN- *Wood*	0
WTOCD- *Diamond*	5
CORI- *Coating*	1
CRM- *Metallurgy*	357
BWI- *Welding*	0
BPI- *Packaging*	0

Only five collective research centres have patents in their portfolio. Except for CRM, the patent portfolio is negligible, considering the age of the collective research centres. This is explained by a number of reasons. First, the collective research centres strive to perform research that is beneficial to all members, and therefore patenting is not considered advisable. In the case of contract research, the IP is owned by the member company. In the few cases (except for CRM) where patents are taken, it is regarded more as a PR tool and it is often still used in order to service the entire member community, for instance by commercialising the technology in specific tools that are available for the community (this is the case e.g. at CoRI and WTOCD). Some collective research centres, such as BBRI, SIRRIS and Centexbel, have a patent cell, which concentrates primarily on providing information (on the patent procedure, for instance) to members.

5.7 Sourcing of information for in-house R&D activities

Even though the descriptions of the collective research centres provide information on how information for in-house R&D activities are insourced, they do not provide insight into how important one type of information is over the other. We therefore provided the collective research centres with a list of potential information sources and asked them to indicate the importance of these sources for collective and contract research by attributing a score between 1 ("never use this source") and 7 ("always, or in most projects use this source"). The table below provides insight into the importance of these information sources. We provide information on the average, median and weighted average (the weight factor was the R&D personnel in 2005).

Table 15:
Overview of information sources for in-house R&D activities (N=11)

Which information is sourced for in-house R&D activities?	Average	Median	Weighted average
a. in-house personnel	6.5	7	6.2
b. clients and members	5.0	5	4.5
c. external developers (acquisition of equipment)	3.0	4	2.5
d. external developers (licenses, patents, IPR)	2.0	2	2.2
e. external developers (software)	1.9	2	2.0
f. universities	4.7	5	5.2
g. public research organisations	3.7	4	3.9
h. other collective research centres	4.0	4	4.4
i. public knowledge- fairs and exhibitions	3.9	4	4.3
j. public knowledge- publications and specialised magazines	5.4	5	5.1
k. public knowledge- meetings and conferences	5.1	5	5.0

The collective research centres indicate that the most valuable, or in each case most used, information source is in-house personnel. This is trivial, since they are the people that are involved with the projects. Other important sources of information are clients and members, universities and public knowledge which can be gained at meetings and conferences and through specialised literature. Weighing the averages shows that larger collective research centres rely less on clients, members and publications for information insourcing, but on the other hand get more information from universities and PROs and from other collective research centres. External developers of IPR and software tend to be of low importance for information insources, and are only called upon in a limited number of cases.

5.8 Sourcing for information for knowledge transfer activities

The following data provide insight into how the information for knowledge transfer activities is sourced. We used the same method as described above. We provided the collective research centres with a list of potential information sources and asked them to indicate the importance of these sources for their knowledge transfer activities.

Table 16:
Overview of information sources for knowledge transfer activities (N=7)

Which information is sourced for knowledge transfer activities?	Average	Median	Weighted average
a. in-house personnel	6.5	6.5	4.6
b. clients and members	5.5	6.0	4.4
c. external developers (acquisition of equipment)	2.8	2.5	1.8
d. external developers (licenses, patents, IPR)	3.0	3.5	2.7
e. external developers (software)	2.5	2.5	1.5
f. universities	4.8	5.0	3.5
g. public research organisations	3.2	3.0	1.8
h. other collective research centres	5.2	5.0	3.8
i. public knowledge- fairs and exhibitions	4.3	5.0	3.0
j. public knowledge- publications and specialised magazines	5.8	6.0	4.2
k. public knowledge- meetings and conferences	5.8	6.0	4.2

Again the collective research centres indicate that the most valuable information source is in-house personnel. Since they conduct the knowledge transfer activities, this seems self-evident. The clients and members are as important for the information concerning knowledge transfer activities as they are for the in-house R&D activities. This also applies for the public knowledge sources. In general, the sources of information for knowledge transfer activities are basically the same as those for in-house R&D activities.

5.9 Reasons for calling upon the collective research centre

The collective research centres were mainly established to stimulate collective research in R&D, and in particular, to integrate SMEs into this research. We asked the collective research centres to indicate why they think member companies call upon the collective research centre. Again, the collective research centres indicated whether or not member companies call upon the collective research centre for these specific reasons (1="very low importance"; 7="very high importance"). The results are shown below.

Table 17:
Overview of drivers of collective research centre assistance (N=11)

Why do members/companies call upon the collective research centre most?	Average	Median	Weighted average
a. Due to the high economic risk of performing R&D itself	5.5	5	5.6
b. Due to the high cost of R&D	5.6	6	5.1
c. Due to the lack of available financial resources	4.0	4	4.3
d. Due to the lack of organisational flexibility	4.2	4	4.9
e. Due to the lack of qualified personnel	6.2	6	5.8
f. Due to the lack of technology information	5.0	5	5.2
g. Due to the lack of market information	2.5	2	2.9

According to the collective research centres, their members call upon the centre most because of a lack of qualified personnel, and because of the high risk and cost associated with performing R&D. The lack of technology information is also found to be an important reason for calling upon the collective research centre, in contrast to the lack of market information, which does not seem to be an important driver for collective research centre intervention. These responses give a first indication of the fact that member companies call upon the collective research centres for the following reason: their own lack of resources drives them to find support for R&D.

5.10 Support activities

Below we analyse what activities collective research centres provide to their members. Even though the individual collective research centre descriptions provided some insight into these activities, we try to understand how often collective research centres provide what kind of support, and how important they believe this support is to the member companies.

Table 18:
Overview of activities carried out by the collective research centres (N=11)

To which extent does the collective research centre provide the following support? (1= not provided at all; 7= provided to all members)	Average	Median	Weighted average
· R&D laboratory for use of company	5.9	7.0	5.5
· Technology guidance (technological advisors)	6.4	7.0	6.8
· Technology innovation stimulation (TIS)	5.7	7.0	5.8
· Information on R&D European programmes	4.7	4.0	5.1
· Access to technical library	5.6	7.0	6.4
· Provision of qualified personnel	6.5	7.0	6.0
· Sales of equipment	2.3	1.0	2.7
· Right to use inventions (licences)	3.9	3.0	4.1
· Provision of advice to external parties active within the sector	6.7	7.0	4.8
· Provision of advice to external parties, firms active outside the sector	5.1	6.0	3.9
· Provision of advice to external parties, other organisations (universities, PROs)	4.6	4.5	2.8
· Performing R&D on behalf of external parties, firms active within the sector	5.5	7.0	4.5
· Performing R&D on behalf of external parties, firms active outside the sector	4.8	5.0	4.1
· Performing R&D on behalf of external parties, other organisations (universities, PROs)	4.0	3.5	3.0
· Small scale in-depth technological consultancy (GTA)	4.3	4.5	3.0
· Support and advice concerning standardisation	5.8	6.5	3.3
· Information on intellectual property	3.0	2.5	3.1
· Certification	5.8	6.5	3.2
· Consulting and audits	5.8	7.0	3.5
· Testing	7.0	7.0	4.9
· Feasibility studies	4.7	5.0	4.0
· Provision of information (websites, magazines, newsletter)	5.5	7.0	3.5
· Standardisation antennas	6.2	7.0	3.6
· European technology platform	4.8	5.5	4.4
· Matching parties in industry and science	4.0	4.5	3.6
· Organisation of study days and seminars	5.8	7.0	4.3
· Technology watch and roadmapping	5.3	6.0	3.6

The collective research centres are to a large extent involved in technology guidance, providing access to technical libraries, standardisation antennas, testing, certification, consulting and audits, provision of qualified personnel and provision of advice to

external parties within the sector. They are only to a limited extent involved in sales of equipment and performance of R&D on behalf of other organisations, such as universities and PROs. The collective research centres also indicate how important they think the provision of this support is to the member companies. The results are shown below.

Table 19:
Overview of importance of activities carried out by collective research centres

How important is this support to the clients of the collective research centre? (1= not important at all; 7= extremely important)	Average	Median	Weighted average
· R&D laboratory for use of company	5.6	5.0	4.4
· Technology counselling (technological advisors)	6.4	7.0	4.8
· Technology innovation stimulation (TIS)	5.4	6.0	3.9
· Information on R&D European programmes	4.6	4.0	2.9
· Access to technical library	5.8	7.0	4.5
· Provision of qualified personnel	6.0	7.0	4.1
· Sales of equipment	1.5	1.0	1.0
· Right to use inventions (licences)	3.1	2.0	1.9
· Provision of advice to external parties active within the sector	6.8	7.0	4.4
· Provision of advice to external parties, firms active outside the sector	5.0	6.0	3.6
· Provision of advice to external parties, other organisations (universities, PROs)	4.4	5.0	3.1
· Performing R&D on behalf of external parties, firms active within the sector	4.1	4.0	2.5
· Performing R&D on behalf of external parties, firms active outside the sector	4.9	5.0	3.5
· Performing R&D on behalf of external parties, other organisations (universities, PROs)	4.0	4.0	2.5
· Small scale in-depth technological consultancy (GTA)	4.0	4.5	3.3
· Support and advice concerning standardisation	6.0	7.0	3.4
· Information on intellectual property	3.2	3.0	3.4
· Certification	5.8	7.0	3.4
· Consulting and audits	5.6	7.0	3.5
· Testing	6.8	7.0	4.8
· Feasibility studies	3.8	4.5	3.9
· Provision of information (websites, magazines, newsletter)	4.3	4.5	3.2
· Standardisation antennas	6.2	6.5	4.1
· European technology platform	3.8	4.5	3.5
· Matching parties in industry and science	4.0	4.5	3.8
· Organisation of study days and seminars	5.5	6.0	4.7
· Technology watch and roadmapping	5.2	5.0	4.5

Given that we find similar results, we can conclude that collective research centres tend to provide those activities to members or clients that are, according to them, most important activities for these members or clients.

5.11 Reasons for collective research centre location

The description of each collective research centre provided some insight into the location reasons for the collective research centres: some grew out of university labs, others are situated close to the members companies. The following table provides a clearer overview of location decisions made by collective research centres.

Table 20:
Overview of drivers of location for collective research centres

To which extent were the following criteria important in setting up R&D activities in your region? (1= very low importance, 7= very high importance)	Average	Median	Weighted average
a. Availability of highly skilled personnel	3.5	3.0	3.7
b. Presence of a university	4.1	4.0	4.0
c. Presence of a research centre	3.8	2.5	3.5
d. Presence of important clients/members/ activities/production facilities	4.8	6.0	4.2
e. Presence of physical infrastructure (terrains, transport/accessibility)	3.8	4.5	3.8
f. Local rules and regulations	2.5	1.5	2.1
g. Possibilities of enjoying grants and subsidies from government	3.5	5.0	3.5
h. Presence of a cluster of companies active in the domain	3.1	3.5	2.9
i. Presence of networking possibilities	3.2	3.5	3
j. Financially attractive location conditions	2.7	2.0	4.1
k. Historical reasons	3.5	3.5	3
l. Prestige	2.0	1.0	2.5

The location drivers seem to be very different from one collective research centre to another. Overall, local rules and regulations, presence of clusters of companies, presence of networking possibilities, historical reasons and prestige seem to be of low importance. The other drivers were in each case the most important drivers for at least one collective research centre. For BWI and BCRC, the availability of skilled personnel was an important location driver. Centexbel in particular mentioned the presence of clients and a cluster of companies as important drivers, just as WTOCD and BRRC. For SIRRIS, CRM and CRIC, the presence of universities was the most important, or one of the most important factors when choosing the location of the collective research centre. BWI, CRM, CRIC and BCRC mentioned the presence of research centres as important determinants for the location. CRIC also mentioned that historical reasons explain their location.

5.12 Networked environment

Collective research centres were established in order to increase the involvement of (especially) SMEs in R&D through collective research. Therefore we can expect collective research centres to have built up a considerable network of companies, and SMEs in particular. During the interviews, we asked the collective research centres to indicate how often they get in touch with SMEs, large companies, other collective research centres, research institutes and universities. The results are shown below.

Table 21:
Overview of contacts by collective research centres with players in the research environment

Indicate the intensity of contact the collective research centre has with the following parties (1=almost every day, 2= 2 to 3 times a week, 3= once a week, 4= 1-3 times a month, 5= less than once a month)	Average	Median
SMEs		
Face-to-face	1.6	1.0
Telephone	1.1	1.0
E-mail	1.1	1.0
Public meetings	3.7	4.0
Large companies		
Face-to-face	2.3	2.0
Telephone	1.9	2.0
E-mail	1.9	2.0
Public meetings	3.8	4.0
Other collective research centres		
Face-to-face	3.6	4.0
Telephone	2.9	3.0
E-mail	2.8	2.5
Public meetings	4.2	4.0
Research institutes		
Face-to-face	4.0	4.0
Telephone	3.4	3.0
E-mail	3.3	3.0
Public meetings	4.6	5.0
Universities		
Face-to-face	3.4	3.5
Telephone	3.2	3.5
E-mail	3.2	3.5
Public meetings	4.5	5.0

The table provides a good insight into the contacts the collective research centres have within the environment. The collective research centres are most frequently in contact with SMEs, and in second instance with large companies. They communicate or work together less frequently with other knowledge centres (other collective research centres, research institutes and universities). The fact that collective research centres work together less frequently with other collective research centres can be partially explained by their sectoral approach. Only in cases of a technical overlap (such as for instance SIRRIS and BWI) do collective research centres collaborate. This happens more and more due to interdependencies and the use of enabling technologies. The fact that collective research centres collaborate less with universities and research institutes was explained during the interviews by the fact that the latter are involved in fundamental research, whereas the member companies are looking for innovations that are closer to market.

6
The point of view of the member companies

The previous sections elaborated on the history and functioning of the collective research centres and presented an overview of the activities that they offer, their involvement in technology transfer and what they believe to be important to member companies. however, we feel that we cannot neglect the view of the member companies in this study. Therefore in this part we analyse what activities member companies call upon from the collective research centres and what activities they find important. In addition, we study how the intervention of the collective research centres affects input and output measures of R&D at the member companies, and their behaviour with respect to R&D and involvement in networks.

6.1 Measuring the impact of support

In a study on the impact of Spanish Technology Institutes (TIs), Modrego-Rico et al. (2005) address the problem of measuring the impact of intermediaries. They indicate that users - or, translated to the collective research centres, member companies - find it difficult to estimate the benefits they can obtain from the various services that TIs are able to provide to them. This problem exists because services impact is distributed among a wide range of activities, which hinders its measurement, and because benefits are not immediate. Instead, they often become clear in the medium or long term (Ham and Mowery, 1998; Geisler, 2001). This problem becomes even sharper when users are small and medium-sized enterprises, especially if they belong to traditional sectors. We believe that, when assessing the efficacy of collective research centres, we are faced with similar problems, and thus need a more fine-grained level of analysis than input and output measures at the SME level only. Therefore, along with studying the financial indicators (such as the public funding raised) and operative indicators (such as the number of contracts, number of members), we will look at the impact of collective research centre activities on member companies by using the concepts of behavioural additionality.

Indeed, in the analysis and evaluation of publicly-funded innovation actions, we can observe a shift from input-oriented measurements over to output and even impact-related measurements (Davenport et al., 1998). Whereas the output-related measure-

ments focus on the direct results of public spending, impact measurements go a step further by taking into account more indirect results as well. In line with the recent evolution towards impact/outcome measurement, we build on the concept of behavioural additionality. The concept refers to the net effect of a policy intervention in comparison to the counter-factual situations in which the intervention would not have taken place (Georghiou et al., 2004, OECD, 2006).

6.2 Defining additionality

The range of additionality perspectives is:

- Input additionality: studies the extent to which resources provided to a firm are additional (meaning that for every Euro of assistance there is one Euro additionally spent by the firm). It analyses whether or not activities would have taken place without the intervention.
- Output additionality: studies the outputs (patents, publications, new products launched) that would not have been realised without the support.
- Behavioural additionality: studies the change in firm behaviour resulting from the intervention.

