N°1

Combining Economy, Science and Innovation for a better society

review

Periodical of the Department of Economy, Science and Innovation | May 2007

Vision for the future

Flemish government

A new spring, a new sound

These famous words triggered a controversial new literary movement in Dutch letters in the 1880s. Without harbouring any literary pretensions, this new magazine also aims to ring in a 'new sound'.

Research institutions disseminate their results within the scientific community and are judged by their colleagues on the basis of the findings thus presented. They also have a moral duty to convey their findings to the general public in comprehensible form.
Companies publicise their products and/or services and pass on "knowledge" about their activities and findings via advertising campaigns. Some publications (like annual reports and balance sheets) are intended for a specific public or serve a very closely defined purpose.
Interest groups place advertisements, go around with petitions and stage demonstrations or happenings to attract the media's attention and showcase their points of view.
Government departments have a far less urgent need to present their expertise and activities or achievements in their policy area to the interested layman (apart from the mandatory annual report for the "initiated"). Nor do they have to present their products and services. And their views are normally expressed by the responsible politicians.

In the future, the Department of Economy, Science and Innovation (*Departement Economie, Wetenschap en Innovatie*, or EWI) wants to communicate regularly about trends and developments in policy in the area falling within its remit. For instance, EWI staff will summarise (foreign) reports and explain important (European) decisions and initiatives and their consequences; map out a theoretical context and background; present the respective Flemish institutions active in the policy area in question; and introduce readers to a leading light in the appropriate field. The choice of subjects will largely depend on current topics being covered within EWI's domain. In time, (foreign) guest authors will also be involved.

On behalf of all my colleagues I would like to wish you many happy hours of reading.
I urge you above all to give your reactions to this new initiative at www.ewi-vlaanderen.be/reageer. Your response may even be included in the readers' section.

Peter Spyns
General Editor

Customer-friendly spectacles

Many texts on the subject of economy, science and innovation address an "inner circle". The articles that we find in daily newspapers and weekly periodicals are much too watered down for anyone looking for background information and analysis.

EWI, whose aim is to improve the interplay between economy, science and innovation to create a better Flanders, wants to position itself between the scientific and the simplified. It was with that goal in mind that it launched this review. "To review" means that scientific texts or actions are looked at again (re-viewed) through customer-friendly spectacles. EWI's core customers are interested parties in society, enterprise and the universities and colleges. With this new review the EWI staff bear witness that "civil servant" is no abstract notion for them.

Rudy Aernoudt
Secretary-General, Department of Economy, Science and Innovation (EWI)

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COLOPHON

EWI Review: Periodical on Economy, Science & Innovation – Volume 1, No. 1: EWI Review is a publication of the Flemish government's Department of Economy, Science and Innovation

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Layout: Edison

Photo 1: Kitchen of the Future

Living tomorrow: the innovation platform of the future

The House of the Future accommodates the *Living Tomorrow III* project. This demonstration project shows how people will be living and working in the near future. The general public is informed, sensitised to and made familiar with innovative applications that give a picture of our future lifestyles.

Getting to know the world of tomorrow

Living Tomorrow incorporates a home, office and research space of the Future[1]. Ideas about and concepts of living and working in the future are integrated into an environment to which everyone can relate: a kitchen (Photo 1), a living room, a home office, an office environment and also a research space of the future, together with the bank of the future, the car of the future, the aviation (infrastructure) of the future, an intelligent mirror, and so on. Innovative products and services give visitors a glimpse of the world of tomorrow. Social, economic and technological developments are translated into realistic, recognisable applications. 80% of the solutions displayed are ready for the market, while 20% are visions of the future. For example, we find here a mirror with built-in sensors and a fully interactive HDTV.

Different themes are considered, such as health, leisure and relaxation, mobility, the environment, energy, the media, and so forth. These themes are combined in many of the installations. In the kitchen (Photo 1) we see a combination of decoration, energy, information and communication technology, media and, in particular, household appliances. The kitchen for instance contains a digital notepad; a hydrogen fuel cell provides the house with most of its energy; and an ingenious heat pump provides environmentally friendly heating - a global first.

Thinking about the world of tomorrow

The project also acts as a meeting place for innovative enterprises to show visitors those products and services that have the potential to improve the quality of people's living and working experiences in the near future. The project and its participants aim to trigger a lively discus-

Photo 2: The House of the Future in Vilvoorde

Photo 3: The children's bedroom (Cocoon)

Photo 4: Warehouse of the Future (Delhaize model)

sion with consumers to learn what they themselves consider to be important for their future.

Thus it is not so much a case of amazing people with the possibilities provided by technology, but rather engaging in a dialogue. In this way the participating enterprises can learn from the impressions and comments of the visitors. The main target groups are professionals, consumers, young people, the Press and the public authorities.

At regular intervals different working groups discuss current topics, and then, after working on them further, they give them visual form. The purpose is to stimulate synergies on the market and to promote the integration of specific ideas, products and services.

Some examples of working group themes are:

- care for the elderly;
- (future) e-government services;
- (future) bio- and health services (growing old more healthily);
- functional nutrition;
- (future) energy.

An additional special working group was set up for the Flemish government to work on giving the policy visual form. In this way it can show the general public what precisely is meant by notions such as 'open innovation' and 'high-tech innovation'. This is done during the guided tour. They can express their opinions on a Personal Digital Assistant.

The former *House of the Future* (2000-2005) was rearranged and divided into a Research and Development laboratory and a VIP area. The existing space for events was expanded and reorganised. The revamped *House of the Future* and the new *Office of the Future* have been put up between the two existing buildings and form a single complex (Photo 2). The project *Living Tomorrow III* was opened to the public, the participating contractors and their guests on 1 March 2007; the project will run for a period of five years. The Flemish government, as co-initiator, is supporting this project with half a million euros and is also involved in its implementation. This money was exclusively contracted out to the infrastructure and the (re)construction of the complex.

More information: **www.livtom.com**

Marc Van Gastel
Operations Strategy and External Relations Team

Guided tours

Living Tomorrow III also organises guided tours for visitors. These tours approach the future from different angles:

- **Home & Design:** Home of the Future
- **Business & Leisure:** Creative Industries - Office of the Future
- **Enjoyment & Vitality:** What role will there be for 'comfort and enjoyment' in the future?
- **Digital Decade:** What part will ICT, consumer electronics, telecommunications equipment and household appliances play in living and working in the future?

1 "Living Tomorrow III" is to be found at Indringingsweg 1, 1800 Vilvoorde, Belgium

Delete the odd one out: seahorse, polar bear, researcher, snow leopard, ...

Are researchers an endangered species? Reading and hearing about the protective measures that are being taken to upgrade and protect the profession of scientist, you could be forgiven for thinking just that.

"The scientist is central in the science and innovation system. Flanders needs considerably more researchers to make its ambitions reality. In the first place more young talent must go on to higher education and be encouraged to take more scientific and technical/technological studies. A career as a researcher must therefore become a more attractive proposition: more young graduates must be given the chance to pursue postgraduate research and later capitalise on their research in economic or social terms" states the policy document *Economie, Ondernemen, Wetenschap, Innovatie en Buitenlandse Handel 2004-2009.*

The message given in that passage is loud and clear. And it is not only at Flemish or even Belgian level that the researcher is given special treatment. In 2005 the European Commission published two important documents that are gradually gaining currency throughout Europe and have aroused interest on the other side of the Atlantic: the *European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers*.

With these documents the European Commission offers a framework for taking action to make a career as a researcher more attractive. In a series of recommen-

dations to researchers and their employers the *European Charter for Researchers* supports putting the position of 'researcher' on a more professional footing. Freedom of research, balance between the genders, the opportunity of professional development, non-discrimination and the value of mobility are some of the most important principles detailed here. The *Code of Conduct for the Recruitment of Researchers* lays down guidelines for the recruitment and appointment of researchers. The selection process for new researchers must be transparent and meet a wide range of evaluation criteria; career breaks must not be penalised; and experience of mobility and seniority must be recognised.

These documents did not get off to a good start in Flanders. Was it something about the text itself? Did it have to do with unclear communication from the European Commission? Or rather the deep-seated Flemish mistrust of initiatives imposed top-down? The fact remains that the documents found little resonance here, as shown by the somewhat detached commentary in the Flemish Science Policy Council's discussion of the Charter and the Code (*Commentaar 14: Een kwaliteitscharter voor de Europese onderzoeker 23 juni 2005*). At the same time however all kinds of research authorities throughout Europe received the texts with open arms and made preparations to officially sign to declare their agreement with them.

Given the importance of the matter, the former Flemish Administration of Science and Innovation (*Administratie Wetenschap en Innovatie*) ran an informal survey of the most important interested parties in November and December 2005. Reactions were positive for the most part . However, there were a number of additional comments. A correct interpretation of the documents could, however, remove a good many of the misgivings, such as, for instance, the fear of a coercive interpretation of the texts.

However, now that the European Commission has emphasised the non-obligatory character of the texts and says that the Charter simply sets a goal to be reached rather than being the letter of the law, the supporters of the documents are gradually gaining the upper hand even in Flanders. The Brussels university VUB and Ghent University (UGent) were the first Flemish institutions to sign the Charter. The Fund for Scientific Research - Flanders (FWO-Vlaanderen) and Flemish Minister for Economy, Enterprise, Science, Innovation and Foreign Trade recently followed suit. In the new CLA for the higher education sector the higher education establishments formally commit themselves to apply the principles of the Charter and the Code of Conduct to their personnel and employment regulations.

The documents are likewise accorded a prominent place, under the rubric 'Personnel Policy', in the new administration agreements between the Flemish government and the research institutions IMEC, VIB, VITO and IBBT set up within EWI. The Charter and the Code of Conduct also formed the point of departure for the *Brain Tour*, the series of dialogues held by the minister in recent months in the Flemish universities to listen to the concerns of Flemish researchers.

For other endangered species such as the snow leopard and the seahorse there is still a long way to go, but the researcher's luck would appear to have changed. We have understood the challenge: if Flanders wants to remain a top-flight knowledge economy, it is high time that we turn our attention to one of its main pillars, the researcher! In that context it is of the utmost importance that we sign the European texts. This official recognition will improve the image of Flanders as a research region in Europe and beyond, making it more attractive to Belgian and foreign researchers.

We may not yet be trendsetters in this area, but the Flemish research community can be proud of the fact that it has caught up with the rest of the field. Despite a slow start, we are now far from being one of the back markers!

Karen Haegemans
Policy Support and Academic Policy Team

Urgent: new entrepreneurs wanted!

2006 brought the seventh edition of the *Global Entrepreneurship Monitor*, or GEM for short. This worldwide research study measures the degree of entrepreneurship in a country and/or region. This year, 40 countries took part, including 16 EU Member States. In Belgium the study was conducted by the Vlerick Leuven Gent Management School on behalf of the Policy Research Centre 'Entrepreneurship, Enterprises and Innovation'.
GEM starts by gauging the degree of entrepreneurship of the Belgians. The Total Entrepreneurial Activity (TEA) index was developed for this purpose. TEA monitors the percentage of the working population that is actively involved in starting up a business (*nascent entrepreneurial activity*) or has set up a business in the past three years (*new business owners*). The TEA index for Belgium in 2006 was 2.73%, which represents a relatively sharp fall compared with the TEA for 2005 (3.93%). The TEA index for Flanders showed a similar downturn from 3.71% to 3.05%. For Flanders this means, in concrete terms, that in 2006 an average of 3.05 individuals declared that they were involved in starting up a company or had already set up a business in the course of the previous three years. Unfortunately, with these figures Belgium has the lowest score of all the participating countries. Furthermore, the European average (5.01%) is well below the world average of 9.29%.

The GEM study also brought out some positive elements though. It is encouraging that high-potential entrepreneurship has increased in relative terms. More new entrepreneurs in Flanders than before are setting up innovative companies (1.53%), are prioritising a vigorous growth in employment (0.35%), and/or are planning to make international deals (0.82%). The relative increase of high-potential entrepreneurship perhaps also indicates that Flanders is on the way to becoming a knowledge economy, fitting the Flemish government's ambition to evolve from a productivity-based economy into an innovation economy. In absolute terms, however, Flanders scores poorly compared with other EU countries (new entrepreneurs setting up innovative companies: 2.22%; new entrepreneurs prioritising strong growth in employment: 0.64%; and new entrepreneurs planning to make international deals: 1.01%). It is also positive that the principal reason for entrepreneurship is the desire to capitalise on a market opportunity. Approximately 85% of Belgian start-ups and 87% of Flemish start-ups are motivated by a perceived business opportunity. Only a very small percentage starts a company out of the sheer necessity of earning a living. Other countries may have a higher TEA, but this is more a matter of entrepreneurship based on necessity rather than on opportunity (EU: 78%).

As in any research, the methodology is a factor that cannot be overlooked. The GEM conducts research into entrepreneurship at the level of the individual. In practice, this means that in 2003 people throughout the country were contacted by telephone and asked about their involvement in entrepreneurship (past and present). It is therefore important to point out that interpretation by the respondents themselves is involved here. The fact that not all nationalities see themselves in the same way is a well-known problem in this regard. Other organisations often approach research into entrepreneurship at a higher level, namely at the level of the enterprise itself. This would explain an apparent contradiction such as that between a falling TEA and a rising number of effectively started businesses.
The GEM study forecasts that in Belgium and Flanders, now and in the future, there is and will remain an urgent need to continue stimulating entrepreneurship.

Els Vermander
Awareness Raising and Society Team

Like the switch by Swatch

Innovation in Flanders: where does it come from and who does it?

Since the start of the new millennium 'innovation' has seemingly become the 'in' word. It is often used in the same breath as 'technological competitiveness', 'maintaining welfare in Flanders', or even 'the Yellow Peril'. But what exactly does innovation mean? And how does innovation happen in Flanders and who is responsible for bringing it about? In this contribution we give brief answers to these questions. We also give a short sketch of what sort of players and institutions are active in the field.

What is innovation?

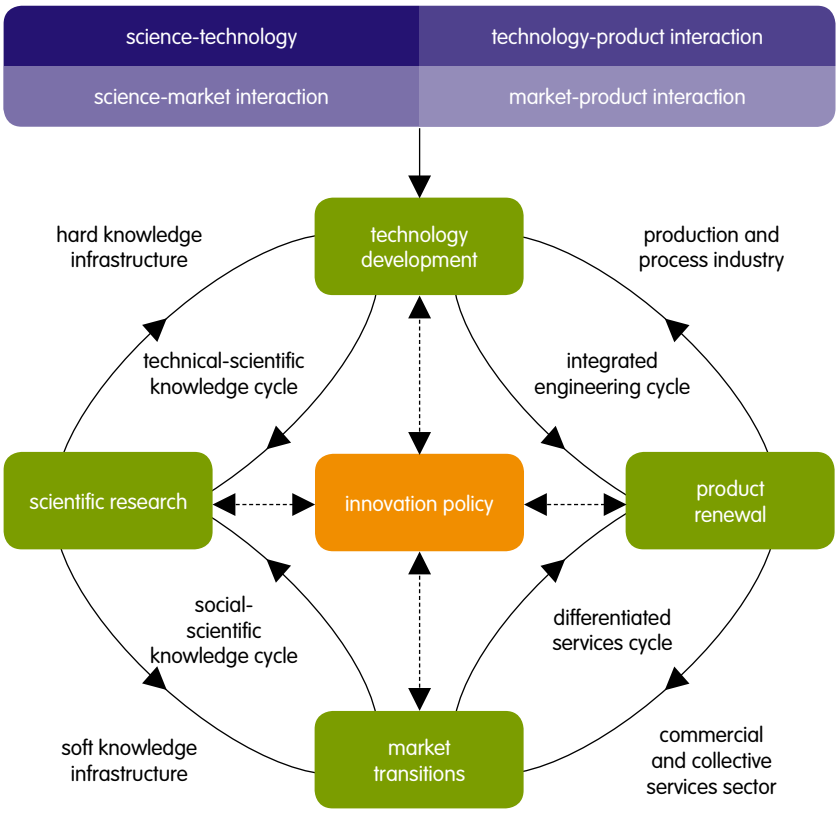
Innovation is loosely defined as the application of new creative insights to bring about the improvement of a particular product, service, process or organisation. Innovation therefore covers both the *gradual* improvement of what exists and the *sudden* introduction of something totally new. In many cases the immediate consequence is that existing things disappear. The invention of the printing press, for instance, led to the disappearance of handcrafted book manufacture. Ancillary activities and art forms also died in the process, such as the miniature, and a completely new branch of industry appeared on the scene (as can be seen, for example, in the Plantin-Moretus Museum in Antwerp). Another example, from the world of services, is the loss of delivery to your door by the local baker and brewer because nowadays people are sufficiently mobile to make all their purchases themselves in a supermarket.

In the twentieth century the concept of innovation - together with capital and work - was recognised as a determining factor in measuring technological progress. Including innovation in the equation greatly increased its explanatory power. Spending on research and development (as an indicator of innovation) has since been incorporated as a production factor. Innovation was until recently regarded mainly as technological progress. Social aspects (e.g. sustainable development) are now also included in the equation, and innovation is now also expected to deliver social added value.

Why is innovation so important?

