2013–2016

CTI MULTI-YEAR PROGRAMME

COMMISSION FOR TECHNOLOGY AND INNOVATION

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs FDEA
Commission for Technology and Innovation CTI
Innovation Promotion Agency

FOREWORD

Innovation – in the sense of the translation of new ideas into economic value – is the fuel of the Swiss economy. Innovation must flow at all times to make sure that our competitive ability remains high and to secure our revenues. People and indeed the government are very aware of this fact and invest a lot of money in education and research, the raw materials of innovation. Much of this raw material is used, applied and implemented without government support in many different kinds of values – economic, artistic, healing, educational. The Commission for Technology and Innovation (CTI) is a tool used by the federal government to promote science-based innovation where it does not happen on its own and where the available potential would otherwise lie fallow.

Compared to other countries in scientific terms, the Swiss innovation system as a whole gets top marks. This should give us the confidence to know that we are on the right track, but it should also motivate us to continuously review and adapt our methods, to almost, in a way, modernise innovation itself.

The many committed individuals at the CTI, the Commission experts, the staff at the Secretariat, the start-up coaches, all take the responsibility of the funds entrusted to them seriously and are dedicated to working on such a creative core task.

In the current difficult economic climate their work is even more important. They are not only expected to promote innovation, but also to help make sure that our innovation resources do not leave the country and that Switzerland does not lose achievement potential.

All of this happens as part of a diverse innovation ecosystem, with regional, national and international components that should be understood in detail if the CTI's measures should work in a complementary manner to promote innovation without reducing self-starting initiatives and setting the wrong incentives.

This multi-year programme describes our understanding of this ecosystem, takes a critical look at current promotion measures, and sets out our proposals for the continued development of CTI's programme to promote the Swiss economy.

WALTER STEINLIN

PRESIDENT OF THE CTI

SUMMARY

"Switzerland has a leading position in education, research and innovation"

This is one of the Federal Council's primary objectives in the current 2011 to 2015 legislative programme. With regard to innovation, the Federal Council decided to "consolidate activities to promote competitiveness at a high level and continue to strengthen Switzerland's international competitiveness."[1] The Federal Council explicitly supports "the strengthening of collaboration between the scientific and business sectors" and the "enhanced promotion of young talent in the scientific and business communities."

The CTI, as the federal government's innovation promotion agency, has a key role to play in the achievement of this objective. As it strengthens the economy's innovation processes, it plays a central role in the federal government's economic policies.

The CTI's mandate is to promote knowledge-based innovation in Switzerland with financial, advisory and network support for the benefit of the Swiss economy. In doing so it helps to turn scientific research into economic output, making sure that unique innovations are developed in Switzerland for Switzerland.

The CTI has three main activities:

— PROJECT PROMOTION (RESEARCH AND DEVELOPMENT PROJECTS): The business sector is encouraged to make greater use of the research resources, know-how and infrastructure of the universities for its innovation processes. The CTI helps scientists at the universities to develop competitive products and services from their research findings in cooperation with business enterprises, and to bring these to market.

— PROMOTION OF ENTREPRENEURSHIP AND START-UPS: The CTI promotes entrepreneurial thinking by future members of the scientific and business communities. The CTI offers professional support to young entrepreneurs with training and coaching programmes and helps them to successfully establish new companies to implement new business ideas. The CTI promotes knowledge-intensive and technology-based companies with great market potential.

— KTT SUPPORT: The CTI uses its networks to offer Swiss companies fast and simple access to knowledge available at universities and to international programmes promoting application-oriented research.

The CTI will face a variety of trends in the future, such as increasing globalisation, the shortening of the half-life of knowledge, intensifying international competition and demographic changes, in particular population ageing.

The Swiss economy will not remain unscathed by these trends, as they not only increase pressure on companies to innovate, but also demand the best possible interaction between a strong education and research system and an innovative economy. The CTI plays a central role in its capacity as an intermediary and as an agency for promotion.

In its promotion activities, the CTI will therefore have to react to the following specific changes:

— The global structural transition is changing the value-added pattern for Swiss companies.

— Switzerland's development into a service economy is continuing.

— Production is increasingly outsourced to low-wage countries, and Switzerland is facing the risk of deindustrialisation even in value-adding activities as well as the resulting loss of skills and know-how.

— The innovation behaviour of companies is changing and there is more pressure to achieve short-term success.

— The uncertain economic situation is leading to muted sales, increased competitive pressure, falling investment and reduced flows of funds for fledgling companies. As a result, innovation activities are often particularly unattractive for small and medium-sized enterprises (SMEs) in the short term.

[1] Dispatch on the Promotion of Education, Research and Innovation from 2013 to 2016.

The CTI is aware of these barriers to innovation and is using the instruments at its disposal to overcome the hurdles to collaboration between public research and the business sector.

In this multi-year programme for the period 2013–2016 the CTI sets out its guidelines and objectives for mastering these challenges. The focus falls on five areas.

R&D PROJECT SUPPORT

The basic concept will be continued: the CTI supports joint innovation projects by research and implementation partners. Grant funding is paid to the research partner and the implementation partner has to contribute an equivalent amount itself.

The concept will be expanded: companies should be given greater scope for formative action, including access to "vouchers" (credit to companies for purchasing research results). Universities will be supported in their efforts to bring technological and innovation projects to research and development (R&D) implementation readiness with little initial business involvement.

The CTI will promote more interdisciplinary projects and projects involving several research and implementation partners. It will focus its limited grant funds on innovation projects of high quality while taking account of the fact that project promotion is likely to see an increase in more complex projects. (→ 7.3)

ENTREPRENEURSHIP AND START-UPS

The tried-and-tested concept of entrepreneurship training for potential young entrepreneurs will be strengthened and the current concept focusing on just one course provider will be expanded to include several providers. The strong regional systems will be linked more closely. The CTI will be responsible for central course management and will improve the harmonisation of the different training courses.

The support services for start-ups provided by CTI coaches will also be expanded in a targeted manner. The CTI will focus on supporting start-ups with their national and international growth strategies, providing access to networks, investors and know-how. An important instrument in this regard is the "CTI label", an award for the most successful company founders. (→ 7.4)

KTT SUPPORT

The knowledge and technologytransfer (KTT) support concept will be totally redesigned and knowledge and technology transfer will in future be promoted through national thematic networks (NTN), innovation mentors and information platforms. The NTN will focus on innovation projects with economic potential of national importance. SMEs can obtain support and advice from CTI innovation mentors, and thematic platforms and web-based information on development prospects will be used to encourage SMEs in particular to improve their innovation opportunities with science-based input from the universities. (→ 7.5)

NATIONAL AND INTERNATIONAL COOPERATION PROGRAMMES

Cooperation with national partners will be continually improved so that synergies can be better exploited. The international dimension in particular should be strengthened and promotion in this area should be intensified.

CTI RESOURCES

The innovation ecosystem is complex and sensitive to shocks. In order to be a reliable and predictable partner, the CTI is committed to stabilising the financial framework while still maintaining competitive strength.

The success of the CTI's efforts is determined by the quality of its experts, and in particular their knowledge of innovation aspects. The framework conditions for their work must be optimised in order to find and retain the best people for the right positions.

For the CTI to remain efficient and effective, modest adjustments will be undertaken at the Secretariat with regard to financial and effectiveness controlling, IT systems and communication.

PRINCIPLES

Statutory mandate to promote innovation

01

FIRST PART

The CTI is the Confederation's agency promoting science-based innovation

The work of the Commission for Technology and Innovation is based on Art. 64 (Research) of the Federal Constitution: "The Confederation shall promote scientific research and innovation." The CTI is the federal government's agency for the promotion of innovation.

The implementation of the constitutional mandate is regulated by the Research and Innovation Promotion Act (RIPA). During the last revision if the RIPA, the federal government's obligation to promote research was expanded to include the obligation to promote innovation and the Confederation's research and innovation policies were combined into one integral approach. Education, research and innovation are incorporated in the Dispatch on the Promotion of Education, Research and Innovation (ERI Dispatch).

With its embodiment in the RIPA, the CTI was separated from the Federal Office for Professional Education and Technology (OPET) in 2011. As an independent executive commission with its own Secretariat, the CTI has been taking its own decisions independent of any directives since 1 January 2011. For administrative purposes it is affiliated to the Federal Department of Economic Affairs (FDEA).

The new RIPA regulates the support provided by the federal government to scientific research and science-based innovation and reduces the overlaps. As far as the promotion of innovation is concerned, the research institutions focus explicitly on competitiveness, added value and the job market in Switzerland.[2] The promotion of research and innovation with public funds is mainly routed through two institutions. The Swiss National Science Foundation (SNSF) is responsible for the promotion of knowledge-based research, while the CTI is the Confederation's agency for the promotion of science-based innovation. As it strengthens the innovation processes of the economy, it plays a central role in the federal government's economic policies. Although the mandates and core tasks of the CTI and the SNSF are different and clearly separate, they have a complementary effect.

The CTI mainly promotes science-based innovation by:

— financing research and development (R&D) projects carried out jointly by companies and universities,
— raising awareness of entrepreneurship and coaching the founders of companies,
— supporting the transfer of knowledge and technology (KTT support) in order to improve the valorisation of knowledge and technology,
— helping to design international programmes to promote research and innovation,
— publicising the importance of innovation for the Swiss economy.

In its new form the CTI as an independent organisation is required to submit a multi-year programme to explain its future financial requirements to parliament and the Federal Council. The multi-year programmes also serve to improve coordination and cooperation among the research institutions. These plans provide the basis for every new ERI dispatch period.

This document containing the plans for 2013 to 2016 is the first multi-year programme submitted by the CTI.

[2] Art. 1 (a) and Art. 2 par. 2 ResA, amendment of 25 September 2009.

INNOVATION LANDSCAPE IN SWITZERLAND

Marked increase in scientific services

02

SECOND PART

62,000 people worked in research and development in 2008

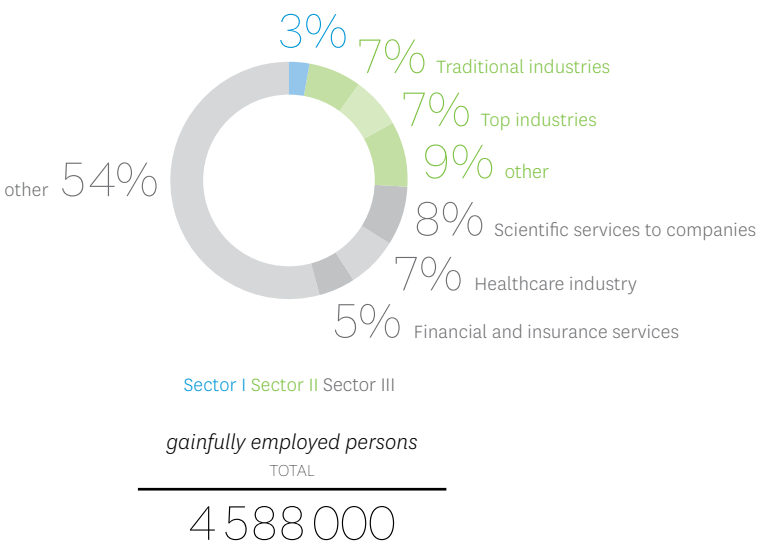
Switzerland has only a very limited supply of natural resources. The most valuable capital of our country is its people and their skills. Thanks to an effective education system, our economy and society have access to more highly qualified workers than comparable countries. Switzerland builds on the strengths of its tertiary education system, the quality and permeability of which ensure that motivated individuals can receive the advanced education required to nurture their talents. The attractive living conditions in Switzerland also make it possible to attract qualified employees from other countries.

The quality of the workforce is reflected in the employment structure. Ever more gainfully employed persons work in innovation-intensive industries than in traditional industries, and within the service sector itself, scientific and healthcare services are noticeably on the increase.

In Switzerland as a whole, 62,000 people worked in research and development in 2008, 65 percent of whom were in the private sector.

FIGURE ONE

GAINFULLY EMPLOYED PERSONS BY SECTOR



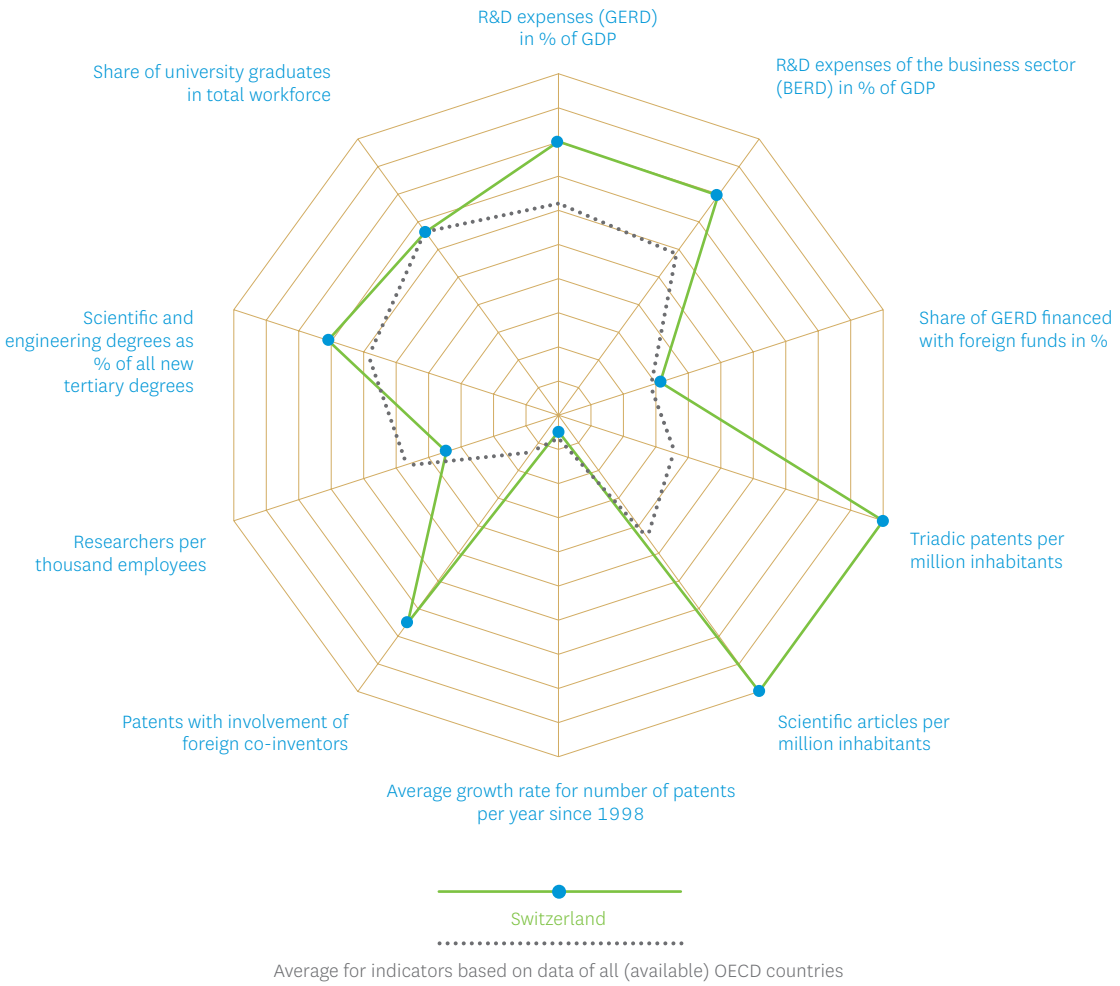
Gainfully employed persons in innovation-intensive industries: A growing number of people work in innovation-intensive industries. (Source: Federal Statistical Office FSO)

In Switzerland, the private sector is responsible for most of the research expenditure. In 2008, R&D expenses amounted to CHF 16.3 billion in total or 3 percent of gross domestic product (GDP). At almost CHF 12 billion, intramural R&D expenditure accounted for 73.5 percent of these expenses. The chemical, pharmaceutical and healthcare services sectors recorded the biggest growth. With the exception of the metal and mechanical engineering sectors, all highly innovative sectors saw their intramural R&D expenses grow in the past six years. The increase in these expenses has been constant for almost a decade now, which is quite impressive. Between 2000 and 2004, intramural R&D expenses increased by 22.4 percent a year on average, and between 2004 and 2008 they rose by as much as 24 percent. To intensify the interaction between a strong education and research system and an innovative economy, the Federal Council is applying an integrated approach: with its new legislation to promote education, research and innovation it combined these three areas into one federal act. With the merger of the two federal offices responsible for education and research (State Secretariat for Education and Research (SER); Federal Office for Professional Education and Technology), the Federal Council is further strengthening harmonisation between education, research and innovation.