Behavioural additionality is a multi-dimensional concept. Larosse (2004) provides an overview of the different types of additionality, including input and output additionality:

Table 22:
Overview of behavioural additionality

Process level		Organisational level		
		Project	**Company - Strategy**	**System**
Input				
		Scale	R&D budget	
		Time		Knowledge spillovers
		Risk	Portfolio composition	
Behavioural	**Internal**	Project management		
		IPR behaviour		
		Synergy in project family		
	External	Cooperation	Alliances	Networking / clustering
			Strategic Autonomy	Relations with VC / financiers
		Quality label		
			Localisation	
Output		Process innovation	Strengthening core or differentiation	Improved environmental impact
		Product innovation	Specialised knowledge / know-how	
		Training		Human capital

Source: Larosse (2004)

6.2.1 Behavioural additionality

Ideaconsult combines different types of behavioural additionality in their study on behavioural additionality of IWT R&D subsidies, based on the work of Falk (2006) and OECD (2006):

- scale additionality: if public funding allows the project to be conducted on a larger scale
- scope additionality: if the coverage of an activity is expanded to a wider range of markets, applications or players
- cognitive capacity additionality: if there is a positive impact on competencies and expertise
- acceleration additionality: if there is a positive impact on the speed of the project
- challenge additionality: when government support helps to take more risk in projects
- network additionality: when government support helps to create networks
- follow-up additionality: when government support helps to establish follow-up projects
- management additionality: when government support improves company management routines

Given the scope of this study, we will focus on the following types of additionality:

- input additionality: focus on understanding what would have happened with the project or project idea, in case the collective research centre had not offered support (for instance: "the project would not have taken place"). In addition, it studies the impact on the R&D budget of the member company, and the proportion of R&D that was financed through the support of the collective research centre
- network additionality: focus on understanding the extent to which collective research centres help to build networks
- scope and scale additionality: focus on the extent to which collective research centres affected the scope and scale of projects carried out by members
- competence or cognitive capacity additionality: focus on the impact of collective research centre support on competencies and expertise
- output additionality: focus on understanding what was the output of the intervention with the collective research centre that would otherwise not have been accomplished.

6.2.2 Member questionnaire

The member questionnaire has been included in appendix II (p. 139). The focus of the questionnaire is twofold:

- understanding why member companies call upon collective research centres and matching of the member needs with the collective research centre activities

- assessing the impact of collective research centres on members by studying input measures of R&D and innovation, output measures of R&D and innovation and behavioural additionality.

6.3 Results

6.3.1 Response rate

In April 2008, the managers of the collective research centres were asked to send the collective research centre members a request to fill out the questionnaire, which was available online through www.checkmarket.com. A total of 856 companies filled out the questionnaire.

The collective research centres selected about 11% of their member firm population and requested the members to fill out the online questionnaire. The 856 members produced a response rate of 9.4%. The fact that it was the collective research centres which contacted the potential respondents might have generated selection bias. However, an analysis of the answers received does not suggest any selection bias. First, the R&D intensities of the respondents were in line with sector averages. The expected average of R&D intensities, based on official statistics (Belgian Science Policy), weighted with the number of respondents per sector was 1.9%, whereas the weighted reported average of R&D intensities was 2.39%, which indicates a minor discrepancy. Similar unbiased results were obtained for size of respondents versus average size.

6.3.2 General descriptives

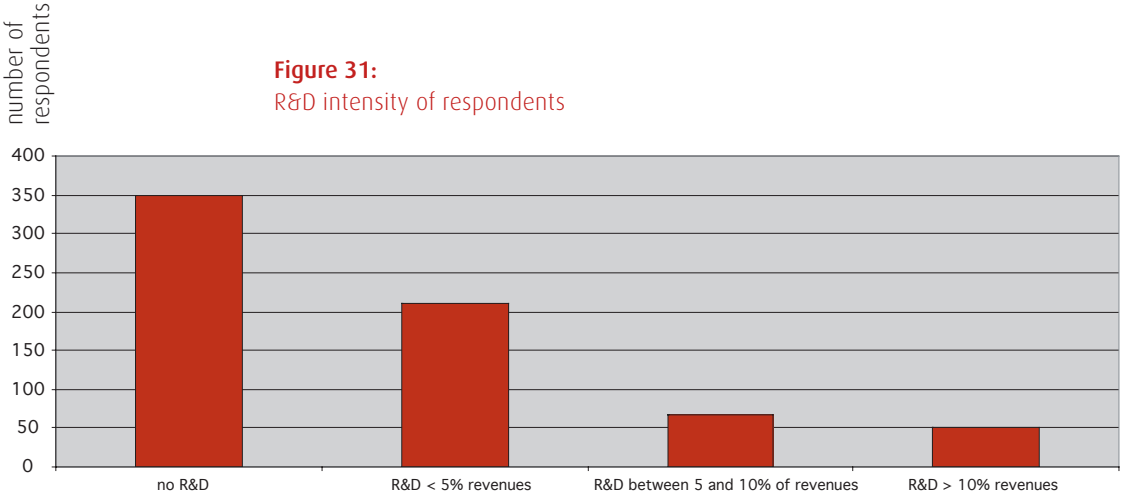
Below we provide more insight into the characteristics of the responding firms and institutes.

Table 23:
Overview of member firm descriptives

	Mean	Median	Standard Deviation	N
Number of employees (31/12/07)	255.04	23	2039.17	574
Revenues in Euro (31/12/07)	52 795 170.07	8 300 000	155 816 441.97	367

The majority of respondents reported that they do not conduct any R&D. Another 31.1% spend less than 5% of their revenues on R&D, as the following figure shows.

Figure 31:
R&D intensity of respondents

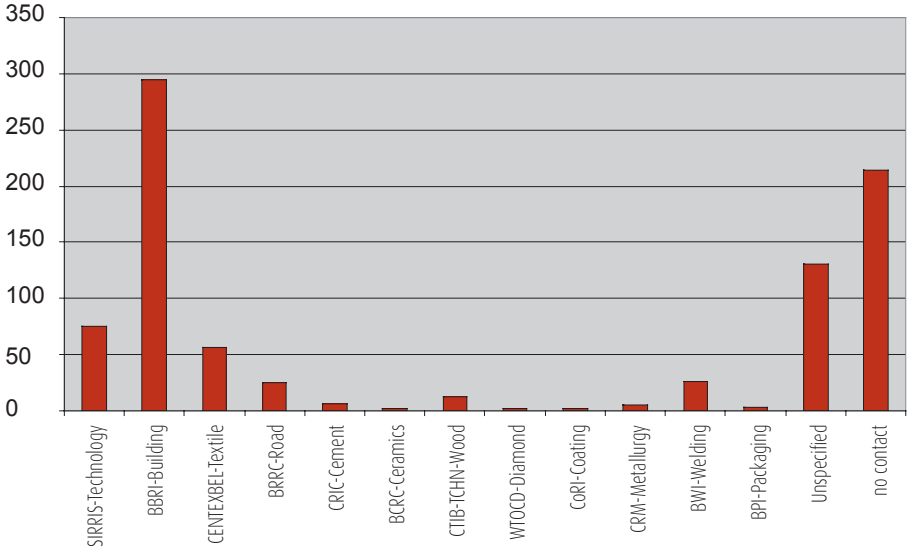


6.3.3 Involvement with collective research centres

The respondents were asked to indicate if they had been in touch with a collective research centre over the past three years, and if yes, with which.

The figure below gives an overview of the collective research centres the respondents had been in touch with over the past three years.

Figure 32:
Overview of respondents and their collective research centre



About 25% of the respondents indicated that they had not been in touch with a collective research centre over the last 3 years. For the rest of the respondents we obtained higher response rates with the larger centres. Moreover, SIRRIS, BBRI, CENTEXBEL, BRRC and BWI in particular actively promoted the questionnaires with their members. The table below gives an overview of the number of respondents per centre.

Table 24:
Number of respondents per collective research centre

collective research centre	Number of respondents
CENTEXBEL-Textile	57
CRIC-Cement	6
BCRC-Ceramics	2
SIRRIS-Technology	75
BRRC-Road	25
BBRI-Building	295
CTIB-TCHN-Wood	13
WTOCD-Diamond	2
CoRI-Coating	2
CRM-Metallurgy	5
BWI-Welding	26
BPI-Packaging	3
Unspecified	131
no contact	214

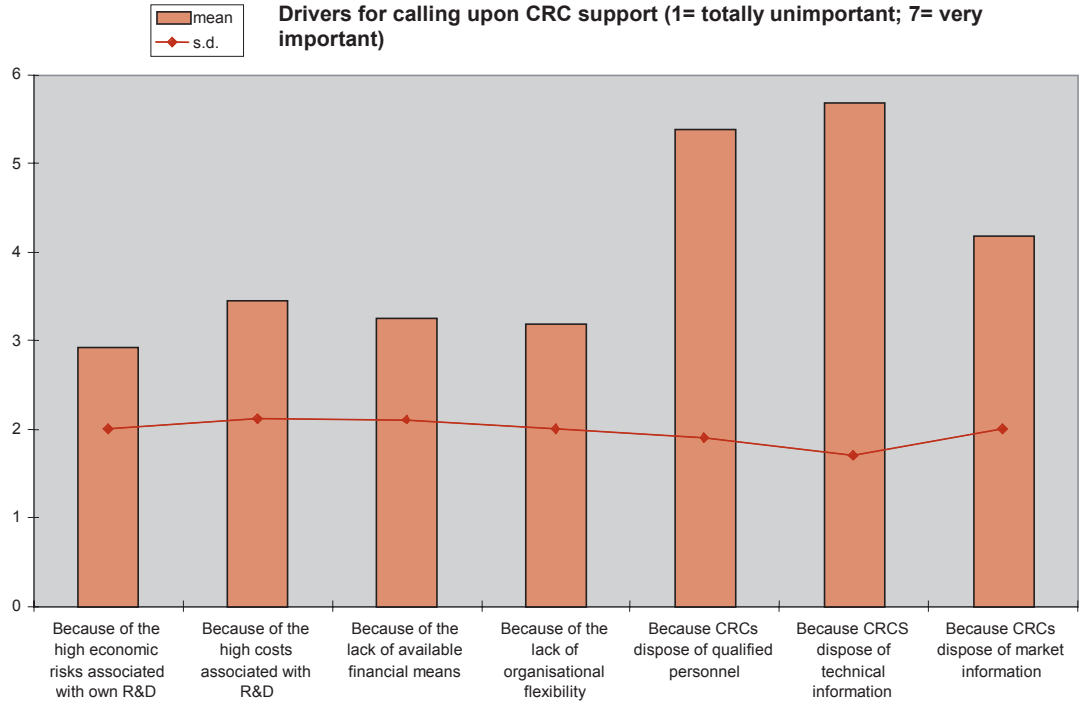
Additional analysis shows that the companies that had been in touch with collective research centres were significantly larger than those that had not worked with the collective research centres over the past three years. This was especially the case when we measured size as the number of employees. The results remain similar after excluding outliers.

Table 25:
Analysis of differences between firms that call and that do not call upon the collective research centre

In touch with collective research centre over past three years?	Yes (mean, s.d.)	No (mean, s.d.)	P-value Mann Whitney U Test
Number of employees	315.41 (2330.09)	69.86 (166.22)	<.001
Revenues	61 258 348 (168 679 105)	29 474 870 (90 686 428)	<.001
N	434	118	

6.3.4 Drivers for calling upon collective research centre support

Figure 33:
Drivers for calling upon collective research centre support



The member companies especially call upon the collective research centres for reasons that have to do with the internal resource base of the collective research centres: the fact that collective research centres dispose of technical information was found to be the main reason for member companies to call upon the collective research centres, followed by the fact that they dispose of both qualified personnel and market information. The lack of internal resources in the member companies or the costs and risks associated with R&D were not found to be the main reason for member companies to call upon the collective research centres. Below we provide an overview of the descriptives:

Table 26:
Descriptives of drivers

Driver for calling upon the collective research centre (1= totally unimportant; 7= very important)	Mean	Median	S.d.
Because of the high economic risks associated with own R&D	2.92	2	2.01
Because of the high costs associated with R&D	3.45	2	2.11
Because of the lack of available financial means	3.26	3	2.10
Because of the lack of organisational flexibility	3.19	2.5	1.95
Because collective research centres dispose of qualified personnel	5.39	5	1.86
Because collective research centres dispose of technical information	5.68	5	1.74
Because collective research centres dispose of market information	4.18	3.5	2.02

We did not find any statistically significant correlations between the size of the member firms, measured in either total revenues or employment, and the reasons for calling upon the collective research centre.

Different member firms indicated, next to the reasons mentioned above, the networking possibilities as a reason for calling upon the collective research centre. As stated by one respondee: "why keep looking for a solution in your own corner all by yourself?" Similar to the responses we received from the collective research centres, the member firms indicate that they cooperate with the collective research centres because they dispose of qualified personnel and technical information. Other reasons that were believed to be quite important by the collective research centres, namely high economic risks associated with own R&D and the high costs associated with R&D, seem to be less of a reason for the member firms to call upon the collective research centre.

Below we analyse whether or not the fact that the member firm engaged in R&D activities itself affected the driver to call upon the collective research centre.

Table 27:
Relation between R&D engagement and drivers

	Mean and s.d.		
	R&D	No R&D	
Because of the high economic risks associated with own R&D	3.04 (1.88)	2.75 (2.17)	***
Because of the high costs associated with R&D	3.57 (1.88)	3.34 (3.34)	*
Because of the lack of available financial means	3.12 (1.88)	3.45 (3.45)	
Because of the lack of organisational flexibility	3.20 (1.80)	3.20 (2.15)	
Because collective research centres dispose of qualified personnel	5.44 (1.63)	5.34 (2.12)	
Because collective research centres dispose of technical information	5.67 (1.52)	5.66 (1.97)	**
Because collective research centres dispose of market information	3.95 (1.85)	4.47 (2.20)	***
N	242	209	

Levels of significance: *=.10; **=.05; ***=.001

The results show that member firms that do not engage in R&D activities themselves call upon the collective research centre to a greater extent because of their disposal of market information compared to those member firms that have their own R&D. In contrast, member firms that do not dispose of their own R&D indicate to a lesser extent that high economic costs associated with own R&D drive them to call upon the collective research centre. This indicates that the role of the collective research centres is broader than technical advice and R&D, and that other information that can be obtained from the collective research centres, such as market information, is also important, especially for those companies that do not engage in R&D themselves.

We additionally carried out statistical tests in order to learn whether all members had the same reason to call upon the collective research centres. In order to do so, we divided the data into four groups: SIRRIS-members, BBRI-members, CENTEXBEL-members and others. The table below shows the results of the Kruskal-Wallis test for difference between groups and the results of the LSD test for differences between means.

Table 28:
Relation between drivers and collective research centre

	Mean and s.d.					
	SIRRIS (1)	BBRI (2)	CENTEXBEL (3)	Others (4)		
Because of the high economic risks associated with own R&D	2.92 (1.87)	3.14 (2.19)	3.16 (1.78)	2.47 (1.81)	χ^2=9.05**	2>4*** 3>4**
Because of the high costs associated with R&D	3.46 (1.97)	3.64 (2.29)	3.85 (1.65)	2.97 (2.01)	χ^2=10.14**	2>4*** 3>4**
Because of the lack of available financial means	3.02 (1.78)	3.67 (2.26)	3.04 (1.52)	2.87 (2.13)	χ^2=10.76**	1<2** 2>4***
Because of the lack of organisational flexibility	3.33 (1.85)	3.31 (1.99)	3.37 (1.80)	2.85 (1.98)	χ^2=5.86	
Because collective research centres dispose of qualified personnel	5.32 (1.55)	5.82 (1.64)	5.71 (1.13)	4.56 (2.31)	χ^2=31.41****	1>4*** 2>4**** 3>4****
Because collective research centres dispose of technical information	5.63 (1.27)	6.14 (1.49)	5.74 (4.86)	4.86 (2.22)	χ^2=50.85****	1<2** 1>4*** 2>4**** 3>4****
Because collective research centres dispose of market information	3.55 (1.66)	4.84 (2.03)	4.02 (1.45)	3.52 (2.08)	χ^2=39.81****	1<2**** 2>3*** 2>4****
N	67	225	54	128		

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

The results show that there are indeed differences between collective research centre members in the drivers for calling upon the collective research centres. First, SIRRIS members found the lack of financial means to be less of a reason to call upon the collective research centre compared to the BBRI members. Similar results were found for the disposal of technical information and market information: this was found to drive collective research centre involvement less for SIRRIS members than for BBRI members. The SIRRIS members, however, found the disposal of technical information to be a more important reason to call upon the collective research centre compared to the group that we labelled "others". We found many differences between this last group and the others. The fact that this last group brings together members from different collective research centres may be the reason for this. For this group, many of the potential drivers seemed to drive to a lesser extent the call upon the collective research centre's support.