It can be seen that products or services disappear when 'better' alternatives appear on the market. The consumer makes his or her own decision as to whether a product or service is worth the money. A large number of factors guide this choice: quality, durability and sustainability and other characteristics. Subjective factors - we can call them fashion or trends - also have an effect. The consumer's decision to buy or not to buy a product or service has a major influence on employment. After all, if too few products or services are sold, a company owner suffers losses. A company owner will adapt the product or service (including, if necessary, the price) to the wishes of the market and/or streamline the company - in the worst case he will dismiss workers. To avoid this negative scenario and therefore make a profit, a company owner will try to work in a forward-looking, prescient manner. By improving his or her own products or services, he/she tries to stay ahead of the competition. These improvements may result from, for instance, customer surveys but, just as frequently, from the application of new scientific/technological developments, i.e. innovation. If other factors in the work process, especially labour costs, lead to a poor competitive position (the product or service is too expensive), this can be compensated for by the degree of innovation of the product or service. The low costs of Eastern European and Asian workforces mean that Western economies are being forced to tackle competition on the basis of innovation. A good example of marketing innovation is the switch by Swatch. This company originally had a rather uninspiring image as a maker of reliable timepieces, whereas now it is regarded as a cool, fashionable trendsetter of 'wrist-watches'.

Figure 1: taken from [2]



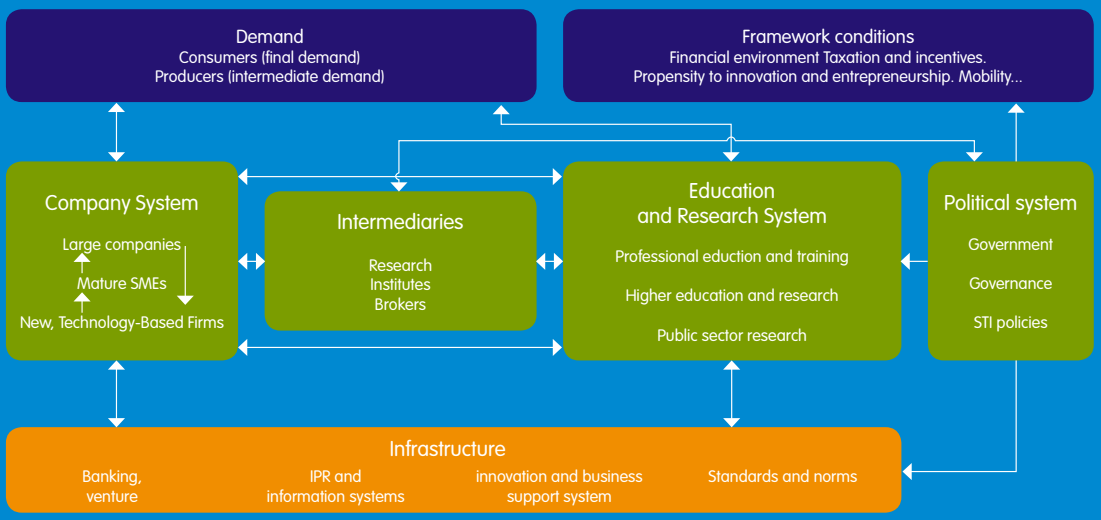


Figure 2: taken from [3]

How does innovation come about?

New insights that lead to innovation do not come out of thin air. Many are the fruit of research at universities. That is why the government granted the universities research budgets in the 1960s. The underlying idea was that the research results should be adopted by enterprises automatically and integrated into their products or services. Just like water is poured into one end of a pipe and sooner or later runs out at the other end (= *the linear model*), new ideas and developments from basic research find their way into industry through the intermediate step of applied research.

The *cyclical model* (Figure 1) is proposed in a more recent and sophisticated analysis. This makes clear that different aspects (and thus also players) are connected with each other and exert an influence on each other. A new idea can emerge at any place in the circle, and the circle relentlessly continues turning in self-renewing, self-reinforcing cycles. The sub-areas in the cycle do not stand alone, but form parts of a *system*, with the players (or actors) belonging to a subsystem. Figure 1 shows that innovation includes not only technological innovation (which leads to new products) (= top of the cycle). Account must also be taken now of new socially desirable evolutions and needs (which find expression in new services) (= bottom half of the cycle). Thus it is that, among others, design, fashion and culinary hypes (take, for instance, cooking with frozen nitrogen) can also be categorised as innovations. Research proposals are increasingly coming to be judged not only on their possible economic added value, but also on their social added value.

Each of the players in the system tries to stand out from his or her competitors; he or she takes initiatives to that end, which then sets off a chain of reactions, or a cyclical reaction throughout the whole system. These days innovation is characterised by a growing number of novel combinations of technological components and/or services spanning various sectors. To see this, we only need to look at the many (and also increasingly flexible) cooperative links between companies. For example, all kinds of services are offered for a technologically highly complex product like a mobile phone, such as horoscopes, newsflashes, and so on. Efforts are increasingly being made to cultivate a feeling of customer solidarity.
The assumption is that government will also innovate, in terms of internal processes as well as content, by way of policy. Lowering tax barriers, stimulating a spirit of enterprise and supporting lifelong learning are often cited in this context, as is the quick introduction of clear and transparent regulation.

How do scientists regard innovation?

A general framework is provided by the national innovation system mapped out in Figure 2. The figure shows the subsystem to which the various actors belong.

For convenience the end-users and the producers of semi-finished products are placed together in the group *demand*. These actors drive the demand (which is known as market pull). Another joint category is found in the top right-hand corner. This includes mainly legislation: all kinds of taxation advantages or disadvantages, subsidies to stimulate entrepreneurship, measures to promote (inter)national exchanges in research institutions and in enterprises and measures to support patent applications. This category of measures concerns, first and foremost, the *framework conditions* supporting innovation in general.

The bottom of the figure deals with the *infrastructure*: patent databases (who is the owner of a specific technological system, e.g. the car windscreen wiper?), research information systems (who is - successfully - active in which field?), banks and institutions that provide venture capital, organisations giving guidance to new entrepreneurs, norms and standards (e.g. the safety of airbags in motor vehicles) and business support systems. Not only is the availability of risk capital important in itself, but also whether each stage in the life cycle of a company is covered. After all, a start-up has other capital requirements than a large, established company.[4]

Who is involved

Flemish universities and colleges of higher education belong to the *research and education system*. In addition to this, there are countless institutions offering vocational skills development and training, e.g. the Flemish Service for Employment and Vocational Training (VDAB). Finally there are public institutions that address a specific problem or subject. Few people know, for instance, that Antwerp Zoo is a research institution of world renown involved, for example, in international (breeding) programmes and studies on animals in captivity. The zoo receives government subsidies for these activities.

The various government bodies that shape the relevant policy belong to the *political system*. Here we are referring to the Parliament (which passes decrees on measures that stimulate innovation), the government and the specific ministers supported by their departments and offices. Advisory boards offer their opinions and visions regarding proposals for Decisions drafted by the Flemish government and the competent minister) and Decrees (drafted by the Flemish Parliament). Experts and representatives 'from the field' serve on such advisory boards. The Flemish Science Policy Council (Vlaamse Raad voor Wetenschapsbeleid) brings together, for example, universities, trade unions and



government bodies as well as industrial federations.

One specific component of the policy is formed by the measures relating to Science, Technology and Innovation (STI). It is concerned with the Decisions and Decrees regulating the form that *STI policy* takes in Flanders. One example of this is the creation of specific institutions and setting down how they will work and the goals that they must attain.
The new Department of Economy, Science and Innovation works on the preparation and evaluation of policy, while agencies such as the IWT, FWO, VLAO[5] and the Economy Agency implement the policy. Together with the staff in her office, the Minister for Economy, Enterprise, Science, Innovation and Foreign Trade is the final link in the decision-making chain in this policy domain. Therefore a deliberate policy choice was made to allow for any technological theme for research proposal submissions and subsidy applications at the IWT (bottom-up approach). In other countries (and at Belgian level) long-term research programmes are set up based on well-defined themes (e.g. the ageing of the population and its consequences for medical care services).

The *company system* includes every kind of Flemish enterprise, with a distinction being made between the large (usually multinational) companies, established SMEs and smaller (mainly high-tech) start-up companies. Each type of company participates in the innovation process in its own way and therefore has its own specific needs. A big pharmaceuticals company earmarks substantial sums of money for research into new drugs and medicines. In so doing, it makes a major contribution to the knowledge economy in Flanders (e.g. through its employment of a large number of highly trained researchers from the world of biotechnology). Capitalising on intellectual property (IPR) and protection against unauthorised imitation are essential for generating sufficient income via the sale of medicines and thus recovering at least the costs of research, and other costs. This explains why such companies will often apply for patents and provide the necessary means for this purpose. A start-up has much more difficulty in building up its resources. One possible form of support for innovative start-ups is lowering the (financial) threshold for patent applications. There are some who want to overhaul the patents system completely - as the period for obtaining a patent is much too long in relation to the time to market. Therefore, one of the challenges facing the political system is to devise a set of measures that are as coherent with each other as possible and that can prove their effectiveness under a range of circumstances. The federal state structure in Belgium further complicates the pursuit of coherent policy at all levels. All the competences for innovation, for example, may well be situated at Flemish level, but a number of framework conditions (e.g. intellectual property and taxation) are located at Belgian level.

The *intermediaries* subsystem groups together institutions that have the explicit goal of translating scientific knowledge into the practical needs of industry. Typical examples are the *collective research centres* (of the major traditional industrial sectors). Companies pay an amount to a collective research centre that offers its members all kinds of services. These range from a technology watch, refresher courses, in-service training, setting up customised research projects and the creation of networks to tracking European initiatives, etc. The universities (and the associated higher education establishments) are also supposed to offer knowledge and may derive income from it (research marketing). To that end every university has set up its own *technology transfer department*.

Other typical organisations place the emphasis more on bringing together all kinds of partners and on cooperation in specific areas. These are the *centres of excellence* (directed more towards Flanders) and the *strategic research centres* (directed mainly at the international stage). These institutions work on a demand-driven basis, i.e. they take as a starting point the real-life needs of the private companies (rather than an initiative by the researchers). Efforts are increasingly being made to attain cooperation at all the various levels: one company alone cannot handle all the relevant knowledge or provide a sufficient budget for internal research. 'Open innovation', then, is a recent way of developing new products and services jointly (and splitting the costs), on the basis of a common platform and the complementary nature of the partners. Innovations often emerge at the interface between different disciplines, so such cooperation platforms take on considerable importance. We have only to look at the home tap installation (a joint operation between InBev and Philips) or the Senseo (with its characteristic "coffee pads"[6]). One special type of (non-technological) *intermediaries* are the 14 *policy research centres*. These act as knowledge-transfer organisations between policy areas and research centres (e.g. concerning mobility and employment). The departments and ministerial offices attend to the steering of demand, while the researchers pitch in with their scientific expertise.

Some organisations are presented in rather more detail elsewhere in this EWI Review: the Interuniversity Microelectronics Centre (IMEC; see p. 20), the Flemish Institute for Biotechnology (Vlaams Instituut voor Biotechnologie - VIB; see p. 24) and the policy research centres (see p. 28).

With this contribution we have tried to offer the reader a general outline of the theoretical approach to innovation as a system, on the one hand, and looked, on the other hand, at the translation of this into the situation on the ground in Flanders.

Peter Spyns
Office for Policy Research and Prospective Studies

2 Berkhout G., "Van Poldermodel naar Innovatiebeleid", in: Het Nederlandse innovatiebeleid: tijd voor vernieuwing? (Reflections on Dutch innovation policy). Ministerie van Economische Zaken, Den Haag 2002, pp. 16 - 26.

3 Den Hertog P. & Smits R., (2004), The Co-evolution of Innovation Theory, Innovation Practice and Innovation Policy, viWTA, Brussels.

4 Another contribution in this EWI Review explains the ARKimedes Fund that is aimed at the specific target group of small start-ups (see p. 32).

5 See also elsewhere in this EWI Review: p. 31.

6 These were protected by a patent, which seems to have been no vain luxury since imitations began to crop up soon afterwards.

Besides human potential, innovation and advanced research activities require substantial financial resources. In late March the Flemish Minister for Economy, Enterprise, Science, Innovation and Foreign Trade presented the latest figures for R&D (Research and Development) expenditure in Flanders. The figures reveal that the 3% objective for R&D intensity will probably not be reached by 2010. Many publications, studies and newspaper articles refer to this objective. We shall now have a closer look at the origin of this objective, and its translation into the situation on the ground in Flanders as well as the calculation method and specific data for the Flemish Region.

The 3% R&D investment objective: a small concept with a big impact

Lisbon

The basis for the frequently used *3% investment objective* was laid in the European summit in Lisbon (March 2000), during which the heads of government agreed to make Europe the most competitive knowledge-based economy in the world. The resultant action plan (presented at the European summit in Barcelona in March 2002) included, among other things, the decision to increase R&D intensity to 3% of the gross domestic product (GDP) by 2010. R&D intensity is calculated by expressing the gross domestic expenditure on R&D (GERD) as a percentage of the GDP of a country or region (GDRP). The division of effort between the various R&D actors was also discussed. Industry would be responsible for 2% and the government for 1%.

Flemish context

The EU ambition expressed in Lisbon was translated to Flemish level with the Innovation Pact of March 2003. All the actors involved in the Flemish innovation landscape (government, enterprises, universities and research institutions) declared their agreement in the Pact to making extra combined efforts to reach the 3% R&D investment objective and bring about dual private/public funding. The practical implementation of this undertaking will obviously have to be further monitored and evaluated with recent, comparable numerical data. The *3%-nota* (3% memorandum), drafted by the Policy Research Centre for R&D Indicators[7] , is an important work instrument for Flanders.

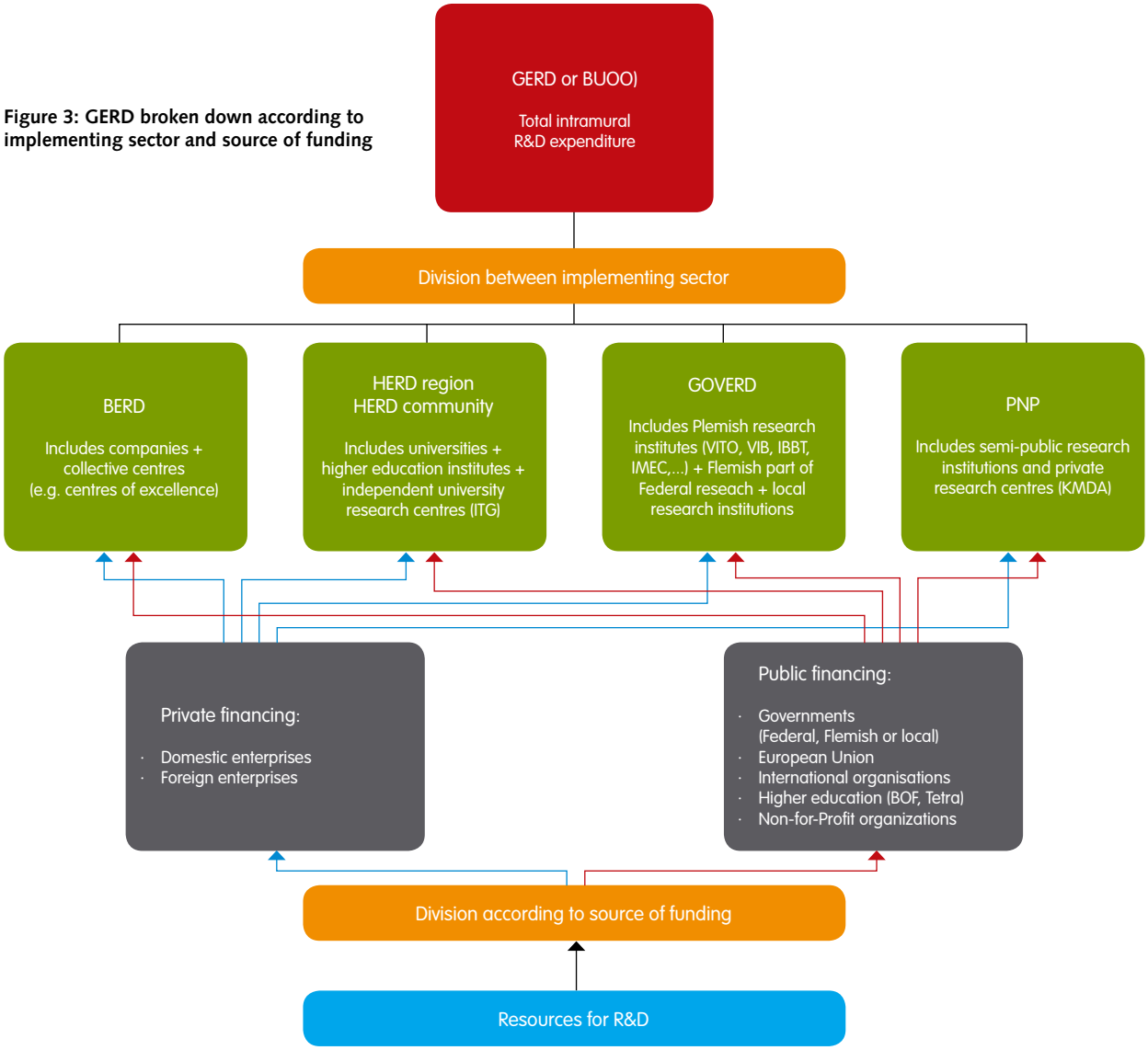
Calculation(s)

GERD[8] is the sum of the amounts of R&D expenditure spent by the four major implementing sectors: higher education (HERD[9]), the private non-profit organisations (PNP[10]), the government institutions (GOVERD[11]) and businesses and collective research centres (BERD[12]) - see Figure 3. This figure gives an overview of the various implementing sectors within the GERD and their composition at institutional level. All research institutions are placed in one of these categories (e.g. IMEC and VIB under government institutions), no account being taken of the origin of their research resources. GERD applies only to intramural R&D expenditure. In other words, it concerns all R&D money spent within an institution, whatever the source of funding, including current expenditure and investments. The Flemish GERD figure is the result of the R&D surveys for the profit and non-profit sectors. The profit survey calculates the R&D expenditure within businesses (BERD), while the non-profit survey examines the results for R&D in GOVERD, PNP, HERD and the collective research centres (BERD). The GDRP of the Flemish Region determined by the Research Centre of the Flemish government was taken as the GDP.

