An Innovative, Prosperous Québec

Québec Research and Innovation Strategy

SHINE AMONG THE BEST

Québec

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Message from the Premier

Québec has tackled many challenges in recent decades. Our transformation into a confident, modern society has touched every aspect of our economic, social, and cultural life and led to an unprecedented measure of individual and collective know-how.

We have created a first-class education system, including a higher education system involved in very advanced research. We have built a modern state and designed instruments of development that stand as a model to others, whether in energy, finance, or social solidarity.

We have stimulated and diversified our economy. Québec today is responsible for nearly 44% of Canada's high-tech exports, a fact we can be proud of. But we must seek to do more. Innovation is the key to the economic and social growth of Western economies facing new sources of competition. And by definition, innovation is a process of perpetual renewal, a never-ending quest.

In the years to come, our prosperity will depend on our ability to master this process. We are already successful innovators. Now we must be better innovators. We will always be outnumbered, but we have all that we need to be creative, daring, and nimble as we seek to thrive in the new global economy.

In *The Québec Advantage: The Québec Government's Economic Development Strategy*, we affirmed the essential role of research and innovation and set precise targets for R&D spending. In *An Innovative, Prosperous Québec*, we have indicated the means by which we will work to attain these targets.

The strategy is based on a partnership with business, the research community, and the public agencies that oversee research and innovation. The goal is to promote innovation, increase the number of firms that invest in innovation, and improve the efficiency of the mechanisms whereby scientific advances are turned into marketable products, jobs, and new wealth.

It is a daunting challenge, but a natural one for today's Québec. By actively promoting innovation, we will unleash the creative forces that have forged our reputation around the world and will ensure our prosperity in tomorrow's world.

Jean Charest
Premier of Québec

Message from the Minister

Research and innovation are the keys to a competitive economy, a fact nowhere in dispute. We must build on our success to prepare for the future and the challenges that we know await. Taking action now is our only choice.

This is why the government has made research and innovation the centerpiece of its economic development strategy. We have set out ambitious objectives that must be met if Québec is to take its place among the leaders in research and innovation.

- Québec must train sufficient numbers of talented researchers and provide them with research facilities of international calibre.
- Research funding levels in universities and hospital research centers must be competitive.
- Québec must be an active participant in international research.
- The ability of businesses to innovate must be strengthened.
- Access to the results of public research must be facilitated.
- More research results must be turned to commercial benefit.

These conclusions, the result of a detailed situational analysis, are the foundation of the *Québec Research and Innovation Strategy*. Our diagnosis is clear: Québec has invested heavily in R&D, and its researchers have made major advances in many fields, but the time has come to turn this success into concrete benefits for the economy and for employment.

To attain our objectives, we must therefore pay particular attention to research development and the transfer of research results to businesses and other organizations. The strategy thus targets areas that will require additional efforts in order to enhance Québec's prosperity and improve the quality of life in all regions.

To optimize our investments, we must be sure to garner the support of all economic stakeholders. No society can achieve innovation without the concerted efforts of industry, government, and the public research community. The strategy will therefore seek to increase cohesion throughout the innovation system.

By stressing its scientific heritage, the vitality of its business community, and the pooling of resources, Québec will be ideally positioned to assume its role as an innovative economy and an exciting and prosperous society.

Raymond Bachand
Minister of Economic Development, Innovation and Export Trade

Introduction

Innovation is the key to the development of knowledge-based economies. It is of vital interest to all Quebecers in that it fosters economic growth and creates jobs in the research sector and, indeed, in all sectors. It will also enable young people to achieve their ambitions and shine among the best, maintain and enhance social programs, and improve the quality of life of all Quebecers. In short, innovation has become the driving force in Québec's economic and social development.

Over the years, Québec has established a scientific research base of international calibre. In order to take full advantage of investment in research, we must now rely more extensively on partners in the university research sector, industry and the government to accelerate the development of an economy that is already based on knowledge.

In *The Québec Advantage: The Québec Government's Economic Development Strategy*, the Québec government set mobilizing targets in respect of research spending with a view to consolidating Québec's competitive advantages.

More specifically, in the realm of research and innovation, the strategy noted that "considerable effort must be made to broaden economic and commercial spinoff from university research and facilitate technology transfers to businesses."[1]

Consequently, the strategy specifies that "the government intends to mobilize all stakeholders in order to accelerate the pace of investment in research. It has set as its objective to meet by 2010 the following mobilizing targets:

- ensure by 2010 that research spending reaches 3% of GDP and maintain Québec among the leading countries in subsequent years;
- increase the private sector's share of R&D financing from 60% in 2002 to over 66% in 2010."[2]

The challenges that Québec must meet in this respect compel us to pay particular attention to the development of research and the transfer of knowledge, which is the focus of this strategy. It reflects a trend observed today in those countries that are the most active in R&D.

[1] Gouvernement du Québec, ministère du Développement économique, de l'Innovation et de l'Exportation, *The Québec Advantage*, 2005, page 37.

[2] *Ibid.*, page 38.

As the government announced in *The Québec Advantage*, it has established the Conseil des partenaires de l'innovation (CPI), which assembles representatives of industry, public research institutions and associations, and experts interested in innovation. The CPI has advised the Minister of Economic Development, Innovation and Export Trade on science and innovation, in particular with regard to the priorities and action strategies to be adopted in the *Québec Policy on Science and Innovation* published in 2001, now being updated.

The policy is being reviewed, not called into question. The current innovation system has strengths and offers undeniable advantages. However, it does have weaknesses that need to be remedied, especially in respect of the development of research findings and the transfer of such findings to businesses and organizations.

While we maintain research that is at the forefront of international standards, we must now emphasize spinoff from it on the economy and employment. This research and innovation strategy proposes broader intervention to bolster the weakest links in the chain that are of the most strategic importance to achieve the mobilizing targets adopted. Through this strategy, the government and its partners now have at their disposal the tools they need to create an innovative, prosperous Québec.

The *Québec Research and Innovation Strategy* centres on three key guidelines:

1. enhance the excellence of public research;
2. better support industrial research and innovation in businesses;
3. round out and strengthen mechanisms to develop and transfer research findings.

This strategy centres on a number guiding principles and ideas.

It stems from the conviction that **enhanced competitiveness is largely attributable to excellence in the realm of R&D and innovation**. Under the circumstances, it would be illusory to claim to excel in all fields of scientific research. For this reason, it is necessary to create a research and innovation environment and public support approaches adapted to the size of our economy.

– Since its economy is relatively small, **Québec must target and concentrate its R&D and innovation efforts** in order to assemble critical masses of researchers in fields and in respect of technologies that are deemed to be of strategic importance.

– It is thus not sufficient to encourage research but we must also **promote targeted research**, which has considerable potential to generate spinoff. This means that it is necessary to pay more attention to the marketing of research results.

– To enhance our chances of success, we must work in complementarity and **strengthen synergy between all interveners**. More than ever, collaboration and partnership are essential.

– Since performance in an innovation system is often limited by the weakest link in the system, the strategy will focus on factors that require additional attention.[3]

Moreover, with regard to the respective roles of the government and the private sector, the government believes that:

– the **State acts as a facilitator**. It intervenes when the private sector is unable to do so. It supports initiatives rather than institutions and ensures effective governance. It is incumbent upon the government to introduce an environment suited to R&D and innovation throughout the development chain for new knowledge and technologies;

– the State must ensure the presence of mechanisms that foster access by businesses to resources such as investment, support, incentives to R&D, and so on, while assuming decisive responsibility in funding public research;

– the State only intervenes inasmuch as spinoff and positive by-products benefit society as a whole. Since **businesses** (or agencies) **are the first beneficiaries of innovation, they must be the principal instigator** of such innovation. They must decide to invest in innovation and to assume the cost of it.

[3] See Ken Guy and Claire Nauwelaers, "Évaluation comparative des politiques de STI en Europe: à la recherche de la meilleure pratique," *The IPTS Report*, No. 71, European Commission, Joint Research Centre, February 2003.

CHAPTER 1

Overview

Overview

Québec is unquestionably a knowledge-based society and engages extensively in R&D.

Its annual gross domestic expenditures on R&D (GERD) are on the order of $7.2 billion.[4] Such spending accounts for 2.72% of its gross domestic product (GDP) and ranks it seventh among the OECD countries.

Business enterprise expenditure on R&D (BERD) stood at $4.3 billion in 2004, equivalent to 1.63% of GDP, compared with 1.72% in the G7 countries overall.

Annual higher education research and development (HERD) exceeds $2.4 billion in Québec, equivalent to 27% of the Canadian total.

When account is taken of all support for R&D and innovation, the Québec government's overall annual contribution totals more than $1.4 billion.[5] This support is directed toward all stakeholders in the realm of R&D and innovation and takes several forms.[6]

Achievements and challenges

Assessments and analyses conducted with respect to research and innovation show that Québec can rely on a dynamic, efficient innovation system. However, this system can be improved, as a thorough examination of its key components reveals.

Public research

The progress made reflects the extent of the effort that governments and the private sector have made to promote R&D in Québec. Québec researchers occupy an enviable position in the production of knowledge and the development of strategic technologies.[7] However, Québec must meet a number of specific challenges, indicated below.

- **The challenge posed by excellence and the upcoming generation of researchers and innovators**. The excellence of research depends to a great extent on the presence of researchers of international calibre, access to state-of-the-art research infrastructure, and the quality of training that young researchers receive.

[4] Data for 2004, the most recent published by Statistics Canada on GERD in Québec. R&D expenditure data are usually published with a two or three year time-lag (see Appendices 1 and 2).

[5] This includes all direct and indirect Québec government support in respect of R&D and innovation.

[6] Appendix 3 presents detailed information.

[7] The key strategic technologies are biotechnology, nanotechnologies, genomics and proteomics, advanced materials, the information and communications technologies, and certain energy and environmental technologies.

In Québec, the proportion of researchers in the labour force falls below that observed in the countries that are the most advanced in the research field. Québec must continue to train, attract and retain researchers of international calibre in a context where the international mobility of researchers, in particular young ones, will intensify and benefit the countries offering the best conditions for research and career advancement.

- **The challenge posed by creating critical masses and the expansion of international collaboration**. Following the example of small successful countries with knowledge-based economies such as Finland, Sweden and Ireland, Québec must rely on research of international calibre.

  To broaden its influence and open itself to the world, Québec must also ensure that its researchers participate more extensively in leading international research forums and projects.

- **The challenge posed by bolstering public research capacity in the regions**. Businesses, especially SMEs, must have access to technological advances and the expertise necessary to carry out their innovation projects, regardless of where they are located. For this reason, Québec must also enhance research capacity in the regions.

Industrial research and innovation in businesses

Québec has made considerable progress in the realm of industrial R&D. Relatively speaking, Québec compares favourably in industrial R&D with many other knowledge-based economies. Tax measures to support industrial R&D have had a decisive impact on growth in strategic sectors in which Québec excels, e.g. aerospace, biotechnology, pharmaceuticals and the information and communications technologies. However, new challenges are in the offing:

- **The challenge posed by increasing industrial R&D spending to the equivalent of 2% of GDP**. Elsewhere in the world, new scientific policies are aimed at bringing total R&D spending to at least 3% of GDP, with industry accounting for two-thirds of such investments. This division obviously confers on the private sector a crucial role in R&D.

The attainment of the objective of 2%, as against 1.63% at present, demands annual growth in private-sector R&D investment of 7.6%. Following the example of the European countries, Québec is seeking to increase from 60% to 66% in 2010 the business community's share of R&D financing. To this end, we must, in particular, attract new foreign investment in R&D.

- **The challenge posed by the university-business partnership**. Québec has relatively fewer businesses derived from university research than the leading provinces of Canada and most American states. Similarly, research sponsored by businesses and conducted in universities accounts for 7% of university R&D in Québec, as against 10% in Ontario and 8% in Canada overall.
- **The challenge posed by innovation**. Despite the progress they have made, Quebec businesses, in particular SMEs, continue to confine themselves to the simplest, least investment-intensive innovations.

  To enhance their competitiveness and position themselves in promising niches, Québec firms must more extensively adopt technological innovations and have at their disposal sufficient highly qualified staff in R&D and innovation.

The biggest challenge facing Québec is its international competitiveness. Research and innovation are our best assets and veritable allies in developing the advantages needed to maintain our achievements and ensure our long-term economic prosperity. It is up to us to meet the challenges posed by excellence in research and innovation.

Development and transfer of research findings

The Québec system to develop and transfer research findings includes measures and procedures aimed at better supporting the marketing of new knowledge stemming from research. Many of the measures and procedures were introduced in the past on an experimental basis. However, the current system has shortcomings that must be remedied to broaden commercial spinoff from investment in public research in recent years. A collective effort is necessary to better flesh out and strengthen different links in the chain to develop knowledge derived from university research.

- **The challenge posed by the development of research**. Compared with North American universities, Québec universities are lagging significantly behind in this regard. While Québec institutions conduct just over 31% of Canadian research each year, Statistics Canada (2006) reports that these establishments only generate 17% of the inventions divulged, 18% of new licences, and 17% of the spinoff companies established to date[8] in Canada.
- **The challenge posed by access to technologies and research findings adapted to industry's needs**. It is essential to better assist firms in various industrial sectors to engage in research and innovation in collaboration with universities and research centres. To this end, we must support, on a sectoral basis, the establishment and development of research and transfer groups that devote themselves specifically to this task.

Scientific culture

Québec displays a sound level of adoption of science and technology. Some 70% of Quebecers say that they are interested in science and technology. Moreover, 56% of them believe that they are informed about scientific and technological advances.[9] While two-thirds of Quebecers regard the impact of science and technology as positive, the level of mistrust concerning new applications stemming from scientific research has almost tripled over the past 10 years, from 5% to 15%.[10]

- **The challenge posed by accessibility and receptiveness**. More than ever before, society expects science to be more responsible, more accessible and more receptive to its socioeconomic concerns.