In the long term it is the balance ensures different education, research and innovation factors that ensures a great measure of flexibility and performance in the international economic contest. The clever linkage of research and innovation is of the utmost importance for a sustainably healthy economy with great innovative power and a qualified workforce. The Confederation promotes this concept through institutions that are independent of the government departments, i.e. the Swiss National Science Foundation with regard to research and the Commission for Technology and Innovation for innovation in Switzerland.

FIGURE TWO

INNOVATION INDICATORS IN AN INTERNATIONAL COMPARISON



Innovation indicators in an international comparison (source: OECD Science, Technology and Industry Outlook 2010):
At around 3 percent of GDP, the R&D expenses (GERD) were higher than the average in an international comparison in 2008.
Private companies financed an above-average percentage of these expenses (BERD).
Other indicators that focus on human resources and therefore measure innovation input analogous to expenses, show a mixed picture.
Measured against the number of (triadic) patents or scientific publications, Switzerland has a strong innovation output.
However, at 0.9 percent per year on average, patent growth between 1998 and 2008 was low.

02.**1**
Higher Education Institutions

Higher education institutions (HEIs) are involved in teaching and research as well as knowledge and technology transfer and also offer continuing education and training. They educate the knowledge bearers of the future and help to find solutions to issues that are important for a society that wants to be sustainably prosperous. The quality of the universities and universities of applied sciences in Switzerland is excellent; according to the 2011 Shanghai rankings, the Federal Institute of Technology Zurich is the best university in Continental Europe. Five other universities rank among the top 200 in the world.[3]

Approximately 21,000 researchers work at the Swiss HEIs, around 80 percent of them at universities and 20 percent at universities of applied sciences. Swiss HEIs have a strong tradition in basic research. Past investments in fields such as system biology, nanotechnology and new materials are bearing fruit – these technologies are currently on the brink of application readiness and are triggering numerous application-oriented research projects. In particular, it is also the quality of the application orientation that makes Swiss research teams such popular international partners for hi-tech projects.

Both HEIs and the private sector are Confederation research partners in government research programmes. The spectrum of government research programmes ranges from health issues to environmental and energy technologies to aspects of national security and social development. The CTI is strongly involved in the practical implementation of the government research programmes.

With the efficient transfer of knowledge and technology, HEIs make a substantial contribution to the widening of the innovation and knowledge base in private sector companies. It is clear that technologically specialised companies involved in KTT are more innovative and competitive than others. Cooperation with HEIs minimises the risks while at the same time enhancing innovative power. According to a study by the KOF Swiss Economic Institute, companies that specialise strongly in a specific technology run the risk of underestimating the development potential of alternative new technologies, which could mean that they lose competitive strength in the medium term. Here, independent university research is of particular importance as it provides early access to new findings and technologies.

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[3] Shanghai Jiao Ton University Ranking: Academic Ranking of World Universities 2011.

02.**2**
Private sector

Innovation is primarily a corporate task, but it relies to a large extent on preliminary work done by the state –particularly in education and research.

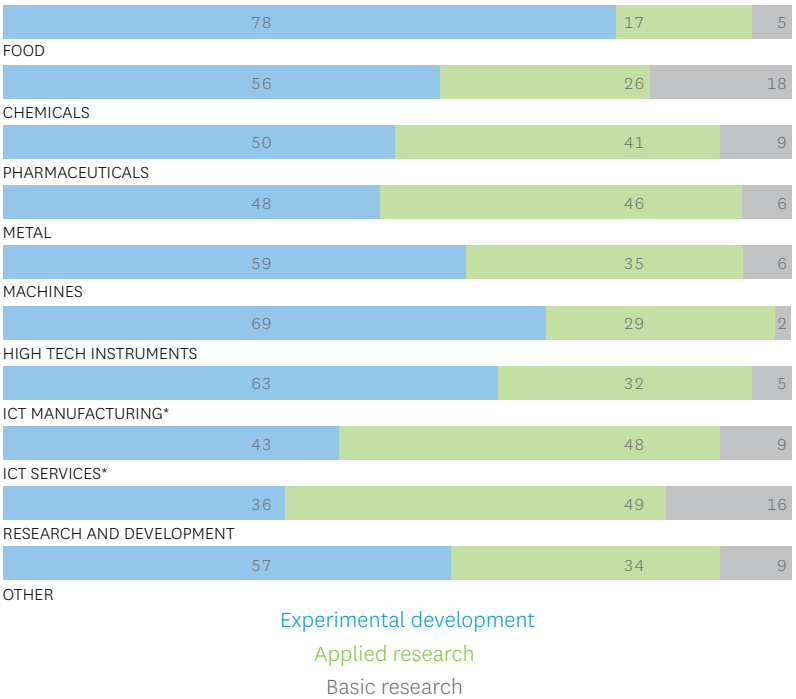
Public investment in education, research and innovation mainly benefits SMEs. Strong research and innovation input returns above-average results. In the past few years, there has been a notable increase in the number of patent applications, and at 186 triadic patent families per billion francs of business expenditure on research and development, Switzerland ranks second in the OECD area. Switzerland has the highest per capita patent density and number of scientific articles and is one of the three top countries when it comes to hi-tech developments and publications in the innovative field of environmental science. There are also numerous “hidden champions” in Switzerland, i.e. export-focused SMEs that pursue a niche strategy with highly innovative products and generate average growth of 9 percent per year. Within a decade, the sales of the hidden champions rose from CHF 167 million to CHF 546 million on average.

The private sector is reacting ever more enthusiastically to government programmes to stimulate innovation. Small and medium-sized enterprises in particular benefit from improved R&D parameters. Most recently, such stimuli focused on the energy, biotechnology and medical technology sectors.

While HEIs are active in basic research and application-oriented research, the private sector focuses more strongly on applied research and the experimental implementation of research results. The following graph demonstrates this for the different business sectors.

FIGURE THREE

INTRAMURAL R&D EXPENSES BY BUSINESS SECTOR AND TYPE OF RESEARCH, 2008
IN %, ROUNDED FIGURES



Businesses are focusing increasingly on intra-company research.
Most of the funds are invested in experimental development and applied research.
Basic research plays a less important role for companies.
(Source: BFS)

* ICT: Information and communication technologies

The most research-intensive business sectors are the pharmaceutical, machine, ICT manufacturing and services, hi-tech instruments, chemical and food sectors. The technological sector comprising the three most technology-intensive business sectors hi-tech instruments, ICT manufacturing and ICT services boasts high growth rates.

Government stimuli promote the interaction between public research and private market interests and lead to the creation of specific services that encourage KTT in this field. It is thanks to two decades of knowledge and technology transfer that the triangle consisting of basic research, private sector and public R&D and market innovation gained in effect and dynamism in fruitful cooperation projects and catapulted Switzerland into a leading position among leading innovative nations. The CTI uses its instruments to support this permanent adjustment process.

02.**3** *International dimension*

Research and innovation do not stop at a country's borders. Given the small size of the Swiss domestic market and the growing internationalisation of research, Switzerland's integration into the international research and innovation arena is gaining in importance. In 2010 the Confederation formulated its international education, research and innovation (ERI) strategy and defined the objectives for the years ahead. Top priority is given to the strengthening and expansion of international networks, both European and global, with the aim of establishing Switzerland as a preferred ERI location in the coming years.

The Confederation wants Swiss companies and HEIs to have access to international research and innovation networks. Joint investments in R&D play a central role in costly technologies and large-scale research institutions that can only be carried to a limited extent by a small country such as Switzerland. Participation in international platforms and programmes allows Switzerland to play an active role in the international value chain. It provides access to research results and new technological developments which for SMEs often serve as the first step towards innovation networks and foreign markets. At the same time these investments enhance Switzerland's appeal as a location for foreign companies.

From 2014 the EU will pursue an integrated approach linking education, research and innovation in which greater consideration will be given to SMEs than in the past. This will bring the ERI landscapes of Switzerland and the EU closer together.

The CTI plays an important role in this process by establishing international networks in all areas that could benefit innovative Swiss companies, thus providing access to sources of innovation and new markets.

MEGATRENDS

Demographic changes, depletion of resources, environmental protection and climate change

03

THIRD PART

Global energy requirements will increase by 60% by 2035

Megatrends refer to change processes that span a period of several decades. Globalisation is advancing, the half-life of knowledge is becoming ever shorter, and international competition is intensifying. For high-wage countries, knowledge, as a factor of production, is essential if their economic efficiency is to keep pace with global competition. Investment in education, research and innovation is indispensable and the key to our future.

Megatrends that will become even more pronounced in the coming years include demographic changes, the depletion of resources and the growing challenges in terms of protecting our environment and climate. All of these trends are giving rise to social and economic change processes on a global scale. At the same time these challenges are powerful drivers for new technologies and innovation.

03.**1** *Demographic changes*

The proportion of older people in the population is rising worldwide. This is leading to a change in the age structure in industrialised countries and thus to the human capital base. Longer life expectancy affects medical and healthcare services, the employment structure and labour market, mobility and housing needs, as well as consumer behaviour. Social security systems are challenged and the health sector will continue to grow. This is followed by a call for efficiency enhancements, cost cuts and innovative social solutions. The quality of care must keep pace with the improvements in efficiency.

HEALTH SCIENCES AND MEDICINE

The health industry is a growing business sector. Lifestyle diseases such as diabetes, obesity, heart and vascular diseases and cancer are on the increase. Medical progress is trying to keep up, and the research and treatment of chronic diseases will play an increasingly important role.

Demographic trends are also leading to an increase in geriatric diseases and defects. Gerontechnology, geriatric rehabilitation and the prevention of illness will create a market for related products and services.

Switzerland has had a strong and innovative pharmaceutical and medical technology sector which is continuing to diversify. The combination of technological development and services to develop tailor-made and efficient solutions is particularly important for the development of the health industry. This also includes intelligent invoicing and patient management systems for hospitals or progress in the cooperation between the fields of medical technology and therapeutic services.

Today, Switzerland already boasts 240 biotech companies employing around 19,000 staff and generating sales of more than CHF 9 billion.

DIVERSITY

Population ageing is altering the human capital base. This directly affects a society's productivity and innovative strength. The quickening pace of progress also increases the pressure to innovate. To keep abreast of these developments, access to and the use of dormant potential must be constantly improved. This requires changes to continuing education and training, lifelong learning, labour market policies, and specifically also the integration of insufficiently exploited workforce potential, such as female workers. Innovation capacity is also improved by the integration of interdisciplinary cultures and their related knowledge as well as social and cultural diversity.

03.**2**
Depletion of resources and climate change

The technologisation process, which has been driven with little consideration to resource efficiency, and growing consumer expectations in emerging countries are contributing to a global increase in resource consumption. Commodities and other natural resources such as food, clean water and fertile land are becoming scarcer. Securing a sustainable supply of energy and commodities and sufficient food is an issue of central importance to national economies worldwide, not least because of resource conflicts and the tension between social justice and generational equity.

GREENING THE ECONOMY

Several international organisations, including the Organisation for Economic Cooperation and Development, the Council of the European Union and the United Nations, are currently developing strategies for the sustainable growth of resource-saving, environmentally friendly and more competitive national economies. This initiative is referred to as "greening the economy".

Numerous experts from all over the world are discussing the core elements of a green economy: reducing emissions, improving resource efficiency, and developing environmentally benign technologies. The reduction in CO_2 emissions is of central importance. Experts agree that a comprehensive technology shift is required and that massive investment in research and development and the promotion of innovation and entrepreneurship are indispensable.

Important global corporations have reacted to the political stimuli. In its cornerstone Vision 2050 report, the World Business Council for Sustainable Development (WBCSD) calls for a prosperous and sustainable world economy that can provide around 9 billion people with food, clean water, living space, sanitary facilities, education, health services and transport services. The pathway to this world offers innovative companies enormous economic opportunities, but such a vision can only be realised with radical and immediate change.

ENERGY AND ENERGY EFFICIENCY

According to the World Energy Outlook, global energy requirements will rise by 60 percent by 2035. The provision of energy at affordable prices is an elementary requirement for a modern economy. Energy is a decisive factor in the production of goods as well as in the agricultural and transport sectors. In Switzerland, around 13 percent of total electricity production is used just for artificial lighting, the foundation for our human productivity gains and affluence. Consistently increasing energy efficiency, expanding renewable energies and securing the supply of energy are on the agenda everywhere in the world. Innovation in the energy sector and energy technology are growing in importance. These trends affect hi-tech as well as traditional industrial companies. All of them will see the targeted efficiency revolution as an opportunity. The renewable energies and material efficiency segments are deemed to harbour the greatest market potential.

RESOURCE EFFICIENCY AND RECYCLING

Sustainable technologies, industries and services that contribute to the protection and maintenance of natural resources are fast gaining in importance in view of the limited natural resources and always stricter political instruments. The market for environmen-

tally friendly products, technologies, processes and services is a market with potential for future growth. Estimates assume that the market volume for sustainable technologies will increase by a factor of ten by 2030. While demand in the developed markets mainly focuses on technologies for the production and transport of renewable energies and on building systems, the emerging countries also have a considerable need for basic technologies to cleanse the air and water and to manage their waste.