Other interesting differences were found between the first three groups. For SIRRIS members, the access to technical information was less of a driving force for them to call upon the collective research centre, compared to BBRI. For BBRI, the access to market information also drove the members to call upon the collective research centre much more, compared to SIRRIS and CENTEXBEL.

6.3.5 The collective research centre services

We provided the collective research centre members with a list of activities that the collective research centres engage in and asked them to indicate the extent to which they had called upon these services. The services contained R&D projects and knowledge transfer activities. The table below illustrates the extent to which companies called upon the services, and whether or not they had used the service over the past three years.

Table 29:
Use of the collective research centre services

To which extent does your company call upon the following collective research centre services? (1=never; 7= often)	Mean	Median	Used over last three years? (%)
- R&D laboratory for use of company	2.73	1	38
- Information on R&D European programmes	2.16	1	24
- Access to technical library	3.66	3	56
- Provision of qualified personnel	2.91	2	38
- Sales of equipment	1.37	1	5
- Right to use inventions (licences)	1.48	1	6
- Research contract between collective research centre and company (bilateral research)	2.04	1	22
- Research contract on a collective basis (collective research centre, your company, and third parties)	2.26	1	25
- Small scale in-depth technological consultancy (GTA)	3.49	3	55
- Support and advice concerning standardisation	3.04	2	43
- Information on intellectual property	1.70	1	13
- Certification	2.45	1	31
- Consulting and audits	2.23	1	24
- Testing	3.28	2.5	46
- Feasibility studies	1.95	1	17
- Provision of information through website	3.56	3	54
- Provision of information through publications	3.66	3	55
- Provision of information through newsletters	3.80	4	63
- Standardisation antennas	2.86	2	38
- European technology platform	2.07	1	17
- Matching parties in industry and science	2.27	1	27
- Organisation of study days and seminars	3.40	3	57
- Technology watch and roadmapping	1.89	1	18
- Solving specific problems (troubleshooting)	3.03	2	42
- Technical advice	4.09	4	68

A number of services are extensively used by member companies: the majority of respondents that had been in touch with a collective research centre over the past three years indicated that they had used the technical library, called upon small scale in-depth technological consultancy, looked into information provided through different sources, attended study days or seminars and called upon technical advice. Other services are called upon by a relatively low number of respondents. These services include sales of equipment and licensing of technology.

Next, we analysed whether or not the fact that the member firm engaged in R&D affected the use it made of the collective research centre's services. The following table shows that member firms that engage in R&D activities call more extensively on a large number of collective research centre services.

Table 30:
Relation between R&D engagement and use of collective research centre services

	Mean		
	R&D	No R&D	
- R&D laboratory for use of company	3.59	1.79	****
- Information on R&D European programmes	2.68	1.54	****
- Access to technical library	3.55	3.77	
- Provision of qualified personnel	3.43	2.32	****
- Sales of equipment	1.35	1.34	
- Right to use inventions (licences)	1.61	1.32	****
- Research contract between collective research centre and company (bilateral research)	2.59	1.42	****
- Research contract on a collective basis (collective research centre, your company, and third parties)	2.76	1.68	****
- Small scale in-depth technological consultancy (GTA)	3.73	3.23	**
- Support and advice concerning standardisation	3.27	2.74	***
- Information on intellectual property	1.92	1.39	****
- Certification	2.91	1.95	****
- Consulting and audits	2.68	1.76	****
- Testing	4.00	2.43	****
- Feasibility studies	2.31	1.51	****
- Provision of information through website	3.39	3.68	
- Provision of information through publications	3.53	3.71	
- Provision of information through newsletters	3.87	3.65	
- Standardisation antennas	3.04	2.61	***
- European technology platform	2.29	1.76	****
- Matching parties in industry and science	2.62	1.80	****
- Organisation of study days and seminars	3.61	3.01	***
- Technology watch and roadmapping	2.18	1.51	****
- Solving specific problems (troubleshooting)	3.33	2.73	***
- Technical advice	4.27	3.86	*
N	241	229	

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

Additionally, we checked for significant correlations between the size of the member firm and the extent to which the firm called upon knowledge-related activities. We only found positive relations between the size (in employees and revenues) and the extent to which member firms call upon information about European R&D programmes, and the extent to which member firms called upon the matching service between industry and science.

Additionally, we analysed the differences between collective research centres in services called upon by members. For most services, we found differences between collective research centres, which we again split into four groups: SIRRIS-members, BBRI-members, CENTEXBEL-members and others.

Table 31:
Relation between collective research centre and use of collective research centre services

	Mean					
	SIRRIS	BBRI	CENTEXBEL	Others		
- R&D laboratory for use of company	2.92	2.69	5.04	2.03	χ^2=81.56****	1>4***,1>3****,2<3****,2>4***,2<3****,3>4****
- Information on R&D European programmes	2.13	2.18	3.85	1.65	χ^2=77.37****	1<3****,1>4**,2<3****,2>4***,3>4****
- Access to technical library	2.50	2.64	3.42	2.39	χ^2=166.47****	1<2****,1<3***,2>3****,2>4****,3>4****
- Provision of qualified personnel	2.77	3.36	4.50	2.02	χ^2=73.10****	1<2**,1<3****,2<3****,2>4***,3>4****
- Sales of equipment	1.19	1.45	1.63	1.28	χ^2=16.91***	1<2*,1>3**,2>4*,3>4**
- Right to use inventions (licences)	1.31	1.51	2.13	1.32	χ^2=34.90****	1<3****,2<3***,3>4****
- Research contract between collective research centre and company (bilateral research)	2.55	1.78	3.85	1.63	χ^2=92.95****	1>2***,1<3****,1>4****,2<3****,3>4****
- Research contract on a collective basis (collective research centre, your Company, and third parties)	2.28	2.22	4.12	1.75	χ^2=82.77****	1<3****,1>4**,2<3****,2>4**,3>4****
- Small scale in-depth technological consultancy (GTA)	3.41	4.25	4.18	2.34	χ^2=67.77****	1>2***,1>3*,1>4***,2>4****,3>4****
- Support and advice concerning standardisation	1.98	3.73	4.08	2.26	χ^2=61.11****	1<2****,1<3****,2>4****,3>4****
- Information on intellectual property	1.56	1.65	2.78	1.45	χ^2=53.78****	1<3****,2<3****,3>4****
- Certification	1.69	2.54	4.43	1.97	χ^2=60.74****	1<2***,1<3****,2<3****,3>4*****
- Consulting and audits	2.42	2.15	3.94	1.67	χ^2=73.82****	1<3****,1>4***,2<3****,3>4*****
- Testing	3.39	3.20	5.55	2.54	χ^2=61.26****	1<3****,1>4***,2<3****,3>4*****
- Feasibility studies	2.27	1.80	2.84	1.68	χ^2=36.34****	1>2*,1<3*,1>4**,2<3****,3<4****
- Provision of information through website	2.24	6.29	3.49	2.37	χ^2=110.22****	1<2****,1<3***,2>3****,2>4****,3>4****
- Provision of information through publications	2.44	5.05	3.67	2.43	χ^2=113.41****	1<2****,1<3****,2>3****,2>4****,3>4****
- Provision of information through newsletters	2.96	2.88	4.41	2.53	χ^2=85.25****	1<2****,1<3****,2>4****,3>4****
- Standardisation antennas	1.68	3.60	3.71	2.06	χ^2=66.09****	1<2****,1<3****,2>4****,3>4****
- European technology platform	1.63	2.24	3.02	1.65	χ^2=31.60****	1<2**,1<3****,2<3***,3>4****
- Matching parties in industry and science	2.19	2.31	3.71	1.67	χ^2=46.35****	1<3****,1>4*,2<3****,2>4***,3>4****
- Organisation of study days and seminars	3.07	3.92	4.69	2.33	χ^2=61.42****	1<2***,1<3****,1>4**,2<3**,2>4****,3>4****
- Technology watch and roadmapping	2.19	1.70	3.02	1.52	χ^2=45.94****	1>2**,1<3***,1>4***,2<3****,3>4****
- Solving specific problems (trouble-shooting)	3.12	3.42	4.04	2.06	χ^2=45.72****	1<3**,1>4***,2<3**,2>4****,3>4****
- Technical advice	3.54	6.39	4.73	2.80	χ^2=78.47****	1<2****,1<3***,1>4****,3>4*****
N	64	195	52	179		

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

We found earlier that the collective research centres are not only heterogeneous in their resource base, but that their members also call upon other services, or call to a different extent upon services offered by the collective research centre. First of all, it is striking that the members that were included in the subcategory "others" consistently call to a lesser extent upon services by the collective research centre. Most probably this can be explained by the size of these collective research centres, which does not allow them to offer all services to the same extent as the larger collective research centres.

The members used to a greater extent the technical online database of the BBRI, and used the information available through website and publications more extensively than other centres. The Centexbel members called significantly more upon the provision of qualified personnel by the collective research centre, the right to use collective research centre inventions, and were more involved in contract and collective research with the collective research centre. Moreover, they called more upon information on intellectual property, certification, consulting and audits, testing and access to information through newsletters. In addition, the members of Centexbel called more upon the matching services between industry and science and were more involved in study days and seminars, technology watch and roadmapping compared to the other centres. Finally, both the BBRI and CENTEXBEL members called significantly more upon small scale in-depth technological consultancy, support and advice concerning standardisation, troubleshooting and technical advice.

6.3.6 Importance of activities

We asked those members that had called upon the collective research centre for specific activities to indicate how important these activities were. The results show that, on average, the access to the technical library, provision of qualified personnel, small scale in-depth technological consultancy, certification, testing, provision of information, standardisation antennas, matching of parties in industry and science, organisation of study days and seminars, troubleshooting and technical advice were found to be the most important activities to the members.

Table 32:
Importance of collective research centre activities

How important was the support you received from the collective research centre for your company? (1= totally unimportant – 7= very important)	mean	s.d.	N
- R&D laboratory for use of company	4.71	1.87	162
- Information on R&D European programmes	4.27	1.78	100
- Access to technical library	5.63	1.67	237
- Provision of qualified personnel	5.07	1.81	164
- Sales of equipment	3.33	2.11	18
- Right to use inventions (licences)	4.53	1.96	19
- Research contract between collective research centre and company (bilateral research)	4.41	1.82	92
- Research contract on a collective basis (collective research centre, your company, and third parties)	4.79	1.85	99
- Small scale in-depth technological consultancy (GTA)	5.24	1.97	220
- Support and advice concerning standardisation	4.91	1.79	177
- Information on intellectual property	3.84	1.86	51
- Certification	5.11	1.81	124
- Consulting and audits	4.57	1.76	101
- Testing	5.58	1.50	188
- Feasibility studies	4.54	1.69	68
- Provision of information through website	5.79	1.42	216
- Provision of information through publications	5.64	1.52	225
- Provision of information through newsletters	5.25	1.65	241
- Standardisation antennas	5.16	1.75	148
- European technology platform	4.61	1.89	62
- Matching parties in industry and science	5.10	1.69	103
- Organisation of study days and seminars	5.16	1.59	218
- Technology watch and roadmapping	4.38	1.78	69
- Solving specific problems (troubleshooting)	5.36	1.64	163
- Technical advice	5.66	1.49	262

Below we analyse the extent to which the importance of the collective research centre's activities relate to the member firm characteristics.

Table 33:
Relation between R&D engagement and importance of support

	Mean			
	R&D	No R&D		
- R&D laboratory for use of company	4.88	4.30	0.58	*
- Information on R&D European programmes	4.34	4.00	0.34	
- Access to technical library	5.24	5.98	-0.74	***
- Provision of qualified personnel	5.08	5.12	_-0.04	
- Sales of equipment	3.00	3.60	-0.60	
- Right to use inventions (licences)	4.08	5.50	-1.42	
- Research contract between collective research centre and company (bilateral research)	4.45	4.20	-0.25	
- Research contract on a collective basis (collective research centre, your company, and third parties)	4.85	4.62	0.23	
- Small scale in-depth technological consultancy (GTA)	5.01	5.52	-0.51	**
- Support and advice concerning standardisation	4.88	4.98	-0.10	
- Information on intellectual property	4.03	3.75	0.28	
- Certification	5.28	4.83	0.45	
- Consulting and audits	4.76	4.08	0.68	
- Testing	5.73	5.29	0.44	*
- Feasibility studies	4.60	4.35	0.25	
- Provision of information through website	5.57	6.02	-0.05	**
- Provision of information through publications	5.40	5.84	-0.44	**
- Provision of information through newsletters	5.14	5.34	-0.20	
- Standardisation antennas	5.06	5.25	_0.19	
- European technology platform	4.75	4.45	0.30	
- Matching parties in industry and science	5.05	5.06	-0.01	
- Organisation of study days and seminars	5.10	5.19	-0.09	
- Technology watch and roadmapping	4.21	4.83	-0.62	
- Solving specific problems (troubleshooting)	5.28	5.53	-0.25	
- Technical advice	5.45	5.96	-0.51	***
N	241	229		

Even though we previously came to the conclusion that member firms that engage in R&D activities call to a greater extent upon the collective research centre services, these figures show that the importance of the activities differs depending on the engagement of the member firm in R&D. First, member firms that do engage in R&D attach more importance to the availability of R&D laboratory and testing facilities. Member firms that do not engage in R&D themselves attached more importance to the access to the technical library, small scale in-depth technological consulting, provision of information through website and publications and technical advice.

We did not find any significant correlations between the member firm size and the importance attached to certain activities.

We also analysed the differences between collective research centres in the importance they attached to having the chance to call upon this service. For some services, we found differences between collective research centres, which we again split into four groups: SIRRIS-members, BBRI-members, Centexbel-members and others. We only report the services for which we found differences between groups of members.

Table 34:
Relation between collective research centre and importance of support

	SIRRIS (1)	BBRI (2)	Centex-bel (3)	Others (4)		
- Access to technical library	5.63	6.18	4.82	4.86	χ^2=43.41****	(2>1, 2>3, 2>4)****
- Research contract on a collective basis (collective research centre, your company, and third parties)	4.79	5.13	4.91	4.83	χ^2=6.37*	1<2**, 1<3*
- Small scale in-depth technological consultancy (GTA)	5.24	5.61	5.14	4.90	χ^2=17.25***	1<2**,2>4**
- Support and advice concerning standardisation	4.91	4.85	5.50	4.90	χ^2=7.69*	2>1*,2<3*,2>4*,3>1***
- Certification	5.11	5.19	5.68	4.81	χ^2=10.34**	1<2**,1<3**,1>4*,4<3*
- Testing	5.58	5.44	6.38	5.44	χ^2=17.00***	1<3***,2<3***,3>4****
- Provision of information through website	5.79	6.24	5.13	5.43	χ^2=39.04****	1<2****,1<3*,1<4***,2>3****,2>4****
- Provision of information through publications	5.64	6.14	5.00	4.98	χ^2=39.48****	(2>1,2>3,2>4)****
- Provision of information through newsletters	5.25	5.57	5.08	5.05	χ^2=16.83***	2>1****,2>3*,2>4*,3>1**,4>1**
- Organisation of study days and seminars	5.16	5.40	5.41	4.98	χ^2=16.34***	1<2***,1>3***,1>4**
- Solving specific problems (troubleshooting)	5.36	5.49	5.53	5.73	χ^2=12.89**	1<2***,1<3***,1<4****
- Technical advice	5.66	6.11	5.24	5.46	χ^2=35.56****	2>1****,2>3***,2>4****,4>1*

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

The results show that BBRI-members attach significantly more importance to the technical library, small scale in-depth technological advice, the provision of information and technical advice than other collective research centre members. On the other hand, Centexbel-members attached more importance to the support received concerning standardisation, certification and testing facilities. SIRRIS-members are often in between.