Governance of research and innovation

In Québec, as elsewhere, the governance of public support for research and innovation must centre on a concerted, enlightened, effective approach. Despite the effort made in this regard, new challenges must be met.

- **The challenge posed by efficiency**. We must consolidate the performance of public support and enhance the cost-benefit ratio for society in order to maximize returns on the considerable investments in R&D and innovation.
- **The challenge posed by cooperation**. Effective governance requires coherent initiatives and the cohesion of the parties concerned (universities, businesses, governments and non-profit organizations). Through this cooperation, it is possible to strengthen the partnership between businesses, universities, the federal, provincial and local governments, and non-profit organizations.

8 Statistics Canada, *Survey of Intellectual Property Commercialization in the Higher Education Sector, 2003*, October 2006.

9 Survey conducted in 2002 by the Conseil de la science et de la technologie.

10 *Ibid.*

The theory of the innovation system: from a compartmentalized perspective to a perspective centred on a partnership between business, universities and government

This strategy takes into account the Québec innovation system's achievements and the challenges it is facing. It sets forth its support in light of a dynamic, interactive vision centred on a tripartite partnership involving the research community, the business community and public agencies responsible for the governance of research and innovation.[11] It reflects what is happening elsewhere in the world at a time when public support for the innovation system is focusing on "the abandonment of the conception of innovation as an individual decision-making process independent of the environment in favour of a conception of actors inserted into different networks of institutions. In this perspective, innovation necessarily implies interaction between the actors (firms, laboratories, universities, and so on) and their environment."[12]

Structural problems

While Québec's R&D investments compare favourably with those of several economies, it must now emphasize the development of new knowledge and technologies in order to broaden spinoff from research in respect of the economy and employment.

Over several decades, Québec has established a first-rate research base. Québec university researchers excel in their fields of specialization. In particular, in 10 years, they have doubled the amount of their research grants and contracts. Furthermore, Québec has acquired extensive infrastructure and state-of-the-art equipment, which has enabled it to accelerate the development of technological fields that are deemed to be strategic, such as genomics, nanotechnologies or the information and communications technologies.

However, certain gaps prevent us from using to the best possible advantage our investments in capital and human resources. Whether they affect public or industrial research, these problems are symptomatic of the insufficient development of knowledge and the transfer of technology to businesses and organizations.

- On average, a Québec firm active in R&D has access to much more limited professional R&D staff than an Ontario firm to obtain, understand and make use of existing or newly developed technological knowledge.

[11] See Henry Etzkowitz and Loet Leydesdorff, "The Dynamics of Innovation: from National Systems and 'Mode 2' to a Triple Helix of University-Industry-Government Relations," *Research Policy*, 29 (2), 2000.

[12] Bruno Amable, Centre pour la recherche économique et ses applications (CEPREMAP), "Les systèmes d'innovation," contribution to the *Encyclopédie de l'innovation* edited by Philippe Mustar and Hervé Penan, June 2001, page 1.

- For a given number of divulged inventions, the number of patents obtained by Québec universities is almost half the number of patents obtained by American universities.

That being the case, it is, understandably, urgent to broaden the capacity of businesses to acquire knowledge and new technologies and it is apparent that knowledge stemming from university research is not properly developed.

> *Québec must now emphasize the development of new knowledge and the transfer of new technologies to broaden spinoff from research.*

Research and innovation, the key to competitiveness, prosperity and job creation

In light of the foregoing discussion, the *Québec Research and Innovation Strategy* centres on three strategic policy directions.

Strategic policy directions

1. Enhance the excellence of public research.
2. Better support industrial research and innovation in businesses.
3. Round out and strengthen mechanisms to develop and transfer research findings.

These three policy directions draw inspiration from a single perspective, i.e. broader development of research and more efficient transfer of research findings to businesses and organizations. Specifically, they seek to:

- strengthen and increase the number of firms active in R&D;
- facilitate access by industrial sectors to public research;
- support the development of the results of R&D at each stage, through development corporations and liaison and transfer agencies, but also and, increasingly, through sectoral industrial research groups.

This explains why the strategy is emphasizing excellence in public research, mainly in the natural sciences and engineering through:

- increased assistance in respect of state-of-the-art infrastructure;
- broader support for training sufficient numbers of qualified, talented upcoming researchers;
- the establishment of critical masses in strategic fields.

This also explains why the strategy encourages the Québec research community to turn more extensively to other countries by:

- supporting active participation in international research projects;
- supporting the networking of researchers with the international research avant-garde;
- attracting and retaining greater numbers of multinational firms active in research.

The *Québec Research and Innovation Strategy* seeks to strengthen the innovation system overall in order to ensure the prosperity of all Quebecers. It includes developmental measures which, over a period of three years, will lead to investments totalling $888 million, broken down as follows:

- $400 million[13] for direct measures aimed at research, innovation, knowledge transfers and the development of research findings;
- $420 million for research infrastructure; and
- $80 million in the form of tax expenditures.

Over 52% of the budgeted cost of the strategy, which totals $400 million, is devoted to measures that directly support the development of research findings and technology transfers, for a total of nearly $210 million over three years.

The investments totalling $888 million over three years are being added to the amounts announced in the 2006-2007 Budget Speech *and the* Québec Aeronautical Industry Development Strategy. *The additional investments allocated by the Québec government stand at $1.2 billion.*

[13] Including debt service (interest and amortization) stemming from capital expenditures on research infrastructure. However, the cost of amortization in respect of such infrastructure during the first three years ($12 million) is not included in the calculation of the total investment of $888 million.

CHAPTER 2

Enhance the Excellence of Public Research

Enhance the Excellence of Public Research

Public (university and institutional) R&D in Québec already accounts for a high percentage of GDP (1.1%). Québec compares favourably in this respect with many similar economies. In order to progress, Québec must rely on its achievements and bolster its advantages.

The challenge posed by excellence in public research makes necessary renewed, long-term government support in relation to what is happening in those economies that are the most extensively engaged in research and innovation.

To be effective, government support for public research must ensure that the funds invested to strengthen public research are:

- targeted to create critical masses capable of excelling and ensuring a significant presence in key research projects and in the means to disseminate knowledge;
- directed, as a matter of priority, toward fields that are of strategic importance to economic development and the needs of all forms of innovation;
- used in such a way that they emphasize the development and commercialization of research findings.

Under the circumstances, and bearing in mind the means at the Québec government's disposal, the *Québec Research and Innovation Strategy* makes provision for specific measures devoted to:

- the maintenance of state-of-the-art research infrastructure;
- support for excellence in research through scholarships and research grant programs;
- the development of knowledge and technology that is of strategic importance to Québec;
- active participation by Québec researchers in international research networks and projects.

Firm commitments to support research infrastructure

Funding for new research infrastructure

The availability of state-of-the-art research infrastructure is now a determinant of excellence in public research. It is a key factor to ensure the retention and recruitment of talented researchers and an essential condition for the training of young researchers. Such infrastructure provides the vital foundation for the competitiveness of Québec research establishments.

In light of accelerating technological change, the increasingly short useful life of specialized facilities and the determination of modern States to step up the pace of their investment in research infrastructure, the Québec government must adopt a level of investment that allows Québec establishments to remain competitive at home and abroad.

Observations made in Canada and the United States in recent years suggest that an infrastructure investment ratio below 15% of subsidized research leads to a decline in the quality of research infrastructure. A ratio between 15% and 20% appears to be necessary to maintain such infrastructure at an internationally competitive level.

Under the circumstances, the Québec government will support investment in research infrastructure that will represent over the next three years 19% of the volume of subsidized research. The value of these commitments will, on average, be worth an estimated $140 million a year.[14]

Average annual investments of $140 million for research infrastructure

Other major investments will also be effected in the coming years. Investment to develop university hospitals (CHUM, MUHC and the CHU Sainte-Justine) in the Montréal area will total $3.2 billion, including $600 million for state-of-the-art research infrastructure. These investments will enable Montréal to play the role of a world leader in the realm of biomedical research.

[14] This infrastructure excludes research infrastructure planned for the Centre hospitalier de l'Université de Montréal (CHUM), the McGill University Health Centre (MUHC) and the CHU Sainte-Justine.

This level of investment will adequately support the development of fields to which Québec has given priority and encourage the federal government to participate in research infrastructure funding. It will also enable us to further expand the boundaries of knowledge and generate promising research findings in the realms of technological progress and innovation.

Moreover, to facilitate the acquisition of research infrastructure in the regions, maximum government assistance of 80% may be increased to 90% with respect to the projects of agencies located in resource or central regions when partners are unable to carry out the project.

These investments are being added to the $195.6 million allocated in 2006-2007.

Support for the cost of operating and maintaining research infrastructure in the regions[15]

The efficient use of research infrastructure must be accompanied by funding for operating and maintenance costs. Since research centres in the regions usually find it harder to self-finance such costs, $12 million over three years is being allocated to partially cover operating and maintenance costs during the start-up phase that follows an investment in research infrastructure.

Two strikingly successful research infrastructure investments

The $35.7-million research infrastructure investment and the grants obtained by the Université de Montréal have made possible the establishment of the **Institut de recherche en immunologie et en cancérologie (IRIC)**. The investment led to the construction of a new 19 000-m^2 building on the Université de Montréal campus. The funding obtained fostered the establishment of 15 research teams and 11 state-of-the-art research platforms. By 2008, IRIC will welcome over 450 researchers, professionals, students, postdoctoral trainees, and technicians. Furthermore, the Université de Montréal intends to allocate 20 Canadian Research Chairs to IRIC and hire 40 full-time lecturers. Eleven researchers have already been recruited outside Québec. By the end of 2005, 55 postdoctoral trainees and graduate students had been trained, along with 11 members of the technical staff.

[15] The expression "in the regions" refers here to all of Québec's administrative regions, except the Montréal, Laval and Capitale-Nationale regions.

The $5.2-million investment for infrastructure and the grants obtained have made possible the construction of a modern, versatile, 2 970-m^2 building to house the **Centre de recherche sur les biotechnologies marines de Rimouski (CRBM)**. Specialized equipment has been purchased to set up five laboratories. It is noteworthy that the microbiology laboratory includes an accredited containment level 3 laboratory for work on pathogens, the only facility of its kind in the Est-du-Québec region, and an accredited containment level 2 laboratory in a good laboratory practice (GLP) environment. All told, 30 permanent positions for researchers, technicians and office staff have been created. Following the establishment of the research centre, the Université du Québec à Rimouski implemented a specific environmental biochemistry program linked to the marine sector.

Increased budgets allocated to grant funds

Grant funds play a key role in the support that the Québec government offers to the research sector. Such funds provide financial support in a complementary manner to the allocation of funding by federal granting agencies to different types of research activities, including research conducted by strategic groups, research centres and networks, hundreds of research projects, and the training of thousands of Québec student researchers.

Grant funds are mandataries of the government whose mission it is, in their respective fields, to promote and financially support research, the training of researchers and the dissemination of knowledge. To this end, they must establish the necessary parameters in collaboration with universities, colleges, industry and public agencies.

Québec government departments and agencies such as the MDEIE, MELS, MAPAQ and RAMQ have granted transfer credits totalling nearly $175 million for fiscal year 2006-2007 to support the activities of three grant funds, i.e. the Fonds québécois de la recherche sur la nature et les technologies (FQRNT), the Fonds québécois de la recherche sur la société et la culture (FQRSC) and the Fonds de la recherche en santé du Québec (FRSQ).

These funds support the development of knowledge through scholarship and research grant programs. Moreover, they have developed expertise and a broad network of collaborators to evaluate applications and manage these programs. Their status as independent agencies enables them to guarantee the impartiality necessary for the management of an objective, transparent process centred primarily on excellence and peer review.

Their initiatives have clearly contributed to the results obtained by Québec researchers in respect of federal granting agencies.

Significantly increased support for merit scholarships

The Québec government regards the training of talented researchers and the development of expertise as a crucial factor for any economy wishing to remain at the forefront among those economies that are in the vanguard from the standpoint of the creation and development of new knowledge. To that end, Québec has established merit scholarship programs in addition to those administered by the federal government to encourage even greater numbers of young people to pursue their university studies to the master's, doctoral and postdoctoral levels.

Innovative societies grant financial assistance to outstanding students to foster careers in research and innovation. Québec granting agencies offer merit scholarships to outstanding applicants who are not supported by federal granting agencies. However, between 75% and 80% of students who are eligible for scholarships, which are governed by stringent criteria, do not have access to them because of budget restrictions. For this reason, the granting agencies will receive an additional $32 million over the next three years, which will allow them to grant nearly 900 additional merit scholarships to Québec students. The attribution of such scholarships encourages the students to complete their advanced training as quickly as possible and thus allows them to start their careers as researchers under the best possible conditions, among other things by reconciling more readily their studies and family lives.

During fiscal year 2005-2006, more than 513 training scholarships for master's, doctoral and postdoctoral students were awarded by Québec granting agencies in the health sector, and over 611 in the natural sciences and engineering sector, in addition to 1 031 scholarships in the social sciences and humanities.

The Québec government is supporting nearly 2 200 students through merit scholarships. The *Québec Research and Innovation Strategy* will provide funding for 900 additional scholarships over three years.

Consolidation of research groups in priority fields for Québec

Innovation systems rely on partnerships to help research teams attain excellence. The research groups that the Québec government supports are enviable centres of excellence, thanks to nearly 300 Québec partner businesses, to 100 or so other partners outside Québec that are also the principal users of research findings, and to the direct contribution by 100 industrial researchers. These groups have been established in targeted research sectors. They assemble Québec's best researchers and foster the integration of young researchers into recognized teams. It is through this tool, among others, that we can ensure the effective structuring of research in Québec and enhance the leverage effect of our research investments.