Sustainability has become an important factor of competition and a driver of innovation in the business world. The key to success for sustainable solutions is the cross-linking of different branches of knowledge with regard to technologies and services, in other words, systems knowledge. This is also the area that harbours the greatest potential from a business point of view.

FOOD TECHNOLOGY AND FOOD SAFETY

The food and fodder industry is gaining in importance. The rise in demand and prices for food is challenging the global community in meeting basic supply needs. Production, processing and distribution processes are becoming ever more global. As a result, food safety requirements are also increasing. In the industrialised nations, social trends such as convenience or health add new impetus. In an ageing society, products such as brainfood or nootropics will become more important.

The food sciences and technology sector is a growing industry with great market potential. With a share of 5.3 percent of GDP and 22 percent of exports, Switzerland already has a strong industrial basis. The sector is at a turning point and has much potential for innovation.

CHANGES IN INNOVATION BEHAVIOUR

Private sector withdrawing from long-term R&D

04

FOURTH PART

The most important developments

To develop new industries, 20 to 30 years must be invested in research and development. With the increasing pace of progress and the pressure to innovate, new trends in the private sector's innovation behaviour can be observed worldwide: companies are increasingly withdrawing from long-term R&D activities and are instead focusing on direct product development where the average investment period is five to seven years. Fundamental changes can also be observed in the implementation of innovation projects. While the focus in the past fell on innovation projects supported by in-house resources (own R&D departments, known as closed innovation), such projects are nowadays usually implemented by networks where the company's own staff, external experts and knowledge providers as well as customers and end users all contribute knowledge (known as open innovation or user-driven innovation). This development is made technically possible by internet applications. The social trend towards an attitude that is more open to innovation is accelerated by web-based social networks. These developments all have consequences.

EXPANSION OF SERVICE SECTOR IS CONTINUING

In addition to the actual services sector, the industrial sector with its "embedded services" is also contributing to the expansion of the tertiary sector. The Swiss software sector is gaining in strength and is offering challenging solutions in niche markets. Information and communication technology is therefore seeing strong growth in its R&D expenses.[4] New market segments are established that cannot be clearly allocated to either the second or the third sectors. Innovative products, processes and services as well as complex systems solutions consisting of a novel mix of technologies, products and services are developed and marketed in these market segments. New opportunities for the international market are opened up in high-value, cost-intensive segments. The focus on exports is still fairly weak in this business sector.[5]

FROM TECHNOLOGICAL INNOVATION TO BUSINESS INNOVATION

Technological performance is just one, albeit an integral, component of aggregate innovation. To improve competitiveness, process innovation, service innovation or the production and use of knowledge as part of open innovation or user-driven innovation projects are equally important. In business innovation, the creation of customer benefits takes centre stage. The business model is carefully reviewed and adjusted, and the focus falls on the development of a novel value proposition for the customer. This is done by way of changes to the combination of products, services, processes, customers and sales outlets. Information technology often acts as the trailblazer here.

INCREASED SIZE AND COMPLEXITY OF R&D PROJECTS

Global megatrends trigger inter- and trans-disciplinary solutions. Innovation potential is greatest at the interfaces between established scientific disciplines. By combining and integrating existing scientific and technological solutions, we develop adjusted and innovative solutions and business models that create added value. New partnerships are established to build aggregate expertise, and the speed at which projects are realised as well as the risks associated with them increase.

For some years now these developments have also been observed in the CTI's project promotion activities: the number of large joint projects with several business and research partners is growing and project volumes are on the increase.

This added complexity to the innovation process has an impact on the management of projects, the communication lines between the participants, the speed of implementation, the exploitation of project results, and the strategies to protect intellectual property.

For the HEIs, who play a central role in this innovation process, mutual cooperation and coordination are becoming ever more important. University partners with different profiles, specialisations and subject expertise take part in joint projects. When it comes to the translation of the results of basic research and application-oriented research for the purposes of implementation, the universities of applied sciences, the research institutes in the ETH Domain and the CSEM play an important role as they have special skills thanks to their focus on practical application and their ties to the business community.

[4] Research and Development in the Swiss Private Sector 2008, economiesuisse.

[5] Cluster in the Swiss Economy, Final Report on Behalf of SECO, November 2008, ECO'DIAGNOSTIC.

GROWING INTERNATIONALISATION

Globalisation is also leaving its mark on R&D activities. Switzerland is renowned for its strong international links, and the degree of internationalisation of its R&D activities is extraordinarily high compared to its trading partners. Exchange is constantly on the increase via the import and export of R&D as well as technologies and patents and has increased more than fourfold over the span of a decade.[6] In 2008, Swiss companies invested more than CHF 15.8 billion in their subsidiaries abroad for R&D. Swiss pharmaceutical companies account for most of the investments made through foreign subsidiaries abroad, as this sector is responsible for 67 percent of all R&D expenses. According to the Federal Statistical Office, this increase in R&D investment and the import and export of R&D reflect the Swiss economy's demand for knowledge. Due to the small domestic market, SMEs are also increasingly required to develop an internationalisation strategy. This is not limited to an export strategy, but also comprises adjustments to the innovation process and participation in international development programmes.

CHANGING NATURE OF ENTREPRENEURSHIP

Young entrepreneurs and the founders of new companies are the future of our economy. A study of company foundations and the lifecycle of American companies has shown that the number of new companies that are established has remained constant for the past hundred years. The company base is therefore constantly renewed and companies that cannot cope with the process of structural change are replaced.

Entrepreneurship is key for an economy because young businesses create jobs, particularly in times of recession. Founders of new companies fill niches, and in science-based segments they often create new industrial sectors. Start-ups are therefore often harbingers of change to the structure of the economy.

In the past decade, Switzerland has seen strong growth in the number of spin-offs generated by the universities and the private sector, not least as a result of support by the CTI. Many of these science-based small and micro enterprises are now moving into an expansion phase. The small size of the domestic market, the inevitable early focus on an expansion and export strategy, the associated high level of risk and increased financing requirements pose challenges which are difficult for young companies to surmount.

Worldwide, the trend towards social entrepreneurship has also increased in the past decade. Such entrepreneurs focus on key social challenges and set to work where they perceive a lack of good approaches to long-term change. Around the world social entrepreneurs have introduced healthy competition in addressing social issues. Several of these business models are based on technology, service or business innovation and are scalable. Although these companies make sure that they are financially independent, the emphasis is on generating social value.

[6] International Aspects of Swiss Research and Development 2008, May 2011, Federal Statistical Office.

CHALLENGES FOR THE CTI
Need for grant funding on the rise

05

FIFTH PART

International competition innovation continues to gather momentum

Market globalisation, technological progress, demographic changes and the depletion of resources are increasing the pressure on companies to innovate. Global structural change is altering the value added pattern for Swiss businesses. The expansion of the Swiss service sector is continuing. An outsourcing movement is taking root, and production is increasingly being shifted to low-wage countries. As far as competition is concerned, the quality and performance requirements for products, processes and services from high-wage countries such as Switzerland are increasing.

The innovation behaviour of companies is changing. Pressure to achieve short-term success is changing time preferences. The risks and uncertainty regarding the future revenues that can be expected from research efforts mean that companies are increasingly withdrawing from basic research and shifting their focus to the development of products in open innovation processes.

The CTI must be able to competently support this expanded complexity, the growing expectations of project partners, and the large number of partners on each project.

An uncertain economic environment also affects companies and their innovation behaviour. Businesses have a gloomy outlook in difficult economic times. SMEs find themselves faced with muted sales, increased competitive pressure and falling investments. As a result, innovation activities are often particularly unattractive in the short term. However, it is precisely in such times that it is important to maintain innovation activities as this is the only way to secure the long-term ability to compete. Another factor hampering the promotion of innovation is that every economic crisis is different and that companies react very differently to government efforts to promote innovation.

Radical innovation is often introduced by start-ups, as such companies are the ideal vehicle for implementing high-risk projects. Although such risky innovation projects that redesign markets or even create new markets offer excellent opportunities, they are also less likely to find suitable financial support. The CTI therefore sees its central task in improving the flow of information, networking and quality assurance for the providers of capital in order to secure more capital for start-ups.

It is part of the HEIs' basic mandate to disseminate and make use of new knowledge, either through the transfer of knowledge and technology or through spin-offs of science-based start-ups. And they are fulfilling this mandate effectively, with the additional support of the CTI. However, on top of the direct R&D costs – the salaries of researchers at the universities – the research institutions applying for funding also incur indirect costs. The more successful an applicant is in translating knowledge into innovation on the market, the more detrimental the effect on the overall expenses of the group or institution if the indirect costs are not included in the funding, at least in part.

The change processes described above also represent an enormous opportunity, as they serve as a powerful driver for new technologies and innovation. The CTI and its instruments promote the successful interaction between basic research, R&D and innovation in the market.

Given the current social and economic changes, the CTI is facing the following specific challenges for which it must find solutions.

INTERNATIONAL COMPETITION IN INNOVATION CONTINUES TO GATHER MOMENTUM. *This is accelerating the transfer of knowledge and technology, and the private sector must be able to exploit the scientific preparatory work done by the universities more precisely and profitably. Innovation gaps must be closed quickly. Advisory services and support for universities and business partners must be expanded and better adapted to meet these needs.*

THE MORE RADICAL AN INNOVATION, THE LONGER THE DEVELOPMENT PERIOD AND THE GREATER THE RISK PROFILE BUT ALSO THE OPPORTUNITIES. *Radical, risky and time-intensive projects are in demand in some sectors, for example the energy sector. The services and promotion criteria of the CTI must meet the demands of such complex and multiple stage-gate processes.*

THE INTEGRATION OF SCIENTIFIC DISCIPLINES AND POTENTIAL MARKET APPLICATIONS, BUT ALSO COMPANY INVOLVEMENT WITH SEVERAL DEVELOPMENT PARTNERS ARE ON THE INCREASE. *This leads to highly complex R&D projects involving several Swiss and foreign partners with stricter requirements regarding intellectual property rights and the compatibility of the merged innovation units. The successful realisation of open innovation projects also requires more effort on the part of the promoter and optimum cooperation between the different advisory units.*

THE GROWING INTERNATIONALISATION OF COMPANIES AS WELL AS R&D REQUIRE IMPROVED ACCESS TO KNOWLEDGE IN FOREIGN INNOVATION SYSTEMS. *This means that the CTI's network of foreign partners and Switzerland's gateways to other countries must also improve.*

THE CTI WILL BE CONFRONTED WITH A GROWING DEMAND FOR GRANT FUNDING. *This will be triggered by the pressure on companies to innovate and the pressure on universities to acquire additional funding from third parties. The expansion of the service sector and interdisciplinary cooperation will bring sectors to the CTI's doors which only rarely applied for funding in the past. These include non-technological sectors with great innovation potential.*

MORE DEVELOPMENT FUNDING ALSO REQUIRES INCREASED COST TRANSPARENCY FOR R&D PROJECTS.

THE CTI'S MISSION
Create sustainable economic value and increase prosperity

06

SIXTH PART

The CTI promotes Switzerland's raw material – innovation

THE MANDATE OF THE CTI
is to promote science-based innovation with money and advisory services with the objective of improving the performance and competitive capacity of the Swiss economy.

The CTI understands its mission as follows:

— In the innovation value chain, the CTI's promotion measures cover the FIELD BETWEEN RESEARCH AND THE MARKET. The CTI's services come together to form a coherent and well-aligned support portfolio.
— It is the primary objective of the CTI to create SUSTAINABLE ECONOMIC VALUE and to increase Switzerland's prosperity. This involves strengthening the competitive capacity of companies, in particular SMEs that create added value in Switzerland, but also enhancing the efficiency and productive capacity of organisations that stand in the service of the Swiss public at large, such as hospitals.
— Government support for the universities represents an investment in the establishment and expansion of the knowledge base. The CTI sees this as an INDISPENSABLE UPFRONT INVESTMENT of which, in cooperation with research and implementation partners, as much as possible should be converted into an economic benefit.
— The PRIMARY BENEFICIARIES ARE THE IMPLEMENTATION PARTNERS: they should be able to enhance their potential for success on most of the global markets. Here the CTI works according to the PULL PRINCIPLE by strengthening demand-driven innovation and supporting the bottom-up approach of SMEs.
— The SECONDARY BENEFICIARIES ARE THE RESEARCH PARTNERS whose productive capacity and sustainable development are supported financially. Here the CTI applies the PUSH PRINCIPLE by strengthening supply-driven innovation and speeding up the development of market laboratories through the transfer of knowledge and technology. In doing so the CTI also finances the training of researchers by implementing near-market R&D innovation projects.
— The CTI selectively promotes the INNOVATION LEADERS AMONG THE START-UPS and improves the innovation systems of these young entrepreneurs at the regional, national and international levels.
— The CTI works in a SUBSIDIARY MANNER, i.e. the measures should have a complementary effect where there are bottlenecks in innovative development and market potential is not exploited.

In carrying out its mission the CTI follows five basic principles:

1. It promotes excellence in innovation.
2. It is open to all knowledge-intensive fields and sectors.
3. It is engaged in close dialogue with its partners and stakeholders.
4. It acts effectively, efficiently and is customer oriented.
5. It uses the latest instruments in the entire spectrum of its promotion activities.

Even though the CTI's mandate will remain basically the same in the coming years, its mission and self-image are unlikely to be static. The CTI constantly monitors its effectiveness, identifies barriers to innovation and applies an ongoing process of improvement.

With the wealth of experience gathered by its experts and coaches and its many relationships, the CTI sees itself as a mentor designing measures to promote an innovative economy.

The CTI always puts innovation for the Swiss economy in an international context. As the Swiss innovation agency its networks provide access to international support instruments wherever this can benefit Swiss SMEs.

In this role and with this understanding, the CTI actively informs society of the benefits and importance of science-based innovation for Switzerland.

