

Introduction to the Hungarian R&D Sector

WHY INVEST IN THE R&D SECTOR IN HUNGARY?

- Rich portfolio of R&D grants. High level of scientific research, significant results in the areas of physics, mathematics, biology, chemistry, clinical medicine and engineering
- Established knowledge centres and increasing economic role of networking
- Long-standing tradition of innovation
- Smart specialisation supported by funding system
- Very open economy
- Supportive legal and taxation environment
- Successful examples of a dual education system (cooperation of companies and educational institutes; forming market compatible education)
- Rapidly developing institutions with framework conditions taking part in world-class projects
- Closer cooperation between academia and the business sector
- Increasing economic role of networking, cooperation and innovation clusters as well as proliferation of incubator services



GENERAL OVERVIEW

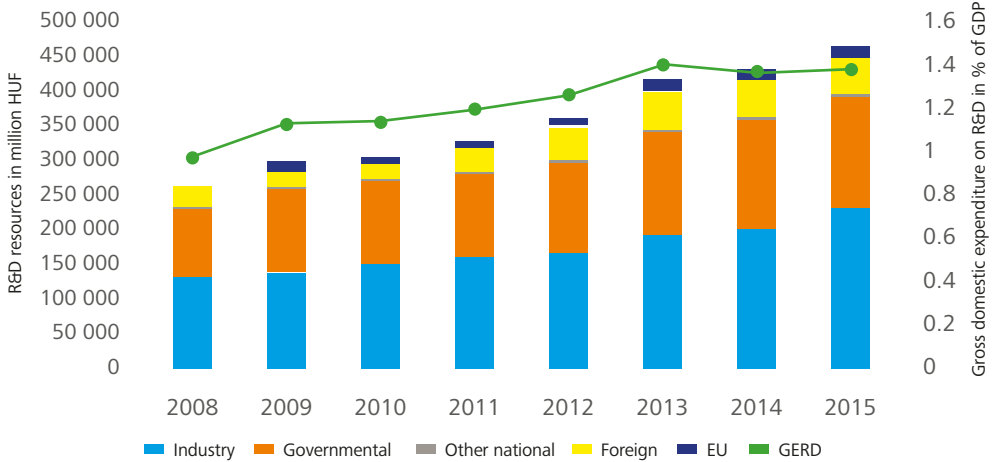
Hungary is an open European economy with a strong industrial sector in which foreign investment and technology play a significant role. It has a long-standing tradition in scientific research. Research and development is one of the main priorities of the Hungarian National Economic Strategy; its importance is emphasized in every sector of the Hungarian economy. R&D investment is increasing year by year as a result of the development activity of Hungarian companies and the participation of the Hungarian Government and grants from the European Union. Total R&D expenditure (GERD) was 1,506 million EUR in 2015, corresponding to 1.39% of GDP (2015, up from 0.62 in 2008).

STRUCTURE OF GOVERNMENT FUNDING

The National Research, Development and Innovation Fund (NKFIA) integrates two funds: The Research and Technological Innovation Fund (KTIA) and The Hungarian Scientific Research Fund (OTKA). The total budget of NKFIA for 2015: HUF 74.1b (about €247M). There are six operational programmes of the EU Structural Funds, co-funded by the central EU budget that are available to the Hungarian regions:

- **Economic Development and Innovation OP (GINOP)**
Total budget (2014-2020) Priority 2 (Reinforcement of research, technological development and innovation): €1,687.9 million
- **Economic Development and Innovation OP (GINOP)**
Total budget (2014-2020) Priority 7 (Financial instruments to top up R&I support): €2,553.2 million
- **Competitive Central Hungary OP (VEKOP)**
Total budget (2014-2020) Priority 1 (Improvement of companies' competitiveness and development of the knowledge economy): €202.2 million
- **Competitive Central Hungary OP (VEKOP)**
Total budget (2014-2020) Priority 2 (Financial instruments and development of services): €44.1 million
- **Human Resources Development OP (EFOP)**
Total budget (2014-2020): €898.3 million
- **Rural Development Programme (VP)**
Total budget (2014-2020): €25.3 million

STRUCTURE OF R&D BUDGET AND GERD



Source: www.ksh.hu/docs/hun/xstadat/xstadat_eves/f_ohk001.html and www.ksh.hu/docs/hun/xstadat/xstadat_eves/f_ohk004a.html

INNOVATION POLICY

Hungary's innovation policy is the cornerstone of the country's overall development strategy, defined in line with the European Union's cohesion and innovation policies for the 2014-2020 programming period.

NATIONAL RESEARCH AND DEVELOPMENT AND INNOVATION STRATEGY

"Investment in the Future – National Research and Development and Innovation Strategy 2020" (RDI strategy) was approved by the Hungarian Government in June 2013. The objective of the strategy is to raise RDI investments, and as a result, to mobilise the Hungarian economy and to strengthen its competitiveness. The strategy set the target to raise the amount of total R&D expenditures to 1.8% of GDP and the amount of business enterprise R&D expenditures to 1.2% of GDP by 2020.