Despite very positive results in key fields, especially the natural sciences and engineering, the research groups are underfunded. The government is thus allocating an additional $18.0 million to the FQRNT to support strategic groups that have not until now obtained funding, for example in the following fields: advanced plasma applications, computation and quantic information, molecule synthesis and animal reproduction. The Fonds québécois de la recherche sur la nature et les technologies (FQRNT) may also encourage the establishment of new groups in fields that are deemed to be of strategic importance to Québec, including energy and the environment.

The additional funds available to them will enable the new strategic groups to assemble more than 320 new researchers and support the training of more than 1 100 graduate students.

Thirty-two **strategic groups** assembling 1 343 university, government and industrial researchers are now operating in the natural sciences and engineering sector. These groups, with which over 100 partner businesses are associated, offer an unrivalled training environment to over 4 600 graduate students.

Indeed, the strategic groups make it possible to optimize the use of key scientific equipment funded by the Canada Foundation for Innovation and the Québec government. Spinoff from the research conducted by these groups includes:

- the establishment of new enterprises such as Quantiscript Nanotechnologies, LTRIM Technologies inc., Logient and Axiocom;
- outstanding scientific and technological innovations in numerous industrial sectors, e.g. holey fibres, marketed by the National Optics Institute (INO) (Optics, Photonics and Laser Centre), and the development of new composites and new types of concrete (Centre de recherche sur les infrastructures en béton).

The strategy also allocates funds to broaden intervention among health research groups. For example, $9 million in additional funding over three years will make possible the establishment of a drug research platform. This initiative offers valuable support to the health industries by ensuring broader availability of qualified researchers.

Granting agencies will thus have at their disposal an additional $59 million over three years to promote the training of researchers and bolster research in recognized scientific niches that are included in the agencies' strategic plans.

To this amount must be added funds allocated to the workplace scholarship program ($9 million), funding for lecturer-researchers and Cegep researchers ($9 million), and additional funding for training sessions abroad ($2.5 million).

The funding earmarked by the ministère du Développement économique, de l'Innovation et de l'Exportation for funding agencies will increase by 2009-2010 from $151 million to $184.4 million. The FQRNT's budgets will increase by 43.8% between 2006-2007 and 2009-2010.

TRANSFERS FROM THE MINISTÈRE DU DÉVELOPPEMENT ÉCONOMIQUE, DE L'INNOVATION ET DE L'EXPORTATION TO GRANTING AGENCIES (MILLIONS OF DOLLARS)

	2006-2007[1]	2009-2010
FQRNT	37.2	53.5
FRSQ	70.4	80.3
FQRSC	43.4	50.6
TOTAL	151.0	184.4

[1] Including an estimate of the funds earmarked for workplace scholarships in the *2006-2007 Budget Speech*.

Enhancement of assistance to attract new lecturer-researchers to the regions

In Québec as elsewhere, it is harder for the regions to attract and retain researchers. We must overcome this difficulty since, in order to develop its full potential, each region must be able to participate in the creation of new knowledge. A special effort is being made in this respect since $3 million over three years is being allocated, in addition to existing funding, to attract to the regions lecturer-researchers starting their careers.

Improved conditions for student-researchers

Student-researchers are assuming broader responsibilities in Québec universities and are generating quality scientific output. Concrete measures must be adopted to offer student-researchers better living and research conditions. It is in this framework that a concerted effort has been made in Québec to enhance the quality of life and research conditions of student-researchers, with particular emphasis on occupational health and safety.

In this perspective, the strategy will make provision for the payment, according to coverage and funding procedures to be agreed upon with the partners, of student-researcher insurance to cover accidents that occur in conjunction with the students' research.

Moreover, the Minister of Employment and Social Solidarity will ask the Conseil de gestion de l'assurance parentale for an opinion on the relevance and advisability of taking into account student-researchers' different sources of income for the purpose of calculating insurable earnings under the Régime québécois de l'assurance parentale.

Significant support for the development of strategic technologies

Like other societies that rely on research and innovation, Québec is banking on the mastery of strategic technologies to ensure its long-term development. Among the technologies that the Québec government has already specifically supported, mention should be made, in particular, of genomics, the nanotechnologies, and optics and photonics, because they have considerable potential to generate economic spinoff in a wide range of fields. Their applications can be marketed both in so-called conventional sectors such as forestry, textiles, mining and pulp and paper and in high-technology fields such as aeronautics, pharmaceuticals, ICTs, and so on. Furthermore, the development of other technologies that have considerable potential for economic, social and environmental spinoff must be supported, in particular in the energy and environmental sectors.

The Québec government is supporting these strategic technologies against a backdrop of keen international competition. Such competition demands that we strengthen the foundation of scientific research and implement an efficient innovative system that encourages participation by businesses big and small, along with research centres and university establishments.

Additional public investment on the order of $104 million has been allocated over the next three years to support the activities of agencies such as the National Optics Institute (INO), Génome Québec and Nano Québec. Investments earmarked for the development of technologies of strategic importance to Québec will total $151 million between 2007-2008 and 2009-2010, bearing in mind that provision has already been made for $47 million in the government's financial framework, including $33 million announced in the *2006-2007 Budget Speech*.

Examples of spinoff from investments in strategic technologies

Achievements of the National Optics Institute (INO)

Over the past 16 years, the National Optics Institute has submitted over 160 patent applications, of which 76 have been granted. It has also granted 30 intellectual property licences, mainly to Québec SMEs, under technology transfer agreements. The INO has instigated 20 high-technology spinoff firms that are still in operation.

Each year, the INO's scientific team executes, on average, over 200 R&D contracts, more than half of which lead to the design of a marketable product or technology. Most of these contracts include intellectual property transfers that generated $1.7 million in royalties between 2001 and 2006. In 2005-2006 alone, research and development contracts generated $14.8 million in own-source revenues from sales of products and services and in exchange for technology transfers. Between 2001 and 2006, INO researchers produced nearly 800 publications and papers.

An INO spinoff company

Established in 2002, Technologies Obzerv Inc. is a National Optics Institute spinoff company set up in the wake of extensive research conducted since 1993 in the laboratories of INO and Defence R&D Canada (DRDC) – Valcartier. Located in Québec City, it is developing and manufacturing high-performance night vision systems optimized for short–, medium- and long-range surveillance. Applications stemming from these new technologies are linked primarily to surveillance and rescue operations. The company now has 10 salaried employees and annual sales of between $500 000 and $1 million. The worldwide market on which the company operates is estimated at $2.5 billion, including $1.5 billion in the United States alone.

Génome Québec

Génome Québec was established in June 2000 on the initiative of the Québec government. It supports genomic R&D in the human health, forestry, agriculture, fisheries, environmental and bioinformatics sectors. The $127 million in funding provided by the Québec government for the period 2000-2008 has enabled Génome Québec to fund crucial research projects and to establish major research platforms in genomics and proteomics. The McGill University and Genome Québec Innovation Centre has become one of the world's top five genomics centres.

Québec government investment has had a significant leverage effect. With the participation of Genome Canada and other partners investment since 2000 has totalled $340 million. These investments have launched genomics in Québec, allowing for the establishment of infrastructure of international calibre and the realization of major projects, as well as spurring unprecedented acceleration of research. This research field is expanding rapidly and initial spinoff is convincing: 459 researchers are now employed, 256 scientific publications have been produced, 726 papers have been given, and 28 inventions and patents have been divulged.

Québec researchers are participating in mapping of the human genome

Through $15 million in funding from Génome Québec, Québec researchers have participated in an international research consortium devoted to drawing up an initial complete catalogue of human genetic variations. The HapMap project assembled over 200 researchers from 65 different establishments. The McGill University and Genome Québec Innovation Centre carried out 10% of the genetic mapping.

The publication of the human genome map will considerably accelerate research on the genes responsible for common diseases such as asthma, diabetes and cancer. Short-term breakthroughs in the treatment of these diseases are anticipated. Some of the research findings were published in October 2005 in the leading scientific review *Nature*.

A broader presence in the international arena

To conduct research of international calibre, researchers must join international partnerships, through networking between Québec researchers and their colleagues in other countries. However, in order to take full advantage of spinoff from such collaboration, we must also provide for funding of major international research projects. In this perspective, additional funds will be allocated to allow Québec researchers to play a broader role in international R&D networks and thus enable the Québec economy to benefit from the results of research projects of international calibre.

Some $15 million in additional funding over three years will be earmarked for participation by Québec researchers in international research networks and, above all, in international research projects that are of strategic importance to Québec. This approach represents a marked improvement over the current situation, since this investment will be added to the annual allocation of $800 000 already earmarked for this purpose.

Some $15 million in additional funding over three years will be earmarked to foster participation by Québec researchers in strategic international research networks and projects

Concretely, this measure could support nearly 20 crucial projects, some of them, for example, under the 7th Framework Programme established by the European Commission. The total value of contributions from all sources, mainly foreign contributors, could reach $135 million. This measure will allow Québec researchers to integrate 20 outstanding international networks. Moreover, by assembling the world's top researchers, this measure will contribute to the launching of 50-odd international projects. Student-researchers will play a leading role under this measure as one hundred of them may take advantage of international training sessions and 390 will be able to conduct research in conjunction with major research projects or international networks. All told, nearly 500 Québec and foreign students will be able to benefit from this measure. The funds allocated could also support initiatives that foster exchanges between internationally renowned researchers who, in a multidisciplinary setting, are tackling complex intellectual questions, e.g. the Canadian Institute for Advanced Research (CIAR).

As for major international initiatives that rely on multilateral collaboration, Québec's participation in certain activities under the European Commission's 7th Framework Programme (2007-2013), worth 50 billion euros, is essential, given the scope of its networks and the consortia that will be established. The countries to be targeted as a matter of priority are France, Germany and the United Kingdom in Europe, the United States, Mexico and, insofar as is possible, Brazil in the Americas, and China, India and Japan in Asia.

SUMMARY OF PUBLIC RESEARCH SUPPORT MEASURES

ADDITIONAL INVESTMENTS (MILLIONS OF DOLLARS)

	TOTAL OVER 3 YEARS
Strengthening of research infrastructure	
Funding for new research infrastructure	28.4[1]
Support for the operating and maintenance costs of research infrastructure in the regions	12
Increased funding for grant funds	
Increased support for merit scholarships	32.0
Consolidation of research groups in fields that are deemed to be a priority for Québec	27.0
Bolstering of research expertise in the regions	
Enhancement of assistance to attract new lecturer-researchers in the regions	3.0
Direct support for strategic technologies	
Extensive support for the development of strategic technologies	104.0
A broader presence in the international arena	
Increased support for international networking by Québec researchers and for international research project	15.0
TOTAL BUDGETED COST OF THE MEASURES	**221.4**
INVESTMENTS IN RESEARCH INFRASTRUCTURE	**420.0**

[1] Debt service stemming from $420 million in investments over three years in respect of research infrastructure.

Moreover, it should be noted that the government has announced the granting of $2 million in financial assistance to support research in small universities. Mention should also be made of the $240-million increase over three years in general funding for the universities announced in August 2006 by the Minister of Education, Recreation and Sports, which will also bolster support for public research through its indirect effect on the salaries of lecturer-researchers. Indeed, Statistics Canada estimates that, depending on the scientific field and the size of the university, between 25% and 40% of the payroll intended for lecturers funds research.

CHAPTER 3

Better Support Industrial Research and Innovation in Businesses

Better Support Industrial Research and Innovation in Businesses

Because the societies that are the most active in industrial research are the most prosperous, the Québec government has set the objective of raising industrial R&D to 2% of GDP, which means annual growth in R&D of 7.6%.

A limited number of big companies conduct industrial research in Québec. Of the 6 775 firms active in R&D, the top 50 companies account for 61% of research, while each of the top 200 firms invests over $2 million annually. Moreover, most industrial R&D is concentrated in three main sectors, i.e. aerospace, pharmaceuticals, and the information and communications technologies. While the number of companies engaged in R&D may seem impressive, it represents barely 3% of the businesses inventoried. In addition, investment in R&D by such firms corresponds, on average, to only 48% of the amounts invested by Ontario companies active in R&D.

Barely 3% of Québec firms are active in R&D and their R&D expenditures represent, on average, only 48% of those of Ontario businesses companies

Government support for industrial R&D focuses primarily on the granting of tax credits. Québec ranks among the economies that rely most extensively on indirect measures to support such activities. In recent years, a number of Western nations and Canadian provinces have adjusted the array of tax credits they offer to enhance the credits' incentive value and competitiveness in respect of private R&D investment. Against this backdrop, Québec must also focus on the competitiveness of its support and do what is necessary to encourage more companies to invest in R&D.

It is big firms, often multinationals, that engage in most R&D spending. Increasingly, industrial R&D is tending to relocate in emerging markets. Québec must maintain its attractiveness without neglecting to encourage established businesses to engage more actively in R&D.

Moreover, for many companies, enhanced competitiveness depends to a greater extent on the acquisition of new technologies, the recruitment of additional strategic employees, and better mastery of innovation from the standpoint of products and processes than on more extensive R&D. Given the importance for businesses of bolstering their productivity and competitiveness, additional measures are necessary to better support innovation in enterprises: innovation with regard to products, processes and marketing, and organizational innovation.

Under the circumstances, targeted government support is essential in order to:

- better support firms already active in R&D and broaden the pool of enterprises engaged in R&D;
- better support innovation and technological adaptation projects.

Broader support for businesses active in R&D and expansion of the pool of enterprises engaged in R&D

Broader access to enhanced R&D tax credit rates through an increase in the assets threshold

The calculation of tax credits applicable to salaries paid in respect of R&D takes into account the company's assets. Beyond $50 million in assets, the tax credit is calculated at the 17.5% rate, but at the 37.5% rate when assets are below $25 million. Companies whose assets fall between the two limits calculate the tax credit by reducing the maximum rate in a linear manner.

To encourage the R&D conducted by medium-sized firms, it would be advisable to raise the level of assets that entitle a company to the enhanced tax credit rate. This enhancement will spur the pace of investment in industrial R&D, which is necessary to attain the government's objective of establishing at 66% by 2010 the share of businesses in overall R&D spending.