MODE OF OPERATION AND STRATEGIC PRIORITIES

Balance between "technology PUSH" and "demand PULL"

07

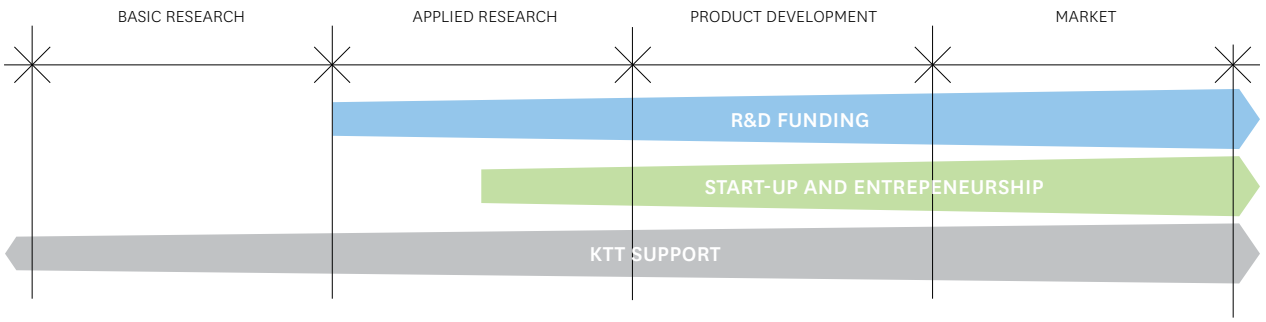
SEVENTH PART

Project, Start-up and KTT Support – promotion along Switzerland's innovation chain

07.**1**
The instruments of the CTI

The CTI offers a range of services and support measures that are constantly improved and expanded. These reliable instruments also equip the CTI to meet future challenges.

FIGURE FOUR
CTI INSTRUMENTS IN THE INNOVATION CHAIN

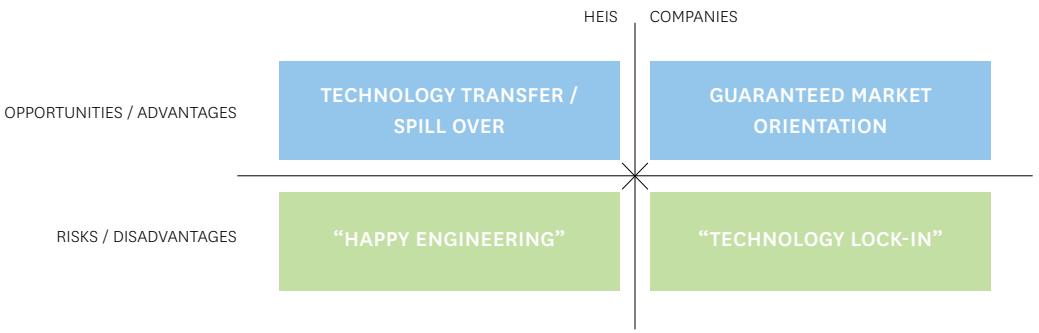


The instruments of the CTI: R&D Project Support, Start-Ups and Entrepreneurship and KTT Support

The CTI identifies barriers to innovation and uses its instruments to overcome hurdles to collaboration between public research and the private sector. In this way it creates favourable framework conditions for science-based innovation and closes gaps in the innovation process. The CTI follows the "bottom-up" principle and empowers market forces to efficiently exercise their leading role in creating science-based innovation and to be successful in the international competitive arena. In doing so it aims to establish a good balance between short-term innovation projects and long-term projects carrying more risk. It is also important to find the right balance between "technology PUSH" – where possible applications and users are located for technologies originating from the universities – and "demand PULL", i.e. market-centric innovation that require a technological solution. Both directions of transfer have their advantages, and placing too much emphasis on just one side harbours great disadvantages (cf. figure five).

FIGURE FIVE

OPPORTUNITIES AND RISKS OF "TECHNOLOGY PUSH" AND "DEMAND PULL"



Opportunities and risks of "technology PUSH" and "demand PULL": The relationship between these two directions of transfer should ideally be balanced, as both directions also harbour some disadvantages. With "happy engineering" there is too much emphasis on technical details and too little on customer needs. With "technology lock-in" the market favours a specific technological standard and misjudges and misses out on possible new technologies.

The CTI promotes projects that support the development of market-relevant and science-based innovation. These R&D PROJECTS *are carried out by companies, public service providers or in some cases also by non-profit organisations (implementation partners) in conjunction with public research institutions (research partners). The support instruments can also be used to support very high-risk but promising projects, feasibility studies and demonstration facilities.*

The CTI also makes young scientists aware of the MARKET RELEVANCE *of their academic research and with its promotion activities it makes a central contribution to the* TRAINING *of R&D young talents. The CTI promotes science-based* ENTREPRENEURSHIP *and provides professional support for the* ESTABLISHMENT AND EXPANSION *of innovative companies. Here the CTI coaches are on hand with advisory services to support and accompany young and highly innovative companies. The CTI uses awareness campaigns to address young people who might decide at a later date to establish an innovative company.*

The CTI supports KNOWLEDGE AND TECHNOLOGY TRANSFER *(KTT support) and contributes to the valorisation of knowledge by offering information, networking opportunities and advisory services. The CTI will in future use innovation mentors and national thematic networks to implement these tasks. Together with its partners it takes on a role as mentor in promoting cooperation between the research and business sectors and strengthening science-based innovation.*

The CTI helps to design INTERNATIONAL RESEARCH AND INNOVATION PROMOTION PROGRAMMES.

07.**2**
Overview of development priorities for 2013–2016

I. R&D PROJECT SUPPORT

The promotion of R&D projects is the core business of the Commission for Technology and Innovation. The CTI improves the way in which market knowledge flows back into the research sector, thus providing targeted support for the transfer of business know-how to the scientific sector: companies are given the possibility of setting out their knowledge and technological requirements to the universities. In addition new services are available which make it possible for high-risk innovation projects that offer great opportunities to be pursued. The CTI also improves the transfer of science to the business sector. HEIs are supported in their efforts to bring technological and innovation projects to R&D implementation readiness with little initial business involvement.

The CTI will promote more interdisciplinary projects and give greater support to projects involving several research and implementation partners.

To achieve the CTI's R&D objectives, its promotion efforts are supplemented by the innovation cheque and the CTI voucher.

The CTI focuses its limited grant funds on high quality innovation projects while taking account of the fact that project promotion is likely to see an increase in more complex projects, which will present new challenges in terms of expertise.

Seen overall, a higher number of applications will have to be processed.

On the cost side, after 15 years, payments to research partners must be adjusted to current circumstances. Salaries as well as the allocation and amount of overheads that no longer meet the current needs of research partners must be adjusted. Both of these affect the amount of funding that is required. (→ 7.3)

II. PROMOTION OF ENTREPRENEURSHIP AND START-UPS

The instruments to promote entrepreneurship must be adapted in a number of respects. For example, the strong regional systems serving the needs of innovative companies should be better integrated. Training courses should be harmonised more intensively and should also take account of sector-specific issues. The CTI must play a national coordinating role.

The support services for start-ups provided by CTI coaches should be expanded selectively in order to eliminate significant barriers to innovation. The CTI focuses on supporting start-ups with their growth strategies. It provides access to industrial networks, investors and know-how regarding the establishment and development of companies; these stimuli support companies in their growth strategy and help them to create jobs. An important instrument in this regard is the "CTI start-up label", an award for the most successful company founders. The international dimension and increased integration of innovation projects should also be given more attention.

Seen overall, the instruments to promote entrepreneurship should become better known and their impact should become more visible. (→ 7.4)

III. KTT SUPPORT

The KTT support concept will be redesigned and knowledge and technology transfer will in future be promoted through national thematic networks, innovation mentors and platforms. The NTN focus on innovation projects with economic potential of national importance. SMEs can obtain advice from the CTI's innovation mentors as well as help in establishing contact with the right local, national and international innovation systems. Thematic platforms and web-based information on development prospects will be used to encourage SMEs in particular to improve their innovation opportunities with science-based input from the universities. (→ 7.5)

IV. NATIONAL AND INTERNATIONAL PARTNERSHIPS

Cooperation with national partners such as the SNSF, the State Secretariat for Economic Affairs (SECO) and the Institute of Intellectual Property (IIP) is continuously improved so that the exploitation of synergies can be enhanced. The international dimension in particular should be strengthened and project support expanded wherever added value in the range of advisory services or innovative networks can be generated for Swiss SMEs. To this end, access to international sources of innovation and project support must be institutionalised and partnerships must be strengthened. (→ 7.6)

07.3 *R&D Project Support*

SWISS SMES – THE BACKBONE OF THE ECONOMY

In addition to the large multinational corporations, SMEs in particular make a strong contribution to innovation. Small and medium-sized enterprises are an important source for new jobs and are renowned for their locational loyalty. In the last ten years, more than 300,000 new jobs were created by SMEs in Switzerland. SMEs with an affinity for innovation can react quickly to market changes and introduce new technologies and processes with little delay. However, the European Innovation Scoreboard 2011, which for many years has given Switzerland top marks for its innovation capacity, is also showing a very worrying trend: the number of innovative SMEs in Switzerland is on the decline. SME in-house innovation programmes as well as their joint innovation programmes with others grew considerably less strongly than the EU average.

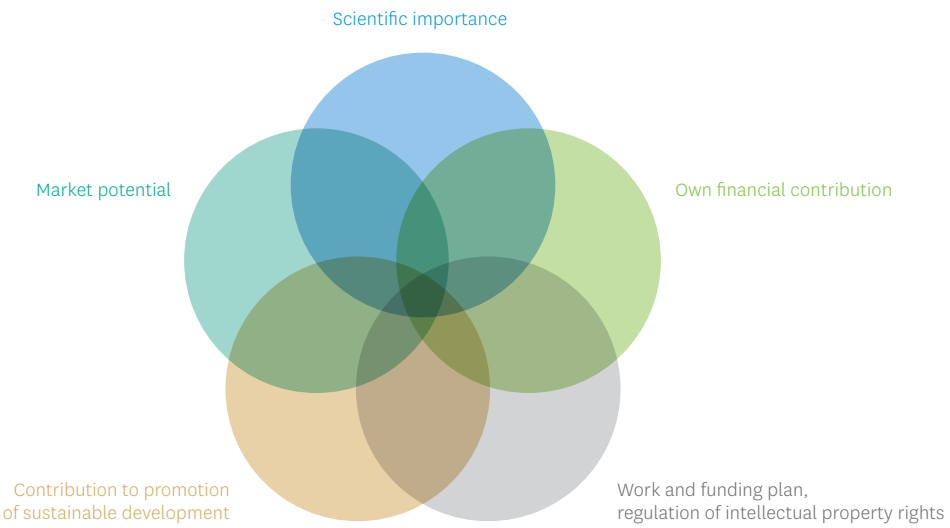
Thanks to the CTI's project support, SMEs with limited resources can use the R&D services and infrastructure of the universities to bring their own innovation projects to implementation readiness faster.

MAIN FEATURES OF R&D PROJECT SUPPORT

The CTI promotes the confluence of knowledge from universities and near-market companies and organisations. R&D projects are carried out by companies, public service providers or in some cases also by non-profit organisations (the CTI calls all of these "implementation partners") in conjunction with public research institutions (research partners). R&D Project Support is basically available to all disciplines that could contribute to science-based innovation. Project applications are submitted in accordance with the bottom-up principle.

The R&D projects promote the development of new products, procedures, processes and services for the business sector and for society. The CTI's support is subordinate. Support is dependent on the innovative content and prospects for successful market implementation. The CTI only covers the R&D expenses of the research institutions, and the Confederation's financial support is given exclusively to research institutions entitled to a contribution in Switzerland. In this way the CTI contributes to the practical training of young people involved in R&D. Businesses benefit twofold: from the project results and from a next generation of qualified market-centric R&D staff.

FIGURE SIX
THE CENTRAL CRITERIA APPLIED TO R&D PROJECT SUPPORT BY THE CTI



Innovation ensures that businesses remain competitive and productive. Research and development activities are an investment in the company's future, they prevent crisis-driven intervention by generating differentiation advantages at an early stage. As described above, even companies that are active on the innovation front and which specialise strongly in a specific technology run the risk of underestimating the development potential of new and alternative technologies. The CTI's R&D Project Support guarantees access to missing infrastructures, new knowledge, know-how and the competent resources of the universities. When crisis-driven intervention is needed, the CTI's support focuses on the integration of complementary know-how and specific R&D skills from the universities, thereby strengthening and speeding up R&D development in companies. Universities benefit from the exchange of company-specific knowledge, practical exposure, market knowledge and corporate development know-how.

DEVELOPMENT PRIORITIES IN R&D PROJECT SUPPORT

For applicants, fast and tailored processes are of central importance. Even with more complex and larger R&D projects, 80 percent of applicants should ideally receive a reply within 4 to 6 weeks, as is the case today. The CTI's R&D process is efficient and customer-friendly. From 2013, the administrative effort should be reduced through the web-based submission of applications via "CTI-PROJECTS".

Over the next few years the CTI wants to support INNOVATION PROJECTS THAT ENTAIL MORE RISK but which have great economic innovation potential; large projects with more opportunities will be supported over a longer period. The CTI will help businesses to implement RISKY PROJECTS WITH HIGH MARKET POTENTIAL for which the necessary R&D resources and capacities would otherwise not be available. Universities and other research institutions on the other hand will be supported in the implementation of PROJECTS WITHOUT AN IMPLEMENTATION PARTNER or with little initial involvement on the part of the implementation partner in order to bring innovation projects that are seen as immature and too risky by industry to implementation readiness. In this way the CTI's promotion activities will dovetail with those of the SNSF to ensure that important technologies can be developed further at the universities. By providing this kind of support the CTI is closing an important gap between the SNSF and its R&D Project Support activities and is enabling interested companies to obtain clarity regarding the innovation relevance of new research results and adapt these results to their needs in follow-up projects.

The CTI improves the way in which market knowledge flows back into the research sector, thus providing targeted support to the transfer of business know-how to the scientific sector. More attention is paid to the impetus given by the economy: companies are granted the possibility to set out their knowledge and technological requirements to the universities. The INNOVATION CHEQUE introduced in 2009 finances small preliminary studies for R&D projects and provides SMEs with an initial opportunity to cooperate with the universities with regard to R&D and to benefit from ongoing research and innovation activities.

The CTI VOUCHER makes it possible for a company to apply for an R&D project quickly and initially without having identified specific research partners. From the point of view of the SME, the application contains a precise description of the targeted innovation and research that is required. The CTI's experts review the application and set a cost ceiling upon approval.

Along with the approved cost ceiling the company is given a voucher – the CTI voucher with which it can start the search for a suitable research partner. In parallel to this the CTI intensifies the personal advisory sessions between the company and the CTI experts in order to smooth the way for the innovation project and to find a suitable research partner.

Projects that involve the CHALLENGING INNOVATION OF SERVICES are also receiving more attention as regards project support than in the past. The CTI wants to expand the interpretation of the term science-based innovation and bring its innovation support in line with current economic developments and events in the Swiss innovation landscape. This will facilitate the comprehensive market implementation of research knowledge.

The options of combining scientific disciplines and the opportunities of application for multidisciplinary research knowledge on the market are on the increase. At the same time the ties between companies and possible development partners are growing.

This leads to HIGHLY COMPLEX R&D projects involving SEVERAL PARTNERS with stricter requirements regarding intellectual property rights (IPR) and the compatibility of the players involved. The successful realisation of open innovation projects, multidisciplinary projects and projects with an international dimension also requires more effort on the part of the promoter and optimum cooperation between the different advisory units.