The regional division is made on the basis of international arrangements, according to the geographical location where the research is carried out. As far as PNP, GOVERD and BERD are concerned, this does not present any problems for the translation of Belgian results into figures for the Flemish Region. For the higher education sector, account was taken of the specific Belgian federal state structure that distinguishes between regional and community competences. Higher education is after all a community competence, so there is a regional as well as a community approach. The community approach considers together the various R&D actions of all institutions within higher education - including the Flemish institutions in the Brussels-Capital Region. The regional approach on the other hand applies a territorial division, and only the R&D efforts of higher education establishments located in the Flemish Region are taken into account. The regional figure is used to enable international comparisons. However, the community figure is often added to give a clearer picture of the effects of policy measures on higher education as a whole.

To be able to make a division between private and public funding, the share of private funding and public funding is examined in each of the four implementing sectors. Not only the institution or sector making the R&D expenditure is important, but also the origin of these R&D resources. These may - as shown in Figure 3 - be of private origin (foreign and domestic companies), but they may equally well be of public origin.
In this way the gross domestic expenditure for R&D or GERD may be broken down according to public or private origin, and the R&D intensity can then be evaluated on the basis of the division of the funding (1% public, 2% private).

Figure 3: GERD broken down according to implementing sector and source of funding



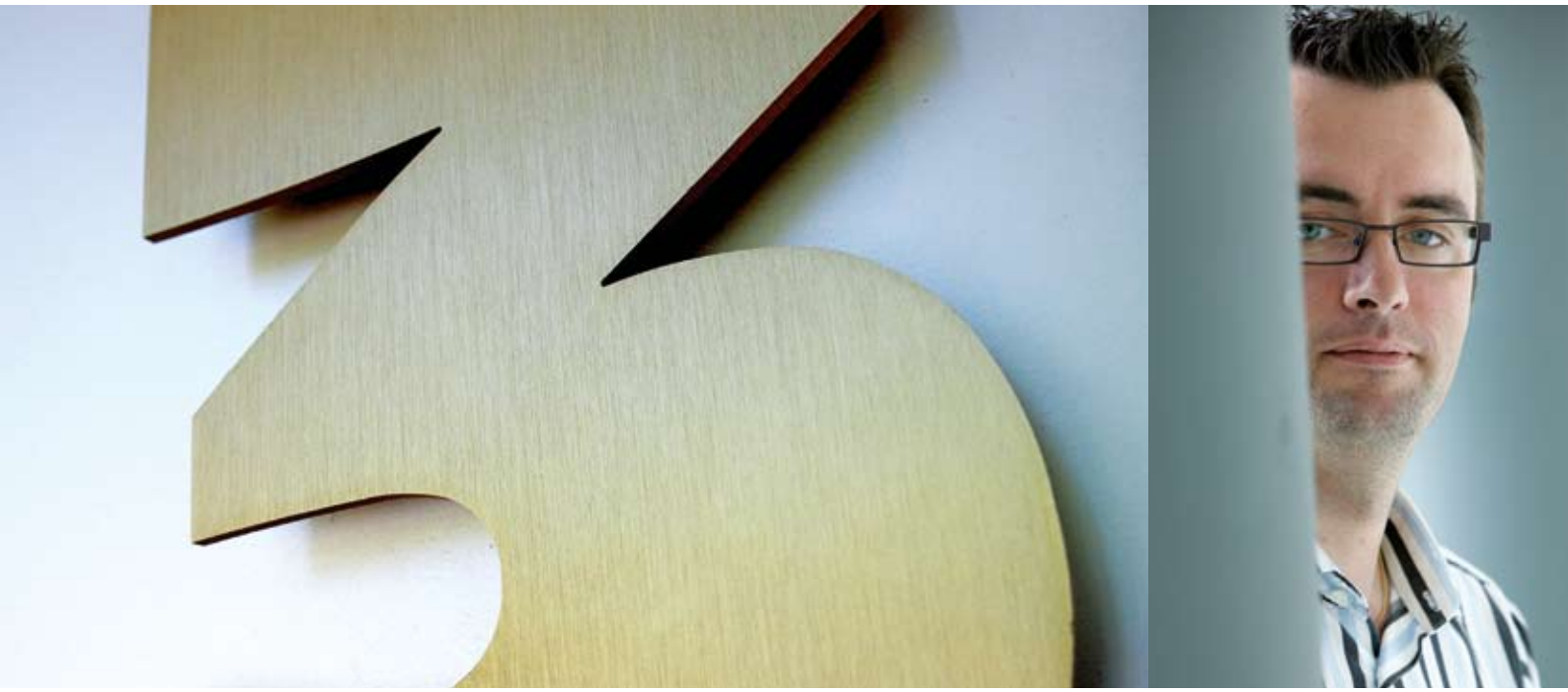
Is Flanders doing well?

The GERD, i.e. the total R&D expenditure, for Flanders came to €3,569 million in 2005. €2,485 million of that figure was put up by enterprises (BERD) and €1,084 million by public research centres, private non-profit organisations and higher education. This figure is equivalent to an R&D intensity of 2.09% (regional approach - Figure 4) and 2.13% (community approach). Starting in 1996, R&D intensity rose each year; in 2001 it peaked at 2.38%. From then on, R&D intensity dropped every year, falling to 2.03% in 2004, the lowest level since 1999. 2005 brought a modest recovery of the R&D intensity, with a rise to 2.09%.

Splitting R&D intensity into private and public funding reveals that the following division applies for Flanders (regional approach): 29% is public funding while 71% is of private origin (Figure 4).
R&D intensity within Flemish businesses (BERD) dipped between 2000 and 2004 from 1.72% to 1.42% and rallied slightly in 2005 to reach 1.46%. R&D intensity among public research institutions (GOVERD) rose from 0.16% in 2000 to 0.22% in 2005, and R&D intensity for higher education (HERDreg) increased from 0.33% in 2000 to 0.39% in 2005. As far as the increased R&D intensity in GOVERD and in HERD is concerned, there is a significant connection with the increased public funds[13] for R&D. Indeed, these increased from €595.7 million to €969.8 million between 2000 and 2005.

Various publications give a tentative Belgian figure of 1.82% as the R&D intensity for 2005. This, however, is a provisional figure (estimated by Eurostat). The estimate is quoted by many sources, but without a mention of its provisional nature. The regional indicators, of which the Flemish figure is only one component, will be further aggregated in the coming months to give a Belgian figure. This figure is expected to be available this summer.

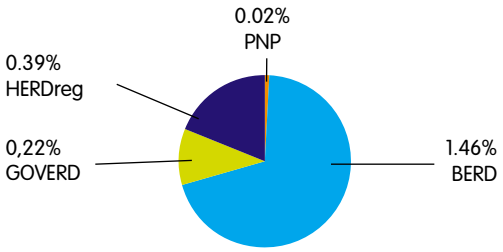
An international comparison for Flanders for 2005 shows that it is very difficult to draw comparisons for this reference year, because not all the figures are available yet for R&D intensity. Comparison with 2004 therefore seems more appropriate. Flanders is following the same downward trend as a good many other European countries. There are, however, some countries that are managing well and are even demonstrating rises: Austria, Finland and the Netherlands. With an R&D intensity of 2.03% for 2004, Flanders is ahead of the Netherlands and Norway but still behind Austria, Denmark, France and Germany. For this reason, it could be interesting to compare Flanders with certain high-technology regions or with some of the smaller countries since they offer a better basis for comparison than do larger countries such as Germany and France.
The figures on Flemish R&D intensity further reveal that more than substantial increases will be necessary if the 3% norm is to be reached in 2010, including the di-



vision of 2% (private funding) as opposed to 1% (public funding). The increase in R&D intensity needed to achieve the 3% objective still requires increased expenditure for R&D, with at least one third for profit and non-profit together. Here it is also assumed that the GDP will remain constant which - fortunately - is not the case for our Flemish economy. It is obvious that the GDRP, as the basis for the calculation of R&D intensity, is an important factor. If the economy is flourishing, the GDRP also rises faster and R&D expenditure must therefore increase more to allow R&D intensity to rise. Considerable investment must therefore be made in research in order to attain the objectives.

Peter Viaene
Office for Policy Research and Prospective Studies

The R&D intensity for 2005 broken down into its four components (BERD, HERD, GOVERD en PNP)



The R&D intensity for 2005 according to its source (private vs. public)

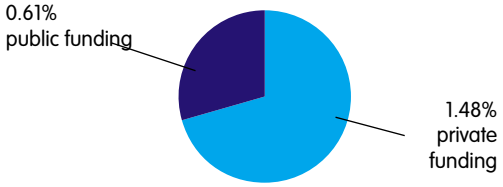


Figure 4: R&D intensity breakdown for 2005

7 See http:// http://www.steunpuntoos.be/inno_data.html
8 GERD: Gross Expenditure on Research & Development
9 HERD: Higher Education Expenditure on Research & Development
10 PNP: Private non-profit organisation expenditures
11 GOVERD: Government Expenditure on Research & Development
12 BERD: Business Expenditure on Research & Development
13 Expenditure for R&D or GERD (real expenditure) should not be confused with planned public funding for R&D, or GBAORD.


SPATS
2007
De innovatieprijs
van de Vlaamse overheid

Innovation in the Flemish government and SPITS

Creativity and innovation are important for the opportunities and challenges of tomorrow and the day after tomorrow. This also holds for public administrations. The policy notes of most ministers say it very loud and very clear.

Innovation is not a separate item on the agenda. Innovations or improvements in the provision of services to clients or in matters of internal organisation take on their form in day-to-day practice. By using the available means creatively and in an innovative manner we will be able to square up to new challenges.

In his policy document *Bestuurzaken 2004-2009*, the Flemish Minister for Administrative Affairs, Foreign Policy, Media and Tourism proposed harnessing the creativity of the members of the personnel of the Flemish government: "It is the civil servant in the front line who is often in the best position to know where changes and improvements are possible or desirable."

That is why the Flemish government established the prize for innovation *SPITS 2007*. Rewarding good practices must reinforce innovative power in our organisation. Making specific projects visible gives pioneers within the Flemish government a welcome boost. At the same time it offers the opportunity to learn from one another, thereby nourishing a culture of innovation through the practice on the ground.

The first Innovation Prize was presented at the Innovation Festival on 12 February 2007. The presentation was preceded by a packed programme with, for example, workshops based around the implementation of innovative ideas on the shop floor.

What nobody dared to say out loud that day, but what everyone was thinking was that business does not have a monopoly on innovation. We in the Flemish administration are as enterprising and pioneering as anyone else. Of course we associate innovation in the first place with the world of commerce and industry. Commerce and industry must, after all, always come up with new ways of selling things that the client used to be perfectly happy living without. How could the human race have survived all those centuries without iPod, e-mail, our daily Yakult or the new Dreft? Yet the effect on the lives of every citizen is greater when the government innovates.
No fewer than 37 projects developed within the Flemish government aim to make all our lives easier. The personnel of the Flemish government were given room to make improvements and changes were allowed. This is completely in line with the philosophy of our own EWI Department.

The SPITS 2007 Innovation Prize was awarded by the Flemish Minister for Administrative Affairs, Foreign Policy, Media and Tourism and there were three winners. First prize went to the Agency for Educational Services for the automatic exchange of data between the Department of Education and the child benefit authorities. The Dilsen-Stokkem region team from Child and Family won second prize for a helpline for breast-feeding advice. The Flemish Land Company and the Agency for Agriculture and Fisheries took third place for the electronic counter for farmers and one-off registration of plots of land.

More information:
www.vlaanderen.be/innovatieprijs
(only in Dutch)

The winning project that allows **automatic data transfer between the Department of Education and the child benefit authorities** is a fine sample of MAGDA (Maximal Data Sharing between Administrations) or the principle "Don't ask what you already know". That means, first of all, time being saved by pupils, students, parents, schools and universities. The public authorities concerned can also work more efficiently and increase their accuracy thanks to electronic data processing. The system helped to do away with 160,000 certificates in higher education and 76,000 in secondary education.

The **Breast-feeding helpline**, the helpline run by regional health experts from the organisation Child and Family in Limburg, was also awarded a prize. This helpline came about through the enthusiasm of a single colleague, Christel Geebelen, a nurse with the Dilsen-Stokkem regional team of Child and Family. The telephone and electronic helpline means that information about breast-feeding problems can be sent directly to mothers. This project clearly demonstrates that innovative projects can arise from any role in the Flemish authorities.

The third prize for innovation went to two initiatives that will make the life of the Flemish farmer much easier: **the Agriculture and Fisheries one-off registration of plots of land and e-counter**. Until recently farmers had to fill in two annual parcel declarations, the first being their Manure Bank Declaration (Mestbankaangifte), and the second their application for Flemish and European subsidies. The Flemish Land Company and the Agency for Agriculture and Fisheries have ensured that, from now on, this can all be done by means of a single annual registration. Thanks to a smart electronic application system, farmers can now also submit applications for support that are of a higher quality. The computer gives help to the farmer so that incorrectly completed applications - possibly with dire financial consequences for him or her - are avoided. The system was developed start-to-finish from the viewpoint of the user. A group of 35 farmers tested it out and fine-tuned it.

Emmelie Tindemans
Communications Team

The 'I' in IMEC

Europe's largest independent research centre in nanotechnology and nanoelectronics

Flanders aims to be a front-runner in the European knowledge society and economy. By developing its knowledge potential and using it to the full, Flanders intends to further increase its powers of innovation. Leading actors in the innovation landscape are the four strategic research centres: IMEC (nanoelectronics), VIB (biotechnology), VITO (energy, materials and the environment) and IBBT (broadband communication). Together with the universities and higher education institutes, these centres play an important role securing Flanders' position in the global knowledge society and economy. The Department of Economy, Science and Innovation (*Departement Economie, Wetenschap en Innovatie*, or EWI) takes care of the administration and monitoring of the strategic research centres.

Figure 5: the IMEC campus, Leuven

With the Interuniversity Microelectronics Centre (IMEC), Flanders now has a world-famous strategic research centre in nanoelectronics and nanotechnology. Nanotechnology makes it possible to work with components of an order of magnitude of one nanometre (one thousand-millionth of a metre); this is on the scale of atoms and molecules. This contribution is a short introduction to the challenging world of nanoelectronics and IMEC's research activities in particular.

Excellence

IMEC was launched in 1984. It was born out of the Third Industrial Revolution Flanders initiative (*Derde Industriële Revolutie Vlaanderen* - DIRV), a programme organised by the first Flemish government that aimed to boost the microelectronics industry in Flanders. In the 1980s, microelectronics was seen as a carrier technology for the economic future, and Flanders was no exception in this respect. The Flemish government decided to invest in the campus of the Catholic University of Leuven, with the participation of research groups from the other Flemish universities. This technology push approach was combined with the creation of the industrial production facility for microelectronics - MIETEC NV - in Oudenaarde, now AMI Semiconductor (AMIS).
In Flanders we always emphasise an integrated approach because only close interaction between research and industry can yield the desired economic results.

From the start IMEC was involved in research for next-generation electronic circuits. The objective was always to be an 'international centre of excellence'. IMEC has since outgrown its Flemish roots and has developed to become the largest independent European research centre in nanoelectronics and related design methods and systems. Researchers from all over the world work there alongside scientists from the Flemish universities and colleges and international experts from industry. They conduct scientific research in the field of nanoelectronics - research that is three to ten years ahead of the current needs of industry.
The research institution has approximately 1,500 staff, including more than 500 industrial residents and guest researchers. The total research budget is €227 million (estimated budget for 2006), only a small part of which (€35 million) comes from the Flemish authorities.

Research at IMEC

- **Miniaturisation of transistors**
  On a day-to-day basis, researchers at IMEC study the question of how they could make their transistors smaller. This is because microscopically small switch transistors form the heart of the integrated electronic circuit (= integrated circuit: IC or chip). They determine what capacities the electronic circuit can handle. The microprocessor, the heart of every computer, essentially consists of millions of these transistors. Even our

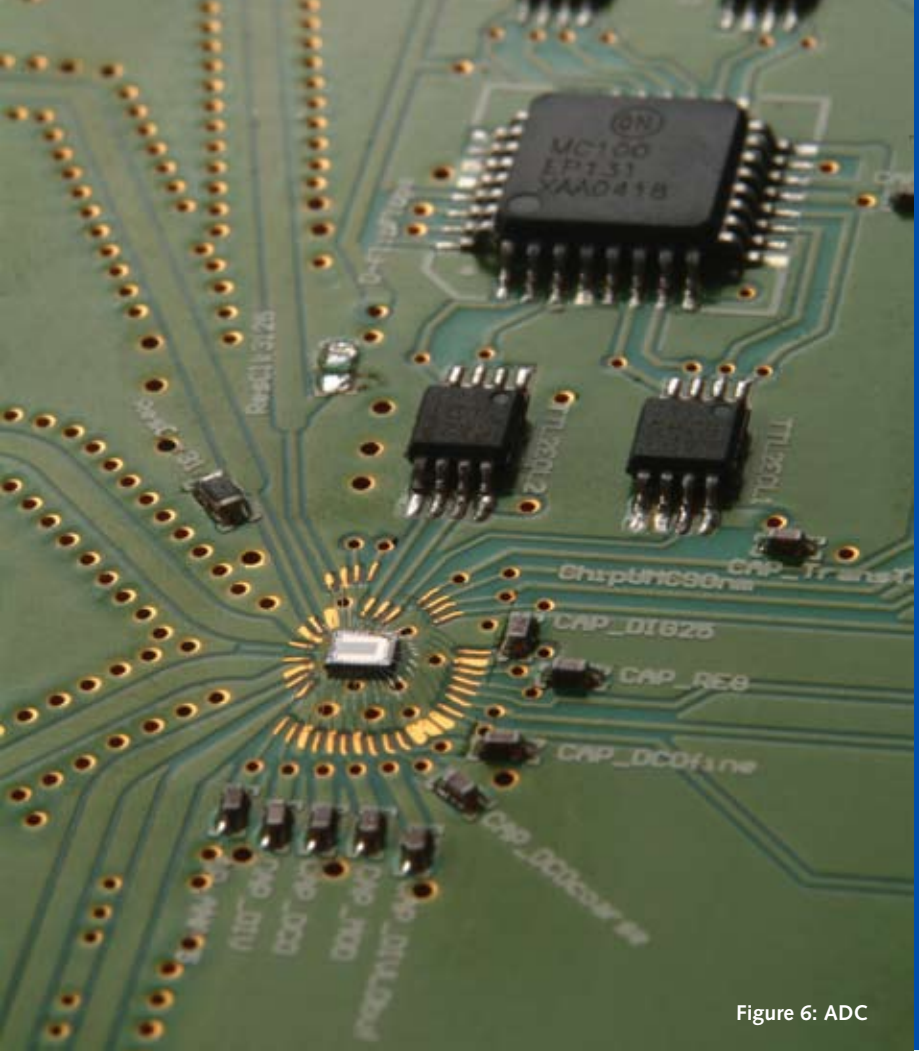


Figure 6: ADC

mobile phones or PDAs work on the basis of these simple electronic building blocks.