It is in this perspective that the Québec government is raising by $25 million the level of assets that entitle companies to the enhanced tax credit rate (the ceiling is being raised from $25 million to $50 million). Moreover, the gradual, linear reduction of the enhanced tax credit rate (37.5%) will now benefit businesses whose assets total between $50 million and $75 million, instead of between $25 million and $50 million as is now the case.

This enhancement will allow businesses to step up their R&D in Québec at a time when the relocation of industrial research is becoming a concern shared by many OECD economies. The measure will benefit, in particular, companies operating in the life sciences, aeronautics and engineering sectors. Over 300 firms will benefit from this measure, which will engender an overall tax expenditure estimated at nearly $75 million over the next three fiscal years.

It should be noted that modifications were announced in the *2006-2007 Budget Speech* to tax measures that support research projects in partnership. The cost of these measures is estimated at $10 million over three years.

Broader access to the tax credits for design through an increase in the assets threshold

The tax credit for design is also a key lever for fostering innovation and R&D in businesses. The rate of the tax credit stands at 15% but may be increased to 30% in the case of small and medium-sized enterprises. However, the 30% rate is reduced in a linear manner in respect of businesses with assets between $25 million and $50 million, according to the same principles that apply to the R&D tax credit. The assets thresholds have not been modified since they were introduced. Concomitantly, and in order to foster R&D, the thresholds will also be raised by $25 million, which should benefit more than 50 companies. This enhancement will lead to a tax expense estimated at $5 million over the next three fiscal years.

Enhancement of the workplace scholarship program, especially in the regions

Two-thirds of researchers pursue careers in business. It would, therefore, be advisable to ensure that student-researchers are aware of industry practices at the outset of their training. Since the *2006-2007 Budget Speech*, master's and doctoral students have had access to scholarships ($21 000 at the master's level and $27 000 at the doctoral level) to engage in research internships in the workplace, mainly in businesses. The scholarships are awarded above all to projects carried out in the natural sciences and engineering.

In addition to the $6 million announced in the *2006-2007 Budget Speech*, $5 million will be added over three years, during two of which enhanced financial support will be offered specifically when students carry out their projects in the regions. The new investment will allow nearly 200 additional students to take advantage of these scholarships. Through this increased funding, the government will help to improve the career

prospects in businesses of master's and doctoral students, facilitate the transition between the universities and businesses, foster the broadening of skills in R&D and innovation in several hundred Québec firms, mainly SMEs, and promote the establishment of a partnership culture between universities and businesses. In addition, companies can benefit from the expertise of the lecturer-researcher responsible for the project to develop new products and processes.

Support for the implementation and broadening of private research in Québec

More than ever, investment in the implementation and retention of research centres in private companies is eagerly sought. The OECD countries are constantly enhancing incentives to investors, especially multinationals that engage intensively in R&D. The relocation of research is a new reality and a key factor in public policy aimed at promoting industrial R&D. Québec must maintain its attractiveness by proposing to investors active in R&D competitive conditions that allow them to locate their research centres here and to invest more heavily in R&D.

In the action plan accompanying *Québec's International Policy*, the Québec government confirmed the importance of seeking foreign investors likely to set up research centres or grant international research mandates to their Québec subsidiaries.

In addition to incentive measures related to R&D tax credits and direct funding allocated to public R&D and skills training, the Québec government will establish a new mechanism aimed at:

- attracting to Québec greater numbers of businesses active in R&D;
- helping the subsidiary of a multinational operating in Québec to obtain worldwide research mandates from the head office; and
- retaining in Québec companies already operating here and active in R&D.

Current support measures for businesses active in R&D centre essentially on tax credits that take into account only salaries and exclude R&D equipment and infrastructure.

For this reason, the Québec government will enhance measures to attract and retain private investments in R&D by adopting a new financial support program open to businesses, in particular when Québec is competing for the implementation of a project.

The program will have a $35-million budget over the next three years, which could generate, through its leverage effect, total private investments in the region of $350 million.

This measure will maximize the benefits stemming from the availability of sufficient numbers of competent researchers, support aimed at excellence in public R&D, industrial R&D tax incentives, and the bolstering of the business-university partnership.

Enhanced support for innovation and technological adaptation projects

The enhancement of the competitive strength of businesses does not depend solely on the intensification of R&D. The future of many firms hinges on their ability to become innovative. To this end, they must pinpoint, evaluate and acquire in a timely manner new technologies and adopt new ways of doing business available to improve their productivity and efficiently market new products and processes.

Against a backdrop of globalization, to produce at the lowest cost is necessary but insufficient to enable companies to gain an edge over their competitors. Businesses must be able to develop distinctive products that meet international standards. They must also be able to follow the accelerated pace of product life cycles, which makes customers more demanding and less loyal.

Strengthening innovation initiatives in businesses in collaboration with Cegep technology transfer centres (CCTT)

While support through outside expertise is suited to the specific traits of small businesses and their technological needs, it is vital to ensure the success of innovation initiatives in businesses.

The 31 CCTTs make up a sectoral expertise network that is accessible in the regions. They are aware of the technological problems encountered by the sectors that they serve and have developed know-how in the realm of knowledge transfers, which makes them ideal partners for firms wishing to innovate and acquire new technologies.

To increase the number of innovative enterprises, the government will offer financial support to companies that engage in innovation or technological adaptation projects in collaboration with a CCTT. A budget of $10 million over three years will be devoted to this measure and should allow for the realization of over 300 new projects.

This new measure will enhance the productivity and competitiveness of SMEs through the acceleration of the introduction and adaptation of new technologies and by strengthening the ability to innovate of SMEs.

A budget allocation of $10 million over three years to facilitate the realization of over 300 new innovation or technological adaptation projects in collaboration with the CCTTs

Support for innovation in businesses through design

Québec has nearly 3 600 industrial designers, equivalent to 58% of the Canadian total, and Montréal has been designated a UNESCO Design City, which confers on it major international recognition. All the same, Québec firms are lagging behind in the integration of design, contrary to the situation in several Scandinavian and European countries, Japan and the United States. However, design is an essential component in the innovation process and is often the factor that makes the difference between the commercial success and failure of a product.

Design is innovation through creativity.

- Invention occurs in R&D laboratories.
- Innovation is the acceptance by users of changes that improve their living conditions.
- Design is the force that transforms an invention into an innovation (Danish Design Centre).

The most recent writing on innovation in OECD countries (Oslo Manual, 2005) deems design to be an integral part of marketing innovations.[16] Such innovations are apparent "in the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing." Design is also a strategic component of product innovation (goods and services).

[16] OECD, *The Measurement of Scientific and Technological Activities: Guidelines for Collecting and Interpreting Innovation Data, Oslo Manual,* 3rd edition, 2005, page 11.

Since 1994, the Québec government has supported the integration of industrial and fashion design into Québec businesses, especially through a refundable tax credit for design that costs the government roughly $15 million a year (2006 estimate). The tax credit, which offers an enhanced 30% rate to SMEs and a 15% rate to big companies, was broadened in the *2005-2006 Budget Speech* to facilitate the contribution made by all designers working for a company, regardless of the industrial sector, and pattern-makers in the garment and textile sectors. All told, this tax credit benefits nearly 1 700 designers and patternmakers and nearly 770 businesses. Moreover, the government also supports design promotion projects.

Québec has enjoyed a number of recent successes in the realm of design:

- some 10 million Plasticase plastic cases have been sold over the past two decades;
- Pélican International exports 85% of its output of boats and toys;
- Bombardier Recreational Products has gained 12 points of market share through the design of the REV chassis in its new snowmobiles.

To pursue the efforts undertaken and go even further, an additional investment of $6 million over the next three years will be allocated to support initiatives aimed at broadening reliance on design in businesses in all industrial sectors. This direct support will be added to the annual budget allocation of $600 000 now available in respect of design activities.

Enhancement of the measure to facilitate the hiring of staff assigned to research and innovation in businesses

To foster innovation, businesses, especially SMEs, must have recourse to researchers of international calibre.

In the *2006-2007 Budget Speech*, the government announced a measure with a $9-million budget intended to help businesses, especially SMEs, create or consolidate the research and innovation function through the hiring of new scientific and technological staff. The assistance, in the form of payroll support for two years paid to the company, enables businesses to hire new staff and thus enhance their ability to innovate and their competitiveness.

In order to broaden the research capabilities of businesses, a new section has been added to the measure. Some $3 million in additional funding is earmarked for the hiring of researchers to conduct specific research projects. The additional funding will make it possible to mobilize 100 researchers to carry out innovation projects in SMEs. All told, roughly 400 individuals with scientific and technological skills will be integrated into businesses in the coming years.

Support for the effective marketing of innovations

Innovative Québec firms often underestimate the cost of and problems stemming from the penetration of new markets. Having in many instances exceeded their R&D, design and manufacturing budgets, they frequently find themselves short of resources when the time comes to market their innovations.

The Québec government is already supporting the establishment of technology showcases. Through them, an enterprise that has developed a new product can install the first working model on a partner's premises, where the partner agrees to use it and act as a demonstrator to prove the product's efficacy under actual use. In its current form, the financial assistance covers only innovations stemming from the use of new scientific knowledge. The application of this criterion means that over half of the applications are rejected even if the product developed centres on a significant, innovative adaptation of scientific knowledge. Assistance eligibility criteria governing projects will be broadened. Products derived from the adaptation of innovative technologies in respect of which, until now, financial assistance was denied, are now eligible for funding, along with innovations stemming from new scientific knowledge.

Moreover, several enterprises are hesitating to become partners in a technology showcase project, in particular because they fear that the innovation used will not produce the anticipated results. Additional proof of the efficacy of the new product or process could facilitate partnerships between the producers and users of innovations. From now on, the government will support enterprises that wish to have carried out preliminary technical validation of their innovation by means of outside, independent expertise.

An additional budget allocation of $9 million over three years is being provided to ensure the development of products stemming from the adaptation of innovative technologies

The revised support for technology showcases will have an additional budget of $9 million over three years and will allow for 40 or so new projects, i.e. approximately 23 technical validation projects and 17 showcases for products derived from the adaptation of innovative technologies. These projects will be added to the 15 technology showcases already supported through the $2.8 million allocated each year by the ministère du Développement économique, de l'Innovation et de l'Exportation.

Example of a project that has benefited from a technology showcase

Paco Corporation of Canada (Paco) is a leader in the design and manufacture of electromechanical equipment for cutting-edge industrial and scenic applications. Through the support offered to technology showcases, Paco, in partnership with the Ville de Saguenay, tested a revolutionary concept for a multipurpose auditorium.

Located in the Centre culturel du Mont-Jacob in Jonquière, the Gala venue features individual rows of independent bleacher spiralifts and a seat-pivoting system that relies on a technology developed by the company. By means of the spiralift, the auditorium can be customized for each type of event, thus enhancing its frequency of use and profitability. The Gala venue offers obvious, enduring advantages that lead to an estimated 50% reduction in costs, compared with existing auditoriums and multipurpose customized and top-of-the-line venues.

Two years after the project's conclusion, the company recorded roughly $9 million in sales and created 45 jobs.

Over six years, the support offered to technology showcases has led to nearly 180 showcase projects that have generated sales on the order of $254 million and the creation of approximately 1 000 jobs.

SUMMARY OF SUPPORT MEASURES FOR INDUSTRIAL RESEARCH AND INNOVATION IN BUSINESSES

ADDITIONAL INVESTMENTS (MILLIONS OF DOLLARS)

	TOTAL OVER 3 YEARS
Increased support for businesses already active in R&D and broadening of the pool of businesses active in R&D	
Modification of the level of assets required to obtain the enhanced tax credit rates:	
• R&D	74.8
• design	5.2
Workplace scholarship program	5.0
Support for the implementation and expansion of private research in Québec	35.0
Enhanced support for business projects	
Intensification of innovation in businesses in collaboration with the CCTTs	10.0
Support for innovation in businesses through design	6.0
Assistance to hire staff assigned in businesses to research and innovation	3.0
Assistance to market innovations	9.0
TOTAL BUDGETED COST OF THE MEASURES	**68.0**
COST OF TAX EXPENDITURES	**80.0**

CHAPTER 4

Round Out and Strengthen Mechanisms to Develop and Transfer Research Findings

Round Out and Strengthen Mechanisms to Develop and Transfer Research Findings

More vigorous marketing of research findings and new technologies is a common denominator of the new research and innovation policies implemented by knowledge-based economies. Québec is participating fully in this change and doing what is necessary to foster better interaction between university research and the needs expressed by the market and society as a whole.

The government is pursuing a twofold objective.

- Through better development of public research, it is seeking to ensure that new knowledge and cutting-edge technologies find buyers on the market, in particular by means of the establishment of spinoff companies, the acquisition of patents on inventions, and the issuing of licences.
- Through the enhancement of the technology transfer process, it is seeking to broaden and accelerate the acquisition and mastery of new technologies by firms in all industrial sectors and by organizations that use new knowledge.

Several measures proposed in the first two policy directions are concrete means of broadening the development of knowledge and its transfer to enterprises and organizations. The hiring of recent university graduates, the execution on behalf of a business of a research contract or a technological adaptation project by university researchers or a CCTT, assistance in marketing innovations or participation by industrial researchers in a research group are good examples. However, to enhance economic spinoff from research, the government must also ensure the presence of interveners who are able to better support development and transfers. The third policy direction makes provision for measures aimed specifically at support for development and transfer mechanisms.

Broader support for development

The management of intellectual property underpins all development of research findings. The protection and pooling of intellectual property is, however, a crucial development factor in knowledge-based economies, especially at a time when growing international trade is increasingly significantly the number of stakeholders.

In more concrete terms, the management of intellectual property is a major factor in the sharing of spinoff from research between universities and industry, at a time when collaborative research is becoming essential to innovation.