The CTI wants to increase its support for such projects and aims to competently accompany the more complex projects of its innovation partners.

In order to take account of the increase in the number and importance of cleantech projects, the CTI has a dedicated expert in every funding area who is in charge of these energy topics and handles the overall coordination of the projects in this department.

OVERHEAD COSTS OF RESEARCH PARTNERS

In addition to direct R&D costs – the salaries of researchers at the universities and material costs – the research institutions also incur indirect costs. The more successful an applicant is, the more detrimental the effect on the total expenses of the group or institution if the indirect costs are not included in the funding, at least in part. Foreign development organisations have long since taken account of these facts. In the past legislative period the SNSF has also introduced an overhead to take account of problematic consequences.

The CTI already partially covers mutual costs that arise at the universities of applied sciences and currently grants a supplement on the normal hourly rate for researchers. Without this supplement universities of applied sciences, which are required to cover their costs (full absorption costing), would be unable to pursue R&D projects with implementation partners.

Other research partners have not been granted overheads to date. In future the CTI wants to apply the same approach as the SNSF and will pay greater attention to cost transparency in R&D projects. Developments in the last few years have shown that increasing numbers of research partners are choosing to refinance their research with third-party funds and that full coverage of the costs incurred with a research project becomes a contractual obligation vis-à-vis the carrier. With an eye to these dynamic trends in the Swiss research landscape the CTI wants to introduce a suitable overhead for its research partners and research projects.

07.4 *Promotion of Entrepreneurship and Start-Ups*

Although more than 2.3 million employees work for more than 311,000 SMEs in Switzerland, entrepreneurship culture is not very well established in Swiss society. Due to the lack of raw materials the Swiss economy can only grow through innovation, particularly as the efficiency potential of the dominant business sectors has been exhausted. The objective must be to achieve synthesis between innovation and entrepreneurship.

Increasing global competitive pressure means that ageing business models in shrinking sectors should be replaced faster than is possible today, where around 11,000 new companies are established every year - of which less than 50 percent survive over five years. Entrepreneurship needs a better image, not only because start-ups create new jobs, even in times of recession. Fundamentally new products pose high risks in development and marketing - due to their atypical investment and return models, they need culturally and financially independent structures. Today, the "creative destruction of economic structures" takes place in a global arena and can only be successfully challenged at the national level with a strong "entrepreneurial spirit".

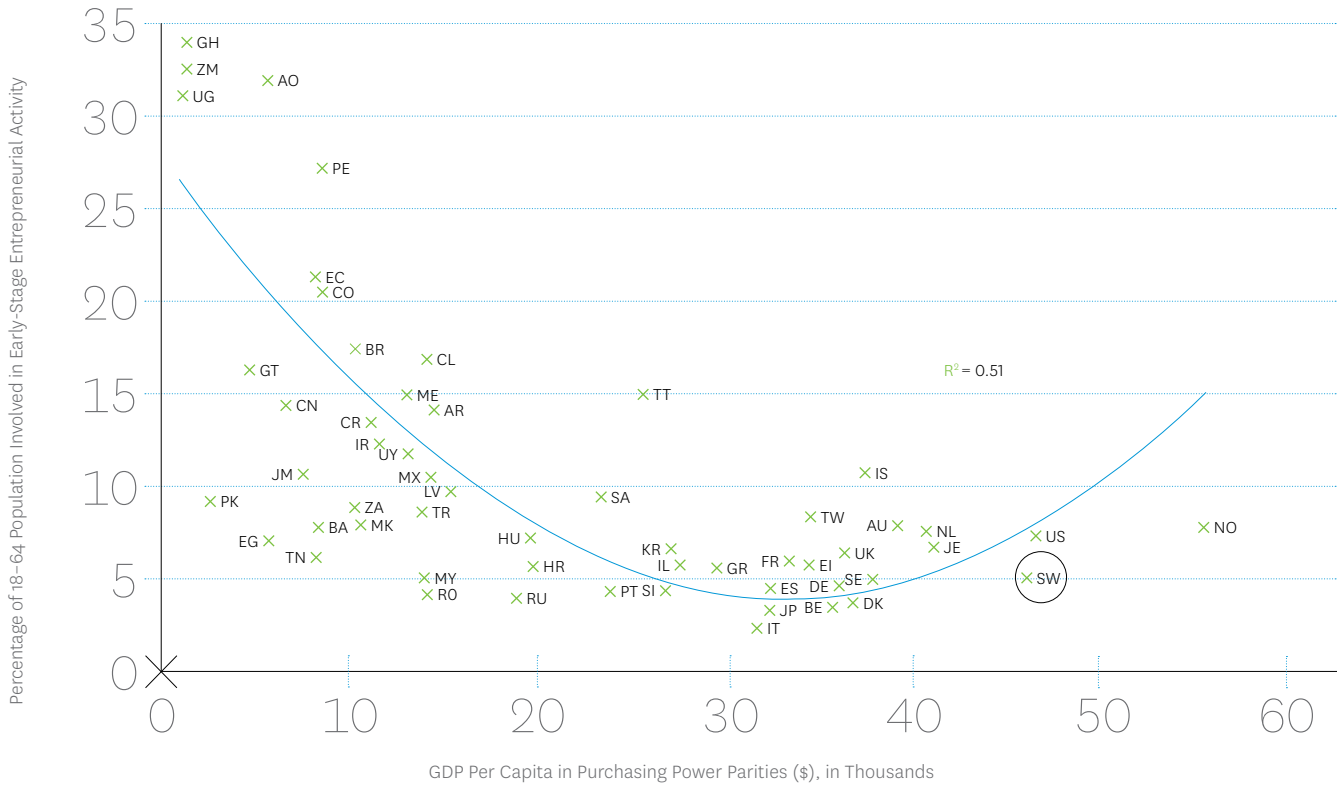
Academic spin-offs and private sector spin-outs give rise to important ventures, particularly in terms of the creation of non-linear (radical) innovation, which require independent culture and financing structures.

The internationalisation of risk financing has its roots in the basic mobility of capital. This is why we need a Swiss innovation policy with an international bias so that Swiss ventures can attract foreign investment and new industries offering new jobs can be developed.

It is one of the tasks of the CTI to use qualified information, networking and quality assurance to help minimise the risks faced by the providers of capital to start-ups, thereby indirectly improving the availability of capital. To achieve this, in-depth expertise and personal contact are required, which is why CTI coaches, who are highly qualified, well-connected people with passionate commitment, play a central role.

Seen overall, the CTI with its objectives of reaching a broader public and achieving a greater impact on some of them with its programmes is on the way to becoming a "public entrepreneur".

FIGURE SEVEN



AO	Angola	CO	Colombia	GH	Ghana	IT	Italy	NL	Netherlands	SI	Slovenia	UG	Uganda
AR	Argentina	CR	Costa Rica	GR	Greece	JM	Jamaica	NO	Norway	SW	Switzerland	UK	United Kingdom
AU	Australia	DE	Germany	GT	Guatemala	JP	Japan	PE	Peru	TN	Tunisia	US	United States
BA	Bosnia and Herzegovina	DK	Denmark	HR	Croatia	KR	Korea	PK	Pakistan	TR	Turkey	UY	Uruguay
		EC	Ecuador	HU	Hungary	LV	Latvia	PT	Portugal	TT	Trinidad and Tobago	ZA	South Africa
BE	Belgium	EG	Egypt	IE	Ireland	ME	Montenegro	RO	Romania			ZM	Zambia
BR	Brazil	ES	Spain	IL	Israel	MK	Macedonia	RU	Russia	TW	Taiwan		
CL	Chile	FI	Finland	IR	Iran	MX	Mexico	SA	Saudi Arabia				
CN	China	FR	France	IS	Iceland	MY	Malaysia	SE	Sweden				

Entrepreneurship culture has relatively weak roots in Switzerland.
(Source: GEM Global Entrepreneurship Monitor – 2010 Report)

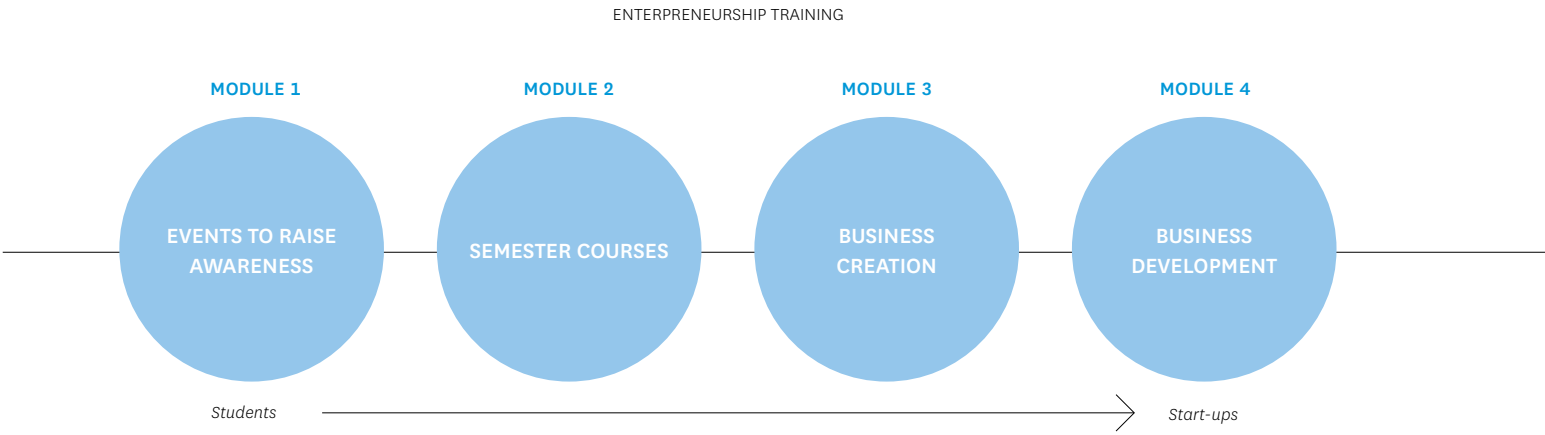
Bolivia and Vanuatu are not shown in this figure, because their TEA rates are outsiders

07.4 1
DEVELOPMENT PRIORITIES - ENTREPRENEURSHIP

Entrepreneurship today is not well established in Switzerland with its highly developed but small economy and appears to be an unattractive option for university graduates - in marked contrast to the emerging nations of Asia and "entrepreneurship hotspots" such as Silicon Valley in the USA. For an "innovation-driven economy", the gainfully employed population of Switzerland also exhibits below-average "entrepreneurial intentions".[7]

For the past decade the CTI has been trying to make university graduates aware of exciting alternatives to the traditional corporate career, which could for some of them lead to the establishment of their own companies. The CTI promotes entrepreneurial thinking by future members of the scientific and business communities. To bolster these efforts, young academics are supported in the implementation of their business ideas. The "ventureLab" programme mandated by the CTI offers progressive training to support teams in the development of their business idea. The courses are available throughout Switzerland and are held regionally around universities or young companies. These courses and programmes will also be opened in stages for other third-party providers.

FIGURE EIGHT
FROM STUDENT TO CEO – THE CTI'S TRAINING AND COACHING MODULES



[7] GEM Global Entrepreneurship Monitor – 2010 Global Report, Kelly/Bosma/Amoros, 2011, GERA, Babson College, Universidad del Desarrollo.

START-UP COACHING

07.4. **2**

DEVELOPMENT PRIORITIES - START-UP

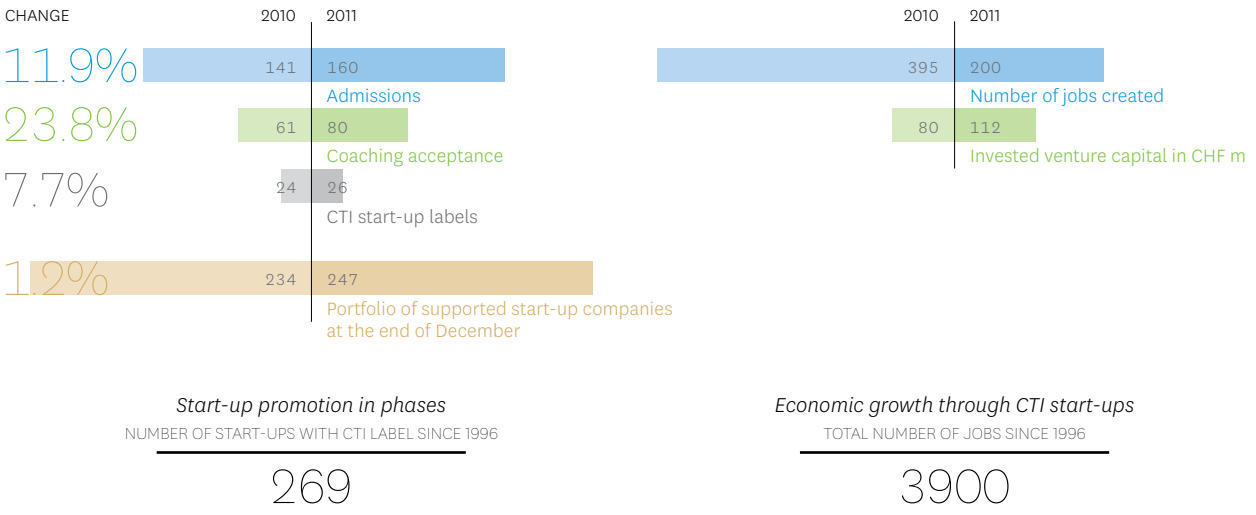
The ideal development process from start-up to independent growth company begins with a basic idea and runs through to its commercialisation, i.e. from the laboratory to the shelves in the shop. The parallel process of creating a company is supported by the CTI and its coaches. The coaches are experienced entrepreneurs who are familiar with the concerns and hurdles faced by a start-up company before, during and after its establishment. They have strong business connections and pass on their knowledge to young entrepreneurs. The work of the coaches is evaluated every year.

The **COACHING ACTIVITIES** are continually **EXPANDED** in order to eliminate key barriers to innovation. The CTI promotes the exchange of information and puts the start-ups into contact with suppliers, partners and investors. This also involves the establishment of contact to business angels – providers of early-stage and venture capital – whose independent and qualified feedback can put these young companies on the road to stable growth (www.cti-invest.ch). At round table discussions, young entrepreneurs benefit informally and directly from the experiences of successful company founders. The CTI also promotes start-ups by taking part in sector-specific events and via the start-up ticker (http://www.startupticker.ch/), which reports on the activities of young companies. A new internet platform specifically for start-ups (www.ctistartup.ch/htm/home.htm) is designed to reduce administrative hurdles, promote networking between start-ups and investors and provide a general overview of the instruments available for supporting start-ups and entrepreneurship.