6.3.7 Relevance of collective research centre activities

Additionally, we combined the scores for the intensity of use of collective research centre services and the importance attached to these services, in case of use. As the following table shows, provision of information, access to the technical library, testing and technical advice are the most relevant activities to the members, which will be highly sector-dependent as the previous analysis showed. Sales of equipment and information on intellectual property are the least relevant activities to the average collective research centre member firm.

Table 35:
Relevance of collective research centre activities

Relevance of collective research centre activities (1= low use and low importance; 49= high use and high importance).	mean	s.d.	N
- R&D laboratory for use of company	24.38	13.48	162
- Information on R&D European programmes	19.85	12.64	100
- Access to technical library	31.21	15.24	237
- Provision of qualified personnel	27.35	14.76	164
- Sales of equipment	12.61	12.64	18
- Right to use inventions (licences)	20.21	16.00	19
- Research contract between collective research centre and company (bilateral research)	20.61	13.65	92
- Research contract on a collective basis (collective research centre, your company, and third parties)	24.34	14.91	99
- Small scale in-depth technological consultancy (GTA)	27.65	14.23	220
- Support and advice concerning standardisation	25.76	14.57	177
- Information on intellectual property	16.57	12.88	51
- Certification	26.03	15.87	124
- Consulting and audits	22.51	13.82	101
- Testing	30.19	14.29	188
- Feasibility studies	20.88	12.70	68
- Provision of information through website	32.52	14.91	216
- Provision of information through publications	31.98	15.03	225
- Provision of information through newsletters	29.05	15.36	241
- Standardisation antennas	27.31	15.27	148
- European technology platform	21.19	14.74	62
- Matching parties in industry and science	23.19	13.76	103
- Organisation of study days and seminars	26.16	14.20	218
- Technology watch and roadmapping	19.20	13.12	69
- Solving specific problems (troubleshooting)	27.46	13.66	163
- Technical advice	30.66	14.26	262

6.3.8 Impact of activities

6.3.8.1 Measuring additionality

We also analysed the impact of the collective research centre activities on the member firms. We looked at two direct indicators, namely output and input additionality, and we withheld three indicators for behavioural additionality, namely network additionality, competence additionality and speed additionality. We analysed these additionalities for two types of activities: knowledge transfer activities and contract research. In fact we asked the respondents to make a distinction between contract research (research between the centre and the firm) and collective research (research between the centre, the firm and third parties), but responses on the impact of the engagement in these activities varied only marginally. The responses for both activities were therefore taken together and analysed under the single heading of "contract research".

The following table provides an overview of the questions asked and the additionalities that the questions cover for each type of activity. We also provide an insight into the Cronbach-Alpha, which indicates whether items that can be summated into one scale are pointing in the same direction. A Cronbach-Alpha of over .65 is acceptable for the construction of summated scales. Since this is the case for all of the constructs that we measure, we will continue the analysis with the summated scales, at additionality level.

Table 36:
Overview of additionalities and items used

Additionality	Knowledge transfer activities	Contract research
Output	The intervention by the collective research centre allowed my company to develop new products	The project resulted in a new product that is, or will be, introduced on the market
	The intervention by the collective research centre allowed my company to bring new products to the market	The project resulted in a new process that is, or will be, introduced in the company
	The intervention by the collective research centre allowed my company to improve the production process	The project has resulted in a patent application, or will result in a patent application
	The intervention by the collective research centre allowed my company to access new markets	The project will allow our company to increase its market share
	The intervention by the collective research centre allowed my company to extend its product range	The project will allow our company to increase our competitiveness
	The intervention by the collective research centre allowed my company to expand its market share	
	The intervention by the collective research centre allowed my company to increase revenues	

Additionality	Knowledge transfer activities	Contract research
Output	The intervention by the collective research centre allowed my company to improve its customer service	
	The intervention by the collective research centre allowed my company to avoid disputes or solve them faster	
	The intervention by the collective research centre allowed my company to cut costs	
	Cronbach-Alpha: .92	**Cronbach-Alpha: .82**
Speed	The intervention by the collective research centre allowed my company to bring products to market faster	
	The intervention by the collective research centre allowed my company to develop products faster	
	Cronbach-Alpha: .93	
Network	The intervention by the collective research centre allowed my company to identify potential partners	The project allowed us to network with universities or public research organisations
	The intervention by the collective research centre allowed my company to cooperate with other companies	The project allowed us to network with other companies
	The intervention by the collective research centre allowed my company to cooperate with knowledge institutes, such as universities or research institutes	The project allowed us to build research networks
	Cronbach-Alpha: .89	**Cronbach-Alpha: .90**
Competence	The intervention by the collective research centre allowed my company to acquire new knowledge	The project increased our skills to network with universities or public research organisations
	The intervention by the collective research centre allowed my company to increase our innovation management capabilities	The project increased our skills to network with other companies
	The intervention by the collective research centre allowed my company to upgrade its human resources	The project allowed us to acquire new knowledge
		The project allowed us to upgrade our human resources
		The project increased our innovation management capabilities
	Cronbach-Alpha: .89	**Cronbach-Alpha: .83**
Input	Thanks to the intervention by the collective research centre my company started a new R&D project	Since the project, we regularly undertake R&D or innovation projects
	Thanks to the intervention by the collective research centre my company decided to allocate more means to R&D	Since the project, the company has more attention for R&D and innovation
		Since the project, we increased our R&D and innovation budget
	Cronbach-Alpha: .91	**Cronbach-Alpha: .91**

6.3.8.2 Impact of knowledge transfer activities

First, we provide an overview of the descriptives for all questions concerning additionality. Next, we group items into constructs of input, output and behavioural additionality.

Table 37:
Impact of knowledge transfer activities

Questions/ Constructs (1= disagree strongly; 7= agree strongly)	Mean	Standard Deviation	N
The intervention by the collective research centre allowed my company to develop new products	3.54	1.82	319
The intervention by the collective research centre allowed my company to bring new products to the market	3.27	1.76	318
The intervention by the collective research centre allowed my company to improve the production process	3.94	1.87	317
The intervention by the collective research centre allowed my company to access new markets	3.22	1.68	318
The intervention by the collective research centre allowed my company to extend its product range	3.41	1.77	316
The intervention by the collective research centre allowed my company to expand its market share	3.27	1.73	316
The intervention by the collective research centre allowed my company to increase revenues	3.43	1.59	307
The intervention by the collective research centre allowed my company to strengthen its image	4.14	1.67	307
The intervention by the collective research centre allowed my company to improve its customer service	4.61	1.71	309
The intervention by the collective research centre allowed my company to avoid disputes or solve them faster	4.43	1.86	309
The intervention by the collective research centre allowed my company to cut costs	4.20	1.71	307
Output additionality	3.38	1.31	304
The intervention by the collective research centre allowed my company to bring products to market faster	3.25	1.56	296
The intervention by the collective research centre allowed my company to develop products faster	3.48	1.68	296
Speed additionality	3.37	1.56	295
The intervention by the collective research centre allowed my company to identify potential partners	3.36	1.62	289
The intervention by the collective research centre allowed my company to cooperate with other companies	3.65	1.69	289
The intervention by the collective research centre allowed my company to cooperate with knowledge institutes, such as universities or research institutes	3.97	1.77	289
Network additionality	3.66	1.53	289
The intervention by the collective research centre allowed my company to acquire new knowledge	5.58	1.27	291
The intervention by the collective research centre allowed my company to increase our innovation management capabilities	4.73	1.57	288
The intervention by the collective research centre allowed my company to upgrade its human resources	5.19	1.56	290
Competence additionality	5.16	1.24	285
Thanks to the intervention by the collective research centre my company started a new R&D project	3.36	1.74	289
Thanks to the intervention by the collective research centre my company decided to allocate more means to R&D	3.19	1.60	287
Input additionality	3.28	1.60	287

The descriptives for the types of additionality show that knowledge transfer activities performed by collective research centres mainly affect competence additionality, meaning that many member companies indicated that, by calling upon the collective research centre for knowledge transfer services, the member firm's personnel was able to acquire knowledge and capabilities.

We analysed the correlations between the extent to which the member firms called upon specific knowledge transfer activities and the different capabilities. All correlations were significantly positive (at a.10 level), except for the extent of use of the technical library, which did not correlate significantly with input additionality, sales of equipment, which does not correlate significantly with output additionality and competence additionality, the use of licenses, which does not correlate significantly with competence additionality, and information provision through website which does not correlate significantly with speed, network and input additionality, and provision of information through publications, which does not correlate significantly with input additionality. For all other services, we find that, the more intensively the member firm called upon the service, the higher the member firm systematically ranked the impact of the collective research centre service on different types of additionality. Moreover, for the non-significant results mentioned above, we found positive correlations between intensity of use of the service and additionalities.

Apart from the intensity of usage of the knowledge transfer service, we also wanted to understand what other characteristics, member firm-related on the one hand and collective research centre-related on the other, affected additionalities.

First, we do not find any correlation between additionalities and revenues and employment of the member firms, meaning that the size of the member firm does not seem to affect the added value provided by the collective research centre through its knowledge transfer activities.

Table 38:
Relation between R&D intensity and additionality

	Mean (s.d.)					
	No R&D (1)	R&D: 0-5% of revenues (2)	R&D: 5-10% of revenues (3)	R&D: >10% of revenues (4)		
Output additionality	3.52 (1.28)	3.39 (1.26)	4.08 (1.36)	4.09 (1.43)	χ^2=11.27**	1<2**,1<3**,1<4**
Speed additionality	3.03 (1.43)	3.49 (1.51)	3.96 (1.60)	3.75 (1.81)	χ^2=14.64***	1<2**,1<3***,1<4**
Network additionality	3.48 (1.42)	3.57 (1.49)	4.07 (1.90)	4.03 (1.47)	χ^2=6.08	
Competence additionality	5.02 (1.24)	5.11 (1.13)	5.55 (1.44)	5.20 (1.38)	χ^2=8.15*	1<3**,2<3*
Input additionality	2.83 (1.46)	3.41 (1.49)	3.83 (2.01)	3.66 (1.49)	χ^2=15.44***	1<2***,1<3***,1<4**
N	119	112	36	25		

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

The results show that member firms especially benefit from calling upon the collective research centre services in the event that they have their own R&D activities: output, speed and input additionality was higher in the cases where member firms had their own R&D activities, even though the extent to which they are involved in R&D does not seem to have a lot of impact. This is, however, the case for competence additionality, where R&D intensity by the member firms had (up to a certain level) a positive incremental effect on competence additionality. This phenomenon can be explained by what is commonly referred to as "absorptive capacity". Cohen and Levinthal (1990: 128) argue that the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capacity. Therefore the concept of absorptive capacity is crucial when firms rely on external knowledge. According to Cohen and Levinthal, the ability to evaluate and use outside knowledge is a function of the knowledge source and the level of prior related knowledge and depends on the ability to appropriate this external knowledge (Todorova and Durisin, 2007). These abilities were collectively defined as a firm's "absorptive capacity". The importance of internal R&D for building absorptive capacity is, according to Cohen and Levinthal (1990) part of the buildup of prior knowledge and depends on the learning environment. In environments where learning is less demanding, a firm's in-house R&D has little impact on absorptive capacity. In the extreme case in which external knowledge can be assimilated without any specialised expertise, a firm's internal R&D would have no effect on its absorptive capacity. At the level of the firm, as Cohen and Levinthal state, absorptive capacity can be generated in a variety of ways: by investing in R&D, as a by-product of a firm's manufacturing operations, or by sending personnel for advanced technical training.

However, these results show that the size of the R&D activities is of little importance. This is confirmed by the analyses below, which show that there are differences in additionality between those members that engage in R&D activities and those that do not. Interestingly, there were no difference in competence additionality between these 2 groups, which indicates that, in order to absorb knowledge through working with the collective research centres, own engagement in R&D seems to be less important: there is no indication that member firms that do not engage in R&D benefit any less from the services offered through building competence.

Table 39:
Relation between R&D engagement and additionalities

	Mean (s.d.)		
	R&D	No R&D	
Output additionality	4.00 (1.30)	3.52 (1.28)	***
Speed additionality	3.62 (158)	3.03 (1.43)	****
Network additionality	3.54 (1.58)	3.48 (1.42)	*
Competence additionality	5.21 (1.24)	5.02 (1.24)	
Input additionality	3.54 (1.61)	2.83 (1.46)	****
N	173	119	

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

We asked the members what would have been the impact if it had not been possible to call upon the collective research centre's knowledge transfer services.

Table 40:
Alternative actions for knowledge transfer services

What would have been the impact if it had not been possible to call upon the collective research centre's knowledge transfer activities?	mean	s.d.
We would have called upon private parties (consultants, companies,...)	4.15	1.67
We would have called upon public bodies	4.26	1.63
We would have called upon universities or public research organisations	4.48	1.60
We would have allocated more internal resources	3.95	1.57
We would not have taken any further actions	3.34	1.62

N=285

The results show that most member firms who called upon the collective research centre's knowledge transfer activities would have called upon alternative parties, especially universities or public research organisations. Less likely was the possibility that the member firms would not have taken any action. The following correlation table allows one to link the action the member firm would have taken to the characteristics of the member firm.

Table 41:
Correlation table between member firm characteristics and alternative actions

If your company had not had access to the collective research centre services, what would have been the impact? (1= disagree entirely – 7= agree entirely)	Revenues	Employ-ment	R&D intensity
We would have called upon private parties (consultants, companies,...)	.00	-.03	.07
We would have called upon public bodies	-.11	-.03	.18
We would have called upon universities or public research organisations	.00	.09	.27***
We would have allocated more internal resources	-.09	.09	.16***
We would not have taken any further actions	-.18**	-.15**	-.14**

The results show that the unavailability of the collective research centre's knowledge transfer services would have been less of an issue for large member firms compared to smaller ones: the higher the revenues and employment in the member firm, the lower the likelihood that the member firm would not have taken any further actions. The same goes for R&D activity: the higher the R&D intensity, the lower the

likelihood that no further actions would have been taken. In addition, the higher the R&D intensity, the greater the likelihood that the member firm would have called upon universities or public research organisations or would have allocated more internal resources. This is in line with the mission of the collective research centres: they were established in order to help those companies that do not have the size or R&D intensity (or internal resources) to engage in collaboration with universities or public research organisations directly.

We also looked at whether we could find differences between different collective research centre's members in the actions they would have taken. The results show that Centexbel-members are more likely to call upon public bodies compared to the other member firms.

Table 42:
Relation between collective research centre and alternatives for knowledge transfer activities

	Mean and s.d.					
	SIRRIS (1)	BBRI (2)	Centexbel (3)	Others (4)		
We would have called upon private parties (consultants, companies....)	4.04 (1.68)	4.13 (1.81)	4.17 (1.57)	4.27 (1.46)	χ^2= .55	
We would have called upon public bodies	4.13 (1.66)	4.07 (1.68)	4.89 (1.56)	4.30 (1.47)	χ^2= 10.09**	1<3***. 2<3***. 4<3*
We would have called upon universities or public research organisations	4.40 (1.74)	4.46 (1.55)	4.64 (1.65)	4.48 (1.61)	χ^2= .60	
We would have allocated more internal resources	4.02 (1.69)	3.77 (1.65)	4.21 (1.50)	4.10 (1.34)	χ^2= 2.71	
We would not have taken any further actions	3.44 (1.59)	3.43 (1.70)	3.02 (1.45)	3.30 (1.61)	χ^2= 2.40	
N	45	133	47	64		

Below we look at whether the intensity with which the member firm called upon the collective research centre for knowledge transfer activities correlated with the likelihood that alternative sources would have been called upon for these activities.