The growing importance of economies in which access to the results of research is less restrictive for industry from the standpoint of the management of intellectual property is problematical.

In 2002, the Québec government implemented an action plan to harmonize university policies governing intellectual property. The plan includes policy directions and guidelines aimed at facilitating the convergence of practices toward institutional ownership of intellectual property rights. In addition, it seeks to harmonize policies and practices in this respect in universities and affiliated establishments. However, we must do more.

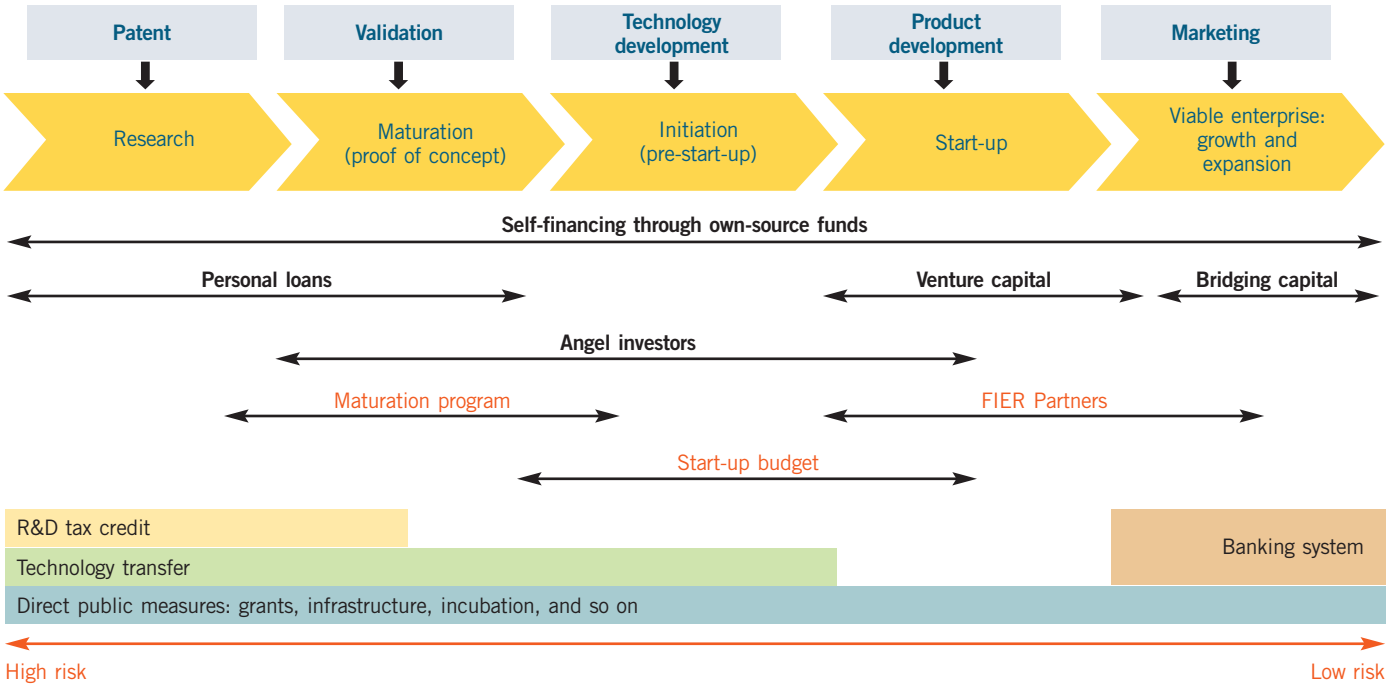
Additional efforts will be made to further heighten awareness among universities, researchers, businesses and the other interveners concerned of the importance of proper management of intellectual property, best practices in this realm, the urgent need to simplify procedures pertaining to intellectual property, the need to optimize spinoff from inventions derived from university research, and the benefits of collaborative research.

Bearing in mind the diversity of parameters and interveners involved in the management of intellectual property, the Québec government intends to strengthen cooperation and collaboration between interveners and foster dialogue between universities and businesses, which is essential to facilitate innovation. To this end, the ministère du Développement économique, de l'Innovation et de l'Exportation will establish a permanent university-business issue table on intellectual property.

Québec businesses must have access to new knowledge and more readily, quickly develop the results of research. At the same time, university researchers and the universities must be able to take full advantage of their research findings.

The diagram below illustrates the key stages in the development chain and the public and private support measures available to facilitate the conversion of new knowledge into inventions and innovation.

STAGES IN THE DEVELOPMENT CHAIN AND FUNDING SOURCES



Without development, research findings are not used and the funds invested to obtain them are likely to remain unproductive for the economy and society. In the process of developing R&D, the riskiest stages and the hardest ones to evaluate are the initial ones, in particular maturation (proof of concept) and initiation (pre-start-up). Public support is crucial at these stages since the level of risk is very high and commercial prospects are still too uncertain to attract private investors. The diagram above illustrates the weakness of the funding available, mainly during the maturation and initiation phases.

It is incumbent upon the government to ensure that research findings with high potential successfully complete the stages in the development chain.

To mitigate the problems that arise during the first stages of development, this strategy is proposing measures specifically geared to the maturation of technologies and the initiation and start-up of businesses. Support for certain agencies that assist promoters during these stages in the development chain round out these measures.

Specific measures provide funding for the maturation of technologies and technology enterprise start-ups

Renewed support for public research development corporations and support to develop projects from Université du Québec campuses in the regions

Over the past five years, university research development corporations such as MSBi, Sovar, Univalor and Valeo have made possible the establishment of professional teams that support researchers in the evaluation of the commercial potential of their research findings. The outcome has been sufficiently convincing for all of the stakeholders concerned to agree on the need to maintain such support mechanisms in the array of development and transfer measures available in Québec.

Development corporations and their sponsors

MSBi: McGill University, Université de Sherbrooke, Bishop's University, McGill University Health Centre, Centre hospitalier universitaire de Sherbrooke, Sir Mortimer B. Davis Jewish General Hospital, and Douglas Hospital

Sovar: Université Laval, Centre hospitalier universitaire de Québec, and Centre hospitalier Robert-Giffard

Univalor: Université de Montréal, École Polytechnique de Montréal, HEC Montréal, Centre hospitalier universitaire Sainte-Justine, Institut de recherches cliniques de Montréal, Centre hospitalier de l'Université de Montréal, Hôpital Maisonneuve-Rosemont, Hôpital du Sacré-Cœur de Montréal, Montréal Heart Institute, and Institut universitaire de gériatrie de Montréal

Valeo: Université du Québec à Montréal, Université du Québec à Rimouski, Concordia University and École de technologie supérieure

The key role that development corporations play is to pinpoint among research findings the technologies that can lead to commercial applications. Moreover, the corporations support the development of these discoveries by adding value to intellectual property, which allows for its transfer to a new or existing enterprise.

For this reason, in response to the Fortier Report, the government is confirming its continued support for the development of university research findings through $16 million in funding over three years. Government funding will cover the joint financing of operations and solicitation, analysis and study initiatives devoted to the technological positioning by the development corporations of university research. This support will also finance technological maturation activities, thus increasing the number of patents and inventions likely to progress through the development chain.

Total funding of $18 million over three years to support development corporations and enhance the development of research findings produced on Université du Québec campuses in the regions

Furthermore, $2 million will be earmarked for bolstering the ability of Université du Québec campuses in the regions to develop and transfer research findings and offer them financial assistance when they resort to the services of development corporations or agencies to support their researchers in the development of their research findings.

Since their inception in 1999, the development corporations have invested $32.8 million in the technologies in their portfolio and their partners have contributed $171.4 million.

The corporations employ 45 people, including 36 development professionals.

Tangible spinoff:

- 32 spinoff companies;
- 32 licences granted;
- nearly 450 jobs created;
- 306 patent applications submitted;
- 72 patents held.

Increased financial support for technological maturation and technology company start-ups

In Québec, as elsewhere, the private sector does not invest in the technological maturation of new research findings recently produced by public research laboratories. At this stage, technological risks and commercial uncertainty must be better delineated through additional research and market surveys.

Moreover, the initiation phase for research spinoff companies in Québec does not receive as much support as elsewhere, notably in the United States, from angel investors who can assume the high risks inherent in this segment of the development chain. Such investors provide less than 10% of the total volume of venture capital available in Québec. It should be noted that some of these investors sustained considerable losses when the technology bubble burst in 2000 and that they have, since then, been less inclined to invest in high-risk projects.

To remedy the weakness of the initiation link, the strategy is implementing financial support covering this stage to help projects that have completed the technological maturation stage and display high innovation potential.

This new development initiative, in keeping with the maturation measure announced in the *2006-2007 Budget Speech*, is being implemented in a simple, pragmatic manner, until such time as it is more clearly defined for more wide-scale application, as the case may be. Consequently, the ministère du Développement économique, de l'Innovation et de l'Exportation will administer the program and rely on an expert panel to select the most promising projects. If need be, funds will be made available to the panel when specific studies are required to analyse the projects. This procedure will accelerate access to additional funding.

All told, to further promote the development of public research findings, the Québec government is bolstering public support for the technological maturation and initiation phases in technology enterprises. An additional investment of $18 million over the next three years will be allocated and added to the $15 million announced in the *2006-2007 Budget Speech*. The enhanced measure maintains recourse to experts to select the best projects.

This investment will allow for the completion of the technological maturation of roughly 25 promising technologies stemming from public research. It will also support the creation of 30 or so proposed businesses.

An additional investment of $18 million over the next three years to better support the technological maturation and initiation stages in technology enterprises

In the summer of 2006, a new section in the FIER Partners program with a $60-million budget was introduced to invest in the establishment of sectoral funds devoted to the start-up of new technology firms, thus completing this series of measures.

This new section has already made possible the creation of the CTI Life Sciences Fund, a specialized fund for enterprises in the biotechnology, biopharmaceutical and medical equipment sectors. The fund has at its disposal capital totalling $100 million, i.e. $75 million from the Caisse de dépôt et placement du Québec (CDPQ), the Fonds de solidarité du Québec, the Régime de rentes du Québec, the Mouvement Desjardins and fund partners; and $25 million from FIER Partners.

Another fund, the GO Capital Fund, whose capitalization stands at $100 million, is dedicated to business start-ups in the technology sector.

Technology incubators

The Québec government will continue to support from existing budget allocations a number of technology incubators, including:

- Ag Bio Centre, in the Chaudière-Appalaches region;
- Biomed Développement, in the Estrie region;
- the Centre de développement d'entreprises technologiques (CDET), in the Outaouais region;
- the Centre incubateur d'entreprises de la Montérégie (CIDEM);
- the Centre d'entreprises et d'innovation de Montréal (CEIM);
- the Centre d'innovation en transformation alimentaire de Lanaudière;
- the Centre québécois d'innovation en biotechnologies (CQIB), in Laval;
- the Centre de l'entrepreneurship technologique (CENTECH, associated with the ÉTS);
- Corporation Inno Centre, in Montréal;
- Incubateur bioalimentaire de La Pocatière;
- Incubateur virtuel de la Mauricie (Technopole Mauricie).

The MDEIE's initiatives in respect of technological incubation will continue in the coming months in collaboration with the government departments concerned. The outcome of these initiatives will allow the government to redefine its position and better target the appropriate public measures in this realm.

Broader support for transfer activities

In order for the considerable investments made in public research to contribute fully to Québec's prosperity, businesses must have ready access to the expertise offered by universities and research centres to carry out their research and innovation projects. Indeed, the development of research must be bidirectional and flow from the universities to the market, for example, through the establishment of businesses or the granting of licences, but also in the other direction, in light of the applied research needs of businesses.

How Ouranos is enabling us to prepare for the impact of climate change

Ouranos is a climate change research consortium established by public, institutional and university partners that focuses on the impact of climate change and seeks to propose adaptation scenarios in response to it.

For example, thawing permafrost, a direct consequence of global warming, is threatening several coastal villages in Nunavik. A research project now under way will take stock of the infrastructure at risk, such as roads and buildings, and establish climatic thresholds beyond which soils and foundations become unstable. The outcome of the project will enhance impact prediction and define the remedial measures necessary.

Another project is intended to describe Montrealers' exposure to intense heat. The project will pinpoint the areas or neighbourhoods at risk to steer public intervention in urban areas during heatwaves (mutual aid, education, housing improvement, land use planning) and, possibly, reduce the adverse effects of heat on health (death and exacerbation of chronic diseases).

Support for organizations to bolster industrial research, liaison, and transfers

Research partnerships are a valuable lever for businesses. They enable enterprises to share the costs and risks inherent in research projects, facilitate the transfer to industry of the findings of public research, make accessible the expertise of university researchers, and foster the establishment of strategic alliances. New types of industrial research groups have emerged recently in Québec. They now include not only businesses but also universities and research centres. The contribution made by universities and research centres to these industrial research groups has enabled the latter to take advantage of cutting-edge scientific knowledge.

The Québec government has, in recent years, supported this new type of university-business partnership by granting financial assistance to implement a novel form of transfer mechanism. The Consortium for Research and Innovation in Aerospace in Québec (CRIAQ), Partnerships for Research on Microelectronics, Photonics and Telecommunications (PROMPT-Québec), and the Institute for Research/Creation in Media Arts and Technologies (HEXAGRAM) are examples. Under its aeronautical industry strategy, the Québec government announced $8 million in additional funding for CRIAQ.

The Québec government also supports the activities of the Society for Arts and Technology (SAT), which makes available to artists, scientists, designers and technologists the Art&D research and creation laboratory, which integrates the very high-speed network and interoperability between platforms.

Some achievements of research groups

CRIAQ – Initiatives have assembled university researchers and specialists from businesses interested in carrying out a bonded composite wing box project. Without CRIAQ's involvement, the $1.87-million investment would otherwise have been made in the United States.