At the end of the coaching process the start-ups are awarded the **CTI LABEL** according to sustainability criteria. This label confirms the company's capacity to grow sustainably as well as its suitability for venture capital, thereby boosting its chances of finding an investor. With an impressive "survival rate" of 86 percent, companies with the CTI label have directly created 3,500 and indirectly 10,000 jobs for highly-qualified people since 1996.

FIGURE NINE

START-UP 2010 AND 2011 IN FIGURES



Since 1996, 269 companies have received the CTI label.
A total of 3,900 jobs were created.

An important factor that improves the chances of success is expansion into foreign markets: the **INTERNATIONALISATION** of the start-up. This is supported by the expansion of the networks of the CTI and related government organisations such as swissnex (with jobs for start-ups in Boston and San Francisco) and their foreign experts as part of the "US Camp" programme. The plan is to expand the programme in the coming years to include the market regions of Asia and Europe. For Switzerland as a high-price country it is important to set the right priorities, even in the case of internationalisation, to ensure that new jobs can be retained in Switzerland and that clusters of new industries are created inside the country. An accumulation of skills is a competitive advantage.

To support the start-ups with their growth strategy, the CTI is strengthening **ITS SELECTIVE POST-LABEL SUPPORT**. The aim is that start-ups that have benefitted from CTI support (almost 300 to date) should have a sustainable impact on the economy as reflected in the tax base and jobs.

The uncertain economic situation has a negative effect on the flow of capital. The initial results of studies carried out in collaboration with Swiss universities also show that it is becoming more difficult to secure financing for start-ups, particularly in the initial phase. The CTI therefore introduced an **EARLY STAGE FINANCING TASK FORCE** which gathers the facts and identifies ways in which these financial bottlenecks for start-ups can be eased. This task force supports and accompanies important stakeholders from the business and political arenas in their efforts to define the required objectives and steps.

07.5 *KTT Support*

After R&D Support and Start-Ups and Entrepreneurship, KTT Support is the third pillar of the CTI's innovation promotion programme. The objective of knowledge and technology transfer is to shape the cooperation programmes between research institutions and private-sector businesses so that the result is innovation output that benefits both partners: the business partners benefit from the development opportunities provided by the universities and the research partners benefit from practical exposure to the business world. The task of a good KTT promotion programme is to support all parties in their search for a partner and to improve the readiness and foundation for a successful innovation process. Good technology transfer uses both directions of transfer: the transfer of knowledge and technology from the scientific sector to the business world, and the feedback of market knowledge to the research sector, i.e. the transfer of business know-how to the scientific sector.

KTT support has developed well in Switzerland over the past two decades. Local and cross-cantonal networks have been established which do excellent work. The CTI helped to initiate this development and to establish KTT consortiums and thematic networks in the form of R&D consortiums, and promoted important events. Other players enriched the market and took on additional tasks step by step. As a result a wide range of offerings were created. However, the visibility of local support systems suffered as a result, in spite of the good quality of the players.

An external evaluation of the KTT consortiums, a comprehensive audit and an OECD study (territorial examination of Switzerland) have shown that in future the KTT structures should be positioned to better meet the needs of SMEs. Transfer from the business world to the scientific sector is being strengthened, and SMEs are given help to set out their knowledge and technology needs. Promotion activities must be brought into line with topics that are relevant to Switzerland in terms of innovation potential and business development.

Switzerland has long played an acknowledged role as trailblazer with regard to topics such as energy and resource efficiency, and also developments related to a green economy. These changes, described under megatrends in chapter 3, require a comprehensive change in technology where Switzerland can position itself actively and innovatively, on the side of both research and industry. The quality of KTT plays an decisive role here.

In terms of their scope and the pace of change, these topics run diagonally to the structure of the CTI's R&D areas of funding (Engineering Sciences, Life Sciences, Micro and Nanotechnologies and Enabling Sciences), and in the CTI's core business support the early detection of new innovation projects that are often born in new thematic fields of existing sectors and industries.

At the beginning of the new ERI period (2013), the KTT and R&D consortiums will be replaced by NATIONAL THEMATIC NETWORKS. These focus on an innovation topic of national importance and build up a network consisting of research and business partners. In 2012 the CTI will put these NTN out for tender for the first time and finance them together with other support organisations. They will replace all existing contracts with consortiums.

A second element in the CTI's KTT Support funding area is the use of INNOVATION MENTORS (IM). These are CTI advisors that have direct contact with SMEs in order to analyse their needs and identify ways in which the SMEs can strengthen their innovation capacity in cooperation with universities or other business partners.

As innovation mentors have many years of experience in the private sector, they understand the language and concerns of SMEs but also have proven access to research and support institutions. The innovation mentors use these skills to negotiate partnerships in Switzerland's "promotion landscape" and to build bridges for SMEs.

National thematic consortiums and innovation mentors work together closely but also prepare their output independently and at different levels. An NTN focuses on a topic at the national and international levels and builds up an innovative and relevant network, while an IM focuses on an individual local company, is familiar with the support systems and establishes links to new partners.

The third element in the CTI's KTT Support is the backing it gives to EVENTS on current topics placing emphasis on real contact between possible partners. It also uses and builds virtual platforms that make it easier to establish links between partners and serve to provide transparent information on the numerous support options and orientation support provided to SMEs.

The CTI is convinced that investment in the creation of partnerships and support for the resulting innovation projects is of the utmost importance. Here too the CTI works in a subsidiary manner and plays a supporting role as national coordinator.

07.6 *National and international partnerships*

The CTI can only be fully effective if it works together with strong partners that professionally manage specific parts of the value chain that focus on education, research and innovation. This applies equally to the regional, national and international dimensions.

Following its newly achieved autonomy, the CTI aims to choose the right partners for key tasks and to strengthen its tried-and-tested partnerships. This process draws not only on the experiences gained to date from the individual partnerships, but also on new findings regarding the creation of innovation processes. In all its partnerships the CTI functions as an integrator, not only in bilateral cooperation partnerships, but also in bringing together other partners with different skill sets to create added value.

A partner organisation with whom the CTI works together intensively is the SWISS NATIONAL SCIENCE FOUNDATION. While the SNSF focuses primarily on knowledge-based research, the CTI supports applied R&D with market and product orientation: innovation projects. As these two areas of promotion are complementary and linked to one another, it is very important to have a partnership that works well. This is the only way in which synergies can be exploited and the loss of knowledge between the different process levels can be avoided.

The straight-line innovation process model from basic research to applied research to development and innovation on the market is too simplified and does not reflect reality. It often depends to a large extent on the motivation of the individual researcher and on whether he or she recognises and pursues any potential for practical use. The promotion programmes of the SNSF and the CTI focus on the same issues here.

Surveys regarding projects first supported by the SNSF as National Centres of Competence for Research (NCCR) or National Research Programmes (NRPs) and then by the CTI have shown that the harmonisation of the support programmes of the SNSF and the CTI is of central importance. The resulting figures are likely to underestimate the actual effects. For example, assessments for the 2001–2008 period show that 62 R&D support projects with a funding volume of CHF 26.7 million resulted from the National Centres of Competence for Research of the SNSF's NRPs. The results for the application-centric national research programmes are similar, such as the ongoing NRP 62 (intelligent materials) and the new NRP 66 (wood as a resource) and NRP 69 (healthy eating and sustainable food production).

SECO also has numerous interfaces with the CTI. For SECO, these primarily include the new regional policy (NRP), e-government, SME policy, locational policy and the activities of the OSEC. For the CTI, these interfaces are related to the promotion of innovation, primarily in the fields of KTT and the promotion of entrepreneurship.

Both organisations give priority to the creation of parameters in Switzerland that favour entrepreneurs. Ideas are regularly discussed, coordinated and aligned.

SECO's activities include a number of tasks that would be difficult to carry out without applied research, such as support for the innovation projects of regional SMEs as part of NRPs, the pro-

motion of young companies, the reduction of administrative barriers to the establishment of companies, and e-government. In all these cases, targeted advisory services by the CTI could help to improve policy efficiency.

The INSTITUTE OF INTELLECTUAL PROPERTY is another important partner of the CTI. In collaboration with the IIP, important questions from SMEs regarding the protection of intellectual property can be answered, which strengthens their position in the international competition arena as well as the investments made in them. The IIP also has access to information that can help the research institutions to derive new findings from the research that was done as well as the existing markets. In both cases the CTI and IIP make an important contribution to building a bridge between the various players and raising the awareness of young scientists for the market relevance of their academic research.

The CTI fulfils its tasks as part of the FEDERAL ADMINISTRATION. It takes a position on all consultation procedures related to innovation and actively works to establish a network involving other government offices. Relationships with the Federal Office for Professional Education and Technology and the State Secretariat for Education and Research, which will be merged to form the future State Secretariat for Education, Research and Innovation, are of central importance in the federal administration. The CTI's important interface to the research done by government departments is covered by two Commission members of the Swiss Federal Office of Energy and the Federal Office for the Environment.

Thanks to the increasing international momentum, relationships with partners that provide access to INTERNATIONAL SOURCES OF INNOVATION, funding and markets are also growing in importance. Euresearch, which is responsible for coordinating the European Framework Programme for Research, is just as much a partner of the CTI as specific European Research Area Networks (ERA-Nets) and other national promotion agencies. ERA-Nets are networks consisting of several national promotion agencies that coordinate the cross-country research activities regarding a specific topic, for example by jointly putting out research projects to tender. The CTI is already involved in the establishment and launch of two ERA-Nets.

THE CTI AS AN ORGANISATION
An independent executive commission with its own regulations

08

EIGHTH PART

The CTI is a central partner and intermediary for the research and business communities

The CTI has been an independent executive commission with its own regulations since 1 January 2011. Its activities are primarily governed by the Research and Innovation Promotion Act and its implementing ordinance (RIPA-O). For administrative purposes it is part of the Federal Department of Economic Affairs (from 2013: Federal Department of Economic Affairs, Education and Research).

Hardly any other federal office has such an intensive external focus as the CTI, which makes it a central partner and intermediary for the research and business communities. More than 170 part-time external experts, coaches and promoters work together with 22 permanent staff (full-time equivalents) at the Secretariat to provide an important service on behalf of Switzerland's economic performance.

Securing and speeding up the transfer of scientific knowledge to boost the development and production processes of large and small companies as well as start-ups represent the last phase in the government's academic research activities. The extraction of benefits for the economy from the research done at universities to the tune of around CHF 6 billion per year[8] has become a complex undertaking in the past few decades. As a result, the role and function of the CTI and its Secretariat as a catalyst is very important today.

In practice, the CTI's mission is closely linked to the Swiss innovation system, which consists primarily of private sector research and development and the government's network of universities. The high level of productivity of this system must be maintained and expanded, as it is Switzerland's only chance to remain competitive. Global studies[9] also show that there is sufficient potential in the dissemination and impact of scientific findings (i.e. academic research):

DISSEMINATION AND IMPACT OF ACADEMIC RESEARCH

	SCIENTIFIC OUTPUTS		KNOWLEDGE CREATION		KNOWLEDGE IMPACT		KNOWLEDGE DIFFUSION	
COUNTRY / ECONOMY	SCORE	RANK	SCORE	RANK	SCORE	RANK	SCORE	RANK
Sweden	62.1	1	75.1	3	39.3	29	71.9	4
SWITZERLAND	62.0	2	73.4	4	50.8	12	61.9	10
Finland	58.5	3	70.9	5	35.6	40	69.1	5
Israel	57.5	4	77.4	2	33.1	58	62.0	8
United States of America	57.4	5	60.4	9	52.5	11	59.4	12

(source: The Global Innovation Index 2011, INSEAD).

[8] Research and development expenses 1987–2008, Federal Statistical Office.
[9] The Global Innovation Index 2011, INSEAD.

08.**1** *Organisation and CTI Secretariat*

The CTI is chaired by a President. Together, the President and the heads of the different funding areas form the Board. The CTI consists of a total of six funding areas: the two funding areas START-UPS AND ENTREPRENEURSHIP AND KTT SUPPORT as well as the four independently focused funding areas under R&D Project Support. (ORGANISATIONAL CHART: CF. A.1 AND ADDITIONAL INFORMATION ON R&D AREAS OF FUNDING: CF. A.2)

These different CTI funding areas provide a structural framework for the experts and coaches that provide services in direct contact to innovative, science-based SMEs – the CTI's customers.

The Secretariat with its Director in charge of all activities and three department heads manages all business dossiers and prepares the decisions of the funding areas formally, organisationally and in terms of content. It is in permanent contact with the research, political and business sectors and serves as the autonomous trailblazer for the Commission and its Board and implements their decisions.

The CTI comprises around 65 Commission members (experts for project promotion appointed by the Federal Council), 65 coaches and a planned 50 innovation mentors – all of them exercising their office as a subsidiary function – and currently 22 full-time equivalent employees working at the Secretariat. Under the chairmanship of the Vice-President, the Commission members decide about requests for funding in their areas of subject expertise. The coaches support start-ups during the coaching process and work for the CTI under a mandate relationship.

The CTI is a lean and effective organisation with excellent links to the entire national innovation system.

08.**2** *Challenges for the part-time system*

The success of the CTI's efforts is determined by the quality of its experts, and in particular their understanding of their subject area and of innovation aspects. Innovation requires knowledge as well as experience, both from the field of research and the field of application. The latter specifically comprises the private sector, but also other organisations that can implement research results, such as social organisations.

The parameters of the part-time system must allow the CTI to attract and retain the best people for the right positions.

08.**3** *Challenges for the Secretariat*

Switzerland's leading position in the competition between national innovation systems rests on several pillars: economy, science, education, government and society. A decisive competitive advantage of our country lies in its position as a global leader in system productivity,[10] which is defined as the output relative to the input for our innovation system. The management and Secretariat of the CTI are committed to securing and expanding this productivity. As a result, the ongoing optimisation of its tasks and processes, also as part of the implementation of its focal points for development (cf. Chapter 7.2), is a priority for the Secretariat.

The increase in the number of applications, the improved visibility and in particular the strategic relevance of the CTI for our export-focused economy show that the CTI must deepen the Secretariat's knowledge of the individual funding areas. This would allow the CTI to speed up the process of preparing applications for review by the experts and to implement proactive measures to increase the number of applications in the fields that have been identified as focus areas by the Confederation. Affiliation with international promotion programmes and funding projects (new proof-of-concept grants by the European Research Council ERC[11]) must be simplified for qualified applicants.

EXPANSION OF R&D PROJECT SUPPORT AND KTT SUPPORT

The R&D Project Support programme, which is the dominant programme with around CHF 100 million a year, is headed by project managers running the four large areas of funding, i.e. Life Sciences, Engineering Sciences, Micro/Nanotechnologies and Enabling Sciences. The project managers are in contact with the applicants, handle the correspondence, formally review the applications to ensure that they are complete, and provide support to the president of the funding area. The applications are then reviewed by the relevant experts on the Commission, who take the final decision.