In our everyday lives we are witness to the fact that each new generation of electronic devices offers more options. This means that more complex and faster electronic circuits are needed, which in itself requires more and smaller transistors. Gordon Moore, co-founder of Intel, observed in the 1960s that the number of transistors in an integrated circuit doubled every two years (*Moore's Law*). More than forty years later that general principle of transistor downsizing still holds. Information and communication technologies have benefited from the downsizing of the transistor.

The evolution of transistor miniaturisation and the increase in the complexity of the electronic circuit are still the major challenges for researchers who are dealing with the production methods for next-generation electronic circuits (process technology). Research at IMEC focuses on development of new materials and techniques for these processes. But how do you design complex electronic circuits, made up of tens of millions of transistors? In fact this is a question that IMEC researchers ask themselves on a daily basis. That is why they also develop systems to design these complex electronic circuits (design methodology).

- **Nanoelectronics**
  Microelectronics has changed our world drastically with the development of computers, mobile phones, digital television, medical screening and healthcare equipment into essential parts of our everyday lives. Nanoelectronics is the next step in development.

  IMEC is currently developing transistors measuring less than 100 nanometres, that is 10,000 times smaller than one millimetre. These transistors are no longer visible to the naked eye. However, the physical limits of today's silicon technology are drawing near. The most advanced research into chip processes takes place in dimensions smaller than 22 nanometres; in future they will even go further on the atomic scale (16, 12 and 8 nanometres). These also happen to be the dimensions of the building blocks of life on Earth, which means that nanoelectronics can be combined, for instance, with biotechnology, which will lead us to new applications: biochips that allow rapid diagnosis close to the patient, nerve cells that communicate with chips and thus support research into diseases such as Alzheimer's and Parkinson's.

- **The intelligent environment**
  In future, technology will be replaced by invisible systems, also called ambient intelligence. IMEC is developing the technology and building blocks for the intelligent environment; chips will be inconspicuously present in our environment, making our lives more pleasant, healthier and safer. The presence of different specialists makes IMEC a suitable environment in which to work on this vision of the future.

The research facilities

Nanoelectronics focuses on minuscule components which means that, apart

The beating heart

Figure 7: the clean room

from the researchers' know-how, a high-technology laboratory is also required. This high-technology laboratory or 'clean room' is the beating heart of IMEC (Figure 7).

This ultra-clean environment is an essential condition for research at one millionth of a millimetre, because even the tiniest particle of dust may cause damage. For a chip a dust particle is the same as a boulder is for a human being: fatal. The air in the 'clean room' contains millions of times fewer dust particles than ordinary air; ambient temperature and humidity are also strictly controlled.
In order to make sure that accurate work is done there, the whole room stands on a vibration-free floor. The new 'clean room' means that it is possible to work with the ultra-modern 300 mm silicon plate (thickness 0.2 mm) and is equipped with all the very latest apparatus. These silicon plates, or *wafers*, form the basis for the electronic circuits. The leading producers of electronics such as *Philips, Infineon, STMicroelectronics, Intel, Texas Instruments, Matsushita, Micron, Samsung* and *TSMC* are also using the clean room, the beating heart of IMEC.

IMEC and industry

While the dimensions of the transistor are decreasing, the costs of research in nanoelectronics is increasing exponentially. Due to these rising costs, industry is cooperating more and more with research centres such as IMEC. As mentioned before, the leading companies in the area of nanoelectronics are working with IMEC. The results of the research at IMEC are marketed throughout the world. That means both Silicon Valley and Flemish SMEs for example. Most of IMEC's current industrial partners, of which there are more than 120, are SMEs. Recent years have also seen an increase in cooperation with non ICT-related companies. These companies are active in other sectors, such as the environment, the automotive industry, textiles, food, construction and transport.
An industrial partner is sought for a technology transfer once a new IMEC technology is ready for the market. If a partner of this kind cannot be found but the technology has adequate commercial potential, a new company is set up, a so-called *spin-off*. These spin-offs manufacture products developed at IMEC. More than 20 spin-off companies have been set up to date[14]. In Flanders, and especially in the vicinity of IMEC, there is a whole (steadily growing) network of high-tech companies that are front-runners in ICT. In this way, IMEC is helping to develop Flanders into the unique knowledge region that it aims to become.

IMEC and international cooperation

IMEC is a research centre that relies heavily on international cooperation with industry. This is particularly evident if you look into the income from contract research for industry. In 2005 IMEC's income rose 23% to reach a total amount of €162 million. The total budget for 2005 came to €197 million, 82% of the income from contract research plus an 18% subsidy from the Flemish government. The income from research contracts (€162 million) has the following sources:

- 68%: International industry
- 22%: Flemish industry
- 8%: European Community (e.g. European Framework Programme)
- 2%: ESA (European Space Agency).

About 68% of the revenue comes from research activities with industry worldwide. Contract research in the European Framework Programme represents only 8% of the total income. However, IMEC belongs to the top 10 European research centres participating in these research programmes.

IMEC Nederland

For some time now, Flanders and the Netherlands have been working together in a number of fields, for example research and development. IMEC has therefore created a new legal entity in the Netherlands, the Stichting IMEC Nederland (IMEC-NL), to manage the activities of a brand-new research centre, the *Holst Centre*. The Holst Centre was set up in 2005 with the support of the Dutch Ministry for Economic Affairs and the Flemish government. The aim is for the Centre to develop into an internationally recognised research institute for future generations of autonomous wireless sensor networks and thin foil electronics. Many electronic devices such as flexible solar panels and displays can be made using foil electronics. The Holst Centre will act as the bridge between the knowledge centres and industry. The centre will also play an important role in supporting Dutch and Flemish industry and creating a European knowledge-based economy.

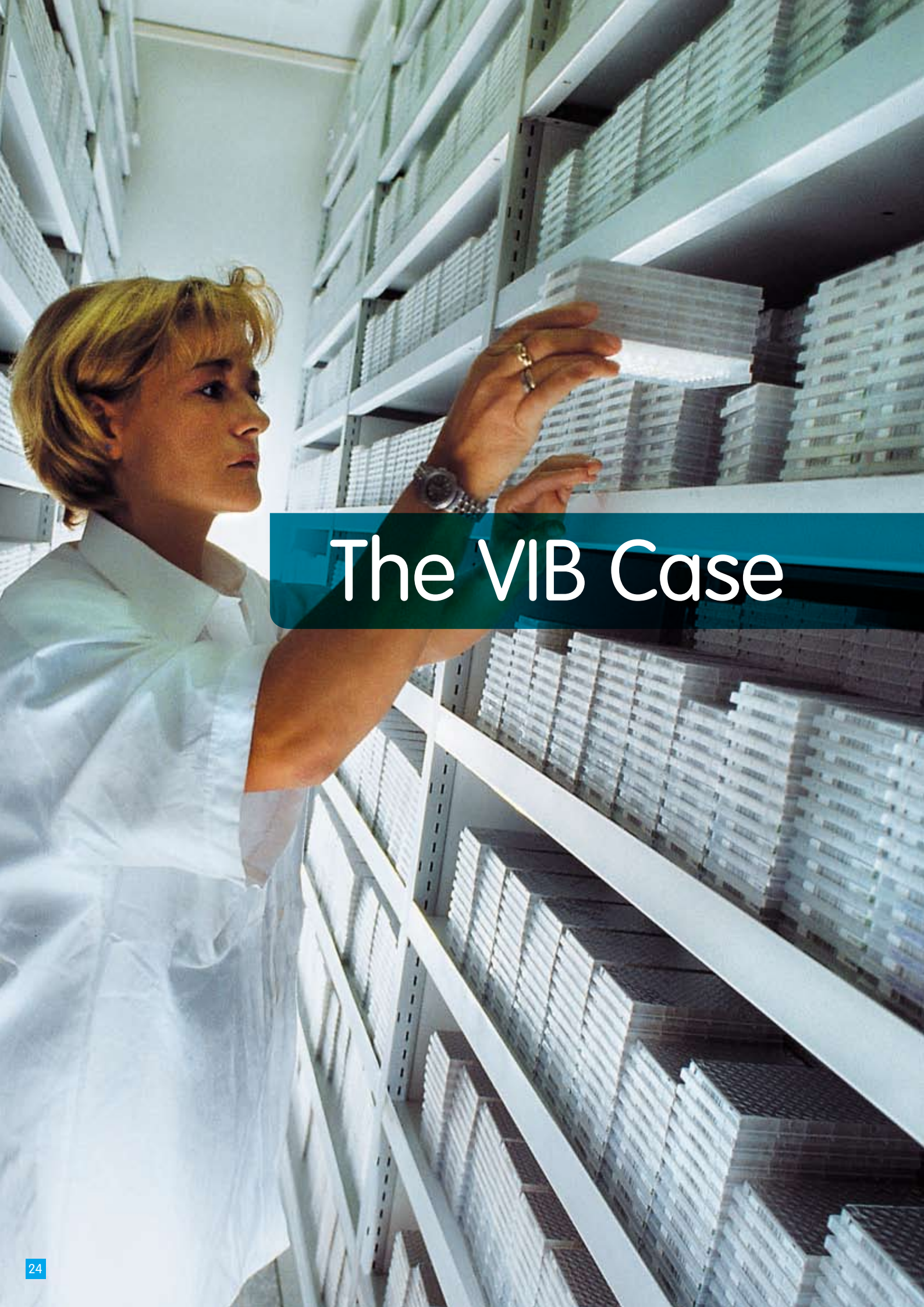
Into the future

It is clear that IMEC has grown in recent decades into one of the largest independent research centres in microelectronics. In that period it has conducted trailblazing research in the drive for transistor miniaturisation, as alluded to by the experts by Moore's Law. Nanotechnology is the future. It is all about minuscule components, but the technology has all kinds of possible applications in key areas such as the environment, medical care, energy, biotechnology and, last but not least, the electronics of the future. These applications are still partially speculative, but scientists are already thinking in terms of, for example, applications such as implanted biosensors, new energy storage and conversion techniques and molecular computer components and systems. Therefore, nanotechnology is also a strategic area for the knowledge-based economy of the future.

Flanders wants to actively contribute to building the nanotechnology-based knowledge society and economy of the future. Moreover, Flanders has the potential to do this, because it has an excellent basis in terms of nanoelectronics and nanotechnology, with strategic research centres such as IMEC. A new administrative agreement has therefore been concluded with IMEC for the next five years (2007-2011). The Flemish government subsidy for 2007 has been set at €39 million and will be increased next year by an extra €4.4 million. The near future for nanoelectronics and nanotechnology in Flanders seems bright.

Karel Goossens
Research Valorisation and Industrial Policy Team

14 Magwel, Gemidis, Vivactis, XenICs, Photovoltech, PowerEscape, Fillfactory, Septentrio, Q-Star, 3E, Oligosense, Ansem, Acunia, Smartpen, Coware, Target Compiler technologies, Sirius Communications, Easics, Frontier Design, Soltech, Cobrain, and Alphabit.



The VIB Case

The exhibitions *'De Zaak DNA'* ('The DNA Case') and *'Eet es genetisch'* ('Genes for dinner'), and the school project scientists@work: successful communication initiatives by the Flanders Interuniversity Institute for Biotechnology (*Vlaams Interuniversitair Instituut voor Biotechnologie, or VIB for short*). VIB is an enterprising research institute, active in the life sciences and plant biotechnology. This virtual institute, which was set up on 1 January 1996, now brings together more than a thousand scientists and technicians from nine universities. They conduct basic research into molecular mechanisms that enable the human body, plants and micro-organisms to function properly. This research lies at the basis, for instance, of new therapies or developments in agriculture and is making a contribution to the development of a sustainable society.

How does the Flanders Interuniversity Institute for Biotechnology spend its funds?

Furthermore, there have been reports in the media illustrating how VIB is one of the key figures involved in explaining the genetic or molecular causes of serious syndromes such as Alzheimer's, leukaemia and other conditions. To put it in a nutshell: in the form of VIB, Flanders has a strategic research institute of world standing. The Flemish government supports the activities of VIB by means of annual subsidies. In this article we give a summary of the financial resources and focus on a number of outstanding results.

VIB's core activities

In cooperation with its university partners Ghent University (UGent), the Catholic University of Leuven (K.U.Leuven), the University of Antwerp and the Brussels university VUB (*Vrije Universiteit Brussel*), VIB aims to lay the foundations for a better quality of life. To achieve this, it is working on three complementary core activities:

1 The primary task of VIB involves acquiring new knowledge through **strategic basic research**. This knowledge yields a fundamentally better understanding of the molecular mechanisms of life. Creativity, combined with cutting-edge technology, makes breakthroughs possible.

Figure 8 shows the evolution of the number of publications in quality journals. The VIB researchers publish almost 60% of their contributions in high-ranking or leading journals. Different publications have been commended for the social importance of their research in the national and the international press. Examples are breakthroughs in research on very common medical conditions such as Alzheimer's, cancer and ALS (Amyotrophic Lateral Sclerosis).

2 The transposition of knowledge into useful applications, such as diagnosis, medicines or agricultural applications is a second core activity of the institute. **Technology transfer** activities aim to lead to products to help the consumer and the patient. Technology transfer thus forges the link between academic research and the world of commerce and industry. This process is made up of three steps. VIB scientists generate new knowledge that may culminate in new medical applications for proteins, methods to stimulate the growth of crops or help to combat diseases, and so on. In 2005 the total number of inventions researched since VIB was launched stood at 443. VIB may acquire property rights in these inventions, for instance by submitting patent applications. The patents portfolio numbered 158 active patent families by late 2005. Finally, VIB concludes agreements with start-ups or existing businesses to convert these inventions into ready-for-market products. VIB signed 59 R&D and licence agreements in 2005. This brought the total number to 293.

VIB research also leads to the establishment of new biotech companies. Besides established start-ups *Devgen, CropDesign* (since taken over by *BASF*), *Ablynx* and recent start-ups *Pronota* (formerly *Peakadilly*) and *Solucel*, in 2006 *ActoGeniX* was founded. The company uses micro-organisms as an innovative oral administration mechanism in biopharmaceuticals. This technology has already led to a promising method for the treatment of Crohn's disease. By late 2006 the VIB start-ups were employing 300 people.

VIB also supports industrial development through operating a bio-incubator. This is a multifunctional building that is put at the disposal of young and start-up companies and R&D departments of domestic and foreign companies. In 2005, the VIB incubator opened its doors to the Japanese company Yakult which, after international evaluation, gave its preference to Ghent as a springboard for its European R&D

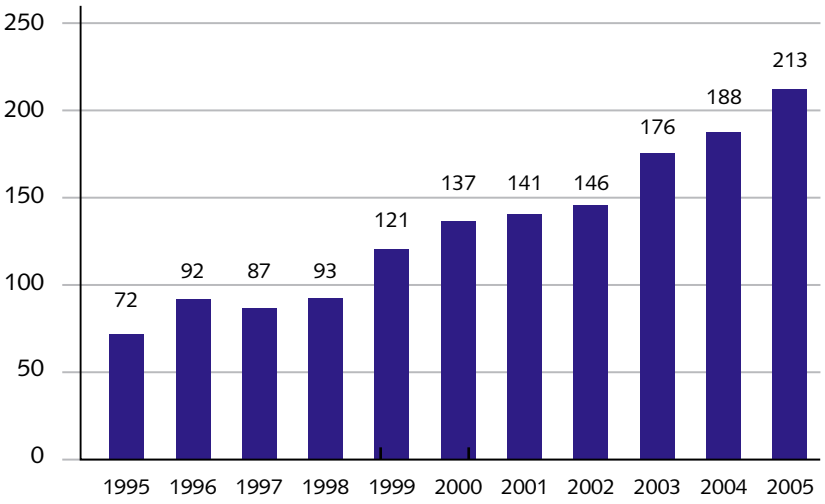


Figure 8: Evolution of the number of publications in high-ranking journals

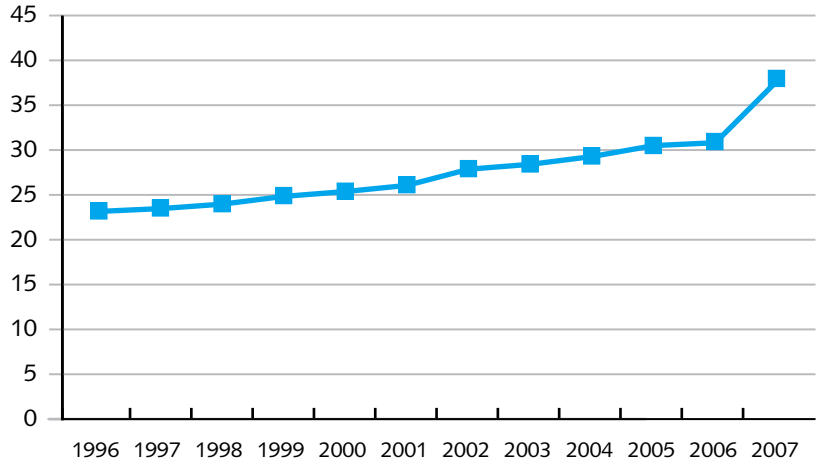


Figure 9: Evolution of the Flemish government subsidy (millions of euro)

Table 1: Evolution of the Flemish government subsidy (in millions of euro)

year	1996	1997	1998	1999	2000	2001
subsidy	22.806	23.49	24.194	24.921	25.669	26.034

year	2002	2003	2004	2005	2006	2007
subsidy	27.817	28.595	29.453	30.366	31.334	38.104

centre. Later, in September 2006, the second bio-incubator opened on the same site in Ghent. Leuven will be next to receive a bio-incubator in 2007.