HEXAGRAM – HEXAGRAM's efforts to draw closer together research in the media arts and technologies have spurred two projects now in the marketing phase: Darwin Dimensions, an artistic agency that distributes virtual human characters, and the HELP Project, which combines the advantages of digital image recomposition software and special effects techniques developed in the film industry.

PROMPT – The university-industry partnerships engendered by PROMPT in the realm of the information and communications technologies include the Software Defined Radio (SDR) modem or reconfigurable radio. This technology, initially destined for the military market, appears to have solid potential in the commercial telephony sector.

SAT – The organization's initiatives have led, among other things, to the development of three innovative immersive projection devices (sound and 360° video), i.e. the Panoscope, to which *Wired* magazine has given an award, the Cyclorama and the Sat-O-sphère, products that are in the technological maturation phase and are arousing the interest of the aerospace industry (CAE) and telecommunications teams (Ericsson and Nortel).

The Québec government will continue to support through taxation, as it has done for several years, precompetitive research consortia that have obtained validation certificates that conduct in-house industrial research.

Precompetitive research consortia that have obtained validation certificates

ACER: Centre de recherche, de développement et de transfert technologique acéricole, Saint-Norbert d'Arthabaska

CEROM: Centre de recherche sur les grains, Saint-Bruno-de-Montarville

CONSOREM: Consortium de recherche en exploration minérale, Saguenay

COREM: Consortium de recherche minérale, Québec

CRFBC: Centre de recherche sur la forêt boréale commerciale, Saguenay

CTGN: Centre des technologies du gaz naturel, Boucherville

FERIC: Forest Engineering Research Institute of Canada, Pointe-Claire

FORINTEK: Canada's Wood Products Research Institute, Québec

IIT-R: International Institute of Telecommunications-Research, Montréal

IRDA: Institut de recherche et de développement en agroenvironnement, Québec

PAPRICAN: Pulp and Paper Research Institute of Canada, Pointe-Claire

One of the objectives pursued by the groups is the realization of applied research projects stemming from the needs of companies in a given industrial sector that rely on universities and research centres. According to the OECD, government support for such research groups has become essential in an increasingly globalized economy. The research groups afford businesses special access to public research infrastructure and new technologies that create a competitive edge.

Five agencies assembled in a liaison and transfer centre (CLT), CRIM, CEFRIO, CIRANO, the CQVB and the CQRDA, established between 1985 and 1993, have a mandate to draw closer together university researchers and businesses, mainly SMEs, and to foster, first and foremost, research on topics of interest to businesses, then transfer the results to the businesses.

Fields of intervention of the CLTs

Information technologies: Centre de recherche informatique de Montréal (CRIM)

Biotechnology: Centre québécois de valorisation des biotechnologies (CQVB)

Integration of the information technologies: Centre francophone d'informatisation des organisations (CEFRIO)

Organizational analysis: Centre interuniversitaire de recherche en analyse des organisations (CIRANO)

Aluminum production and processing: Centre québécois de recherche et de développement de l'aluminium (CQRDA)

These agencies contribute to the dissemination among and transfer to businesses of knowledge produced in the universities. Between 2005 and 2007, the government is allocating nearly $12 million a year to funding them and intends to continue to support their activities.

As is true of the research conducted in the natural sciences and engineering, research in the social sciences and humanities engenders new practices, approaches or products to solve problems in an array of fields. The use of research findings leads to savings because of its often preventive nature and to substantial productivity gains, for example in fields such as the environment (sustainable development), business management (new management approaches), worker qualifications, health and social services (suicide prevention), and education (measures to combat dropping out of school).

In order to draw closer together university researchers and the organizations and businesses that use research findings in the social sciences and humanities, the ministère du Développement économique, de l'Innovation et de l'Exportation will have at its disposal additional funds to financially support:

- activities and projects that foster the development and transfer of research findings in the social sciences and humanities, e.g. experimental projects, the production and dissemination of tools and new practices; and
- the operations of recognized development and transfer agencies, including the Centre de liaison sur l'intervention et la prévention psychosociale (CLIPP) and the Centre de transfert pour la réussite éducative du Québec (CTREQ).

The development of new activities and the pursuit of the initiatives of these agencies will allow users to take advantage of existing research in addition to pursuing and emphasizing the integration of social innovations in businesses and organizations.

Existing sectoral industrial research groups have shown that this is a winning formula to sustain on a solid footing ongoing relations between universities and businesses. The government will thus support the establishment of such sectoral groups. It is also important to support existing CLTs and agencies active in the transfer of research findings in the social sciences and humanities to help them better respond to the growing needs of their clienteles and partners.

Under the circumstances, the strategy makes provision over the next three years for an additional investment of $46 million to help existing sectoral industrial research groups, support the new initiatives of partners in sectors such as furniture, textiles and plastics processes, and financially support social sciences and humanities liaison and transfer agencies.

A $46-million investment to assist organizations to support industrial research, liaison and transfers

The Centre de recherche industrielle du Québec

Established in 1969, the Centre de recherche industrielle du Québec (CRIQ) plays a leading role among Québec SMEs. Its mission is to foster Québec's economic development through support to enable businesses to innovate by making available to them advanced expertise in the realms of manufacturing technologies, industrial and technological information, and standardization. In light of the policy directions in this strategy, CRIQ's role will be updated so that it contributes further to the development of businesses by better satisfying their needs from the standpoint of industrial research and innovation.

Increased funding for the activities of the Cegep transfer and technology centres (CCTT)

Several studies have demonstrated the relevance of the support offered by the CCTTs[17] to businesses, especially projects carried out in conjunction with the ACCORD niches.[18] The studies have noted that their main problem is a lack of public funding. The ministère de l'Éducation, du Loisir et du Sport and the ministère du Développement économique, de l'Innovation et de l'Exportation are supporting the operation of each CCTT through fixed annual grants of $200 000 and $100 000, respectively. Outside revenues generated by service delivery round out the funding of CCTT operations.

This funding does not allow the CCTTs to maintain their expertise, develop a critical mass of research, and initiate research whose level of risk requires more substantial investments.

Some $12.6 million in additional funding over three years to help the CCTTs better fulfil their mission

To further help the CCTTs fulfil their mission, the government is allocating an additional $12.6 million in funding over three years to:

- gradually increase the funding of the 31 existing Cegep technology transfer centres based on their performance;
- establish new centres, in light of the needs of businesses and the regions, in sectors that are not now served and in keeping with the policy directions spelled out in this strategy;
- support initiatives aimed at broadening networking between the CCTTs and between the CCTTs and other stakeholders in the innovation system, including initiatives carried out by the Réseau Trans-tech.

This funding will be added to the $8.8 million allocated annually to the CCTTs by the ministère de l'Éducation, du Loisir et du Sport and the ministère du Développement économique, de l'Innovation et de l'Exportation.

[17] See Appendix 5 for a complete list of CCTTs.

[18] Action concertée de coopération régionale de développement (concerted action for regional development cooperation).

Financial support for Cegep researchers, especially those working in the CCTTs

Research conducted in the Cegeps is contributing significantly to the strength of research in the regions and generating technology transfers to businesses. Releasing Cegep lecturers from their teaching duties is an essential condition to ensure the survival and consolidation of Cegep research, in particular the development of the CCTTs. The government is earmarking $6 million over three years for the enhancement of the program aimed at releasing Cegep lecturers from their teaching duties to allow them to conduct research.

SUMMARY OF SUPPORT MEASURES FOR DEVELOPMENT AND TRANSFER MECHANISMS

ADDITIONAL INVESTMENTS (MILLIONS OF DOLLARS)

	TOTAL OVER 3 YEARS
Increased support for the development of research	
Renewed support for public research development corporations and support for the development of projects on Université du Québec campuses in the regions	16.0 and 2.0
Increased financial support for technological maturation and support for the initiation of technology enterprises	18.0
Support for organizations dedicated to the transfer of research findings	
Support for agencies that fund industrial research, liaison and the transfer of research findings	46.0
Increased funding for the activities of Cegep technology transfer centres	12.6
Financial support for Cegep researchers working in the CCTTs	6.0
TOTAL BUDGETED COST OF THE MEASURES	**100.6**

CHAPTER 5

Conditions for Success

Conditions for Success

Receptive, accessible, responsible science

A society's economic and social development and quality of life depend on its ability to create, disseminate and use knowledge. To ensure prosperity, it thus seems necessary to heighten public interest in science and technology. Foreign experience reveals the importance of supporting initiatives aimed at promoting careers in science and technology and fostering dialogue between the public and researchers. Given the positive spinoff in society as a whole, it is incumbent upon the State to intervene.

There is every indication that the appeal of training and careers in science and technology among young Quebecers has not increased significantly. Some 80% of young people are apparently put off scientific careers, in particular because of their negative perception of mathematics.[19] It should also be noted that women are still a small minority in certain engineering, computer and physics programs.

However, the Québec government's initiatives under the Programme de soutien à la promotion de la culture scientifique et à la relève en science et en technologie have demonstrated their effectiveness both in terms of the number of partnerships established and the clientele served.

In 2005-2006, the Programme de soutien à la promotion de la culture scientifique et à la relève en science et en technologie, with a budget of $3.6 million:

- reached 1 362 794 individuals, i.e. 1 064 621 members of the general public, 221 065 students and 77 108 teachers;
- made possible 41 scientific culture initiatives and 42 initiatives to promote careers in science and technology, for a total of 10 291 activities. Mention should be made, among others, of:
  - local, regional and provincial science fairs, through which roughly 9 469 young people from all regions of Québec carried out 5 261 projects and at which 60 000 visitors admired their creativity and sense of innovation. In 2004-2005, nearly 18 500 young people carried out 10 249 projects and over 60 000 people visited the local, regional and provincial science fairs;

[19] M. Soucy, R. Ducharme, S. Veillette, P.-A. Paquet-Gagnon and N. Soucy, *Les sciences et les technologies: quel intérêt ?* Paper presented by the Groupe d'étude des conditions de vie et des besoins de la population (ECOBES), 2004.

– 450 scientific volunteers, "innovators in the schools," met with nearly 17 000 students in classrooms throughout Québec;

– nearly 1 000 school children from underprivileged, multiethnic backgrounds in Montréal took part in science and technology activities and received assistance doing their homework. These activities should foster the diversification of their career choices and help break the circle of exclusion and poverty.

A specific agreement devoted to the promotion of the sciences and innovation was signed in June 2006 with the Conférence régionale des élus de Montréal. This agreement is aimed at publicizing science in Montréal and encouraging the public to get involved in a participatory approach that will mobilize all Montréal interveners and scientists. Moreover, the agreement will enable Montréal to position itself at the international level as a major centre for knowledge, scientific mediation and innovation.

The government will earmark additional funding under this program for various agencies in respect of projects that contribute, in particular, to:

- encouraging greater numbers of secondary school and Cegep students to focus on careers in science and technology;
- supporting the development of innovative educational practices among elementary and secondary school and Cegep teachers;
- developing an open, critical attitude to advances in the realms of science and technology.

The additional funding will increase the support for the operations of key agencies recognized for their decisive action in the promotion of science and technology, including:

- the Conseil de développement du loisir scientifique and the Conseils de loisir scientifique, which are organized in networks and are found in nine regions of Québec. They are essential regional interveners to promote careers in science and technology among young people;
- scientific communication agencies, which are essential links for broader knowledge of scientific and technological activity in Québec;
- provincial agencies that foster cooperation and promotion among other agencies and the general public.

At the federal level, the PromoScience program of the Natural Sciences and Engineering Research Council (NSERC) allocates at least $2.75 million a year to Canadian agencies that offer young people an opportunity to learn more about the sciences. In 2005, Québec obtained 11% of funding under this program, i.e. $301 500 for the four projects selected.

Moreover, the Commission de l'éthique de la science et de la technologie, established to heighten public awareness and advise the government on critical issues raised by scientific and technological advances, will receive support to carry out greater numbers of activities pertaining to the promotion of ethics among young people, the general public, the business community and industry.

This strategy will increase by $7 million over three years the funds allocated to these measures.

Concerted, enlightened, effective governance

Recent analyses and assessments of research and innovation policies reveal that effective governance is essential to ensure the success of such policies, which attain their objectives by achieving cohesion among the interveners and engendering synergy that maximizes the attendant spinoff.

In this perspective, two pillars will underpin governance in respect of the policy. First, the government is reaffirming and broadening the mandate of the Conseil de la science et de la technologie (CST) in its capacity as an agency responsible for advising the government on all questions pertaining to scientific and technological development in Québec, including questions related to the relationship between science and society (ethical, accessible, receptive science).

First established as the Conseil de la politique scientifique in 1972, the Conseil de la science et de la technologie (established in 1983 by the *Loi sur le développement scientifique et technologique du Québec*) has existed for over 30 years in Québec. The key role played by this agency devoted to analysis and reflection is to advise the Minister on Québec's scientific and technological development.

The Conseil's mandate will be broadened to include annual follow-up and reporting on the results that Québec obtains in the realms of research, science and innovation. To this end, the Conseil must focus, in particular, on the priority initiatives under this strategy. Furthermore, the CST will ensure that the government is informed of new issues and emerging problems in respect of research and innovation. If need be, it will suggest the most appropriate measures under the circumstances.

The new responsibilities assigned to the Conseil de la science et de la technologie will allow it to fulfil its mandate to act as a special advisor to the government on initiatives that will make Québec more efficient as a knowledge-based society.

The government will set up an issue table that assembles interveners involved in the development and transfer of new technologies

Then, to broaden collaboration and cooperation between the interveners involved in development and transfers, the government will set up an issue table that assembles interveners involved in the development and transfer of new technologies. The issue table will ensure greater coherence in the interveners' initiatives and enhance the availability of services offered to businesses in respect of research and development and innovation. In addition, it will coordinate the realization of concerted initiatives devoted to the promotion of innovation, including an awareness campaign aimed at businesses on the advantages of all forms of innovation, e.g. products, processes, organizational innovation, and so on. Some $3 million over three years will be earmarked for this purpose.