During the 2008–2011 legislative period, the number of applications that was received rose substantially, which also increased the requirements for efficient project management as well as the workload of the project managers. In view of the international competitive pressure, it must be assumed that the **APPLICATION VOLUME** will remain high in future.

The **NEW SUPPORT INSTRUMENTS** introduced by the CTI which are in great demand by the applicants, such as the CTI voucher, the innovation cheque and the feasibility studies without implementation partners, substantially increase the requirements for the competency portfolio as well as the workload. The same applies for the more complex rules regarding intellectual property of Art. 10y RIPA-O. More demanding processes and the need to communicate with the Commission members also increase the workload. The new instruments also require professional introduction by way of suitable pilot procedures, which not only raise the need for suitable communication processes but also demand numerous adjustments to and the redesign of the support processes.

A new **PLATFORM** (CTIprojects) for applicants for the R&D areas of funding will be introduced which will make it possible to enter applications digitally. This will reduce the workload of the applicants and also reduce the time needed by the CTI employees to process the applications. The goal for the coming years will be to migrate all CTI processes to a central digital system, but the introduction of this system will substantially increase the employees' workload.

Knowledge and technology transfer (**KTT SUPPORT**) was given a new focus, and the implementation of this focus on SMEs with an affinity for innovation will be finalised by the end of 2012. The public tender of new national and thematic networks, the introduction of innovation mentors and the resulting need for performance monitoring will increase the time and effort required for support, coordination and operational management. The Secretariat therefore needs additional personnel resources.

GROWTH FOR ENTREPRENEURSHIP AND START-UPS

CTI ENTREPRENEURSHIP coordinates established programmes for awareness raising and training of future founders of companies at the universities that are offered by mandated providers. These programmes will be expanded from 2013, both in terms of content and geographically. The number of partnerships that will have to be coordinated will increase, which will substantially increase the workload.

THE CTI'S SUPPORT FOR START-UPS is based on a multi-level coaching process involving more than 65 part-time coaches that is co-

[10] "Innovation Indicator 2011", study by BDI The Voice of German Industry and the Telekom Foundation.

[11] European Research Council, http://erc.europa.eu/proof-concept.

ordinated by the Secretariat. Due to high demand, the number of coaches (+25 percent) as well as the number of companies in the support portfolio (+40 percent) have increased substantially since 2008. The improved access to sector-specific networks and investors, the organisation of events and the expanded range of services to support businesses in their growth and internationalisation strategies demand additional resources.

NEW RESOURCE MANAGEMENT

While both CTI programme departments are constantly adjusting their operating processes to changed circumstances and monitoring their efficiency, it is the remit of the resource department created at the beginning of 2011 to support this work as best as possible. In addition to general administrative tasks, the focus falls on the continued development of the CONTROLLING mandate (to monitor operating processes and strategic objective achievement), the establishment of effectiveness analyses, the continued development of the CTI'S CURRENT INTERNAL IT SOLUTIONS, the establishment of an internal control system ICS (in accordance with the instructions of the Federal Finance Administration) and risk management. In the period from 2013 to 2016 the current IT stand-alone solutions will be replaced by a productive and integrated E-GOVERNMENT SYSTEM. At the same time this department must manage all relationships to other government offices. To provide extra support, a SERVICE LEVEL AGREEMENT has been concluded with the Federal Office for Professional Education and Technology to provide FINANCIAL AND ACCOUNTING services, HR administration, logistics and IT operation support services.

COMMUNICATIONS

The CTI's COMMUNICATIONS department provides efficient internal and external communications services. Apart from internal communication, this includes MEDIA RELATIONS as well as advisory, support and project services and the coordination and organisation of all kinds of EVENTS. Every year this department organises the national medtech event as well as the SwissNanoConvention, and the CTI is also involved in a number of other events. In future, the communications department will further simplify and improve the efficiency of its processes and collaboration with all dialogue groups. One measure in this regard is the upgrading and user-friendly redesign of the WEBSITES (e.g. www.kti.admin.ch and www.ctistartup.ch) as well as the clear-cut positioning of the CTI as a promotion agency.

The new independent status of the CTI makes it possible for the agency to react quickly and adequately to new challenges. What is also needed is EFFICIENT PROCESSES supported by IT systems that guarantee permanent transparency. The effectiveness of the Secretariat and its downstream part-time experts must be given first priority in the militia system prescribed by the law. Here it must be said that the separation of the CTI from OPET meant that many interface services in HR, finance, communications and legal services disappeared, a development that was not anticipated by the current workforce.

CTI RESOURCE REQUIREMENTS

CHF 580.8 million requested, CHF 547 million approved

09

NINTH PART

The current trends are changing resource requirements

09.**1** *Staff requirements*

The CTI Secretariat was made independent in 2011 with only 20.8 full-time equivalent staff positions. Since 2011 the CTI has taken over additional promotional tasks such as the issue of innovation cheques, the launch of the CTI voucher and the promotion of projects entailing a higher risk. As explained in chapter 8, the Secretariat not only has to manage a more sizeable support portfolio, but also an ever growing number of applications, start-ups and interactive relationships with the research and business sectors as well as the CTI's experts and coaches. Every year around 1,000 contracts are drawn up in the various funding areas. This goes hand in hand with an ever increasing controlling workload to ensure risk and quality management. In parallel to this, the Secretariat also processes and implements the new entrepreneurship and KTT support strategies adopted by the CTI board and described in the 2013–2016 ERI Dispatch. The Secretariat also implemented a series of special measures, most recently in 2011 to combat the strong Swiss franc. As the many measures and volume of applications can only be handled seriously and effectively if the CTI employees remain specialists, the number of employees should be increased appropriately – not least in order to reduce the CTI's current dependence on external service providers (and thus on fluctuating know-how).

Without at least additional personnel resources financed by collateral loans the CTI cannot guarantee the implementation and management of its promotion measures in the fields of research, technology and innovation. For the 2012 legislative period, the CTI received three full-time positions as a staff collateral loan. For the 2013–2016 period the CTI needs at least four additional full-time positions if it wishes to cope with the implementation of all new measures and the volume of applications and projects. These new tasks also include the drafting of position papers on topics concerning research and innovation promotion for the Federal Council and parliament, to the extent that this task is the responsibility of the CTI.

OVERVIEW OF PERSONNEL RESOURCES AND DEVELOPMENT NEEDS
FROM 2013

CTI SECRETARIAT		2011	2012	FROM 2013
MANAGEMENT	*Director*	1	1	1
	Director's assistant	1	1	1
	Scientific assistant (research)	1	1	1
	SUBTOTAL	**3**	**3**	**3**
R&D	*Department head*	1	1	1
	Enabling Sciences project staff	1	1	1.25
	Engineering Sciences project staff	1	1	1.25
	Life Sciences project staff	1	1	1.25
	Micro and Nanotechnologies project staff		1[1]	1.25[1]
	Innovation cheque		1[1]	1
	International issues			0.5
	CTI voucher		(1)[2]	1
KTT	*Deputy department head R&D*	1	1	1
	KTT & events project staff			1
	SUBTOTAL	**6**	**7**	**10.5**
START-UPS / ENTREPRENEURSHIP	*Department head*	1	1	1
	Entrepreneurship	1	1	1.6
	Start-Ups	1.6	1.6	2
	Contract administration and assistance	1	1	1
	SUBTOTAL	**4.6**	**4.6**	**5.6**
RESOURCE MANAGEMENT	*Department head*	1	1	1
	Controlling	1[1]	1[1]	1.9[1]
	Contract administration and assistance	0.7	0.7	0.7
	Political business / Commission support	0.8	0.8	0.8
	Communications	1	1	1
	Diversity	0.4	0.4	0.4
	Finance / accounting	0.5	0.5	1
	IT	0	0	1
	Processes and quality control / ICS	0	0	0.8
	Legal services			
	Internal audit			
	HR			
	Translation			
	SUBTOTAL	**5.4**	**5.4**	**8.6**
TEMPORARY ASSIGNMENT	*SLA OPET*	1.8	1.8	1.8
TOTAL		**20.8**	**21.8**	**29.5**

[1] of which one full-time position as collateral loan
[2] temporary measure pursuant to FC decision of 22.6.2011

09.**2** *Financial requirements*

The Federal Council's ERI Dispatch 2012 made it clear that the CTI's requests for additional financial resources can only be met in part. On the other hand, the Federal Council formulated one of the Confederation's main objectives for the 2011–2015 legislative period as follows: "Switzerland has a leading position in education, research and innovation."[12]

The Federal Council did this in full cognisance of the fact that aggressive global competition means that innovation output in Switzerland is of the utmost importance for the country's prosperity and future: With regard to innovation, a decision was taken to "consolidate activities to promote competitiveness at a high level and continue to strengthen Switzerland's international ability to compete." The Federal Council explicitly supports "the strengthening of collaboration between the scientific and business sectors" and the "enhanced promotion of young talent in the scientific and business communities" – both of which are major pillars in the CTI's strategy and mission.

Scenario A sets out the financial requirements of the CTI as originally formulated for the ERI Dispatch 2013–2016. Based on the prevailing framework conditions at that time, the CTI assumed that at least CHF 580.8 million would be needed to achieve the objectives of the ERI Dispatch, i.e. the strengthening of the collaboration between the scientific and business sectors and the international competitive capacity. In the middle of February 2012 the Federal Council approved CHF 547 million of this amount, only partially meeting the CTI's request for funding.

[12] Dispatch on the Promotion of Education, Research and Innovation from 2013 to 2016.

CTI'S REQUIREMENT FOR FUNDING SCENARIO A

CHF MILLION	2011[1]	2012[2]	2012[3]	2013	2014	2015	2016	2013–2016
R&D Project Support	211	113.5	153.5	113.9	118.8	123.9	129.3	**485.9**
of which overhead contributions				9.6	10.1	10.5	10.9	**41.1**
Innovation cheque	1	2.0	2.0	2.0	2.0	2.0	2.0	**8**
KTT Support	4	4.3	4.3	7.5	7.8	8.2	8.5	**32**
Start-Ups and Entrepreneurship	11	12.3	12.3	12.8	13.4	14.0	14.6	**54.8**
FINANCIAL REQUIREMENTS	**227.0**	**131.5**	**171.5**	**136.3**	**142.0**	**148.1**	**154.4**	**580.8**

The funding needed for 2013–2016 as per scenario A is based on the state of knowledge in January 2011. It is equivalent to the funds available for the ERI period 2008–2011 without taking account of the special measures. The calculations carried out at that time did not take account of the current megatrends, the economic situation, the new KTT strategy, the new support instruments (CTI voucher, etc.) and in particular the effects of the special measures. In order to meet these challenges in the future and to avoid a sudden reduction in financial resources, the CTI's financial requirements must be adjusted by at least an additional CHF 50 to 100 million (scenarios B and C).

The following tables (scenarios B and C) set out the financing requirements of the CTI for the 2013–2016 ERI period. Depending on the scenario, 87–90 percent of the CTI's funds go to R&D Project Support, and 6–7 percent to the Promotion of Start-Ups and Entrepreneurship. The rest of the funds are divided between KTT Support (3–4 percent) and the innovation cheque.

While scenario B assumes that the funds will stabilise at the level of the 2012 contributions, scenario C assumes funds to stabilise at the level of 2011.

CTI'S REQUIREMENT FOR FUNDING SCENARIO B

CHF million	2011[1]	2012[2]	2012[3]	2013	2014	2015	2016	2013–2016
R&D Project Support	211	113.5	153.5	153.5	160.1	167.0	174.2	**654.8**
of which overhead contributions				12.0	12.5	13.0	13.6	**51.1**
Innovation cheque	1	2.0	2.0	2.0	2.0	2.0	2.0	**8**
KTT Support	4	4.3	4.3	7.5	7.8	8.2	8.5	**32**
Start-Ups and Entrepreneurship	11	12.3	12.3	12.8	13.4	14.0	14.6	**54.8**
FINANCIAL REQUIREMENTS	**227.0**	**131.5**	**171.5**	**175.8**	**183.3**	**191.1**	**199.2**	**749.4**

[1] incl. CHF 10 million for flexible support criteria and CHF 100 million for "strong franc" special measures
[2] incl. CHF 10 million for flexible support criteria
[3] incl. planned CHF 40 million from Addendum I for follow-up projects from special measures

CTI'S REQUIREMENT FOR FUNDING SCENARIO C

CHF million	2011[1]	2012[2]	2012[3]	2013	2014	2015	2016	2013–2016
R&D Project Support	211	113.5	153.5	203.5	212.3	221.4	230.9	**868.1**
of which overhead contributions				15.9	16.6	17.3	18.0	**67.8**
Innovation cheque	1	2.0	2.0	2.0	2.0	2.0	2.0	**8**
KTT Support	4	4.3	4.3	7.5	7.8	8.2	8.5	**32**
Start-Ups and Entrepreneurship	11	12.3	12.3	12.8	13.4	14.0	14.6	**54.8**
FINANCIAL REQUIREMENTS	**227.0**	**131.5**	**171.5**	**225.8**	**235.5**	**245.5**	**256.0**	**962.8**

Scenario C shows the FUNDS THAT ARE REQUIRED to stabilise the situation in view of the events and trends seen in the CTI's innovation promotion over the past months and years. In particular, it reflects the funds that are actually needed by Switzerland's business and research systems. For example, rising demand in the actual promotion business as well as the cumulative special measures of the CTI against the global financial crisis (2009) and the strong franc (summer and autumn 2011) have repeatedly shown the innovation potential that can be activated, in particular among small and medium-sized enterprises. In this regard the CTI's innovation promotion activities met with an extraordinary response, specifically from those business circles that not only represent the backbone of the Swiss economy, but will also have a decisive influence on the country's economic future. In addition to the majority of established SMEs, these also include numerous new companies that guarantee the jobs of tomorrow as well as the SME applicants that have submitted an application for the first time (around 45 percent). The introduction of the innovation cheque to motivate SMEs to work together with research institutions for the first time and the successful pilot CTI voucher programme also contributed to this development. The stabilisation of promotion volumes pursuant to scenario B takes at least partial account of this momentum and leads to a broadening of the innovation efforts of SMEs in Switzerland.

From 2013, the new KTT Support of the CTI will raise the awareness of companies of the need for innovation and the promotion opportunities that are available. The introduction of strong national thematic networks and the appointment of innovation mentors as "ambassadors" for the CTI's innovation promotion will break down the existing barriers to innovation even further, leading not only to a noticeable improvement in the quality of applications, but also in a substantial increase in the number of applications, particularly in the field of R&D Project Support.