Table 43:
Correlation between extent to which the company called upon the collective research centre services and alternatives

To which extent does your company call upon the following collective research centre services? (1=never; 7= often)	We would have called upon private parties	We would have called upon public bodies	We would have called upon universities or PROs	We would have allocated more internal resources
- R&D laboratory for use of company	X	X	X	X
- Information on R&D European programmes		X	X	X
- Access to technical library			X	
- Provision of qualified personnel	X	X	X	
- Sales of equipment				
- Right to use inventions (licences)				X
- Research contract between collective research centre and company (bilateral research)		X	X	X
- Research contract on a collective basis (collective research centre, your company, and third parties)		X	X	X
- Small scale in-depth technological consultancy (GTA)	X	X	X	
- Support and advice concerning standardisation		X	X	
- Information on intellectual property	X	X	X	X
- Certification		X	X	X
- Consulting and audits	X	X	X	X
- Testing	X	X	X	X
- Feasibility studies		X		
- Provision of information through website		X	X	
- Provision of information through publications			X	
- Provision of information through Newsletters		X	X	
- Standardisation antennas			X	
- European technology platform		X	X	X
- Matching parties in industry and science	X	X	X	X
- Organisation of study days and seminars		X	X	
- Technology watch and roadmapping		X	X	X
- Solving specific problems (troubleshooting)	X	X	X	
- Technical advice	X	X	X	

X= correlation significant at p<.05 level

6.3.8.3 Impact of contract research

First, we provide an overview of the descriptives for all questions concerning additionality. Next, we group items into constructs of input, output and behavioural additionality.

Table 44:
Impact of contract research

Questions/ Constructs (1= disagree strongly; 7= agree strongly)	Mean	Standard Deviation	N
The project resulted in a new product that is, or will be, introduced on the market	3.90	1.88	114
The project resulted in a new process that is, or will be, introduced in the company	4.01	1.69	114
The project has resulted in a patent application, or will result in a patent application	2.90	1.82	114
The project will allow our company to increase its market share	4.05	1.74	114
The project will allow our company to increase our competitiveness	4.67	1.56	114
Output additionality	**3.91**	**1.32**	**114**
The project allowed us to network with universities or public research organisations	4.48	1.74	115
The project allowed us to network with other companies	4.50	1.76	116
The project allowed us to build research networks	4.08	1.64	116
Network additionality	**4.34**	**1.57**	**115**
The project increased our skills to network with universities or public research organisations	4.17	1.64	115
The project increased our skills to network with other companies	4.20	1.63	115
The project allowed us to acquire new knowledge	5.51	1.00	115
The project allowed us to upgrade our human resources	5.33	1.16	116
The project increased our innovation management capabilities	4.70	1.41	116
Competence additionality	**4.78**	**1.07**	**114**
Since the project, we regularly undertake R&D or innovation projects	4.03	1.57	120
Since the project, the company has more attention for R&D and innovation	4.14	1.59	120
Since the project, we increased our R&D and innovation budget	3.65	1.50	120
Input additionality	**3.94**	**1.43**	**120**

Again, competence additionality appears to be the factor for which the impact of the collective research centres activities is the highest. However, the other additionalities also seem to be influenced by contract research between the collective research centre and the member firm. Working with the collective research centre on contract research in the first instance allowed the member firms to upgrade their human resources, acquire new knowledge and innovation management capabilities and to increase competitiveness.

In addition, we wanted to understand which member firm characteristics affected additionalities. We did not find any correlations between the size of the firm, measured in number of employees and revenues, and the additionalities. We found only very small differences in the R&D intensities and the additionalities generated by working on contract research together with the collective research centre. Network additionality was significantly higher for those companies that have a high R&D intensity, compared to those that do not engage or only limitedly engage in R&D activities, as the following table shows.

Table 45:
Relation between R&D intensity and additionalities

	No R&D (1)	R&D: 0-5% of revenues (2)	R&D: 5-10% of revenues (3)	R&D: >10% of revenues (4)		
Output additionality	3.81 (1.33)	3.90 (1.36)	4.01 (1.32)	4.14 (.96)	χ^2=.84	No significant differences
Network additionality	3.93 (1.63)	4.22 (1.45)	4.75 (1.91)	5.39 (1.12)	χ^2=8.91**	1<4*, 2<4**
Competence additionality	4.64 (1.16)	4.64 (.93)	5.18 (1.17)	5.28 (1.02)	χ^2=4.38	No significant differences
Input additionality	3.53 (1.56)	3.90 (1.36)	4.26 (1.55)	4.25 (1.27)	χ^2=2.48	No significant differences
N	24	68	12	12		

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

Below we analyse what would have been the impact of the member firm not being able to call upon the collective research centre for contract research. It is clear that the average member firm would have carried out the project, but with a lower budget and at a lower speed. This average member firm would have called upon universities or PROs to carry out the project.

Table 46:
Alternatives for contract research

What would have been the impact if it had not been possible to call upon the collective research centre contract research? (1= disagree entirely – 7= agree entirely)	Mean	Standard deviation
The project would have taken place with the same budget	3.34	1.50
The project would have taken place with a smaller budget	3.51	1.53
We would have allocated more internal resources to the project	4.07	1.45
The project would not have taken place at all	3.29	1.56
The project would have taken place at a slower speed	4.46	1.48
The project would have taken place on a much smaller scale	3.82	1.50
The project would have taken place with less ambitious goals	3.88	1.43
We would have called upon private parties (consultants)	4.07	1.64
We would have called upon public institutions	4.19	1.71
We would have called upon universities or public research organisations	4.51	1.57

N= 76

Table 47:
Correlation table for member firm characteristics with alternatives

	Revenues	Employment	R&D intensity
The project would have taken place with the same budget	.19*	-.05	.09
The project would have taken place with a smaller budget	-.11	-.04	-.06
We would have allocated more internal resources to the project	.00	.08	-.02
The project would not have taken place at all	-.19*	-.05	-.17*
The project would have taken place at a slower speed	-.11	.03	.08
The project would have taken place on a much smaller scale	-.11	-.01	.13
The project would have taken place with less ambitious goals	-.17	.05	-.08
We would have called upon private parties (consultants)	.090	.12	.20**
We would have called upon public institutions	-.11	-.01	.21**
We would have called upon universities or public research organisations	.00	.20*	.33****

Levels of significance: *=.10; **=.05; ***=.001; ****=.0001

The results again show that the collective research centres fulfil the role they were established for. First of all, it is clear that the lower the R&D intensity of the member firms, the higher the likelihood that the project would not have taken place. In addition, the higher the R&D intensity of the member firms, the greater the likelihood that the member firms would have called upon private parties, public institutions, universities or PROs.

Finally, we do not find any statistically significant differences between the collective research centres with regard to potential alternatives for collaboration with the collective research centre.

7
General conclusions

Many authors have commented on the innovation paradox, or the observation that not all generated knowledge gets translated into commercial products or processes. This is especially the case in the European Union. This report sought to understand how technology intermediaries, and more specifically collective research centres, can help to create and transfer knowledge and R&D to commercial products and processes. In order to understand their role we took two routes. First, we interviewed the collective research centres about their functioning, especially with respect to technology transfer. Second, we surveyed the collective research centres' member firms in order to assess the impact of the involvement of collective research centres on the firms' functioning and innovation strategy.

This study shows that collective research centres are very diverse in their nature. First, collective research centres operate on behalf of the members in a specific industry, and mainly engage in two types of activities: knowledge transfer activities and R&D. Second, the centres are largely autonomous in sourcing relevant technology and knowledge. The R&D activities comprise to a large extent collective and contract research. Our research shows that the extent to which the collective research centres engage in these activities differs from one centre to the other. However, overall, most of them engage in research, and some of them even dedicate the majority of their resources to this activity. This can partly be explained from an absorptive capacity perspective: in order for the collective research centre to be able to engage in knowledge transfer activities, it requires people who keep track of the latest developments and who are familiar with research in order to capture the newest trends and knowledge in the environment and translate this knowledge to the member firms. Collective research centres operate on behalf of all members in a specific industry, which also explains why patents are seldom taken, as it is indeed the purpose that all members be allowed to derive value from the inventions of the collective research centre. However, the collective research centres do actively engage in research.

It is noteworthy that a large part of the research is directed towards applied research. This is mainly due to the fact that the research domains and topics are suggested by the Technical Committees of the collective research centres. In these committees companies active in the industry are active stakeholders, and they are looking

for applied research that benefits groups of firms. Contract research is also performed by the centres on behalf of a sole member, and, if relevant and allowed, these results are made public to other interested members. The interviews with representatives of the centres indicated that each centre has to engage in research in order to build absorptive capacity within the centre, but it is clear that it is not always easy to finance this research, especially when fundamental research is concerned. However, especially smaller collective research centres find it difficult to dedicate part of the staff's time to research that is not financed by specific programmes. Overall, the interviews with the collective research centres show that these intermediaries were established for and by the member firms, and that companies in the sector still largely determine the activities that the collective research centres engage in (for instance, through the technical committees). Hence, the operation of collective research centres is predominantly based on bottom-up processes where member firms largely determine the research topics and benefit from the results directly, since that is the mission of the collectieve research centres. This is very different from (for instance) universities, which rely less on industry for determining research topics.

A second part of this report focuses on the impact of the involvement of collective research centres on member firms. In order to assess this impact, we asked the managers of the collective research centres to address their member companies and ask them to fill out a questionnaire. The managers selected about 11% of the total population. In total 856 members, or 9.4% of the potential respondents, completed the questionnaire. These respondents have similar R&D and size characteristics compared to the total population. As a general trend, we find that member firms that used the collective research centre's services are larger than firms that did not. The 'average' member firm uses the collective research centre's services because of the qualified personnel and technical and market information the centre disposes of. The availability of market information is especially important for those members that do not perform their own R&D. Moreover, we find that the reason for using the services of the collective research centres is highly sector dependent. Overall, member firms mainly use the following services: in-depth technical advice (GTA), provision of information, organisation of study days and seminars, and technical advice. Member firms that engage in R&D themselves use the centre's services more frequently. Again, this can be explained from an absorptive capacity perspective: for a member firm to be able to process the research-related information it receives from the collective research centre, it has to build its own absorptive capacity, which can be done by having people who engage in R&D activities. Again, we find many differences between the use of specific services and the collective research centre that offers the service: CENTEXBEL-members seem to be using other services than BBRI- and SIRRIS-members (for instance, CENTEXBEL-members rely more on the CRC's testing facilities, whereas BBRI-members use information provided through website and newsletters more extensively). In addition, we find that member firms which engage in R&D attach more importance to the use of the R&D laboratory and testing facilities, compared to companies that do not carry out their own R&D, which attach more importance to information, technical advice and in-depth technical advice (GTA). Again, sectoral differences are postulated to explain the importance which particular members of collective research centres atttribute to a service.

Another important part of this study looked at the impact of services by the collective research centre on the member firm. In order to assess this impact, we studied

additionality, comprising behavioural, input and output additionality. Additionality captures the effective contribution of the centre in the operations of the member firms. Up to now, the effects on input (i.e. the resources available to the members in terms of higher R&D etc.) and output (the effects of dealing with the centres in terms of hits on websites, patent applications, etc.) additionality are best known. The results show that for both knowledge transfer activities and research, the largest impact of the involvement of collective research centres is on behavioural additionality: by working with the collective research centre, the member firm enlarges its own knowledge base. This is especially the case for member firms that are already engaged in R&D, which can again be explained from an absorptive capacity perspective: the higher the absorptive capacity (or R&D intensity), the better the information obtained through the collective research centre can be processed and the more likely the positive impact of the collective research centre. However, this is only the case for knowledge transfer activities: in the case of collective or contract research, we do not find significant differences in impact of the involvement of collective research centres between member firms that engage in R&D and those that do not.

The added value of the activities of collective research centres is to a great extent determined by the availability of alternatives for these services. The study shows that member firms would most likely have called upon universities and public research organisations (PROs) if they would not have been able to use the services of the collective research centre for knowledge transfer services. However, this is less the case for the smaller companies and for the less R&D intensive companies, which would encounter greater difficulties in collaborating with universities and PROs. This indicates that, especially for small, less R&D-intensive companies, which are precisely the main target group of the collective research centres, few alternatives exist for the knowledge transfer activities by collective research centres. In the case of unavailability of contract research by the collective research centre, the interviewees indicated that the project would have taken place at a lower speed, or they would have called upon universities or PROs. However, the analysis shows that it is primarily the firms with a high R&D intensity that would have called upon universities and PROs, whereas we found a significant negative correlation between R&D intensity and the probability that the project would not have taken place, meaning that member firms with lower R&D intensity were more likely to have abandoned the project if cooperation with the collective research centre had not been possible.

In sum, this report sheds light on the relatively neglected topic of collective research centres and illustrates their functioning and specific nature. This research shows how collective research centres deploy a diverse range of activities that are offered to their members. It shows that, especially for smaller and less R&D intensive member firms, few alternatives exist for the services of centres, making the collective research centres an indispensable ingredient in their search for relevant knowledge and technology. However, these firms tend to benefit less from the services of centres compared to the larger and more R&D intensive firms. The companies that work with the collective research centre tend to be larger than those which do not. On the other hand, firms without R&D tend to benefit more from specific activities such as access to market information than their R&D-intensive counterparts, and more explicitly use the services of the collective research centre to gain access to market information.

This report makes it clear that collective research centres are faced with a number of challenges. First is the challenge of financing the generation of internal

absorptive capacity, or people who are dedicated to R&D activities. Second, they are faced with a challenge of, more prominently, reaching the smaller and less R&D intensive members, since they were established in order to service these companies, and since this research shows that these firms are the ones that have the fewest alternative parties to call upon. However, this is not easy to accomplish, since these smaller and less R&D-intensive firms are at least as time intensive to advise as larger members, given their lack of or low level of absorptive capacity. Finally, the collective research centres are faced with a lack of public visibility. Even though they have visibility within their own industry, their functioning is hardly known beyond the boundaries of their sector. One of the reasons for the relatively low visibility of the collective research centres may be the fact that the outcome of the research is less obvious to measure compared to the outcome of other R&D organisations, which often provide information on the number of patents and publications obtained as output measure. The collective research centres hardly ever patent, since the results of their research should be applicable and available to all members. The number of contacts through collective and contract research and through advice, guidance and counselling, however, indicates that R&D carried out at collective research centres may be less fundamental, but defined in closer collaboration with the users (industry) than is the case of research at, for instance, universities. Whether or not the lack of visibility is an impediment for these centres, which were established to serve a particular industry, is debatable. It is clear on the one hand that the high visibility within the sector is beneficial to the member firms, but on the other hand, the relative low visibility outside the sector may cause them to be less prominent on the political agenda.

8
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9
Dissemination of the results

Four working papers have been written based on the results:

- "The Ugly Duckling in Technology Intermediaries: the case of collective research centres"
- "Building Absorptive Capacity to Organise Inbound Open Innovation in Low Tech Industries"
- "Determinants and effects of users' search strategies in quasi internal technology transfer"
- "When do firm-technology intermediary interactions result in cognitive capacity additionality?"

The final three papers were financed by FDC (Flanders District of Creativity). The second paper was presented at ISPIM conference on "Open Innovation", Tours, June 2008. The third paper will be presented at ISPIM conference on "The Future of Innovation", Vienna, June 2009.
The final paper will be presented at the AOM (Academy of Management) Annual Meeting, Chicago, August 2009.

10
Appendices

10.1 Appendix I: Centres Techniques Industriels (CTIs) in France

Collective research centres are technology intermediaries that are quite unique, but still comparable, for instance with certain initiatives in Ireland and New Zealand. They operate quite similarly to the French CTIs, even though these intermediaries have less engagement with the firms than is the case of the CRCs. In what follows, we provide a description of the CTIs.