Conclusion

Research and innovation are key determinants of prosperity. An investment in research is an investment in the future. It means relying on the production and development of knowledge to gain advantages, create jobs and ensure the prosperity of Québec society. Québec has invested heavily in R&D, which has enabled its researchers to achieve remarkable advances in several fields. However, obstacles are preventing Québec from obtaining results that meet its expectations from the standpoint of economic and social spinoff.

R&D in Québec seems efficient in terms of inputs. It is considerably less so in terms of spinoff, in the form of marketable products, and ultimately in the form of wealth creation. That is why this strategy focuses primarily on the development of research and innovation.

Under the strategy, the government is emphasizing, in particular, the university-business partnership, which leads to reciprocal enrichment. Such a partnership enables businesses to become and remain competitive through innovation by means of the adoption of new technologies and procedures, the development of new products, and access to new markets. The partnership also allows the universities to better build on their research findings.

The strategy is bolstering these partnerships by adjusting certain existing measures and introducing new ones aimed at fostering the development of industrial R&D covered by agreements with the universities. Furthermore, it will make possible the establishment of research groups and consortia in which businesses and universities participate. The strategy also relies on the mobility of students between universities and businesses and considerably strengthens the means to develop and transfer new knowledge that creates a bridge between businesses and universities (Cegep technology transfer centres, development corporations, support for the initial stages of development, and so on).

The strategy does not review all public support measures in the research and innovation system. It tackles instead the solution of specific problems by seeking to increase spinoff from public research with regard to economic prosperity and stepping up R&D investments in light of clearly defined choices and priorities.

The following features of the strategy are noteworthy.

1. The strategy places unusual emphasis on the development of research and the transfer of research findings to businesses by means of:
   - broader support for different stages in the research development chain;
   - renewed support for university research development corporations and broader access to this expertise in respect of research conducted in the regions.
2. It consolidates the excellence of public research, especially in the natural sciences and engineering, through:
   - broader support for state-of-the-art infrastructure, with particular emphasis on the specific needs of the regions;
   - support for the training of sufficient numbers of qualified, talented upcoming researchers;
   - increased funding for the FQRNT;
   - an incentive for the establishment of critical masses in research fields deemed to be of strategic importance;
   - increased assistance for researchers in the regions.
3. The strategy encourages the Québec research sector to focus more on other countries through:
   - support for active participation by Québec researchers in international research projects;
   - networking of Québec researchers with avant-garde researchers the world over;
   - support to attract and retain multinationals active in research.
4. The strategy bolsters industrial R&D by means of:
   - the enhancement of R&D tax credits;
   - consolidation of the university-business partnership, especially through support for sectoral research groups;
   - the broadening of the pool of businesses active in R&D in Québec through support for the maturation and initiation of technology enterprises, support for the hiring of researchers, and so on.

The *Québec Research and Innovation Strategy*, which reflects a trend observed elsewhere in the world, focuses more closely on the development and marketing of research findings.

To meet the challenges that Québec is facing, it proposes a series of developmental measures that directly support the development of research findings and technology transfers through its three policy directions. Some 52% of the overall budgeted cost of the strategy is geared to better supporting development and transfers.

Through the series of measures stemming from the strategy, the government will invest $888 million over three years:

- $400 million[20] to strengthen the excellence of research, support industrial research and innovation in businesses, and round out and bolster development and transfer measures;
- $420 million for research infrastructure;
- $80 million to support research in businesses through changes to tax credits.

These funds are being added to the $83 million in additional funding announced in the *2006-2007 Budget Speech* and in conjunction with the aeronautical industry strategy and $195 million in investments in research infrastructure this year.

The government is clearly indicating the priority that it is giving to research and innovation by allocating $1.2 billion to fund the new measures in its research and innovation strategy

For Québec, as for the other OECD countries, the decision to invest in research and innovation is a vital strategic choice. While research and innovation are already thriving in Québec, it can take up the challenge of doing even better. Indeed, the mobilizing targets pursued in the realm of research and innovation make this strategy the cornerstone of the Québec government's economic policy.

An Innovative, Prosperous Québec: Québec Research and Innovation Strategy thus focuses on the achievements and strengths of the existing innovation system to spur Québec to advance to a higher level in terms of investment in R&D and innovation. The preservation of social benefits, the strengthening of growth, the creation of quality jobs, and, ultimately, the enhancement of the quality of life of Quebecers depend on Québec's ability to excel and to shine among the best.

To meet challenges as ambitious as those in this strategy, we must mobilize the stakeholders and partners interested in the development of research and innovation in Québec. This mobilization must lead to more extensive research and innovation activities and tripartite synergy and collaboration that relies at once on private-sector stakeholders such as businesses and non-profit organizations, those in the research sector such as universities and research centres, and federal, provincial and local government stakeholders.

The *Québec Research and Innovation Strategy* benefits all Quebecers since, through spinoff from it in terms of employment, the treatment of disease, environmental protection and the enhancement of social intervention, it enhances the standard of living and quality of life of Quebecers in all regions of Québec. All told, the strategy bolsters Québec's advantages to enable it to do even better from the standpoint of innovation and achieve greater prosperity.

[20] Including debt service (interest and amortization) stemming from capital expenditures on research infrastructure. However, the cost of amortization in respect of such infrastructure ($12 million) is not included in the calculation of the total investment of $888 million.

SUMMARY TABLE OF INVESTMENTS IN RESEARCH AND INNOVATION

ADDITIONAL INVESTMENTS (MILLIONS OF DOLLARS)

	Total commitments 2007-2010	*2006-2007 Budget Speech* and appropriations	Total
1. Enhance the excellence of public research			
Firm commitments to support research infrastructure	28.4[1]		28.4[1]
Support to cover the operating and maintenance costs of research infrastructure in the regions	12.0		12.0
Increased funding for merit scholarships	32.0		32.0
Consolidation of research groups in priority fields for Québec	27.0	1.0	28.0
Establishment in the regions of new lecturer-researchers	3.0		3.0
Substantial support for the development of strategic technologies	104.0	33.0	137.0
A broader presence in the international arena	15.0		15.0
2. Better support industrial research and innovation in businesses			
Updating of the level of assets required to benefit from enhanced tax credit rates:			
* R&D	74.8		74.8
* design	5.2		5.2
Workplace scholarship program	5.0	6.0	11.0
Support for the implementation and expansion of private research in Québec	35.0		35.0
Intensification of the innovation initiatives of businesses in collaboration with the CCTTs	10.0		10.0
Support for innovation in businesses through design	6.0		6.0
Assistance to hire staff assigned to research and innovation in businesses	3.0	9.0	12.0
Innovation marketing assistance	9.0		9.0
3. Round out and strengthen mechanisms to develop and transfer research findings			
Renewed support for public research development corporations and assistance for initiatives to develop the projects of Université du Québec campuses in the regions	18.0		18.0
Increased financial support for the technological maturation and initiation of technology enterprises	18.0	15.0	33.0
Support for industrial research, liaison and transfer support agencies:			
– sectoral industrial research groups – liaison and transfer agencies	46.0	8.0[2]	54.0
Increased funding for the activities of the CCTTs	12.6		12.6
Financial support for Cegep researchers working primarily in the CCTTs	6.0		6.0
Measures pertaining to conditions for success			
Scientific culture and ethics	7.0		7.0
Collaboration and promotion of innovation	3.0		3.0
Total budgeted cost	**400.0**	**73.0**[3]	**473.0**
Investments in research infrastructure	**420.0**	**195.6**	**615.6**
Estimated cost of tax expenditures	**80.0**	**10.0**	**90.0**
TOTAL	**888.0**[4]	**278.0**	**1166.0**[4]

[1] Increase in debt service stemming from $420 million in investments over three years in research infrastructure.

[2] Amount announced in conjunction with the aeronautical industry strategy.

[3] Including $1 million for Biomed.

[4] Excluding the value of amortization ($12 million) stemming from infrastructure and included in debt service.

Initialisms and acronyms

A

AETMIS: Agence d'évaluation des technologies et des modes d'intervention en santé

B

BAPE: Bureau d'audiences publiques sur l'environnement
BBP: best business practices
BERD: business enterprise expenditure on R&D

C

CDPQ: Caisse de dépôt et placement du Québec
CCTT: Cegep technology transfer centres
CDET: Centre de développement d'entreprises technologiques
CEFRIO: Centre francophone en informatisation des organisations
CEIM: Centre d'entreprises et d'innovation de Montréal
CEST: Commission de l'éthique de la science et de la technologie
CHUM: Centre hospitalier universitaire de Montréal
CIRANO: Centre interuniversitaire de recherche en analyse des organisations
CL2: (accredited) containment level 2 laboratory
CL3: (accredited) containment level 3 laboratory
CLIPP: Centre de liaison sur l'intervention et la prévention psychosociale
CLT: Centres de liaison et de transfert
CNRC: Conseil national de recherches du Canada
COREM: Consortium de recherche minérale
CPI: Conseil des partenaires de l'innovation
CQIB: Centre québécois d'innovation en biotechnologies
CQRDA: Centre québécois de recherche et développement de l'aluminium
CQVB: Centre québécois de valorisation des biotechnologies
CRBM: Centre de recherche sur les biotechnologies marines de Rimouski
CRIAQ: Consortium de recherche et d'innovation en aérospatiale du Québec
CRIM: Centre de recherche informatique de Montréal
CRIQ: Centre de recherche industrielle du Québec
CRSNG: Conseil de recherches en sciences naturelles et en génie
CSE: Conseil supérieur de l'éducation
CST: Conseil de la science et de la technologie
CTREQ: Centre de transfert pour la réussite éducative du Québec

D

DISP: Direction de l'information stratégique et de la prospective (MDEIE)

F

FDI: foreign direct investment
FIER Partners: Fonds d'intervention économique régionale
FQRNT: Fonds québécois de la recherche sur la nature et les technologies
FQRSC: Fonds québécois de la recherche sur la société et la culture
FRSQ: Fonds de la recherche en santé du Québec

G
GDP: gross domestic product
GERD: gross domestic expenditure on R&D
GLP: good laboratory practice
GOVERD: government intramural expenditure on R&D

H
HERD: higher education research and development
HEXAGRAM: Institute for Research/Creation in Media Arts and Technologies

I
ICTs: information and communications technologies
INO: National Optics Institute
INRIA: Institut national de recherche en informatique et automatique
INSERM: Institut national de la santé et de la recherche médicale
IRIC: Institut de recherche en immunologie et en cancérologie
ISQ: Institut de la statistique du Québec

M
MDEIE: Ministère du Développement économique, de l'Innovation et de l'Exportation
MELS: Ministère de l'Éducation, du Loisir et du Sport
MUHC: McGill University Health Centre

N
NIH: National Institutes of Health
NPO: non-profit organization
NRC: National Research Council of Canada
NSF: National Science Foundation

O
OECD: Organisation for Economic Co-operation and Development

P
PROMPT-Québec: Partnerships for Research on Microelectronics, Photonics and Telecommunications

Q
QPSI: *Québec Policy on Science and Innovation*

R
R&D: research and development

S
SDR: Software Defined Radio
SMEs: small and medium-sized enterprises
S&T: science and technology
SVA: Sociétés de valorisation accréditées

T
TCM: technical and commercial maturation

U
UQTR: Université du Québec à Trois-Rivières

Key indicators of R&D and innovation

R&D SPENDING (2004)

	QUÉBEC				ONTARIO				CANADA		
INDICATORS	$M	% GDP	% Canada	Average growth rate[1]	$M	% GDP	% Canada	Average growth rate[1]	$M	% GDP	Average growth rate[1]
Total R&D spending (GERD)	7 208	2.72	27.7	7.4	12 633	2.44	48.6	6.6	26 003	2.02	6.9
Business enterprise expenditure on R&D (BERD	4 308	1.63	29.8	7.7	7 457	1.44	51.6	6.1	14 441	1.12	6.7
Higher education R&D (HERD)	2 447	0.92	27.1	8.0	3 836	0.74	42.4	10.3	9 037	0.70	9.4
Government intramural expenditure on R&D (GOVERD	449	0.17	18.6	2.9	1 328	0.26	55.1	2.0	2 409	0.19	1.8

[1] Compound annual growth since 1994 (as a percentage).

Source: Compilation by the Direction de l'information stratégique et de la prospective produced using Statistics Canada data.

R&D SPENDING AS A PERCENTAGE OF GDP (2004)

INDICATORS	GERMANY	DENMARK	USA	FINLAND	SWEDEN[1]	OECD	G7[1]
Gross domestic expenditure on R&D (GERD)	2.49	2.48	2.68	3.51	3.95	2.26	2.50
Business enterprise expenditure on R&D (BERD)	1.75	1.69	1.88	2.46	2.93	1.53	1.72
Higher education R&D (HERD)	0.41	0.61	0.36	0.69	0.87	0.39	0.40
Government intramural expenditure on R&D (GOVERD)	0.33	0.17	0.33	0.33	0.14	0.28	0.30

[1] The most recent statistics available are for 2003.

Source: Compilation by the Direction de l'information stratégique et de la prospective produced using OECD data, *Main Science and Technology Indicators (MSTI)*, 2006 edition.

OTHER SELECTED INDICATORS

INDICATORS	QUÉBEC		ONTARIO		CANADA	OECD
	NUMBER	% CANADA	NUMBER	% CANADA		
Number of establishments conducting industrial R&D (2004)	6 778	43.3	5 571	35.6	15 662	…
Total industrial R&D personnel (2004)	43 334	34.2	60 174	47.5	126 671	…
Number of researchers per thousand labour market participants (2002)	8.9	…	8.6	…	7.0	6.6

Source: Compilation by the Direction de l'information stratégique et de la prospective produced using Statistics Canada data.

The R&D flow matrix makes it possible to visualize R&D expenditures by sector of execution of the R&D (who does what?) and according to the sources of R&D financing (who pays for the research?).