Not least thanks to the support of the SNSF, several research projects are on the threshold of implementation readiness. According to the estimates of numerous experts, these are likely to

[1] incl. CHF 10 million for flexible support criteria and CHF 100 million for "strong franc" special measures
[2] incl. CHF 10 million for flexible support criteria
[3] incl. planned CHF 40 million from Addendum I for follow-up projects from special measures

combine efforts from the fields of energy production, energy transmission and storage as well as production efficiency - topics that are of essential importance for the Swiss economy and its exports, in particular in the context of the global energy crisis. Similar growth trends can be expected for the aforementioned topics, i.e. the ageing of the population, life sciences and food technologies. Annex A.2 returns to the developments that can be expected in the individual areas of funding.

As the momentum in the innovation contest in the business sector described above is copied in the research sector, a substantial increase in funding is required. A large portion of the funds awarded by the CTI goes to the salaries of researchers and also contributes to their practical training. Rising demand from the business sector for science-based partnerships also requires bigger pre-investment in research. The CTI uses feasibility studies to support the necessary preliminary and development work at the research institutions for up to 18 months so that the economic benefits for a later R&D project can be identified. The CTI has recorded an increased need for funding since the introduction of this instrument at the beginning of 2011. In general it should be said that ever more research institutions are forced to cover their applied research with third-party funding outside of the basic financing, which is generally on the decline, and that the demand for funding by the CTI is constantly on the increase.

From 2013 the CTI is proposing to partially fund the indirect research costs of the research institutions with overhead contributions. At the same time the salaries of researchers, which have remained the same for more than ten years, should be adjusted. With growing demand for cost transparency in the output of applied research, the obligations of the institutions to also collect the so-called indirect costs that cannot be allocated to the general project costs in the form of overhead surcharges are also on the rise. While the SNSF can at least partly meet the need in the national promotion of knowledge-based research and the applied research programmes supported by the EU can make significant overhead contributions to Swiss partners, the CTI's subsidies for public research falls far short of these needs. The financing requirements set out in the different scenarios should also partly cover these needs of the Swiss research system.

The stabilisation of growth is of central importance for the development of a sustainable strategy and measures and the implementation of promotional measures. A financial stop-and-go policy directly influences demand for funding and jeopardises not only the long-term financial equilibrium of the CTI but also the sustainable and reliable promotion of innovation to benefit the economy against the background of fast-paced innovation and its importance for the prosperity of Switzerland.

09.3 *Administrative and operating expenses*

The CTI focuses on the promotion of innovation and the transfer of knowledge to the benefit of the economy, but it has close links to the government's education and research activities. The competitive allocation of funds makes it possible to finance around 700 full-time positions, mainly for young researchers, at the universities every year. As part of the support projects these young researchers also gain valuable access to practice, which brings substantial added value to their training.

For the CTI to be effective it needs efficient processes, from the receipt of applications by the Secretariat to the submission of these to the Commission. The CTI goes to great lengths to achieve the momentum and reaction times that are required in order to quickly achieve the objectives inherent to the independence granted to the CTI in 2011. Even with the lean processes advocated by the President and the Director, expansion is unavoidable, particularly in the areas of communications and IT.

Until the end of 2012, the administrative tasks of the Secretariat such as financial planning and budgeting, accounting and auditing, HR, IT and logistics will be handled in part by OPET under a service level agreement. This situation should be reviewed to see if these and other functions can be handled and financed within the Federal Department of Economic Affairs, Education and Research from 2013.

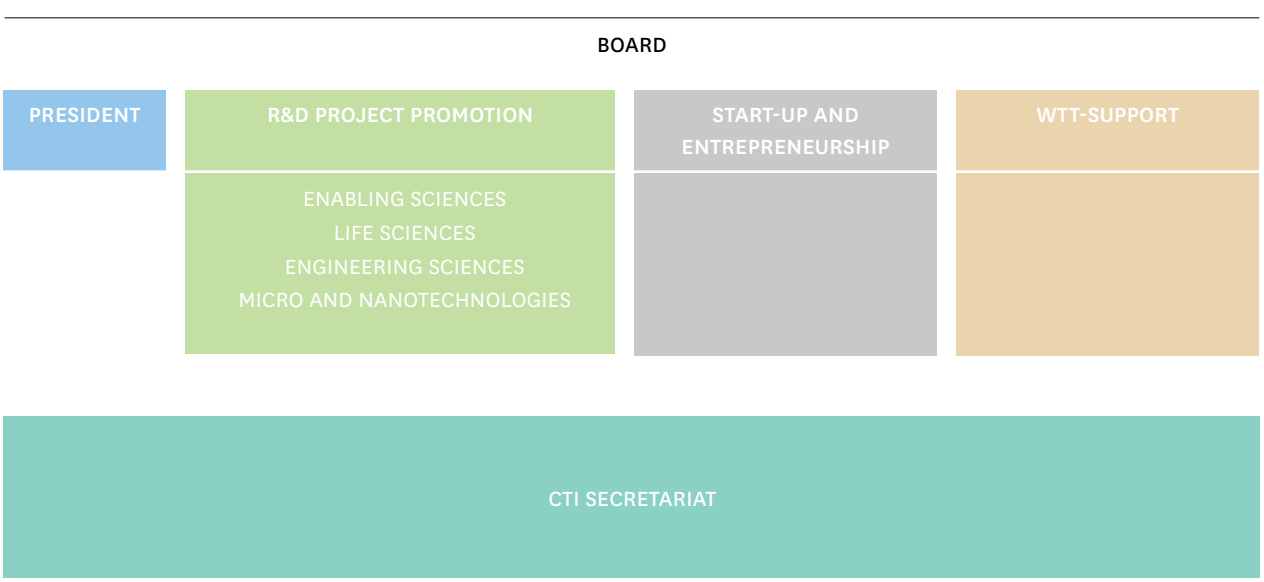
09.4 *Information technology*

Given the complex processes linking the economy, research and administration, information technology is of essential importance to the business activities of the CTI and must at all times meet the growing requirements with regard to project, financial and risk management as well as controlling processes. The current standalone solutions must be replaced by an integrated subject application platform that can be managed as part of the infrastructure solutions prescribed by the Confederation and the department. In addition to the "CTIprojects" web interface for the submission and processing of applications for project funding that is planned for 2013, a central CTI platform will be introduced in 2012 by way of a WTO tender. In the first phase, "CTIanalytics" will use a uniform centralised CRM module to improve the efficiency of the current three applications used in the different business areas. In a second phase these obsolete and isolated programmes should be replaced. The new solution will be directly integrated into the Confederation's standard applications, in particular SAP, and will allow real-time access to data. The new solutions will also meet increased demand for comprehensive controlling processes and evaluation and analysis tools as well as a management cockpit.

With "CTIanalytics" the CTI will have a path-breaking e-government solution that can live up to its role as the innovation promotion agency of the Federal Department of Economic Affairs, Education and Research.

ANNEX
A.**1**
CTI Organisation Chart

FIGURE TEN



A.2 *R&D funding areas*

While the Start-Ups and Entrepreneurship and KTT Support funding areas have their own target groups and products, R&D Project Support is divided into four different funding areas. In these four funding areas, i.e. Enabling Sciences, Engineering Sciences, Life Sciences and Micro/Nanotechnologies, the R&D Project Support project managers function as an important interface between the applicants and the members of the Commission. They are responsible for the administrative, advisory and communication tasks during the entire project period. They also ensure the quality and efficiency of the defined processes.

The four R&D Project Support funding areas are described here in brief:

A.2.1
R&D FUNDING AREAS
ENABLING SCIENCES

In the Enabling Sciences funding area, more than 50 percent of R&D projects that are supported come from the information and communications technology sector. Most of the other applications come from what is termed the "non-technical" scientific disciplines.

The CTI already opened its doors to non-technology-based innovation projects incorporating knowledge from the health, social work and art sectors in the middle of the 1990s. Service aspects also play a central role in all technical natural sciences innovation projects. Innovation, interpreted as the successful implementation of new products and services on the market, is inconceivable in the modern economy without optimum services for business partners and customers. Around 80 percent of the R&D projects supported by the CTI since 2008 include a smaller or bigger share of service innovation. This also applies to natural science and engineering projects, where buyer acceptance of quality and the price/benefit ratio depends to a large extent on the services that accompany the product. The Enabling Sciences projects range from ICT projects to business innovation to innovation in the fields of design and healthcare. The R&D projects in this funding area to a large extent reflect the demographic and IT trends described earlier.

A.2.2
R&D FUNDING AREAS
ENGINEERING SCIENCES

The market for environmentally friendly products, technologies, processes and services is a market with potential for future growth, both in national and global terms. Estimates assume that the market volume for sustainable technologies will increase by a factor of more than ten by 2030.

Sustainability has become an important factor of competition and a driver of innovation in the business world. In this field Switzerland has excellent chances and opportunities to develop new technologies and services for the global market. This also applies for young companies and SMEs.

The small size of the domestic market, the resulting inevitable early focus on an expansion and export strategy, the associated high level of risk and increased financing requirements pose challenges difficult to surmount for young companies and SMEs. The key to success lies in sustainable solutions in the fields of resource efficiency and renewable energies. The cross-linking of different branches of knowledge with regard to technologies and services, in other words systems knowledge, harbours the greatest economic potential.

New materials for energy efficiency and renewable energies, e.g. building materials that save on energy, highly effective insulating materials, catalytic materials for the direct production of hydrogen, heat and electricity storage, photovoltaic and thermoelectric electricity production are central fields that will shape R&D

Project Support in the coming years and require substantial funding.

Production processes and machines that protect raw materials and produce little waste and intelligent recycling processes, in particular for the very scarce raw materials in the ICT application fields, also belong in this group.

These trends affect high tech as well as traditional sectors. The renewable energies and material efficiency segments are deemed to harbour the greatest market potential.

A.2.3
R&D FUNDING AREAS
LIFE SCIENCES

The life sciences will experience great change in the coming years.

The focus continues to fall on the medical technology and biotechnology funding areas. Where these two areas touch and overlap, the field of regenerative medicine will see above-average advances with technical and well as biological innovation.

The consequences of demographic change and increased life expectancy present a particular challenge. Chronic diseases will play a special role, as well as new research areas such as gerontechnology and geriatric rehabilitation. Special topics such as ageing and brainfood will also gain in importance for the ageing society.

These developments have strong ties to new health services and therefore the Enabling Sciences area.

As system biology will become more important, biological ingredients and components will also gain in importance. In other words, the "building blocks" principle will grow more important, i.e. the combination of individual biological building blocks and therapeutic drugs, tailored to the specific needs of the individual patients with their own genetic conditions. Start-ups will focus strongly on system biology. The development and manufacture of new biological ingredients present a great opportunity for new SMEs.

Synthetic biology is another new area of research and application. The CTI expects to receive applications in the fields of biorobotics and artificial life even as soon as the next financing period. The simulation and emulation of biological organisms by technical systems is already a research topic for the SNSF. As innovation in this regard will become relevant shortly, the CTI will also participate in the new SynBio ERA-Net programme launched by the EU in order to pave the way for international cooperation for Swiss companies.

A.2.**4**

R&D FUNDING AREAS

MICRO AND NANOTECHNOLOGIES

Microtechnology has become an indispensable part of every field of application. Switzerland already plays a leading role in microelectronics and micro systems technology and is also in a good position to participate in future developments in these fields. Research and development in these fields and the implementation of the research results in the business sector are already very well established in Switzerland. Various providers such as the watch industry and the medical technology sectors already benefit from system miniaturisation.

In microelectronics, the investment-intensive production of semiconductors plays a significant role. Although it is focused on a few companies that have strongly expanded their production in Switzerland in the last few years and will continue to do so (e.g. ABB, ESPROS and EM Marin), the users of this technology are often SMEs that are active in different sectors.

Although the production of microelectronic switches in the field of submicron systems is concentrated in the hands of only a few Swiss companies, Switzerland is a leader in the design of such switches. This should be seen in the context of increasing contract production in the Far East, which has become the standard in the microelectronics sector. System and design know-how is becoming the most important link in their value chain and a significant differentiation feature in the global competition for many Swiss companies.

Switzerland has excellent design skills in the "low power" and communication technologies, for example for RFID and other technologies with extreme energy consumption requirements.

Many young companies supported by leading research institutions are using laser technology for modern communication systems and are also active in materials processing.

Further miniaturisation in the microtechnology sector leads to nanotechnology: the nanotechnology sector is developing very dynamically and will have a substantial impact on the value chain in the medium term. Experts forecast a global market volume for nano-based products of USD 3 billion per year by 2015.

Switzerland has a strong research position in nanotechnology, which is reflected in the number of publications and patents, but it needs to catch up with the implementation of the results by the business sector.

Nanotechnology is an interdisciplinary cross-sectional technology with potential for innovation in almost all industrial fields of application. The trends in the different fields of application of nanotechnology are just as diverse. This technology is already applied in all the megatrends described above – from medicine to energy-saving production processes.

In the field of nanotechnology, a young technology where research still plays an important role, partnerships between the SNSF and the CTI are of special importance. NRP 62 (intelligent materials) will be carried out as a cooperation programme between the SNSF and the CTI from 2010 to 2015. The resulting research findings will lead to an increase in the CTI's project volume in the field of innovation based on nanomaterials. Given the global momentum in nanotechnological applications, the international integration of Swiss companies is important for the CTI.

GLOSSARY AND ABBREVIATIONS

CLOSED INNOVATION	Innovation projects based on a company's in-house resources
CTI	Commission for Technology and Innovation
EAER	Federal Department of Economic Affairs, Education and Research (from 2013)
ERA	European Research Area
ERC	European Research Council
FOEN	Federal Office for the Environment
FSO	Federal Statistical Office
FTE	Full-time equivalent
GDP	Gross domestic product
HEIS	Higher education institutions
ICT	Information and communication technology
IIP	Institute of Intellectual Property
IM	Innovation mentors
IPR	Intellectual property rights
KOF	KOF Swiss Economic Institute at the Federal Institute of Technology ETH Zurich
KTT	Knowledge and technology transfer
NCCR	National Centres of Competence for Research
NRP	New regional policy
NRP	National Research Programme
NTN	National thematic networks
OECD	Organisation for Economic Cooperation and Development
OPEN INNOVATION	Also user-driven innovation; innovation projects that use in-house resources and also include external persons (e.g. experts, customers, suppliers) in the network.
OPET	Federal Office for Professional Education and Technology
OVERHEAD	Indirect costs for R&D projects
R&D	Research and development
SECO	State Secretariat for Economic Affairs
SER	State Secretariat for Education and Research
SFOE	Swiss Federal Office of Energy
SNSF	Swiss National Science Foundation
STAGE-GATE PROCESS	Innovation or development process that is divided into different stages by intermediate objectives.
WBCSD	World Business Council for Sustainable Development

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