10.1.1 Introduction

10.1.1.1 Origin

The "**Centres Techniques Industriels**" (CTI) are institutions under private law but with a public purpose. The majority of them were created by a law of July 1948 in the context of the French reconstruction after the Second World War. At the time, industry was lacking technical personnel and the public authorities and the economic actors created an institution which we may consider as the first attempt of what has become collective research and was called a CTI.

10.1.1.2 Number and sectors

The 16 French CTIs cover 26 different sectors in the manufacturing industry. By pooling the resources of the different economic actors, the CTIs contribute to the economic and social development of the sectors in which they are active. The 26 covered sectors represent 120 professions, 70,000 firms (of which 68% have fewer than 50 employees), 1.7 million direct jobs (58% of the French manufacturing jobs and 9% of the total working population) and €190 billion in revenues (including 30% from exports).

10.1.1.3 Financing

The financing sources (€470 million in 2005) of the CTIs are twofold:

- The so-called "mission of general interest" is financed by a grant from the government and a dedicated tax paid by the member firms. In 2005, this kind of financing accounted for €310 million.
- The technical services provided by the CTIs are paid exclusively by the member firms. In 2005 this kind of financing accounted for €160 million.

The CTIs are not financed by the local government. Other local or regional "Centres de transfert" exist at this level.

10.1.1.4 Environment

Compared to other institutions in the French Research and Innovation System, the CTIs are able to add more value because of:

- their specialisation (other institutions are often more generalist)
- their specific role as technology integrator
- their close cooperation and links with the industry
- their balance between applied and fundamental research
- their balance between research which benefits a whole sector and the implementation of this research on projects with single firms
- their role as an intersection for various scientific and technical fields
- their central function as an intermediary between research and SMEs.

10.1.1.5 Employment

The CTIs employ approximately 4500 people, of which 50% are scientists (820 PhDs), engineers, industry experts or managers, 30% are technicians, 16% white-collar and 4% blue-collar workers. The fact that the CTIs employ people during their PhD process makes them different from the collective research centres that are the topic of this research.

10.1.2 Activities

The CTIs define themselves as "**a link between industry and research**". As an intermediary in the French innovation and technology transfer system, they are at the intersection of a large number of scientific and technical fields and hold strong links with public research.

Their mission has 4 pillars:

- to anticipate/forecast (technological, prospective...)
- to innovate (R&D)
- to disseminate (congresses, technological meetings, scientific and technical journals...)
- to transfer R&D results to firms (advice, analyses, tests, evaluations...).

10.1.2.1 Knowledge transfer activities

As an intermediary in the French innovation and technology transfer system, the CTIs participate in:

- meetings, visits, interviews and question/answers sessions with companies (40,000)
- service contacts: research, consultancy, audits and tests (34,000)
- professional publications (60)
- journals/technical reviews (200,000 copies)
- meetings (300)
- professional training (30,000 people in 1 million hours of training).

The CTIs want to play a role at both a regional and European level. At the regional level they are present in 40 French departments and 20 regions. At this regional level they conducted 110 partnerships with regional or decentralised state services. At the European level, they have 50 research contracts with the European Framework programmes; they have 200 partnerships with European organisations (research labs, technical institutes...) and 50 partnerships outside the European Union (with 15 members).

10.1.2.2 R&D activities

The CTIs conduct primarily industrial (or applied) research. They have strong links with universities, fundamental research labs (French or European) and other research institutes.

To increase the contribution to the competitive position of the industrial sectors, the CTIs have increased their involvement in research and their link with the public research sector.

The collaboration with fundamental research labs involves around 200 PhD dissertations and 50 post-doc researchers. The number of staff holding a PhD in the CTIs in general has increased noticeably over the past years, and has reached the number of 820.

10.1.3 The CTI's new roles

In a changing environment, the CTIs have to adapt themselves constantly and their role is becoming broader. They have an ever-increasing role in the field of standardisation, clarification of rules and regulations and the safety and health of consumers. Another important field in which the CTIs are playing a more important role is sustainable development. By taking into account the effects on the environment in their activities, participating in regularity and technological watch, conducting studies of and evaluating products and processes and spreading information on the subject, CTIs try to contribute as much as possible to this current trend.

10.1.4 Future challenges for CTIs

10.1.4.1 The main changes in recent years

Over the last few years the mission of the CTIs has been expanded. New domains such as industrial organisation, innovation, ICT and Business intelligence have been explored. These new trends gradually extend the field of intervention of the CTIs towards business services. They also create new needs and new possibilities for answering those needs in a more coordinated way, avoiding wasted effort and an ineffective use of resources.

10.1.4.2 SME Support

In the changing economic environment it is often the SMEs which are confronted with problems due to resource deficiencies. Therefore SMEs tend to rely more on institutions such as the CTIs, which have proven very useful to them. The CTIs are aware of their importance for the SMEs and this is reflected in the "Livre Blanc des Centres Techniques Industriels", a special report which contains a number of proposals made by the network of CTIs. The majority of these proposals relate to SMEs directly and include fiscal measures, simplification of the financial support system for SMEs and the reinforcement of industrial research in the 7th Framework Programme especially for SMEs.

10.2 Appendix II: Questionnaires

Vragenlijst voor leden van collectieve onderzoekscentra

(Officiële) naam van uw onderneming: _____

Sector: _____

BTW-nummer: _____

Q.1. Aantal werknemers (2007): _____

Q.2. Het aantal werknemers van uw onderneming is de afgelopen drie jaar:

○ Toegenomen ○ Afgenomen ○ Constant gebleven

Q.3. Omzet in 2007: _____

Q.4. De omzet van uw onderneming is de afgelopen drie jaar:

○ Toegenomen ○ Afgenomen ○ Constant gebleven

Q.5. Hoe groot was het budget voor Onderzoek en Ontwikkeling (O&O) in % van de omzet?

○ Mijn onderneming doet niet aan O&O
○ Minder dan 5% van de omzet
○ Tussen 5 en 10% van de omzet
○ Meer dan 10% van de omzet

Q.6. Geef aan met welk Collectief Onderzoekscentrum (COC) u het meeste contact had in de afgelopen drie jaar:

a. SIRRIS (WTCM-CRIF) – Technologie	○
b. WTCB-CSTC – Bouw	○
c. CENTEXBEL – Textiel	○
d. OCW-CRR – Wegenbouw	○
e. OCCN – Cement	○
f. CWOBKN – Keramiek	○
g. CTIB-TCHN – Hout	○
h. WTOCD – Diamant	○
i. CORI – Coating	○
j. CRM – Metallurgie	○
k. BIL-IBS – Lastechniek	○
l. BVI-IBE – Verpakking	○
Ik ben niet in contact geweest met een collectief onderzoekscentrum	○ (->Einde van de vragenlijst)

Q.7. Waarom doet uw onderneming het meest beroep op de COC's?

	Tnb			N			Zb
a. Door de hoge economische risico's verbonden aan de uitvoering van eigen O&O	1	2	3	4	5	6	7
b. Door de hoge kosten verbonden aan O&O	1	2	3	4	5	6	7
c. Door het gebrek aan beschikbare financiële middelen	1	2	3	4	5	6	7
d. Door het gebrek aan organisatorische flexibiliteit	1	2	3	4	5	6	7
e. Omdat COC's over gekwalificeerd personeel beschikken	1	2	3	4	5	6	7
f. Omdat COC's over technische informatie beschikken	1	2	3	4	5	6	7
g. Omdat COC's over marktinformatie beschikken	1	2	3	4	5	6	7
h. Andere redenen:	1	2	3	4	5	6	7

Tnb = Totaal niet belangrijk - N = Neutraal - Zb = Zeer belangrijk

Q.8. Belang en gebruik van diensten van de COCs

	N			Z			V
a. O&O laboratorium voor onderzoek ten behoeve van de onderneming	1	2	3	4	5	6	7
b. Informatie met betrekking tot Europese O&O programma's	1	2	3	4	5	6	7
c. Toegang tot de technische bibliotheek	1	2	3	4	5	6	7
d. Het ter beschikking stellen van gekwalificeerd personeel	1	2	3	4	5	6	7
e. De verkoop van uitrustingen	1	2	3	4	5	6	7
f. Het recht op het gebruik van uitvindingen (licenties)	1	2	3	4	5	6	7
g. Uitvoeren van een onderzoekscontract tussen COC en de onderneming (bilateraal onderzoek)	1	2	3	4	5	6	7
h. Het uitvoeren van onderzoek op een collectieve basis (onderzoek met COC, uw onderneming en derden)	1	2	3	4	5	6	7
i. Grondig Technologisch Advies (GTA)	1	2	3	4	5	6	7
j. Ondersteuning en advies met betrekking tot normalisatie	1	2	3	4	5	6	7
k. Informatie met betrekking tot intellectuele eigendom	1	2	3	4	5	6	7
l. Certificatie	1	2	3	4	5	6	7
m. Consulting en audits	1	2	3	4	5	6	7
n. Het uitvoeren van testen en proeven	1	2	3	4	5	6	7
o. Haalbaarheidsstudies	1	2	3	4	5	6	7
p. Ter beschikking stellen van informatie via website	1	2	3	4	5	6	7
q. Ter beschikking stellen van informatie via publicaties	1	2	3	4	5	6	7
r. Ter beschikking stellen van informatie via nieuwsbrieven	1	2	3	4	5	6	7
s. Normen-antennes	1	2	3	4	5	6	7
t. Europees Technologie Platform	1	2	3	4	5	6	7
u. Samenbrengen van partijen uit industrie en de wetenschappelijke wereld	1	2	3	4	5	6	7
v. De organisatie van studiedagen en seminaries	1	2	3	4	5	6	7
w. Technology watch en roadmapping	1	2	3	4	5	6	7
x. Oplossen van specifieke problemen (troubleshooting)	1	2	3	4	5	6	7
y. Technisch advies	1	2	3	4	5	6	7

N = Nooit - Z = Zelden - V = Vaak

Als OF (a,b,c,d,e,f,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y) is aangevinkt: Voeg Q.9. toe (na Q. 8b)
Als g is aangevinkt: Voeg Q.10 toe (na Q. 8b)
Als h is aangevinkt: Voeg Q.11 toe (na Q.8b)

	Hoe belangrijk is deze ondersteuning van de COC's voor uw onderneming?						
	Tnb						**Zb**
a. O&O laboratorium voor onderzoek ten behoeve van de onderneming	1	2	3	4	5	6	7
b. Informatie met betrekking tot Europese O&O programma's	1	2	3	4	5	6	7
c. Toegang tot de technische bibliotheek	1	2	3	4	5	6	7
d. Het ter beschikking stellen van gekwalificeerd personeel	1	2	3	4	5	6	7
e. De verkoop van uitrustingen	1	2	3	4	5	6	7
f. Het recht op het gebruik van uitvindingen (licenties)	1	2	3	4	5	6	7
g. Uitvoeren van een onderzoekscontract tussen COC en de onderneming (bilateraal onderzoek)	1	2	3	4	5	6	7
h. Het uitvoeren van onderzoek op een collectieve basis (onderzoek met COC, uw onderneming en derden)	1	2	3	4	5	6	7
i. Grondig Technologisch Advies (GTA)	1	2	3	4	5	6	7
j. Ondersteuning en advies met betrekking tot normalisatie	1	2	3	4	5	6	7
k. Informatie met betrekking tot intellectuele eigendom	1	2	3	4	5	6	7
l. Certificatie	1	2	3	4	5	6	7
m. Consulting en audits	1	2	3	4	5	6	7
n. Het uitvoeren van testen en proeven	1	2	3	4	5	6	7
o. Haalbaarheidsstudies	1	2	3	4	5	6	7
p. Ter beschikking stellen van informatie via website	1	2	3	4	5	6	7
q. Ter beschikking stellen van informatie via publicaties	1	2	3	4	5	6	7
r. Ter beschikking stellen van informatie via nieuwsbrieven	1	2	3	4	5	6	7
s. Normen-antennes	1	2	3	4	5	6	7
t. Europees Technologie Platform	1	2	3	4	5	6	7
u. Samenbrengen van partijen uit industrie en de wetenschappelijke wereld	1	2	3	4	5	6	7
v. De organisatie van studiedagen en seminaries	1	2	3	4	5	6	7
w. Technology watch en roadmapping	1	2	3	4	5	6	7
x. Oplossen van specifieke problemen (troubleshooting)	1	2	3	4	5	6	7
y. Technisch advies	1	2	3	4	5	6	7

Tnb = Totaal niet belangrijk - Zb = Zeer belangrijk

Q.9. Geef aan in welke mate u akkoord gaat met elk van de volgende stellingen (voor activiteiten waar u een beroep heeft opgedaan die geen O&O zijn, bijvoorbeeld: advies, informatie, testen):

	Vo	O	Lo	N	Lme	Me	Vme
Output							
a. Door de tussenkomst van het COC kon mijn onderneming nieuwe producten ontwikkelen.	1	2	3	4	5	6	7
b. Door de tussenkomst van het COC kon mijn onderneming nieuwe producten op de markt brengen	1	2	3	4	5	6	7
c. Door de tussenkomst van het COC kon mijn onderneming haar productieproces verbeteren	1	2	3	4	5	6	7
d. Door de tussenkomst van het COC kon mijn onderneming nieuwe markten betreden	1	2	3	4	5	6	7
e. Door de tussenkomst van het COC kon mijn onderneming haar productgamma uitbreiden	1	2	3	4	5	6	7
f. Door de tussenkomst van het COC kon mijn onderneming haar marktaandeel vergroten	1	2	3	4	5	6	7
g. Door de tussenkomst van het COC kon mijn onderneming haar omzet verhogen	1	2	3	4	5	6	7
h. Door de tussenkomst van het COC kon mijn onderneming haar imago versterken	1	2	3	4	5	6	7
i. Door de tussenkomst van het COC kon mijn onderneming een betere dienstverlening aan klanten aanbieden	1	2	3	4	5	6	7
j. Door de tussenkomst van het COC kon mijn onderneming betwistingen vermijden of sneller oplossen	1	2	3	4	5	6	7
k. Door de tussenkomst van het COC kon mijn onderneming kosten besparen	1	2	3	4	5	6	7
Draagwijdte							
l. De tussenkomst van het COC had te maken met technologie die momenteel standaard is maar die niet aanwezig was in de onderneming.	1	2	3	4	5	6	7
m. De tussenkomst van het COC had te maken met incrementele technologie (die bestaande technologie uitbreidt)	1	2	3	4	5	6	7
n. De tussenkomst van het COC had te maken met technologie van de volgende generatie (het gebruik van technologie in een volledig andere omgeving)	1	2	3	4	5	6	7
o. De tussenkomst van het COC had te maken met een doorbraak- technologie (volledig nieuwe toepassing van een technologie die nieuw is voor de sector)	1	2	3	4	5	6	7
Snelheid							
p. Door de tussenkomst van het COC kon mijn onderneming haar producten sneller op de markt brengen	1	2	3	4	5	6	7
q. Door de tussenkomst van het COC kon mijn onderneming sneler producten ontwikkelen	1	2	3	4	5	6	7

Netwerk							
r. Door de tussenkomst van het COC kon mijn onderneming potentiële partners identificeren	1	2	3	4	5	6	7
s. Door de tussenkomst van het COC kon mijn onderneming met andere ondernemingen samenwerken	1	2	3	4	5	6	7
t. Door de tussenkomst van het COC kon mijn onderneming samenwerken met kenniscentra zoals universiteiten en onderzoekscentra	1	2	3	4	5	6	7
Competentie							
u. Door de tussenkomst van het COC kon mijn onderneming kennis verwerven	1	2	3	4	5	6	7
v. Door de tussenkomst van het COC was mijn onderneming beter in staat om aan innovatie te doen	1	2	3	4	5	6	7
w. Door de tussenkomst van het COC kon mijn onderneming de kennis van haar personeel versterken	1	2	3	4	5	6	7
Input							
x. Door de tussenkomst van het COC startte mijn onderneming een nieuw O&O project	1	2	3	4	5	6	7
y. Door de tussenkomst van het COC besloot mijn onderneming om meer middelen aan O&O toe te wijzen	1	2	3	4	5	6	7

Vo = Volledig oneens - O = Oneens - Lo = Licht oneens -N = Neutral - Lme = Licht mee eens - Me = Mee eens - Vme = Volledig mee eens

Als uw onderneming geen toegang had gehad tot de diensten van een COC, wat zou dan de impact geweest zijn?