3 VIB's third core task is to **provide information to the general public** about discoveries and developments in the life sciences. VIB has developed an extensive range of educational material concerning biotechnology; this material is distributed widely. The complete list can be found at **http://www.vib.be/InfoEdu/EN/Educational+material/**. The school project scientists@work, for example, brings 14 to 18-year-olds into a laboratory. VIB research that provides news of interest to the general public is announced through national and international press reports.

VIB screened

On 1 January 1996, VIB started work as an institute in its own right, following the laying of the legal foundations in 1995. When VIB was set up, the Flemish government laid down the institute's core activities in a management agreement. Its main objectives were (i) to enhance the excellence of Flemish research in life sciences and (ii) to transform its results into new economic growth.

Like any other Flemish research institute, VIB is evaluated by the Flemish government every five years. The latter checks whether the objectives were in fact attained and whether the benefits (if any) for Flanders warrant the annual subsidies. VIB was given a very positive report by the various committees. This gave rise to a new management agreement for the period 2002-2006. In late 2005 and continuing into 2006, a critical analysis of the institute and departments was carried out by specialist international advisory boards. In view of the positive evaluation results, the Flemish government regarded VIB as consummately successful and upped its funding for the third administration agreement (2007-2011) by 20% to €38.1 million. This substantial increase has already been integrated into the new long-term strategy for VIB and its research departments.

Financial summary

Income

Table 1 and Figure 9 chart the evolution of subsidies paid by the Flemish government to VIB. After the positive evaluation results, the subsidy to VIB was increased to €38.104 million from 2007. This represents a structural increase of €6.3 million in comparison with 2006 over and above indexation.

Besides this direct funding from the Flemish government, VIB also nets other income; this revenue is indicated in the VIB management accounts. Table 2 charts the period 2000-2005.

Table 2: VIB income for the period 2000-2005 (in millions of euro)

	Turnover	Subsidies	Other income (*)	Total
2000	5.413	27.160	0.748	33.320
2001	5.628	28.289	2.498	36.415
2002	5.186	30.251	4.576	40.013
2003	5.800	31.640	0.699	38.139
2004	8.471	32.142	0.689	41.301
2005	9.795	34.177	3.501	47.473

(*) 'Other income' refers to financial revenue (€898.000 in 2005) and one-off or non-recurrent income. 2005 saw €2.4 million coming from the Flemish government for the joint funding of two new bio-incubators (Ghent and Leuven).

Table 3: Expenditure for VIB period 2000-2005 (in millions of euro)

	Personnel	Operations	Investments	Other (**)	Total
2000	17.945	11.306	1.798	1.183	32.232
2001	18.195	11.240	3.677	1.766	34.878
2002	18.046	12.556	2.129	1.097	33.828
2003	18.439	10.815	6.103	1.183	36.540
2004	20.331	14.763	2.155	2.120	39.368
2005	21.665	16.840	4.098	2.604	45.206

(**) 'Other expenditure' includes depreciations, financial charges, extraordinary expenditure and capital commitments.

In 2005, VIB received €12.262 million in external funding. Some €9.284 million came from contract research with industry, the European Commission and other international actors within the research field. The VIB bio-incubator generated a turnover of €0.511 million in 2005. Total turnover was therefore €9.795 million.

Besides the Flemish government subsidy in 2005, VIB also obtained €2.264 million through revenue from various other subsidy-giving international institutions or companies. This represents a modest increase of €0.157 million in comparison with the previous financial year (8%). VIB researchers are continuing the successful trend in competing for international prizes and grants that started in 2003.

Expenditure

Out of the €2.4 million received in 2005 for the joint funding of two new bio-incubators an amount of €4.098 million was paid in investments for the bio-incubators in Ghent and Leuven.

Personnel

When it started, VIB brought together some 500 employees from existing university research groups. This number has since doubled. Many of the new associates are from outside Belgium. After all, high-quality science takes place in an international context. VIB launches international calls and reaches graduates from all over the world.

A distinction is made between four categories of associates:

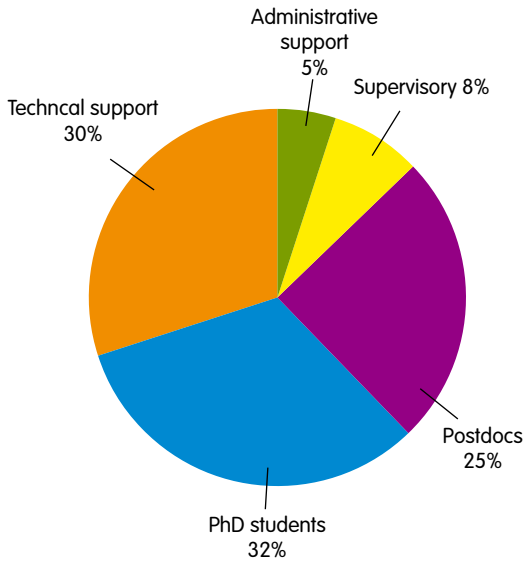
- supervisory scientific personnel;
- scientific personnel: postdoctoral and predoctoral (Ph.D.-student) researchers;
- technical support personnel;
- administrative, IT and logistical support personnel.

The general services of the VIB head office deal with coordination. By late 2005 the breakdown of associates on the basis of the groups indicated above was as shown in Figure 10.

The new management agreement provides VIB with more than €190 million, spread over the period 2007-2011. This is effectively a 20% increase of the annual subsidy. Thanks to this important input, VIB can continue on the path chosen; the continuity of the research of more than 1,000 scientists is guaranteed for the next five years.

Koen Waeyaert,
Statistics and Indicators Team
Kathleen D'hondt,
Team Policy Support and Academic Policy

Figure 10: 65% of the staff is scientific personnel



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Policy based on science – science based on policy

After a few hectic months, the dust in the relocated EWI archives has settled and the heating in the new Ellips building has been adjusted, so it is high time to take stock of the Policy Research Centre Programme (*Programma Steunpunten voor Beleidsrelevant Onderzoek*), which was in urgent need of renewal. In this contribution we explain the purpose of the policy research centres and give an outline of their history. We also give the various specific research results.

Research, but there is more

The Policy Research Centre Programme was launched in 2001 to provide a scientific basis for policy, which was needed by the Flemish government of that time in its eagerness to quickly anticipate social developments and challenges and take proactive measures. The Policy Research Centre Programme is a reworking of the earlier *Programma Beleidsgericht Onderzoek*, which proceeded on a project basis. The emphasis in the policy research centres is laid more on structural funding. On 15 December 2006 the Flemish government approved the new management contracts with a new generation of policy research centres. The term of 5 to 6 years for the first generation ran until late 2006. The second generation runs from 2007 to late 2011.

The focus of the policy research centres is both on problem-driven short-term research and on fundamental long-term basic research on themes that the Flemish government regards as priorities and relevant to its policy. The task further includes the transfer of knowledge, the provision of scientific services, the building up of collections of data, the unlocking of data sources and data analysis. With the recognition and funding of the Policy Research Centres, the Flemish government is aiming for:

- structural research funding for priority policy themes;
- stability of research within a clearly established contractual framework;
- a scientific basis for policy through the structural integration of research into the policy and administration cycle;
- promotion of the multidisciplinary aspect within research of relevance to policy;
- accessibility of available knowledge and transfer of that knowledge to the Flemish government.

Through this initiative a number of high-ranking Flemish research groups can also develop a critical mass of knowledge. For the first time these groups now also have sufficiently long-term structural funding. They can help young researchers to write a doctoral thesis. Unlike other programmes, the Policy Research Centre programme is not intended to only finance research. The government, as the client, also expects clear, usable results. The Policy Research Centres Programme forms the basis for an interaction whereby policy supports research and vice versa.
The basic framework of the research centre is constituted by one or more research groups from one or more Flemish higher education institutions. These groups work with institutions from Belgium's French Community and from other countries, the Flemish Institute for Technological Research (*Vlaamse Instelling voor Technologisch Onderzoek*, or VITO) and foreign public research institutions. A cooperation agreement leads to as good a candidacy as possible for a theme.
This new approval is naturally part of a broader process. The overall effect of the first generation of Policy Research Centres was evaluated. On the basis of that evaluation the new structure for the programme was developed. On 12 May 2006, the Flemish government decided on the new research themes and assessed the candidacies submitted by the research institutions. In the policy area Economy, Science and Innovation (EWI) the annual central funding of the Policy Research Centres Programme comes to €8.5 million. This amount is shared between the various research centres. Each research centre can reckon on additional funding from parties involved in the policy areas on which they are working.

Many themes

The Flemish government selects the themes on the basis of its policy priorities. It assesses research group candidacies by using scientific, policy-relevant and management-oriented criteria. On the basis of this judgement, one candidate to become a Policy Research Centre is accepted for each theme. The management contract also provides recognition and elementary rules and procedures for the running of the policy research centre, plus a long-term plan that states obligations as to the content of the research. Fourteen policy research centres have been accepted for the period 2007-2011 (the second generation):

1. Public Administration in Flanders (Bestuurlijke Organisatie Vlaanderen)
2. Foreign Policy, Tourism and Recreation (Buitenlands beleid, Toerisme en Recreatie)
3. Culture, Youth and Sport (Cultuur, Jeugd en Sport)
4. Sustainable Development (Duurzame Ontwikkeling)
5. Taxation and Budget (Fiscaliteit en begroting)
6. Equal Opportunities Strategy (Gelijkekansenbeleid)
7. Environment and Health (Milieu en Gezondheid)
8. Mobility and Public Works (Mobiliteit en Openbare Werken)
9. R&D Indicators (O&O-Indicatoren)
10. Entrepreneurship and International Entrepreneurship (Ondernemen en Internationaal Ondernemen)
11. Spatial Planning and Housing (Ruimte en Wonen)
12. Education and School Careers (Studie en Schoolloopbanen)
13. Welfare, Public Health and Family (Welzijn, Volksgezondheid en Gezin)
14. Employment and Social Economy (Werk en Sociale Economie)

The term *generation* underlines the fact that this second term is more than a mere continuation of what went before. The term alludes to growth, improvement, evolution, and innovation of the existing programme. Indeed, the evaluation of the first generation of policy research centres was intended as a learning process. A new list of research themes was drawn up in the light of current policy needs, and on this basis a new call was launched. Among the candidates and the research centres that were ultimately selected we also include the total newcomers, those known from the first generation and new cooperation agreements between newcomers

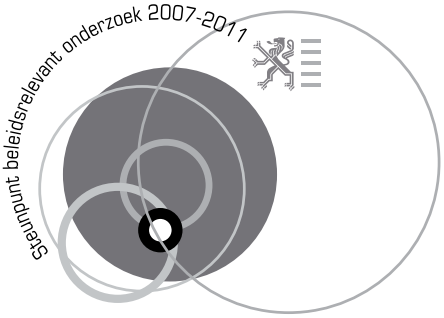


Figure 11:
Type logo of the Policy Research Centres

and older acquaintances. New logos were designed to put this renewal literally and figuratively in the picture; they have the same basis but differ slightly.

There is always room for improvement

The new management contract is based on the one for the previous generation, but has been thoroughly reworked with account being taken of the evaluation of the first generation. Among other things, this evaluation taught the following lessons.

- As the *perspectives* of the political authorities, the civil service and the academic world are sometimes highly divergent, a clear balance must be struck between short-term and long-term assignments. Short-term assignments must offer direct answers to current questions. Long-term assignments are oriented more towards fundamental research; the results are less immediate and offer, among other things, possibilities for the future. Both types of research have their rightful place, but the preferences of the interested parties in the Policy Research Centre Programme may differ. That is why the parties have to ensure in advance that there is clarity about the balance between the two types of assignment.
- The policy-relevant research that the centres conduct is obviously aimed at Flanders. However, a number of experts are pressing for *more international contacts* and integration of the research centres into the international research community. Although Flanders has a strong research basis in the areas covered by the research centres, comparisons with foreign situations and the use of foreign research results would be beneficial. This would also stimulate research centres to participate in European research programmes.

Some specific examples

The research of the policy research centres is usually open to the general public as well. The first generation of policy research centres appeared in the Press with their work on, among other things, the following subjects.

The Steunpunt Gelijkekansenbeleid (Equal Opportunities) conducted research on equal opportunities for women, immigrants, homosexuals, lesbians and bisexuals and the elderly. It was found that:

> Turkish and Moroccan immigrants felt less healthy. Financial access to medical care is a threshold in this respect. 25% of this group of the population say that they have postponed medical care for financial reasons, compared with only 5% of Belgians.
> Homosexuals, lesbians and bisexuals are less likely to have a life or steady partner. 65% of the members of these groups have a life or steady partner, compared with 81% of heterosexual Flemings. As opposed to the average Fleming, the trust network of homosexuals, lesbians and bisexuals is based mainly on their male or female friends rather than on their family. A contributing factor here is a lack of openness about their homosexuality. The results of a survey in which 3,000 homosexuals, lesbians and bisexuals were interviewed was compared with an earlier study with 1,500 Flemings.
> 75% of the volunteers in Flanders are over 40 years old. The research centre published a report giving tips to associations for the efficient deployment of their older members. The problems involved with an ageing population have the potential to thus be turned into new opportunities.

The *Steunpunt Ondernemerschap, Ondernemingen en Innovatie* (Entrepreneurship, Enterprises and Innovation) supported the government in the development of measures in the field of innovation and entrepreneurship and in the evaluation of these measures.

> Economic growth was brought about by a very small group of extreme growers, with only 1% of Flemish businesses accounting for 50% of new jobs. This growth may be ascribed to two kinds of innovation: a strong technology push, or the development of a completely new concept.
> Although there are more start-ups than last year, Flemings and Belgians - compared with the rest of Europe and the world - show less inclination to set up a business of their own. However, this statement needs some qualification. In countries with a strong enterprise mentality, people often set up a business out of necessity, because no other work is to be had. Companies in highly developed economies are usually started up on the basis of a (market) opportunity.

The *Steunpunt Loopbanen van Onderwijs naar Arbeidsmarkt* (Paths from Education to the Labour Market) explores what paths young people follow from the start of basic education through to arrival on the labour market. The policy research centre also examines the respects in which these paths differ and what the possible causes and consequences may be.

> Young children from 'method schools' gain as much from learning as young children in other schools. Although children in 'method schools' work less on preparatory reading, writing and arithmetical skills, their reading, writing and arithmetical skills improve to a similar degree to children in other schools. Language skills improve less rapidly, but young children arriving at these schools have a higher level anyway.
> 18.1% of the pupils leaving secondary education in Flanders in 2001 did not manage to obtain a diploma or certificate. The percentage for boys was slightly higher than that for girls. The number of pupils leaving secondary education without a diploma has remained constant over the past decade. The slight upward trend in the latter half of the 1990s has not been followed through.
> The secondary education performances of children of immigrant families and those of native Belgian children with similar backgrounds are similar. Secondary schools even manage to eliminate the effect of ethnicity. Native students do however sometimes reach a higher final level. The socio-economic background generally acts as a disadvantage to the child from the immigrant family.

The EWI Department is the key player in the Policy Research Centre Programme. The department provides the basic resources for the first and second generations of policy research centres and does the groundwork for evaluation and ensuring the maintenance of the programme. For the second generation of research centres the department will act as a secretary for the steering committees and as a front-line desk for questions concerning the general operation of policy research centres. The department is of course also very closely involved in the research in its 'own' research centres, 'Entrepreneurship and international entrepreneurship' and 'R&D Indicators'.

Wim Winderickx,
Office for Policy Research and Prospective Studies

The VLAO decree was passed on 7 May 2004. This decree was the basis for the creation of the Flemish enterprise agency Flanders Enterprise (VLAO) in July last year. The aim is to be the Flemish government's single point of contact for all companies located in Flanders. Besides the central umbrella in Brussels, there is a VLAO branch in each province. The entrepreneur can visit these offices with all sorts of questions about exports and investments, support in subsidy policy, information about design, the environment, energy and town and country planning. The central idea of these 'counters' is the principle *single access, multiple back office*. In the provincial branches the account managers see to comprehensive independent tracking and guidance of enterprises. The account manager may enlist the aid of - and put business persons in touch with - experts in other agencies and departments of the Flemish government.