R&D FLOW MATRIX IN QUÉBEC, 2004 (MILLIONS OF DOLLARS)

	SECTOR OF EXECUTION						
FINANCING SECTOR	FEDERAL GOV.	QUÉBEC GOV.	ENTERPRISES	UNIVERSITIES	NPOS	TOTAL	FINANCING STRUCTURE (%)
Federal gov.	360	-	92 [c]	650 [f]	-	1 102 [i]	15.3
Québec gov.	1	78	35	318 [g]	4	436	6.0
Enterprises	6	4	3 701 [d]	180	-	3 891	54.0
Universities	-	-	-	1 109 [h]	-	1 109	15.4
NPOs	-	-	-	171	-	171	2.4
Foreign	-	-	480	19	-	499	6.9
TOTAL	367 [a]	82 [b]	4 308 [e]	2 447	3	7 208	100

	GOVERD		BERD	HERD		GERD
Structure of execution (%)	5.1	1.1	59.8	33.9	< 0.1	100

[a] Includes, in particular, the Canadian Space Agency, the Biotechnology Research Institute, Defence Research and Development Canada - Valcartier, the Institut Maurice-Lamontagne and the Laurentian Forestry Centre, to which were added recently the Institute for Aerospace Research and the Centre des technologies de l'aluminium.

[b] Includes R&D conducted in government departments and agencies, including the administration of R&D programs, and CRIQ.

[c] Includes, above all, the Programme de partenariat technologique and PARI.

[d] In accordance with the rules applied (*Frascati Manual*), tax benefits are not deemed to be expenditures and are not included in government funding. Tax credits are implicitly included in the self-financing of businesses in the same way as profits, liquidities, the issue of liabilities, contributions from venture capital corporations, and so on.

[e] Includes, aside from private enterprises, public corporations (Hydro-Québec) and institutions, associations and non-profit organizations that serve businesses (CQRDA, COREM, CRIM, Forintek, INO, IRBVM, IRSST, Paprican, and so on).

[f] Includes the CRSNG, the CRSH, the IRSC, the CFI, chairs, and so on.

[g] Includes the FQRNT, the FRSQ, the FQRSC, the VRQ, CFI counterpart, CORPAQ, Génome Québec, and so on.

[h] Estimate of free research (non-subsidized and sponsored) to which is added R&D executed in certain non-university hospitals. In the statistics published by the OECD, the general university funds, a sub-group of amounts allocated to the post-secondary education sector ($1.109 billion above), are included in government funding. The general university funds (GUFs) are the portion that post-secondary educational institutions devote to R&D through the general grant that they receive from the department of education or corresponding provincial or local authorities. Statistics Canada omits publishing them as a source of government funding in the Canadian R&D flow matrix. The method that Statistics Canada uses to estimate the general funds at the Canadian level is followed to evaluate the data by province. In 2004, of the $1.109 billion recorded in the Québec R&D flow matrix in respect of the self-financing of the universities, $769 million represents the general funds. The proportion assumed by the government thus stands at 69.3%. Given the importance of the general funds in relation to the other direct R&D expenditures that the government assumes, this choice underestimates much more the provincial contribution, in proportion.

[i] The *Frascati Manual* stipulates that the declaration of R&D expenditures is incumbent upon the project-operating entity and not on the funding agency. In the case of government expenditures, for example, the declarations of enterprises or universities concerning government R&D assistance (contracts, subsidies, and so on) are noted rather than a list of government assistance granted.

Sources: Statistics Canada and ministère du Développement économique, de l'Innovation et de l'Exportation.

Government support for research and innovation

The federal and provincial governments fund 21% of R&D spending in Québec. Ottawa allocates $1.1 billion to such research, compared with $436 million from the Québec government.[21] This estimate (see Appendix 2) is confined to R&D expenditures and thus excludes spending in respect of innovation and the tax benefits granted by governments to businesses by way of incentives for industrial R&D.

When account is taken of all support for R&D and innovation, the Québec government's overall contribution totals more than $1.4 billion a year.[22]

SUMMARY TABLE OF INVESTMENTS MADE BY THE QUÉBEC GOVERNMENT IN RESEARCH AND INNOVATION (2006-2007) (MILLIONS OF DOLLARS)

Public research[1]	418.8
Industrial research and innovation[2]	51.8
Development and transfers	65.1
Scientific culture, Conseil de la science et de la technologie and Prix du Québec	5.6
Total, transfer budgets	541.3
Capital expenditures (research infrastructure)	195.6[3]
Tax credits	690.5[4]
GRAND TOTAL	1 427.4

[1] Excluding investments in research infrastructure.

[2] Excluding tax expenditures stemming from tax credits.

[3] Infrastructure commitments for 2006-2007.

[4] Estimate based on data concerning R&D tax credits, skills training and innovation. This estimate excludes abolished tax credits that continue to benefit businesses that took advantage of them prior to their abolition, thus engendering a tax expenditure of nearly $300 million (2005-2006) (see Appendix 4).

This support is aimed at interveners in the realm of R&D and innovation and takes different forms:

- Nearly one-quarter of industrial R&D expenditures are funded indirectly through R&D tax credits granted by the federal and provincial governments. Québec grants tax credits in respect of industrial R&D and innovation worth nearly $690 million, including almost $605 million for R&D, to nearly 6 200 enterprises (see Appendix 4). All told, industrial R&D incentives offered in Québec by the two levels of government are among the most generous found in the OECD countries.

[21] The striking gap between the amounts that the federal and provincial governments invest in Québec stems primarily from R&D that the federal government conducts and the substantial funding allocated by grant funds, research chairs, and the Canada Foundation for Innovation (CFI).

[22] This includes all direct and indirect Québec government support for R&D and innovation initiatives.

- The three grant funds that financially support health research (FRSQ), research in the social sciences and humanities (FQRSC) and research in the natural sciences and engineering (FQRNT), in particular through the granting of merit scholarships, have an annual budget of $175 million, including contributions from other government departments and agencies.[23] This strategic lever is unique among the Canadian provinces.
- The Québec government also finances research infrastructure and agencies active in leading-edge sectors, such as Génome Québec, the National Optics Institute and NanoQuébec.
- To support the development of university research findings, the Québec government is funding the activities of development corporations and announced in the *2006-2007 Budget Speech* a new technological maturation program.
- In the realm of liaison and transfers, the Québec government is supporting the activities of CRIQ ($17 million a year), those of five liaison and transfer centres (CEFRIO, CIRANO, the CQRDA, the CQVB and CRIM) ($12 million annually), those of 31 Cegep technology transfer centres (roughly $9 million a year), and those of seven technology incubators (nearly $4 million annually).
- Government support for businesses also includes measures aimed at the promotion of innovation, in particular in conjunction with the business assistance program which, among other things, offers SMEs tools that enable them to adopt the best business practices.
- In August 2006, the government announced that it would reinvest in post-secondary education networks: the universities will receive $240 million in additional funding by 2008-2009 and the Cegeps, $80 million, which will help support public research through its effect on the payroll allocated to lecturer-researchers.

To ensure better governance of the research and innovation system, the Québec government has implemented advisory and consultation mechanisms, including:

- the Conseil de la science et de la technologie. Established in 1983, the Conseil has a mandate to advise the Minister on all questions pertaining to overall scientific and technological development in Québec. Its advice and summary reports offer valuable planning guidelines.
- the Commission de l'éthique de la science et de la technologie. Established in 2001, the Commission encourages reflection on ethical issues related to science and technology, organizes debates and proposes guidelines intended to facilitate decision-making among interveners interested in these questions.

[23] The ministère du Développement économique, de l'Innovation et de l'Exportation allocates nearly $150 million annually to grant funds. Other government departments or agencies provide additional funding, among other things for the realisation of specific research projects.

KEY R&D AND INNOVATION TAX CREDITS ACCORDED BY THE QUÉBEC GOVERNMENT
(MILLIONS OF DOLLARS)

R&D tax credits	
Refundable tax credit on R&D-related salaries	573
Refundable tax credit on precompetitive research project expenses	14
Refundable tax credit on fees/royalties paid to a research consortium	9
Refundable tax credit on university and comparable research contracts	6
Tax assistance for training and skills upgrading	
Tax holiday for foreign researchers or foreign experts	11
Tax exemptions for scholarships and awards	30
Tax credits for innovation	
Refundable tax credit for design	9
Refundable tax credit for technological adaptation services	0.2
Refundable tax credit for the production of multimedia titles	33
Refundable tax credit for major projects that create jobs in the ICT sector	3[1]
TOTAL	**690.5**

[1] Projection for 2006.

NOTE: Other tax credits pertaining to R&D and innovation have been abolished in recent years. However, these credits continue to generate annual tax expenditures of nearly $300 million. Indeed, enterprises that conducted R&D and engaged in innovation or which were eligible for these credits prior to their abolition continue to benefit from them.

Source: Ministère des Finances du Québec, *Dépenses fiscales du gouvernement*, 2006 edition, October 2006.

CEGEP TECHNOLOGY TRANSFER CENTRES (CCTT)

AGENCY	REGION	ATTACHED TO	FIELD OF APPLICATION
Centre collégial de transfert en biotechnologies (TransBIOtech)	Chaudière-Appalaches	Cégep de Lévis-Lauzon	Biotechnology
Centre technologique des résidus industriels (CTRI)	Abitibi-Témiscamingue	Cégep de l'Abitibi-Témis-camingue	The environment (develop-ment of industrial wastes)
Centre collégial de transfert de technologie en foresterie (CERFO)	Capitale-Nationale	Cégep de Sainte-Foy	Forestry
Centre d'expérimentation et de développement en forêt boréale (CedFob)	Côte-Nord	Cégep de Baie-Comeau	Forestry (boreal forest)
Service d'innovation et de transfert technologique pour l'entreprise (SITTE)	Chaudière-Appalaches	Cégep Beauce-Appalaches	Industrial mechanics
EQMBO-Entreprises inc. Centre d'aide technique et technologique	Centre-du-Québec	Cégep de Victoriaville	Furniture and milled wood
Centre collégial de transfert de technologie en oléochimie industrielle (OLEOTEK)	Chaudière-Appalaches	Cégep de Thetford Mines	Oleochemistry
Centre de technologie minérale et de plasturgie inc. (CTMP)	Chaudière-Appalaches	Cégep de Thetford Mines	Plastics processes and minerals
Centre de productique intégrée du Québec inc. (CPIQ)	Estrie	Collège de Sherbrooke	Computer-integrated manufacturing and industrial data processing
Centre de robotique industrielle inc. (CRI)	Chaudière-Appalaches	Cégep de Lévis-Lauzon	Computer-integrated manufacturing, robotics and vision
Centre de transfert de technologie en musique et son -Musilab inc.	Centre-du-Québec	Cégep de Drummondville	Music and sound technologies
Innovation maritime	Bas-Saint-Laurent	Cégep de Rimouski	Marine technologies
Centre collégial de transfert de technologie des pêches (CCTTP)	Gaspésie–Les Îles-de-la-Madeleine	Cégep de la Gaspésie et des Îles-de-la-Madeleine	Marine technologies (fisheries)
Centre spécialisé de technologie physique du Québec inc. (CSTPQ)	Bas-Saint-Laurent	Cégep de La Pocatière	Physical technologies
Centre de développement des composites du Québec (CDCQ)	Laurentides	Cégep de Saint-Jérôme	Composite materials

CEGEP TECHNOLOGY TRANSFER CENTRES (CCTT) (continued)

AGENCY	REGION	ATTACHED TO	FIELD OF APPLICATION
Institut en transport avancé du Québec (ITAQ)	Laurentides	Cégep de Saint-Jérôme	Advanced transportation
Centre d'innovation en micro-électronique du Québec (CIMEQ)	Laurentides	Collège Lionel-Groulx	Electronics and microelectronics
Centre spécialisé en pâtes et papiers (CSPP)	Mauricie	Cégep de Trois-Rivières	Pulp and paper
Centre national en électro-chimie et en technologies environnementales Inc. (CNETE)	Mauricie	Collège de Shawinigan	The environment and industrial chemical and biotechnological processes
Centre intégré de fonderie et de métallurgie inc. (CIFM)	Mauricie	Cégep de Trois-Rivières	Metallurgy
Cintech agroalimentaire inc. – Centre d'innovation techno-logique agroalimentaire	Montérégie	Cégep de Saint-Hyacinthe	Agri-food
Centre de transfert technologique en Écologie industrielle (CTTEI)	Montérégie	Cégep de Sorel-Tracy	The environment (develop-ment of industrial residual material)
Centre technologique en aérospatiale (CTA)	Montérégie	Collège Édouard-Montpetit	Aerospace
Groupe CTT Group - Centre des technologies textiles et géosynthétiques	Montérégie	Cégep de Saint-Hyacinthe	Textiles and geosynthetics
Centre d'études des procédés chimiques du Québec (CEPROCQ)	Montréal	Cégep Maisonneuve-Rosemont	Chemical processes
Centre de transfert techno-logique de la mode (CTTM)	Montréal	Collège LaSalle	Fashion
Centre de photonique du Québec (La Pocatière), Centre de technologie physique et de photonique de Montréal (CEPHOM)	Montréal and Bas-Saint-Laurent	Cégep de La Pocatière, Cégep André-Laurendeau et John-Abbott College	Optics and photonics
Institut des communications graphiques du Québec (ICGQ)	Montréal	Cégep d'Ahuntsic	Graphic communications
Centre de géomatique du Québec inc. (CGQ)	Saguenay–Lac-Saint-Jean	Cégep de Chicoutimi	Geomatics, data processing and software
Centre de production automatisée (CPA)	Saguenay–Lac-Saint-Jean	Cégep de Jonquière	Computer-integrated manufacturing and industrial mechanics
Centre de recherche et de développement en agriculture (CRDA)	Saguenay–Lac-Saint-Jean and Montérégie	Cégep d'Alma	Agriculture

Développement économique, Innovation et Exportation
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