	Vo	O	Lo	N	Lme	Me	Vme
a. We zouden een beroep gedaan hebben op private partijen (consultants, ondernemingen,...)	1	2	3	4	5	6	7
b. We zouden een beroep gedaan hebben op publieke instellingen (IWT, DGTRE,...)	1	2	3	4	5	6	7
c. We zouden een beroep gedaan hebben op universiteiten of publieke onderzoeksinstituten	1	2	3	4	5	6	7
d. We zouden meer interne middelen toegewezen hebben	1	2	3	4	5	6	7
e. We zouden geen verdere acties ondernomen hebben	1	2	3	4	5	6	7

Vo = Volledig oneens - O = Oneens - Lo = Licht oneens -N = Neutral - Lme = Licht mee eens - Me = Mee eens - Vme = Volledig mee eens

Q.10. Denk aan een project dat u de afgelopen drie jaar met een COC uitvoerde (onderzoek op bilaterale basis).

Geef aan in welke mate u akkoord gaat met volgende stellingen:

	Vo	O	Lo	N	Lme	Me	Vme
Input							
a. Sinds het project voeren we op regelmatige basis O&O of innovatie projecten uit	1	2	3	4	5	6	7
b. Sinds het project heeft onze onderneming meer aandacht voor O&O en innovatie	1	2	3	4	5	6	7
c. Sinds het project hebben we ons O&O en innovatie budget verhoogd	1	2	3	4	5	6	7
Draagwijdte							
d. Het project kwam perfect overeen met de kernactiviteit van de onderneming	1	2	3	4	5	6	7
e. Het project liet toe om meer risico te nemen	1	2	3	4	5	6	7
f. Het project had te maken met technologie die momenteel standaard is maar die niet aanwezig was in de onderneming.	1	2	3	4	5	6	7
g. Het project had te maken met incrementele technologie (die bestaande technologie uitbreidt)	1	2	3	4	5	6	7
h. Het project had te maken met technologie van de volgende generatie (het gebruik van technologie in een volledig andere omgeving)	1	2	3	4	5	6	7
i. Het project had te maken met een doorbraak-technologie (volledig nieuwe toepassing van een technologie die nieuw is voor de sector)	1	2	3	4	5	6	7
Netwerk							
j. Het project liet ons toe om contacten te leggen met universiteiten of publieke onderzoeksinstellingen	1	2	3	4	5	6	7
k. Het project liet ons toe om contacten te leggen met andere ondernemingen	1	2	3	4	5	6	7
l. Het project liet ons toe om onderzoeksnetwerken uit te bouwen	1	2	3	4	5	6	7
Competentie							
m. Het project verhoogde onze vaardigheden om met andere universiteiten en publieke onderzoekscentra te netwerken	1	2	3	4	5	6	7
n. Het project verhoogde onze capaciteiten om met andere ondernemingen te netwerken	1	2	3	4	5	6	7
o. Het project liet ons toe om nieuwe kennis te verwerven	1	2	3	4	5	6	7
p. Het project liet mijn onderneming toe de kennis van haar personeel versterken	1	2	3	4	5	6	7
q. Het project verhoogde onze vaardigheden om aan innovatie te doen	1	2	3	4	5	6	7

Breedte							
r. Het project was voornamelijk gericht op het ontwikkelen van een nieuw of een verbeterd product	1	2	3	4	5	6	7
s. Het project was voornamelijk gericht op het ontwikkelen van een nieuw of verbeterd productieproces	1	2	3	4	5	6	7
Output							
t. Het project resulteerde in een nieuw product dat op de markt is gebracht, of zal gebracht worden	1	2	3	4	5	6	7
u. Het project resulteerde in een nieuw proces dat in de onderneming is geïmplementeerd, of zal geïmplementeerd worden	1	2	3	4	5	6	7
v. Het project resulteerde in een patentaanvraag, of zal resulteren in een patentaanvraag	1	2	3	4	5	6	7
w. Het project zal toelaten om ons marktaandeel te verhogen	1	2	3	4	5	6	7
x. Het project zal de competitiviteit van onze onderneming doen toenemen	1	2	3	4	5	6	7

Vo = Volledig oneens - O = Oneens - Lo = Licht oneens -N = Neutral - Lme = Licht mee eens - Me = Mee eens - Vme = Volledig mee eens

Als de onderneming geen hulp/ondersteuning van het COC had gekregen, wat zou dan de impact op uw project geweest zijn?

	Vo	O	Lo	N	Lme	Me	Vme
a. Het project zou met hetzelfde budget uitgevoerd zijn	1	2	3	4	5	6	7
b. Het project zou met een kleiner budget uitgevoerd zijn	1	2	3	4	5	6	7
c. We zouden meer interne middelen aan het project hebben toegewezen	1	2	3	4	5	6	7
d. Het project zou helemaal niet uitgevoerd zijn	1	2	3	4	5	6	7
e. Het project zou aan een lagere snelheid uitgevoerd zijn	1	2	3	4	5	6	7
f. Het project zou op een veel kleinere schaal uitgevoerd zijn	1	2	3	4	5	6	7
g. Het project zou met minder ambitieuze doelstellingen uitgevoerd zijn	1	2	3	4	5	6	7
h. We zouden een beroep gedaan hebben op private partijen (consultants, ondernemingen,...)	1	2	3	4	5	6	7
i. We zouden een beroep gedaan hebben op publieke instellingen (IWT, DGTRE,...)	1	2	3	4	5	6	7
j. We zouden een beroep gedaan hebben op universiteiten of publieke onderzoeksinstituten	1	2	3	4	5	6	7

Vo = Volledig oneens - O = Oneens - Lo = Licht oneens -N = Neutral - Lme = Licht mee eens - Me = Mee eens - Vme = Volledig mee eens

Q.11. Denk aan een project dat u de afgelopen drie jaar met een COC en andere partijen uitvoerde (onderzoek op collectieve basis).

Geef aan in welke mate u akkoord gaat met volgende stellingen:

	Vo	O	Lo	N	Lme	Me	Vme
Input							
a. Sinds het project voeren we op regelmatige basis O&O of innovatieprojecten uit	1	2	3	4	5	6	**7**
b. Sinds het project heeft onze onderneming meer aandacht voor O&O en innovatie	1	2	3	4	5	6	**7**
c. Sinds het project hebben we ons O&O- en innovatie budget verhoogd	1	2	3	4	5	6	**7**
Draagwijdte							
d. Het project kwam perfect overeen met de kernactiviteit van de onderneming	1	2	3	4	5	6	**7**
e. Het project liet toe om meer risico te nemen	1	2	3	4	5	6	**7**
f. Het project had te maken met technologie die momenteel standaard is maar die niet aanwezig was in de onderneming.	1	2	3	4	5	6	**7**
g. Het project had te maken met incrementele technologie (die bestaande technologie uitbreidt)	1	2	3	4	5	6	**7**
h. Het project had te maken met technologie van de volgende generatie (het gebruik van technologie in een volledig andere omgeving)	1	2	3	4	5	6	**7**
i. Het project had te maken met doorbraak-technologie (volledig nieuwe toepassing van een technologie die nieuw is voor de sector)	1	2	3	4	5	6	**7**
Netwerk							
j. Het project liet ons toe om contacten te leggen met universiteiten of publieke onderzoeksinstellingen	1	2	3	4	5	6	**7**
k. Het project liet ons toe om contacten te leggen met andere ondernemingen	1	2	3	4	5	6	**7**
l. Sinds het project werken we intensiever samen met de partners in het project							
m. Het project liet ons toe om onderzoeksnetwerken op te bouwen	1	2	3	4	5	6	**7**
n. Sinds het project gestopt is, is de samenwerking met de partners ook gestopt.							
Competentie							
o. Het project verhoogde onze vaardigheden om met andere universiteiten en publieke onderzoekscentra te netwerken	1	2	3	4	5	6	**7**
p. Het project verhoogde onze vaardigheden om met andere ondernemingen te netwerken	1	2	3	4	5	6	**7**
q. Het project liet ons toe om nieuwe kennis te verwerven	1	2	3	4	5	6	**7**

r. Het project liet mijn onderneming toe de kennis van haar personeel versterken	1	2	3	4	5	6	**7**
s. Het project verhoogde onze vaardigheden om aan innovatie te doen	1	2	3	4	5	6	**7**

Breedte							
t. Het project was voornamelijk gericht op het ontwikkelen van een nieuw of een verbeterd product	1	2	3	4	5	6	**7**
u. Het project was voornamelijk gericht op het ontwikkelen van een nieuw of verbeterd productieproces	1	2	3	4	5	6	**7**

Output							
v. Het project resulteerde in een nieuw product dat op de markt is gebracht, of zal gebracht worden	1	2	3	4	5	6	**7**
w. Het project resulteerde in een nieuw proces dat in de onderneming geïmplementeerd is, of zal geïmplementeerd worden	1	2	3	4	5	6	**7**
x. Het project resulteerde in een patentaanvraag, of zal resulteren in een patentaanvraag	1	2	3	4	5	6	**7**
y. Het project zal toelaten om ons marktaandeel te verhogen	1	2	3	4	5	6	**7**
z. Het project zal de competitiviteit van onze onderneming doen toenemen	1	2	3	4	5	6	**7**

Als de onderneming geen hulp/ondersteuning van het COC had gekregen, wat zou dan de impact op uw project geweest zijn?

	Vo	**o**	**Lo**	**N**	**Lme**	**Me**	**Vme**
a. Het project zou met hetzelfde budget uitgevoerd zijn	1	2	3	4	5	6	7
b. Het project zou met een kleiner budget uitgevoerd zijn	1	2	3	4	5	6	7
c. We zouden meer interne middelen aan het project hebben toegewezen	1	2	3	4	5	6	7
d. Het project zou helemaal niet uitgevoerd zijn	1	2	3	4	5	6	7
e. Het project zou aan een lagere snelheid uitgevoerd zijn	1	2	3	4	5	6	7
f. Het project zou op een veel kleinere schaal zijn uitgevoerd	1	2	3	4	5	6	7
g. Het project zou met minder ambitieuze doelstellingen uitgevoerd zijn	1	2	3	4	5	6	7
h. We zouden een beroep hebben gedaan op private partijen (consultants, ondernemingen,...)	1	2	3	4	5	6	7
i. We zouden een beroep gedaan hebben op publieke instellingen (IWT, DGTRE,...)	1	2	3	4	5	6	7
j. We zouden een beroep gedaan hebben op universiteiten of publieke onderzoeksinstituten	1	2	3	4	5	6	7

Hartelijk dank voor uw medewerking!

Questionnaire pour membres des centres de recherche collectives

Nom (officiel) de votre entreprise: _____

Secteur: _____

Numéro TVA : _____

Q.1. Nombre de travailleurs (2007): _____

Q.2. Le nombre de travailleurs (au niveau de l'entreprise) les trois dernières années:

○ A augmenté ○ A diminué ○ Est resté constant

Q.3. Chiffre d'affaires en 2007: _____

Q.4. Le chiffre d'affaires (au niveau de l'entreprise) les trois dernières années:

○ A augmenté ○ A diminué ○ Est resté constant

Q.5. Quelle était la part du Budget de Recherche et Développement (R&D) en % du chiffre d'affaires?

○ Mon entreprise n'a pas de R&D ○ Moins de 5% du chiffre d'affaires
○ Entre 5 et 10% du chiffre d'affaires ○ Plus de 10% du chiffre d'affaires

Q.6. Indiquez avec quel centre de recherche collective vous aviez le plus de contacts au cours des trois dernières années:

b. SIRRIS (WTCM-CRIF) – Technologie	○
b. WTCB-CSTC– Construction	○
c. CENTEXBEL – Textile	○
d. OCW-CRR – Construction routière	○
e. OCCN – Ciment	○
f. CWOBKN – Céramique	○
g. CTIB-TCHN – Bois	○
h. WTOCD – Diamant	○
i. CORI – Coating	○
j. CRM – Métallurgie	○
k. BIL-IBS – Soudure	○
l. BVI-IBE – Conditionnement	○
Je n'ai pas été en contact avec un Centre de Recherche Collectif	○ (->Fin du questionnaire)

Q.7. Pour quelles raisons votre entreprise fait-elle principalement appel aux centres de recherche collectives?

	Api			N			Ti
a. A cause des hauts risques économiques liés à l'exécution de la propre R&D	1	2	3	4	5	6	7
b. A cause des coûts élevés liés à R&D	1	2	3	4	5	6	7
c. Par manque de ressources financières disponibles	1	2	3	4	5	6	7
d. Par manque de flexibilité sur le plan organisationnel	1	2	3	4	5	6	7
e. Parce que les CRC disposent de personnel qualifié	1	2	3	4	5	6	7
f. Parce que les CRC disposent d'informations techniques	1	2	3	4	5	6	7
g. Parce que les CRC disposent d'informations relatives au marché	1	2	3	4	5	6	7
h. Autres raisons _____	1	2	3	4	5	6	7

Api = Absolument peu important - N = Neutre - Ti = Très important

Q.8. Importance et utilisation des services des centres de recherche collectives

	Dans quelle mesure votre entrprise utilise-t-elle l'appui suivant, mis à disposition par les CRC?						
	J			R			S
a. Laboratoire R&D de recherche au profit de l'entreprise	1	2	3	4	5	6	7
b. Information concernant les programmes européens de R&D	1	2	3	4	5	6	7
c. Accès à la bibliothèque technique	1	2	3	4	5	6	7
d. Mise à disposition de personnel qualifié	1	2	3	4	5	6	7
e. La vente d'équipements	1	2	3	4	5	6	7
f. Le droit d'utiliser des inventions (licences)	1	2	3	4	5	6	7
g. Exécution d'un contrat de recherche entre le CRC et l'entreprise (recherche bilatérale)	1	2	3	4	5	6	7
h. L'exécution de la recherche sur base collective (recherche avec CRC, votre entreprise et tiers)	1	2	3	4	5	6	7
i. Conseil Technologique Approfondi (CTA)	1	2	3	4	5	6	7
j. Informations et conseils concernant la normalisation	1	2	3	4	5	6	7
k. Information concernant la propriété intellectuelle	1	2	3	4	5	6	7
l. Certification	1	2	3	4	5	6	7
m. Consulting et audits	1	2	3	4	5	6	7
n. L'exécution de tests et essais	1	2	3	4	5	6	7
o. Etudes de faisabilité	1	2	3	4	5	6	7
p. Mise à disposition d'informations par sites web	1	2	3	4	5	6	7
q. Mise à disposition d'informations par des publications	1	2	3	4	5	6	7
r. Mise à diposition d'informations par des lettres informatives	1	2	3	4	5	6	7
s. Antennes normes	1	2	3	4	5	6	7
t. Plateforme technologique européenne	1	2	3	4	5	6	7

u. Rencontre entre industriels et scientifiques	1	2	3	4	5	6	7
v. L'organisation de journées d'études et de séminaires	1	2	3	4	5	6	7
w. Technology watch et roadmapping	1	2	3	4	5	6	7
x. Solution de problèmes spécifiques (troubleshooting)	1	2	3	4	5	6	7
y. Conseil technique	1	2	3	4	5	6	7

J = Jamais - R = Rarement - S = Souvent

Si OU (a,b,c,d,e,f,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y) est coché: Ajoutez Q.9. (après Q. 8b)
Si g est coché: Ajoutez Q.10 (après Q. 8b)
Si h est coché: Ajoutez Q.11 (après Q.8b)