VLAO goes local

Enterprises, especially start-ups and small enterprises, also often seek advice and support in their direct surroundings. With a view to a further lowering of the threshold and the creation of a close-knit network of VLAO contact points in the Flemish Region and in each province, local VLAO contact points will be developed together with the private sector. These contact points will offer front-line advice and pass on any questions that require further attention to the provincial branches. The entrepreneur can take all his or her questions to the local contact point. The contact points do not have the function of an administrative 'counter', so they cannot perform the formalities required by the authorities. The advisory service of the local VLAO contact point is, however, free of charge for the inquirer.

Cooperation between VLAO and a private partner, with local contact points, means a win-win situation for all concerned. For companies the entrance threshold is lower. The government is thus able to reach more companies. In the end the local contact points can offer their target group extra access and better service in terms of information and advice about areas of enterprise in which the government is involved. The very good cooperation between VLAO and the private partners concerned is also to be seen in combined proactive initiatives or other actions involving the dissemination of information. Cooperation will be formalised in an agreement with VLAO.

The call for recognition and subsidies as an organiser of VLAO contact points and as a VLAO contact point issued by the EWI Department ran from 26 February 2007 to 23 April 2007. A contact point cannot be accredited unless its organiser is accredited. Once accredited, the contact point receives an operating subsidy of up to €30,000 for the following year. Each year the EWI Department publishes in the Belgian Official Gazette a list of the names of the accredited organisers and their contact points. The list will be published towards the end of June.

Liselotte De Vos
Awareness Raising and Society Team

ARKimedes: a lever for the funding of SMEs

One of the biggest obstacles to starting up a business and its growth is access to capital. Depending on the phase in which the business finds itself at any given point in time and the kind of activity that it pursues, the business will need different forms of funding. Practice shows us that private capital providers have a certain neophobia when it comes to funding projects, seeing these new project as too risky. That is why Participation Company Flanders (PMV), driven by the Flemish government and with the blessing of the European Union, offers a comprehensive range of instruments for the funding of commercial activities. PMV, by order of the Flemish government, thus plays a facilitating role in bridging the funding gap for small and medium-sized enterprises.

One of the funding products offered to enterprises by PMV is **ARKimedes**. ARK stands for 'Activering van RisicoKapitaal' (activation of risk or venture capital). The investment resources of ARKimedes have been collected from the public since late 2005. As of 15 September 2005, private individuals could sign up for shares or bonds in the *ARKimedes-Fonds*. 90% of the nominal value of the shares, and 100% of the nominal value of the bonds, is guaranteed by the Flemish Region. Shareholders also benefit from a tax advantage of 35% of the issue price. The investing public reacted with such enthusiasm that the IPO had to close early, with the maximum amount of €110 million being reached on 20 September 2005.

The *ARKimedes-Fonds* has thus far invested in eleven private risk capital funds, the 'ARKIVs' (*ARK Investerings Vennootschap*). These ARKIVs have amassed at least 50% of their capital from private investors, with the rest coming from the *ARKimedes-Fonds*. To date, the *ARKimedes-Fonds* has spent €98,504,000 of its resources on ARKIVs. Table 4 shows the investment amounts (in euros) of the *ARKimedes-Fonds* (ARK-F) in the different ARKIVs and the focus of the different ARKIVs for each sector.

Start-ups and SMEs looking for venture capital can submit their business plan to an ARKIV. They must, however, meet a number of conditions. The investment must therefore involve a new contribution of money to the enterprise. The enterprise must also conform to the European definition of an SME and have their headquarters in the Flemish Region; the amount invested must also be less than €1 million; and there are also other criteria. ARKIV uses its internal methods to evaluate the incoming file and takes a decision for itself whether or not to invest in this or that Flemish SME. The *ARKimedes-Fonds* does not get involved in ARKIVs' investment decisions.

The government instrument appears to be working well, but some comments about ARKimedes were made in the 2006 yearbook *Durven groeien in Vlaanderen*:

Table 4: overview of investments by the ARKimedes Fund in ARKIVs

Name of ARKIV	Fund amount	Amount assigned by ARK-F	Sectoral focus
ARKAFUND NV (Dexia/Sydes)	19,999,000	9,999,000	Services sector with a particular focus on media, information, telecom and communications
BAEKELAND II NV (Ghent University Association)	11,100,000	4,000,000	Spin-offs from Ghent University, Arteveldehogeschool, Hogeschool W-VL and Hogeschool Gent
BIG BANG VENTURES ARKIV Comm. VA	20,000,000	9,930,000	ICT
CAPITAL-E ARKIV NV (IMEC)	30,100,000	15,000,000	Micro-electronics
FORTIS PE ARKIMEDES NV	10,000,000	4,990,000	All sectors
FUNDUS II NV	5,010,000	2,500,000	All sectors falling within the competences of the shareholders
GIMV ARKIV ICT FUND NV	30,100,000	15,000,000	ICT
ING ACTIVATOR FUND NV	9,999,000	4,995,000	All sectors
KBC ARKIV NV	25,000,000	12,000,000	All sectors
KMOFIN NV (Limburg Investment Company)	25,000,000	12,250,000	Any sector contributing to the economy of the Province of Limburg
QAT ARKIV NV	16,000,000	7,840,000	Environment, renewable energy technology, healthcare and ageing, ICT
TOTAAL	**202,308,000**	**98,504,000**	

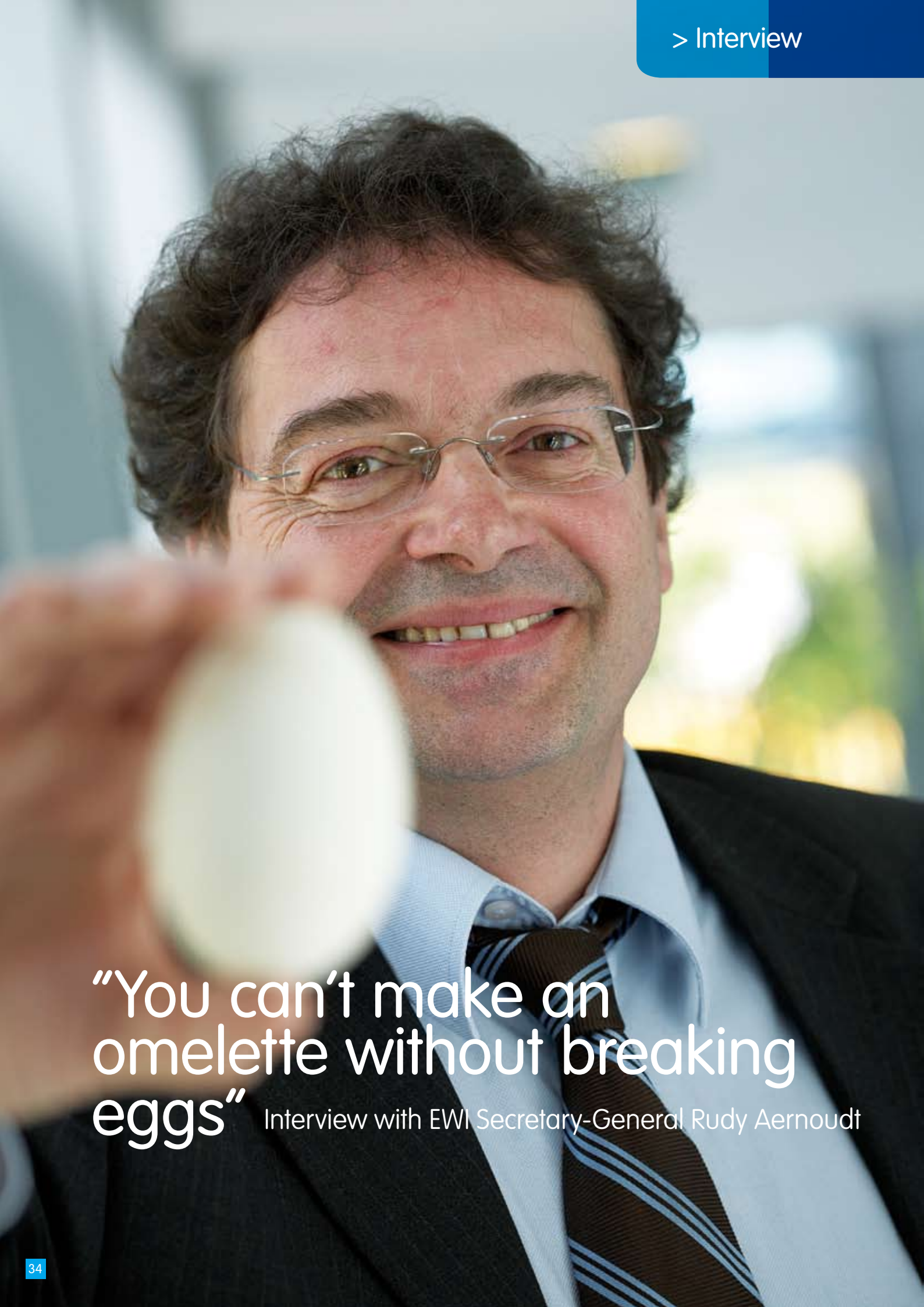
een boek voor gevorderden[15] (roughly translated "Daring to grow in Flanders: a book for experts"). Although the initiative put a new flow of capital at the disposal of SMEs and raised general public awareness of entrepreneurship and venture financing, the maximum investment amount of an ARK investment (€1 million) was still a restriction. Studies show that this amount is too small for many businesses. If they need large amounts for funding growth, they will have to look around for new funding. The researchers also fear that ARKIV-funded businesses will find it difficult to obtain second-round funding, except under very unfavourable conditions. PMV puts the situation into perspective. Follow-through investments are indeed possible via the ARKIVs, because the maximum investment amount of €1 million applies per investment round (a period of 12 months). After that period an ARKIV can therefore invest up to a further €1 million. Other funds may also co-invest with an ARKIV, making the total amount per round appreciably higher.
But still the researchers advocate increasing the maximum investment amount. In this respect PMV has already decided to apply to the European Commission to raise the investment amount to €1.5 million per round.

The smaller funds are also a problem for researchers. The biggest fund (GIMV ARKIV ICT FUND NV) can call on €30 million while the smallest fund (FUNDUS II NV) is good for some €5 million. The question arises as to whether the small fund is up to the task of supporting the expansion phase of enterprises. And are these funds not economically vulnerable because of their limited size? According to PMV, the smaller funds will, by definition, gravitate towards the less cost-intensive projects, precisely in order to be able to make follow-through investments. Otherwise they might not find any funding. As such smaller funds thus have a clear *hands-on approach*, they can also ensure that these companies are ushered to the next stage, in which there is more interest among other ARKIVs or investment funds.

A full year after the start of the new funding instrument we can conclude that ARKimedes, after an uncertain start, is now getting into its stride. Out of the €110 million that ARKimedes collected from the public in 2005, more than €18 million found its way into businesses. As many as 31 businesses were financed with ARKimedes money. In addition, letters of intent are ready for a subsequent round of 10 new ARK investments in businesses, amounting to €8,600,000 for which actual investments are now in the offing.

Sophie Callewaert
Research Valorisation and Industrial Policy Team

15 Publication by the Steunpunt Ondernemerschap, Ondernemingen en Innovatie.



"You can't make an omelette without breaking eggs"

Interview with EWI Secretary-General Rudy Aernoudt

In the brand-new Ellips Building, a stone's throw from Brussels North Station, the fifteenth floor is home to an equally young government department: the Department of Economy, Science and Innovation. In a soberly furnished corner office with double-glazed soundproof walls we talk to new Secretary-General (SG) Rudy Aernoudt. Since his arrival, the department and Rudy himself have frequently figured in Belgium's Dutch and French-speaking media.

Interaction between Economy, Science and Innovation

The EWI Department came into being in the context of the Flemish government's Beter Bestuurlijk Beleid (Better Administrative Policy), put together from elements of other departments. What, in your opinion, are the links between science, economy and innovation?

Rudy Aernoudt: "If we consider Economy, Science and Innovation separately, that would lead to what the Dutch call 'verkokering', or segregation. Here in Flanders we are working towards a competitive society with room for the low-skilled and highly qualified, where they can feel really at home. Science is the basis for innovation, but fundamental research in itself also contributes to competitiveness. And if we are talking about science and innovation, we are also talking about research marketing and the economy. In order to be able to remain economically competitive, we use the instrument 'productivity'. But it is actually more a matter of innovation, in terms of the process and the product. To be competitive you have to bring things together, not set them apart."

Has that gone far enough yet? The federal level holds a number of competences for science, and different funding mechanisms are managed by the Education Department. So there is still considerable fragmentation, even after the recent administrative reform. How firm is the political will to arrive at central policy control?

Aernoudt: "I find the administrative reform in itself a good idea. But we have not managed to create a one-to-one relation between ministers and policy areas. There are still many areas for which two ministers are competent and many ministers who have various areas of activity. Therefore one possibility would be to set up a scientific council chaired by the Prime Minister in which all the relevant ministers could take part. But then you must, of course, have the political will to work together and to avoid people trying to score 'on their home turf'. Otherwise you are constantly faced with the problem of the splintering of the political parties. And that will have repercussions in the government departments."

Entrepreneurship at a low ebb because of a culture of ministerial offices

Is that where your famous pronouncement that the ministerial offices should be abolished comes from?

Aernoudt: "It sounds odd when someone who has spent seven years as a head of office in various administrations argues in favour of scrapping the ministerial offices. (smiles) I made the choice of leading a department because the department is the beating heart of the policy area. It is where policy is prepared and evaluated. If I compare my job description as Secretary-General with what I did as a head of office, it is clear that they overlap completely. The only difference is that I now have the administration as well. If you put the people aside for a moment, you have to be consistent: either you do away with the department, or the ministerial office. If you want two people to work efficiently, you must not give them the same job to do.

"As a civil servant I am, in fact, paid to implement decisions. The administrative reform started in 2001. The opening sentence of the reform text reads "in order to reduce the ministerial offices to political units". Either you apply the new rules and laws, or you give a new version, but you must have the courage to do so.
I also believe in the possibility of a structure like in the Netherlands, where the minister has one chauffeur and one political adviser and leaves the rest to the administration. You do not have that here, and the result is a frustrated civil service. France and Belgium are the only two countries in Europe that still have a ministerial office culture. They are also the very two countries where entrepreneurship is at a very low ebb. I suspect a causal relation."

Do not think in terms of structures, but in terms of results

A new Secretary-General, or SG, will also want to make his mark. Have you come here with a master plan in the back of your mind? Where are we heading and what are we likely to experience?

Aernoudt: "What lies ahead of you must be a surprise, otherwise it will not be interesting any more. (laughs) I am the new kid on the block: among the thirteen SGs there is only one novice - all the rest have already served in the administrative departments. The advantage is that you can see things in an independent way. That does not mean a lack of knowledge - it just entails a new way of seeing things. You will therefore find it easier to break the force of habit. If a number of changes

have been made in a department, it is not because I want to make my mark or want to be remembered. It is more because I think that we should think in terms of results, not in terms of structures.
We must work together for a competitive Flanders, we must make people think of entrepreneurship, and think of technology, of the future of Flanders. For that you have to adjust the structures.
One of the big adjustments is that we will now have to think in terms of delivery, that is, more in terms of output. For that you must gauge performance and efficiency, and you do not do that with a chronometer, but with results, with your impact."

If you don't like your boss, take the initiative and move

Reform always provokes resistance. How do you keep your people motivated?
Aernoudt: "There are two laws working against us: the law of inertia and the law of restraining progress. Statistics show that we are better than other regions, such as the south of Belgium. What should we do then? (leans backwards). Rest on our laurels?
Resistance is natural, especially because people cling to what they know, and the symbolic. I am utterly convinced that people would be much happier if they set off in a new direction. I also get the impression that about 80% of people would react with "OK, we'll accept that and get on with it". Another 15% will first wait and see which way the wind blows but eventually take the right course. Then you are left with the intransigent, but you will always come across them, wherever you go.
Mobility is therefore important. Employees must be able to change location - and that includes their function or role too. If you are somewhere where you do not feel happy for whatever reason - say, because you do not like sitting by the window or you do not like your boss - you have to take the initiative and move - either you move within the department or you go elsewhere. If you do not have the courage to do that, there is no hope left in the world!"

Pumping billions into science policy will not make it any more efficient

You are an economist and a philosopher, what do you make of the saying "money is the root of all evil"?
Aernoudt: "Money once used to be a means to an end, but in today's society money has become an end in itself - an essential part of people's lives. Goods have evolved into a means to that end. What I find regrettable, as a philosopher, is the importance that some people attach to money. There are some people just one or two years away from their pension who decide: "I'll keep on working for a while, otherwise it's going to cost me so many euros a month". I am not saying that they should just take their pensions and go, but I do find their motivation for continuing to work flawed.
Another example is science policy. If you launch a new funding programme, the universities do not look first at its intrinsic value. Instead, they immediately begin to fight over what part of the plunder they want! We can pump all the billions we want into science policy, but that will not make it any more efficient!"

Basic research leads nowhere, but those working in it are happy

What is your position on the relationship between applied and basic research? Does there need to be a balance between the funding of the two?
Aernoudt: "My view is influenced by my philosophical background. We are all victims of the platonic manner of thinking in terms of dualities: good-bad, man-woman. I find that a wrongheaded way of looking at things. I am also no advocate of directed basic research. You cannot say that applied research leads to new products and basic research does not. So the concept of balance is incorrect, if for no other reason than that.
It is all about finding simple solutions for complex problems – think of Columbus and the egg. In basic research you often come across something completely different than what you were looking for. Just take an example how the popular mobile-phone text message (SMS) came about: researchers had no reception and wanted to communicate with each other. They were not thinking of the application of text messages at the time. If basic research is to have any importance for the economy, it must not apply to just product a or b. Otherwise it is no longer basic research. If we put all our eggs into the applied research basket, we would only achieve short-term results."
"You need to look not at the instruments but at the objectives. What do we want? Do we want the current 7% share of company turnover in new products to hit 20% within one year? Then you can determine the basis on which you are going to have to invest.
The closer you are to the market, the easier it is to obtain private funding. If you are involved in basic research, it may perhaps be very difficult to attract enterprises. I always think of Spinoza. He said: "What is basic research? It doesn't lead anywhere, but a researcher involved in it is a happy person". But I would not relegate basic research to a mere hobby!"

The European Commission does not come to us

The European Union has considerable influence in the area of economy, science and innovation. How do you see the role of Flanders?
Aernoudt: "First of all we have to be realistic: we are just one of 300 regions. Second, it is not because we are based in Brussels that the European Commission comes to us. Third, if we want to have any influence on what goes on in Europe, we cannot just stand idly by until the official position is announced. When the Flemish position goes to Europe through the official channels, it is much too late actually and all you can then do is make a sleight of hand in the margins. It would be much better to pass a number of things on to Europe. Let's send some good politicians there and get a powerful European Commission!"

You end up with chaos

The European 3% GDP norm for research is far too little for us to talk about a knowledge economy?
Aernoudt: "The 3% objective is a good stepping stone, but setting aside 3% of GDP for research is too little for us to talk about a knowledge economy. It makes a contribution, but we should not be thinking solely in terms of amounts, but rather in terms of how the money will be spent. I find it more important to increase the efficiency of innovation expenditure. We have to ask ourselves one thing: where is government involvement heading? For example, where does our region need to specialise? Of course we have nanotechnology with IMEC, biotechnology with VIB, and logistics. But if you go to Wallonia and ask "what are you doing?", exactly the same issues are highlighted."

Everyone is doing the same thing, but surely the essence of innovation is in creating a difference?

Aernoudt: "We all began with the same given and, at the end of the day, it all comes down to much the same thing. I think that innovation is overly associated with the mentality of the Flemish entrepreneur. You have a small business, then you build it up a bit, then create one a bit smaller. You end up with chaos. That is how we expand in Flanders. Innovation, in my opinion, is not at home in IMEC, nor even in VIB, but on the common ground between the two. Innovation is in fact bringing things together - innovation is not the bottom of the barrel, it is the *interface* between things that exist."

What we need is a sense of urgency

Shouldn't we then follow the example of the Scandinavian countries with their good innovation profile and strong brands?

Aernoudt: "You have to bear in mind the specific context. Why are Nokia, originally a paper factory and then a rubber factory, and Ericsson numbers 1 and 2 in telecommunications? Because of the distances in their country. Go try and lay cables there the way we do. Then there was a *sense of urgency*, the realisation that something had to change. That is something we do not have here. Take Finland. If your big neighbour to whom half your own GDP and exports are directed implodes, you have no choice but to make changes in your industry. That was not lost on the Finns either.

In Belgium we have a big debt and a steadily ageing population. The basis of our society - people in active employment - is becoming too small - just look for example at the pensions system. The working population must create more added value - you do not have to be an economist to understand that. So you need innovation, and you make progress.

One of the fathers of innovation, Schumpeter, spoke about creative destruction. This is connected with economic turbulence and reform of the fabric of the economy: something new leads to tearing down of something old. One of the big problems in Belgium is that there is not enough tearing down, because too much is kept standing through subsidies and regulations. The Scandinavian population does a better job of it and does this in tandem with a social welfare state. I am

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certainly not arguing for dismantling the social welfare state, but I am a strong supporter of greater mobility between the private, public and non-profit sectors. And this is most of all a question of mentality. We just have to realise that we have to get our hands dirty to achieve what you want!"

Herd animals and sticking your head above the parapet

Aernoudt: "The problem in Flanders is the herd mentality. (*warming to the theme*) Imitation does not lead to innovation. We must do more to kindle individual creativity, by cultivating a success culture as well as tolerating a failure culture. Only then will we have made some progress! A tide from an opposing direction throws up new ideas. The way things are, anyone who sticks his or her head above the parapet is cut down. A graduate can easily find a risk-free job with a good salary. Many will therefore join the system and imitate. (*leaning forwards*) We must not forget that it is not equality, but rather inequality that is the basis for progress. On the basis of progress you can develop social security for those who cannot fend for themselves, for those who need it. Justice does not mean that everyone is equal, just that everyone gets the same chances. We are too preoccupied with petty corporatist rules from the days of the guilds and the like. Let's get back to the individual, not in the sense of individualism, but in the sense of individual creativity! Let the individual make his or her own decisions! Innovation springs from creativity. But to take creative action you have to create room for manoeuvre!"

Why do we work?

That does not come naturally to everyone. Some people feel 'safe' in the herd.
Aernoudt: "I once wrote a book on the philosophical value of work. Why do we work? Marx got it wrong when he linked work alienation to the modernisation of industry. In today's knowledge economy you have to be able to take a new direction to find out where you feel best. Everyone has to strive for job satisfaction, otherwise you have no self-respect. A safe job should never be a determining factor. You do not have to take unnecessary risks and end up in the poorhouse, but you may perhaps earn less for a while after changing jobs."

But surely that is an individual choice in which different factors must be weighed up according to your personal situation?
Aernoudt: "People are naturally lazy or not given to creativity, but the social security system hampers mobility. People who have worked in the private sector and then go and teach lose their seniority. Civil servants who become self-employed lose part of their pension rights. The system needs to be made more flexible! You should be able to take your acquired rights with you, without their being tied to an employer or one status or another. Far be it for me to criticise an employee whose ambition is to receive a gold watch after 35 years of faithful service to one and the same employer. After all, you cannot make a silk purse out of a sow's ear. What I am saying, though, is that we should be flexible, and we should not be punished if we stick our heads above the parapet."

Policy has always fascinated me, certainly as far as innovation is concerned

A certain young economist once wrote a dissertation with the title "Determinants of innovation and implications for policy". What do you think when you look back on your early work, now that this student of yesteryear is now himself a determinant of policy?
Aernoudt: "In those days I followed the industrial and international economy and wrote my thesis on industrial economy. It was the period of the *Third Industrial Revolution in Flanders*. I found it important to research the innovation task of government and how the relationship between public and private can have an impact on innovation. Policy has always fascinated me, certainly as far as innovation is concerned. In fact, that has been the leitmotiv of my career. My dissertation back then was perhaps prophetic, but I would say I was determined rather than a determinant!" (*leans back smiling*)

Public opinion must know that the civil service has a mind of its own

A Secretary-General circulating press releases to stand out in the media - it must be a first. Why do that?
Aernoudt: "Politicians go to the media and the scapegoat is always the bureaucracy: "The civil servant is a slacker, the civil servant is not efficient", and so on and so forth. I feel that it is important that public opinion knows that the civil service has a mind of its own. Therefore it is also important that the civil service should communicate, and that the Secretary-General is not yet another faceless official who only ever appears in the news if something goes badly wrong."

Peter Bakema (Policy Support and Academic Policy Team) and Peter Spyns (Office for Policy Research and Prospective Studies), ably assisted by Els Jacobs (Communications Team) and Annie Matthijs (Office for Policy Research and Prospective Studies)

Clocking-in machine as a catalyst for ideas

Then we come on to clocking in. Isn't the vision rather skewed here? The media feast on stuff like this, and then you complain about the clichés about civil servants.

Aernoudt: "The clocking-in machine is a symbol, which means we make far too much of it. But that is precisely because it is a catalyst for ideas - an example of 'input-to-output' thinking. The clocking on machine - the chronometer in the film Modern Times with Charlie Chaplin - is the symbol of this par excellence.
If the Press latches on to this, it sparks off a debate and provokes a conservative, defensive reflex from the trade unions. That is not all that healthy. Still, I find it all well and good that they do react. I am a great admirer of a heroic battle. After all, if we all thought in the same way, there would be no thinking any more!"

We rounded off our talk on that philosophical note - just in time to clock out and catch the train home.

6 socio-economic challenges for Flanders[16]

True to the motto 'meten is weten' - to measure is to know - the Sociaal-Economische Raad Vlaanderen (SERV[17]) published its two-yearly report concerning socio-economic development in our part of the country. On Friday 9 February 2007 the *Sociaal-Economisch Rapport Vlaanderen 2007* - all 850 or so pages of it - was presented in the Flemish Parliament. This third SERV report consists of two parts. The first compares Flanders with various leading countries and regions, while the second part analyses six themes. In this contribution we briefly present both parts and reflect on how the Flemish authorities meet the challenge facing them at this level of operations.

Flanders: a second-rank player with a low degree of employment

Flanders was compared with nine countries and seven regions that belong to the absolute socio-economic elite. All in all, Flanders occupies a mid-table position as regards welfare. If we then consider the elements of gross domestic product (GDP) per capita, the only field where Flanders performs at all well is work productivity[18]. A minus point is that Flanders scores highest in its labour unit cost[19]. And the score has more weight than our position as regards work productivity. As for the other elements of GDP per capita, Flanders cuts a moderately good figure. We have a low score for employment[20] in general, and for older employees in particular. Compared with the other countries and the regions we also have in relative terms a smaller potential working population.

In relation to these other countries, Flanders performs quite well as regards unemployment. Even for unemployment among the young and the elderly we can hold our own with the top group of the countries with which the region was compared. Long-term unemployment is more prevalent here in Flanders than in the other countries and regions. The unemployment trap[21] in jobs with low wages is in any case greatest here.

Turning to training, the conclusion is double-sided. On the one hand Flanders performs conspicuously well in education. Then again, it occupies only a mid-table position as regards the participation of the professionally active population in skills development and vocational training.

Two different conclusions can also be drawn for entrepreneurship. The high investment ratio[22] and the good score for the number of entrepreneurs in the working population are squarely opposed to the low business dynamism, high company taxation and stricter regulation for enterprise. It also takes a relatively long time and costs too much to set up a business in Flanders.

When it comes to innovation, Flanders - patents apart – is one of the three best-performing regions in every case. Flanders performs rather less well for the government budget for R&D (research and development).

Nowhere is the export ratio[23] for goods higher than in Belgium and in Flanders, while the export ratio for commercial services figures amont the leading countries and regions. Less positive is the fact that the share of high-technology products in the total export volume is the lowest share in relative terms.

Flanders appears to perform tolerably well in terms of social matters, both for the general development indicators and the most specific sub-indicators (income level and distribution, minimum wage, healthy living, healthcare development, and so on). Turning to mental health, however, the picture is rather less of a cause for jubilation. Nowhere else in the world, except in Japan, are there more suicides than in Belgium. Flanders does not come out much better.

Six themes for closer inspection

Give business people room for manoeuvre

A certain number of new areas of activity with a suitable infrastructure are necessary if the economy of a region is to operate at top gear. The three administrative levels (local authority, province and region) thus have to further implement the *Ruimtelijk Structuurplan Vlaanderen* (Spatial Structure Plan for Flanders). At present, some 40% of the Flemish and provincial plan objective - 2,952 ha out of 7,671 ha - is as good as achieved. What went on locally is anyone's guess. To bring this into sharper focus, we need an accurate measuring and monitoring system with a built-in signal function. We will also have to see to the *IJzeren Voorraad*, a stock of lots ready for building on that can absorb demand for the next 3 to 5 years. The stock can only be maintained if a supply of lots that have been earmarked but not yet fitted out is also available for the next three years. Over and above the laying out of new business parks, the renovation and refurbishment of existing properties will also be instrumental in a quality-minded town and country planning economic policy. More pre-emptive policy initiatives must be undertaken to prevent the ageing and dereliction of commercial and industrial properties.

Who pays for water purification in Flanders?

To implement the EU Water Framework Directive (*Kaderrichtlijn Water*), the European countries must pass on reasonable costs to the consumers by 2010. Flanders currently charges the total costs for the production and distribution of drinking water. The costs for waste water, sewage and effluent collection and purification are for the most part still defrayed by the Flemish Region. A reasoned policy vision for passing on these costs is still conspicuous by its absence.

Get young people working

The analysis of youth unemployment would appear to show that the passage from education to the labour market is unusually difficult for specific groups. The Flemish government's *Action Plan on Youth Unemployment* is designed to tackle unemployment among low-skilled young people in 13 municipalities, towns and cities. Special attention must also be paid to the rather difficult integration process for young people from immigrant families. The degree of gainful employment of these young persons is, incidentally, rather lower than that for their Belgian-born peers.

Belgium and globalisation

Globalisation is the buzzword for recent economic growth. In essence it boils down to an increase in production processes organised on a global scale. Advanced globalisation leads not only to increasing trade flows, but also to a greater international division of labour. Production processes (from raw material or ingredient to finished product) no longer operate at regional or national level but world-wide. Despite the benefits expected world-wide, globalisation will be less positive for some countries and industries in the short and medium term.

In Flanders, and in Belgium for that matter, and throughout Western Europe if we think about it, there are also indications of de-industrialisation. Industrial employment is shifting from Western Europe (mainly) to the new economic production bases in Eastern Europe and in the Far East. As the bulk of international trade is all about industrial products, these international economic trends are of great importance for the future of Belgium and Flanders.

Belgium's position in the changed international order regarding division of labour does not look better in any shape or form in the period following the year 2000. After 2000, the growth of international trade found little if any expression in domestic job creation. In the decades before 2000, the position was improving, up to a point where employment was generated by the interaction of the Flemish and Belgian economies with those of other countries.

Flanders and logistics: a lasting marriage?

Its central location is one of the main reasons why Flanders is one of the most attractive regions in Europe for anyone with half a mind to set up businesses in logistics and distribution activities. Flanders is right in the middle of what we like to call the *blue banana*: a fertile crescent-shaped area from which most European consumers can be supplied at relatively low transport costs and with realistic turnarounds.
This is not the only advantage that Flanders holds: we should not forget the presence of a well-developed transport infrastructure. If we compare the situation with other European countries, Belgium, and more particularly Flanders, is a European front-runner as regards density of infrastructure. With approximately 127 km of railway line per 100 km2, Flanders can boast the densest railway network anywhere in Europe and, just behind the Netherlands, the second densest motorway and inland waterways network.

We are nevertheless confronted with a number of not inconsiderable challenges for the sustainability of Flanders as a logistics region. Freight transport (by road) is lagging behind. Flanders is having to contend more and more with problems of mobility and accessibility. The competitive advantage offered by infrastructure is thus becoming smaller by the minute. Keen anticipation of new logistical trends and concepts is crucial if we are to safeguard and further develop the Flemish Region's position.

Does Flanders ensure good regulation?

In early 2006, researchers calculated that a reduction in administrative charges in Belgium of 25% - as part of better regulation - would bring about an upswing in the GDP of some 1.4%. Legislation policy and legislation quality are closely linked to the competitiveness and economic performance of a country. The same applies to the quality of the institutions, and of the government bodies in particular: this is essential for the economic performance of a country. And, most of all, the credibility of the government would appear to be of some importance. Analysis would seem to suggest that Flanders falls short in precisely this area, with a lack of predictability, transparency and participation and responsibility being taken in the hammering out of regulation. International bodies thus take the view that, in Flanders, 'better governance' and 'better regulation' must become part of socio-economic policy.

Having taken on board the *Sociaal-Economisch Rapport 2007*, SERV has formulated twelve priority policy recommendations which fall within the scope of three primary objectives.

More - and better trained - employees

To protect itself against the shifting socio-demographic contours, Flanders must get *more and better trained employees* into work. SERV has three policy actions up its sleeve:

- Flanders must continue to try to reduce the numbers of school-leavers without diplomas. More attention must also be paid to skills development among job-seekers and among persons already in employment.
- The elimination of the unemployment trap, encouragement of diversity and improved guidance for employees on the labour market (with special attention being paid to low-skilled young people, the over-50s, immigrants and people with a work disability) should increase the degree of employment.
- The optimum use of Flemish wage cost subsidies could create additional employment in the private sector.

Entrepreneurship and innovation as an engine for welfare

If Flanders wants to remain a leading region and also guarantee its welfare in the future, it must evolve into an *enterprising and innovative society*. SERV would like to advance five policy initiatives in this respect.

- Flanders needs to grow into an attractive investment region.
- There is a need for a modernised, efficient preventive industrial policy.
- Sustainable entrepreneurship must be stimulated.
- The Flemish government must attend to the fiscal pact with the local authorities that has been agreed.
- The existing knowledge potential must be marketed more and better.

A livable environment
The final important primary objective is that the Flemish authorities must guarantee a *livable Flanders*. The Flemish authorities must work towards greater energy efficiency. They must also achieve better results in mobility policy. The supply of assistance and care must be accessible and affordable to everyone. Finally, preventing and curing poverty is also a priority.

How will the Flemish authorities face these challenges?
Many measures have already been taken to make Flanders an attractive investment region. We limit ourselves here to the challenges in the field of entrepreneurship. The Flemish authorities try in general to create a facilitating environment for entrepreneurship via the raising of awareness (for example the *'You are Flanders' Future'* campaign), through incentives addressing various problems, and through simplifying access to capital. We also mention here some more specific initiatives.

Flanders Enterprise (VLAO[24]) is a unique point of contact for all entrepreneurs - both face-to-face and via computer. VLAO wants all entrepreneurs to be able to come with their questions to a single contact point and, in its turn, it will accommodate the entrepreneurs in an efficient, business-friendly manner and/or direct them to the appropriate channels within the Flemish government.