	Dans quelle mesure cet appui des centre de recherche collective est-il important pour votre entreprise?						
	Api			**N**			**Ti**
a. Laboratoire R&D de recherche au profit de l'entreprise	1	2	3	4	5	6	7
b. Information concernant les programmes européens de R&D	1	2	3	4	5	6	7
c. Accès à la bibliothèque technique	1	2	3	4	5	6	7
d. Mise à disposition de personnel qualifié	1	2	3	4	5	6	7
e. La vente d'équipements	1	2	3	4	5	6	7
f. Le droit d'utiliser des inventions (licences)	1	2	3	4	5	6	7
g. Exécution d'un contrat de recherche entre le centre de recherche collective et l'entreprise (recherche bilatérale)	1	2	3	4	5	6	7
h. L'exécution de la recherche sur base collective (recherche avec centre de recherche collective, votre entreprise et tiers)	1	2	3	4	5	6	7
i. Conseil Technologique Approfondi (CTA)	1	2	3	4	5	6	7
j. Appui et conseils concernant la normalisation	1	2	3	4	5	6	7
k. Information concernant la propriété intellectuelle	1	2	3	4	5	6	7
l. Certification	1	2	3	4	5	6	7
m. Consulting et audits	1	2	3	4	5	6	7
n. L'exécution de tests et essais	1	2	3	4	5	6	7
o. Etudes de faisabilité	1	2	3	4	5	6	7
p. Mise à disposition d'informations par sites web	1	2	3	4	5	6	7
q. Mise à disposition d'informations par des publications	1	2	3	4	5	6	7
r. Mise à diposition d'informations par des lettres informatives	1	2	3	4	5	6	7
s. Antennes normes	1	2	3	4	5	6	7
t. Plateforme technologique européenne	1	2	3	4	5	6	7
u. Rassemblement de milieux industriels et scientifiques	1	2	3	4	5	6	7
v. L'organisation de journées d'études et de séminaires	1	2	3	4	5	6	7
w. Technology watch et roadmapping	1	2	3	4	5	6	7
x. Solution de problèmes spécifiques (troubleshooting)	1	2	3	4	5	6	7
y. Conseil technique	1	2	3	4	5	6	7

Api = Absolument peu important - N = Neutre - Ti = Très important

Q.9. Indiquez dans quelle mesure vous êtes d'accord avec une des affirmations suivantes (pour des activités auxquelles vous avez eu recours et qui ne sont pas de R&D par ex. : conseils, informations, tests):

	Pdta	Pa	Mpa	N	Ma	A	Tafa
Output							
a. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu développer des nouveaux produits	1	2	3	4	5	6	7
b. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu commercialiser des nouveaux produits	1	2	3	4	5	6	7
c. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu améliorer son procédé de production	1	2	3	4	5	6	7
d. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu accéder à de nouveaux marchés	1	2	3	4	5	6	7
e. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu étendre sa gamme de produits	1	2	3	4	5	6	7
f. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu accroître sa part du marché	1	2	3	4	5	6	7
g. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu augmenter son chiffre d'affaires	1	2	3	4	5	6	7
h. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu renforcer son image	1	2	3	4	5	6	7
i. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu offrir un meilleur service aux clients	1	2	3	4	5	6	7
j. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu éviter des disputs ou a pu les résoudre plus vite	1	2	3	4	5	6	7
k. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu économiser	1	2	3	4	5	6	7
Portée							
l. L'intervention d'un centre de recherche collective concernait la technologie qui est actuellement standardisée mais qui n'était pas présente dans mon entreprise	1	2	3	4	5	6	7
m. L'intevention d'un centre de recherche collective concernait la technologie incrémentale (qui étend la technologie existante)	1	2	3	4	5	6	7
n. L'intervention d'un centre de recherche collective concernait la technologie de la génération suivante (l'utilisation de la technologie dans un environnement tout à fait différent)	1	2	3	4	5	6	7
o. L'intervention d'un centre de recherche collective concernait une technologie de pénétration (application tout à fait nouvelle d'une technologie qui est neuve pour le secteur)	1	2	3	4	5	6	7

Rapidité							
p. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu commercialiser plus rapidement ses produits	1	2	3	4	5	6	7
q. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu développer plus rapidement des produits	1	2	3	4	5	6	7
Réseau							
r. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu identifier des partenaires potentiels	1	2	3	4	5	6	7
s. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu coopérer avec d'autres entreprises	1	2	3	4	5	6	7
t. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu coopérer avec des centres de connaissances tels que les universités et les centres de recherche	1	2	3	4	5	6	7
Compétence							
u. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu acquérir des connaissances	1	2	3	4	5	6	7
v. Grâce à l'intervention d'un centre de recherche collective mon entreprise a été mieux à même de pratiquer des innovations	1	2	3	4	5	6	7
w. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu renforcer les connaissances de son personnel	1	2	3	4	5	6	7
Input							
x. Grâce à l'intervention d'un centre de recherche collective mon entreprise a pu démarrer un nouveau projet de R&D	1	2	3	4	5	6	7
y. Grâce à l'intervention d'un centre de recherche collective mon entreprise a décidé d'affecter plus de ressources à la R&D	1	2	3	4	5	6	7

Pdta = Pas du tout d'accord - Pa = Pas d'accord - Mpa = Modérément pas d'accord - N = Neutre - Ma = Modérément d'accord - A = D'accord - Tafa = Tout à fait d'accord

Si votre entreprise n'avait pas pu avoir recours aux services d'un centre de recherche collective, quel en aurait été l'impact ?

	Pdta	Pa	Mpa	N	Ma	A	Tafa
a. Nous aurions eu recours à des organismes privés (consultants, entreprises,...)	1	2	3	4	5	6	7
b. Nous aurions eu recours à des organismes publics (IWT, DGTRE,...)	1	2	3	4	5	6	7
c. Nous aurions eu recours à des universités ou des centres publics de recherche	1	2	3	4	5	6	7
d. Nous aurions affectés plus de ressources internes	1	2	3	4	5	6	7
e. Nous n'aurions pas fait des démarches	1	2	3	4	5	6	7

Pdta = Pas du tout d'accord - Pa = Pas d'accord - Mpa = Modérément pas d'accord - N = Neutre - Ma = Modérément d'accord - A = D'accord - Tafa = Tout à fait d'accord

Q.10. Songez à une project que vous avez exécuté dans le courant des trois dernières années avec le concours d'un centre de recherche collective (Recherche sur base bilatérale)

Indiquez dans quelle mesure vous êtes d'accord avec les affirmations suivantes :

	Pdta	Pa	Mpa	N	Ma	A	Tafa
Input							
a. Depuis ce projet, nous exécutons régulièrement des projets de R&D ou d'innovation	1	2	3	4	5	6	7
b. Depuis ce projet, notre entreprise accorde une plus grande attention à la R&D et l'innovation	1	2	3	4	5	6	7
c. Depuis ce projet, nous avons majoré notre budget de R&D et innovation	1	2	3	4	5	6	7
Portée							
d. Le projet s'accordait parfaitement avec l'activité principale de l'entreprise	1	2	3	4	5	6	7
e. Le projet a permis de prendre plus de risques	1	2	3	4	5	6	7
f. Le projet concernait une technologie qui est actuellement standardisée mais qui n'était pas présente dans l'entreprise	1	2	3	4	5	6	7
g. Le projet concernait la technologie incrémentale (qui étend la technologie existante)	1	2	3	4	5	6	7
h. Le projet concernait la technologie de la génération suivante (l'utilisation de la technologie dans un environnement tout à fait différent)	1	2	3	4	5	6	7
i. Le projet concernait une technologie de pénétration (application tout à fait nouvelle d'une technologie qui est nouvelle pour le secteur)	1	2	3	4	5	6	7

Réseau							
j. Le projet nous a permis d'établir des contacts avec des universités ou centres publics de recherches	1	2	3	4	5	6	7
k. Le projet nous a permis d'établir des contacts avec d'autres entreprises	1	2	3	4	5	6	7
l. Le projet nous a permis de développer des réseaux de recherches	1	2	3	4	5	6	7
Compétence							
m. Le projet nous a permis d'accroître nos aptitudes à développer des réseaux avec d'autres universités ou centres publics de recherches	1	2	3	4	5	6	7
n. Le projet nous a permis d'accroître nos capacités à développer des réseaux avec d'autres entreprises	1	2	3	4	5	6	7
o. Le projet nous a permis d'acquérir de nouvelles connaissances	1	2	3	4	5	6	7
p. Le projet a permis à mon entreprise de renforcer les connaissances de son personel	1	2	3	4	5	6	7
q. Le projet a permis d'accroître nos aptitudes à procéder à l'innovation	1	2	3	4	5	6	7
Etendue							
r. Le projet était principalement axé sur le développement d'un nouveau produit ou produit amélioré	1	2	3	4	5	6	7
s. Le projet était principalement axé sur le développement d'un nouveau procédé de production ou d'un procédé de production amélioré	1	2	3	4	5	6	7
Output							
t. Le projet a débouché sur un nouveau produit qui est commercialisé ou qui sera commercialisé	1	2	3	4	5	6	7
u. Le projet a débouché sur un nouveau procédé qui est implémenté ou qui sera implémenté dans l'entreprise	1	2	3	4	5	6	7
v. Le projet a débouché ou débouchera sur une demande de brevet	1	2	3	4	5	6	7
w. Le projet permettra d'accroître notre part du marché	1	2	3	4	5	6	7
x. Le projet fera augmenter la compétitivité de notre entreprise	1	2	3	4	5	6	7

Pdta = Pas du tout d'accord - Pa = Pas d'accord - Mpa = Modérément pas d'accord - N = Neutre - Ma = Modérément d'accord - A = D'accord - Tafa = Tout à fait d'accord

Si l'entreprise n'avait pas reçu l'aide/l'appui d'un centre de recherche collective, quel en aurait été l'impact sur votre projet ?

	Pdta	Pa	Mpa	N	Ma	A	Tafa
a. Le projet aurait été exécuté avec le même budget	1	2	3	4	5	6	7
b. Le projet aurait été exécuté avec un budget plus réduit	1	2	3	4	5	6	7
c. Nous aurions affecté plus de ressources internes au projet	1	2	3	4	5	6	7
d. Le projet n'aurait pas été exécuté	1	2	3	4	5	6	7
e. Le projet aurait été exécuté plus lentement	1	2	3	4	5	6	7
f. Le projet aurait été exécuté à plus petite échelle	1	2	3	4	5	6	7
g. Le projet aurait eu des objectifs moins ambitieux	1	2	3	4	5	6	7
h. Nous aurions eu recours à des organismes privés (consultants, entreprises,...)	1	2	3	4	5	6	7
i. Nous aurions eu recours à des organismes publics (IWT, DGTRE,...)	1	2	3	4	5	6	7
j. Nous aurions eu recours à des universités ou des centres publics de recherche	1	2	3	4	5	6	7

Pdta = Pas du tout d'accord - Pa = Pas d'accord - Mpa = Modérément pas d'accord - N = Neutre - Ma = Modérément d'accord - A = D'accord - Tafa = Tout à fait d'accord

Q.11. Songez à un projet que vous avez exécuté dans le courant des trois dernières années avec un centre de recherche collective (recherche sur base collective)

Indiquez dans quelle mesure vous êtes d'accord avec les affirmations suivantes :

	Pdta	Pa	Mpa	N	Ma	A	Tafa
Input							
a. Depuis ce projet, nous exécutons régulièrement des projets de R&D ou d'innovation	1	2	3	4	5	6	7
b. Depuis ce projet, notre entreprise accorde une plus grande attention à la R&D et l'innovation	1	2	3	4	5	6	7
c. Depuis ce projet, nous avons majoré notre budget de R&D et d'innovation	1	2	3	4	5	6	7
Portée							
d. Le projet s'accordait parfaitement avec l'activité principale de l'entreprise	1	2	3	4	5	6	7
e. Le projet a permis de prendre plus de risques	1	2	3	4	5	6	7
f. Le projet concernait une technologie qui est actuellement standardisée mais qui n'était pas présente dans l'entreprise	1	2	3	4	5	6	7
g. Le projet concernait la technologie incrémentale (qui était la technologie existante)	1	2	3	4	5	6	7
h. Le projet concernait la technologie de la génération suivante (l'utilisation de la technologie dans un environnement tout à fait différent)	1	2	3	4	5	6	7

i. Le projet concernait une technologie de pénétration (application tout à fait nouvelle d'une technologie qui est nouvelle pour le secteur)	1	2	3	4	5	6	7
Réseau							
j. Le projet nous a permis d'établir des contacts avec des universités ou centres publics de recherches	1	2	3	4	5	6	7
k. Le projet nous a permis d'étalir des contacts avec d'autres entreprises	1	2	3	4	5	6	7
l. Depuis le projet nous travaillons plus intensivement avec les partenaires du projet							
m. Le projet nous a permis de développer des réseaux de recherches	1	2	3	4	5	6	7
n. Depuis que le projet est arrêté, la coopération avec les partenaires a cessé.							
Compétence							
o. Le projet nous a permis d'accroître nos aptitudes à développer des réseaux avec d'autres universités ou centres de recherches	1	2	3	4	5	6	7
p. Le projet nous a permis d'accroître nos capacités à développer des réseaux avec d'autres entreprises	1	2	3	4	5	6	7
q. Le projet nous a permis d'acquérir de nouvelles connaissances	1	2	3	4	5	6	7
r. Le projet a permis à mon entreprise de renforcer les connaissances de son personnel	1	2	3	4	5	6	7
s. Le projet a permis d'accroître nos aptitudes à procéder à l'innovation	1	2	3	4	5	6	7
Etendue							
t. Le projet était principalement axé sur le développement d'un nouveau produit ou produit amélioré	1	2	3	4	5	6	7
u. Le projet était principalement axé sur le développement d'un nouveau procédé de production ou d'un procédé de production amélioré	1	2	3	4	5	6	7
Output							
v. Le projet a débouché sur un nouveau produit qui est commercialisé ou qui sera commercialisé	1	2	3	4	5	6	7
w. Le projet a débouché sur un nouveau procédé qui est implémenté ou qui sera implémenté dans l'entreprise	1	2	3	4	5	6	7
x. Le projet a débouché ou débouchera sur une demande de brevet	1	2	3	4	5	6	7
y. Le projet permettra d'accroître notre part du marché	1	2	3	4	5	6	7
z. Le projet fera augmenter la compétitivité de notre entreprise	1	2	3	4	5	6	7

Pdta = Pas du tout d'accord - Pa = Pas d'accord - Mpa = Modérément pas d'accord - N = Neutre - Ma = Modérément d'accord - A = D'accord - Tafa = Tout à fait d'accord

Si l'entreprise n'avait pas reçu l'aide/l'appui d'un centre de recherche collective, quel en aurait été l'impact sur votre projet ?

	Pdta	Pa	Mpa	N	Ma	A	Tafa
a. Le projet aurait été exécuté avec le même budget	1	2	3	4	5	6	7
b. Le projet aurait été exécuté avec un budget plus réduit	1	2	3	4	5	6	7
c. Nous aurions affecté plus de ressources internes au projet	1	2	3	4	5	6	7
d. Le projet n'aurait pas été exécuté	1	2	3	4	5	6	7
e. Le projet aurait été exécuté plus lentement	1	2	3	4	5	6	7
f. Le projet aurait été exécuté à plus petite échelle	1	2	3	4	5	6	7
g. Le projet aurait eu des objectifs moins ambitieux	1	2	3	4	5	6	7
h. Nous aurions eu recours à des organismes privés (consultats, entreprises,...)	1	2	3	4	5	6	7
i. Nous aurions eu recours à des organismes publics (IWT, DGTRE,...)	1	2	3	4	5	6	7
j. Nous aurions eu recours à des universités ou des centres publics de recherche	1	2	3	4	5	6	7

Pdta = Pas du tout d'accord - Pa = Pas d'accord - Mpa = Modérément pas d'accord - N = Neutre - Ma = Modérément d'accord - A = D'accord - Tafa = Tout à fait d'accord

Merci de votre cooperation!

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