'Bridge projects' (*brugprojecten*) forge the link between education and enterprise. The Flemish government supports these cooperation agreements between education and industry and commerce which stimulate young people to become entrepreneurs. The focus lies on the raising of awareness and stimulating an entrepreneurial attitude. In a drive to anchor entrepreneurship more firmly in the education system, the Action Plan *Enterprising Education* was put together in cooperation with the Minister for Education. An enterprise class week will be organised every year as part of this initiative.

Coaching and networking are also important in putting entrepreneurship on a more professional footing. The 'mentorship projects' are designed to cater to this need.

To facilitate *access to funding*, the Flemish government provides various subsidies (Budget for Economic Advice (BEA)[25], growth premium, ecology premium, and so on) and funding instruments (win-win loan, ARKimedes[26] , the NRC fund[27], the Flanders International Fund, guarantee arrangement).

The SERV report presents some important challenges. The Flemish government is aware of their importance and seriousness. The Economy, Enterprise, Science, Innovation and Foreign Trade Policy Letter 2007 addresses the challenges in economy, science and innovation.

Sophie Callewaert,
Research Valorisation and Industrial Policy Team

16 This text is a summary of the symposium Sociaal-Economisch Rapport Vlaanderen 2007 held on 9 February 2007.
17 SERV is the discussion and consultation body of the Flemish social partners.
18 Work productivity: Gross Domestic Product (GDP) divided by total employment.
19 Labour unit cost: wages divided by number of workers.
20 Degree of employment: the percentage of people gainfully employed within the section of the population that is of working age (15-64 years).
21 The unemployment trap is a phenomenon whereby some persons do not find it economically worthwhile to seek a way out of unemployment because of the social security benefits situation and taxation situation.
22 Investment ratio: the proportion of gross investments by the private sector in fixed assets (i.e. without depreciations) in the GDP.
23 Export ratio: exports in relation to the GDP.
24 See also the VLAO contribution in this EWI Review (p. 31).
25 Budget for Economic Advice
26 See also the contribution on the ARKImedes fund in this EWI Review (p. 32).
27 Non-Recurring Costs.

Utopia

The thirst for knowledge of a genuine researcher is insatiable. Once he or she knows something, the researcher carries on searching in the hope of finding out more. The many discoveries and explanations are a drop in the ocean when compared with the many more that are still unknown. This is because everything that we know is provisional and amenable to improvement. The true researcher then also asks whether what he or she knows is correct and how he or she might determine this.

The pursuit of truth is like looking for water in the desert - even if many oases turn out to be mirages, there is nowhere where water tastes as good. Even an ideal science policy with unlimited resources would never quench researchers' thirst for knowledge. Give a researcher a blank cheque and he is happy only for a short while. And perhaps such a utopia is not even in the interests of the researchers. After all, where would it all end?

The end would be missing, no matter how much we discover and learn along the way. The sheer span of knowledge in many areas of science already defies a panoramic view, even among specialists - an effect that is only accelerating with the exponential increase in knowledge. Researchers are coming to know more and more about less and less. Increased specialisation means fewer and fewer specialists with the same 'ultra-specialisation'. Some researchers make their discoveries in the first place for themselves. In extreme cases 'ultra-specialisation' leads to a lack of knowlege and isolation.

This leads to dilettantism, mediocracy and complacency. Perhaps competition for the scarce resources is the best guarantee of scientific quality, in the same way as the market principle is the only guarantee that, there is quality on offer besides all the junk. All we have to do then is to agree what we understand by 'scientific quality'. It goes without saying that each researcher has his or her own interpretation of the term. Is it a case of which a researcher has published the most or who is the most quoted? Or is it a question of who has conducted considerable promotional research, or someone who has attracted a lot of research contracts? Or is it everything taken together? But in what proportions?

Besides the needs of the researcher, we must also take account of the needs of society. We do not have everything to hand for research, and that limits the possibilities for researchers. The European countries have arranged to set aside 3% of their GNP (gross national product) for research and development in 2010: the *Lisbon objective*[28]. However, there is hardly a single European country that is keeping to that objective. Roughly speaking, 2% must come from industry and commerce and 1% from government: far too little for us to talk about a knowledge-based economy.

We must consider not only the scale of the resources, but also how we intend to allocate them. Enterprises are oriented towards applied and not towards basic research. The efforts of enterprise are furthermore very much directed towards specific sciences, namely those that are likely to yield profit. That is logical enough because without the prospect of profit an enterprise would not engage in research. In Flanders this means sectors such as biotechnology, pharmacy, information and communication technology (ICT) and chemistry, often concentrated in a few multinationals. If we left research to enterprise, the result would be an enormous impoverishment. government action would then be necessary to correct the situation, to give promising sectors a chance to develop. Indeed, government has the task of guaranteeing a certain versatility of research, certainly in sciences whose direct benefit is not immediately clear.

Why? Much knowledge appears useless. But it is very difficult to say in advance what is useful and what is not. Much knowledge, whether research results or new theories, does not bring about changes in the short term. Nobody can deny that our view of ourselves, society and nature has been changed enormously by Freud, Marx and Einstein. Their ideas have had far-reaching effects. But nobody could have suspected it when these theories came into being. Even knowledge of knowledge is not completely impartial. And you sometimes have the best view from an ivory tower. Anyone who really wants to change society should become a scientist.
Some talk of an innovation paradox: only a fraction of our knowledge leads to innovation or to new applications in industry. Even the government is uneasy. However, this relationship will never be completed balanced. The deciphering of cuneiform will not lead directly to spin-offs, innovations or marketable products. However, this research is essential for knowledge about ancient civilisations and, by extension, about ourselves. We never quite know which sciences are the best guarantee for the future. Who would have dared to think that language and speech technology would become so important and that linguistic knowledge would be indispensable for automatic language processing? Linguistics always seemed to be a haunted house of abstractions and - according to Chomsky - of mathematical formulas.

Given the unpredictability of science, we cannot just prescribe what must be researched and what must not be investigated. Researchers themselves are best placed to determine what they want to research and what the innovations are in their field of expertise. The best we can hope for is that brilliant researchers do not lose heart, and that is not simply a question of finances.

Science is a group phenomenon, and that requires the adaptation of existing trends, theories or models. However, the true innovator has an independent mind, and this sometimes has far-reaching ramifications for his career. Much science is the result of the stubborn belief of some that they know better than the received wisdom. They stick to their guns, even if everyone considers them mad or dangerous – ranging from colleagues to the Church and society. These wayward pioneers are later accepted as the great benefactors of science, as generations of researchers earn their living through the application, refinement and criticism of their theories. Until, that is, another new pioneer comes along and shows that it was all just an illusion.

The ideal science policy must be able to reconcile the often conflicting interests of researchers, enterprise and society. The result is frequently a compromise, whereby each party gets a little of its own way: the government works for a balanced division of the resources between applied and basic research across the various disciplines. Although it is no utopia, creating a balance, with all its inherent fairness, is probably the best that we can manage.

Peter Bakema
Policy Support and Academic Policy Team

28 See also elsewhere in this EWI Review: p. 14.

More youngsters with moustaches after the Flemish Science Week

True to the motto "Wetenschap maakt knap" ("Science makes you smart"), the Flemish government offers a wide range of activities designed to popularise science, technology and technological innovation. The *Flemish Science Week* (*Vlaamse Wetenschapsweek*)[29] is one of the major initiatives that form part of this action plan, called the *Actieplan Wetenschapsinformatie en Innovatie*[30].

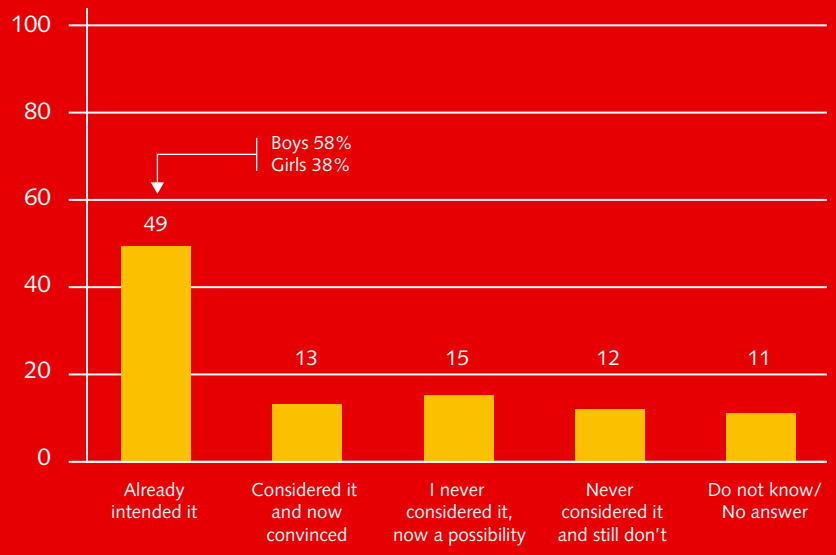
The objectives are to provide information about and raise awareness of the importance of science, technology and technological innovation among the target groups (youngsters (at school), teaching staff, the general public, and so on). Youngsters, and girls in particular, are encouraged to choose to study scientific and/or technological subjects. In this contribution we pause to take stock of the extent to which the initiative has succeeded.

Do it yourself

Interactivity is essential in the Flemish Science Week; after all, doing it yourself and experiencing something for yourself generates the greatest effect. Youngsters from the third and fourth stages of secondary education can spend half a day or a whole day as a scientist in the Flemish higher education institutions (universities and higher education institutes) and scientific and research institutes (*Wetenschap in de kijker*). The general public and youngsters from the fifth and sixth years of primary education and the first stage of secondary education can participate in the Science Festival (*Wetenschapsfeest*) where they can perform experiments or experience a scientific show or demonstration during the Science Festival.

Participating in the Flemish Science Week has its consequences! Interest in science and technology is increasing among the target groups. Among the participating students, there is also a clear effect on the choice of studies in their further education.

About one fifth of the youngsters who took part in *Wetenschap in de kijker* (and plan to go on to higher education) will certainly choose, or at least consider, scientific or technical studies (Figure 12).

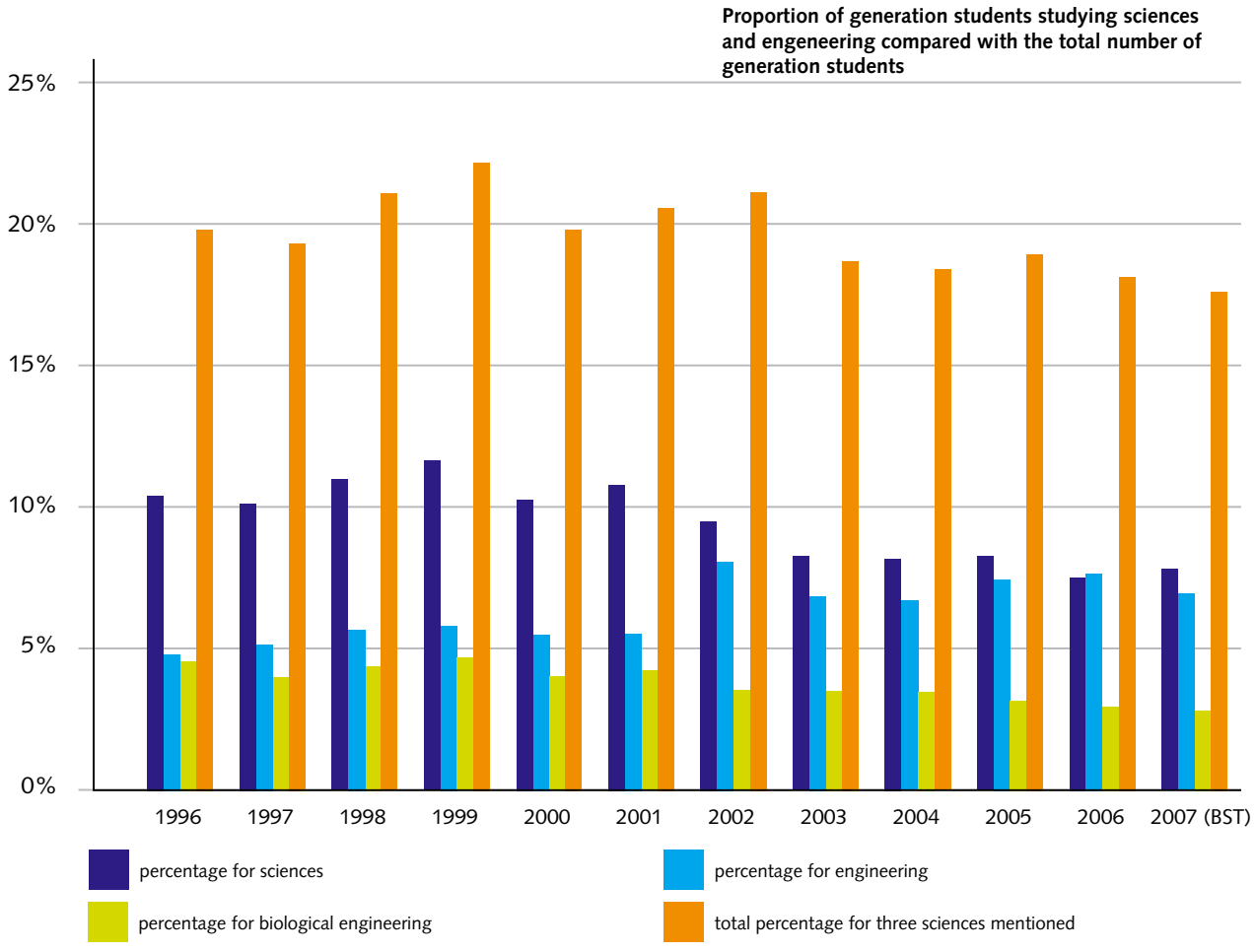


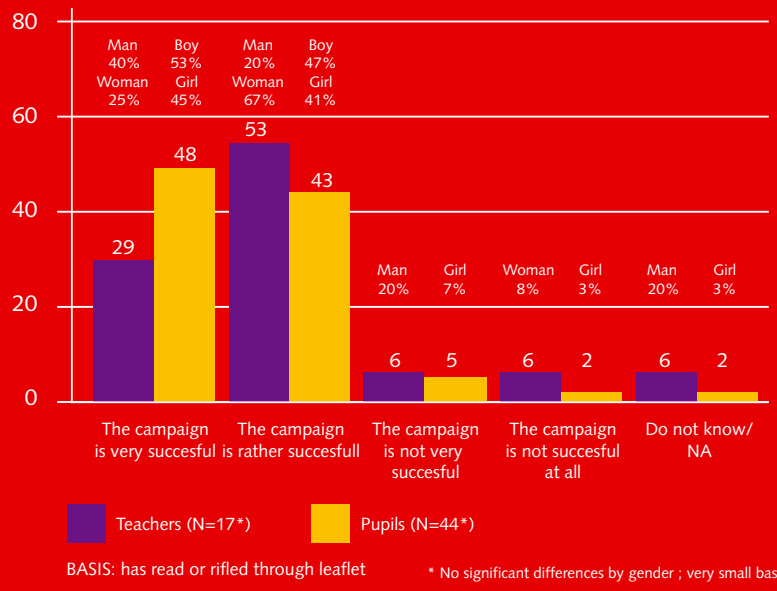
BASIS: Pupils (N=988)

Figure 12: (from the evaluation report Vlaamse Wetenschapsweek

"Which of the following statements regarding the choice for a (further) education with a strong scientific and/ or technological component applies most to you?"

Figure 13: student numbers for S&T courses [31]





BASIS: has read or rifled through leaflet

* No significant differences by gender ; very small bases!

Figure 14: is this campaign a success?

"The campaing aims on the one hand to provide girls with female rolemodels with respect to science and technology and on the other hand to show the girls that with science and technology a lot of possibilities are open to you and that girls have the same scientific or technological talents as boys. How succesful do you think the campaign is with respect to these objectives?"

Whether these youngsters eventually will, in fact, opt for scientific or technological studies when they go into higher education is not clear. What is clear is that the Flemish Science Week does have an impact on the decision-making process, but how decisive that is cannot be gauged from the survey. In any case, since 2004 the percentage of generation students at the Flemish universities choosing sciences or (biological) engineering has been increasing again (Figure 13).

Who wears the moustache?

The Flemish Science Week also wore a moustache in 2006. International research reveals that girls are much less inclined than boys to choose scientific and/ or technical studies. Underlying reasons may be the absence of female role models and the conviction that they will not be successful in such studies. To increase girls' confidence in their own abilities as regards science and technology, the EWI Department held a special campaign as part of the Flemish Science Week (Figure 15). In the brochure eight female role models were presented (among others, TV weather presenters Sabine Hagedoren and Jill Peeters). They explain what science and/or technology has meant for them in their education and what it means now in their current careers. According to pupils and teachers who attended the Schools' Day at the Science Festival, such a campaign has the potential to succeed (Figure 14).

However, it is still important not to focus too much on one gender or the other. An OECD[32] recommendation, for instance, advises against programmes for girls only because these could diminish the credibility of the campaign for the many stakeholders.

On the other hand, it is clear that girls and boys in secondary education have parallel as well as divergent interests as regards the natural sciences.
The challenge for teaching staff and policy-makers will be to give a form to lessons or actions that will satisfy everyone's interests as much as possible. The *Actieplan Wetenschapsinformatie en Innovatie* and the Flemish Science Week are doing just that.

More infomation: **http://ewi-vlaanderen.be/documenten/rapport_resultaten_enquete.pdf**
(only in Dutch)

Sabine Borrey
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Figure 15: the moustache campaign: "Do you need a moustache to choose for science or technology?"

29 http://www.vlaamsewetenschapsweek.be

30 http://www.wetenschapmaaktknap.be

31 The limited statistical count (beperkte statistische telling - BST) for 2007 was used, making the data not completely comparable with the data for previous years.

32 Organisation for Economic Cooperation and Development.

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