NATIONAL SMART SPECIALISATION STRATEGY

The Smart Specialisation Strategy (S3) is developed in every member state within the framework predefined by the EU. Hungary's smart specialisation strategy was approved in November 2014. It sets the directions for the entire country, along which it is planned that research, development and innovation will be supported in the most sustainable way, with the greatest social profit and the promise of the best financial utilisation rate.

The Strategy sets up six sectoral and two horizontal research and innovation priorities. These priorities encompass domains, areas and economic activities where Hungary has a competitive advantage or has the potential to generate knowledge-driven growth.

SECTORAL PRIORITIES

- Healthy society and well-being
- Advanced technologies in the vehicle and other machine industries
- Clean and renewable energies
- Sustainable environment
- Healthy local foods
- Agricultural innovation

HORIZONTAL PRIORITIES

- ICT (info-communication technologies) & Services
- Inclusive and sustainable society, viable environment

● A HISTORY OF GREAT INNOVATION

Historically, Hungary has performed rather well in terms of inventions and patents. There are many inventions that are known and recognised worldwide, although, in most cases, Hungarian scientific inventiveness and innovation are not recognised. The most popular inventions include (just a few of the most well-known Hungarian inventions and discoveries from a long list):

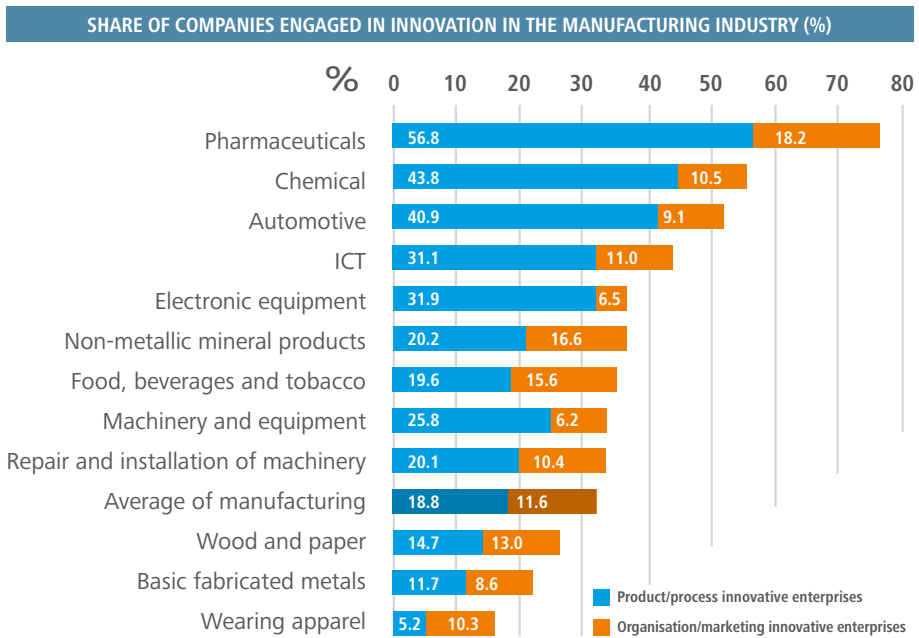
- Segner wheel, water turbine – János András Segner (1750)
- Transformer – Ottó Bláthy, Miksa Déri, Károly Zipernowsky (1884)
- Dynamo – Ányos Jedlik (1861)
- Telephone exchange – Tivadar Puskás (1877)
- Carburettor – Donát Bánki, János Csonka (1893)
- Vitamin C – Albert Szentgyörgyi (1931)
- Nuclear chain reaction – Leó Szilárd (1933)
- Ball point pen – László József Bíró (1938)
- Colour Television – Péter Károly Goldmark (1940)
- Digital computer – János Neumann (1945)
- Holography – Gábor Dénes (1947)
- Basic Programming language – János Kemény (1964)
- Rubik's Cube – Ernő Rubik (1974)



INNOVATION PERFORMANCE BY SECTORS

BUSINESS ENTERPRISE SECTOR

In 2015, business enterprises spent over seven hundred and fifty million EUR on research and development that corresponds to 49.7% of the total domestic R&D expenditure. The proportion of companies engaged in innovation is significantly different among the various sectors. In terms of size, large enterprises spend 30% more on research than micro-, small- and medium-sized enterprises combined. In regard to the source of funding, while only 4.1% of the R&D expenditures of large companies come from public sources; this ratio is 18% in the case of medium-sized companies and over 40% for micro and small enterprises.



Source: National Smart Specialization Strategy 2014²

¹National Smart Specialisation Strategy, Nemzeti Innovációs Hivatal, 2014, p.19

²National Smart Specialisation Strategy, Nemzeti Innovációs Hivatal, 2014, p.21

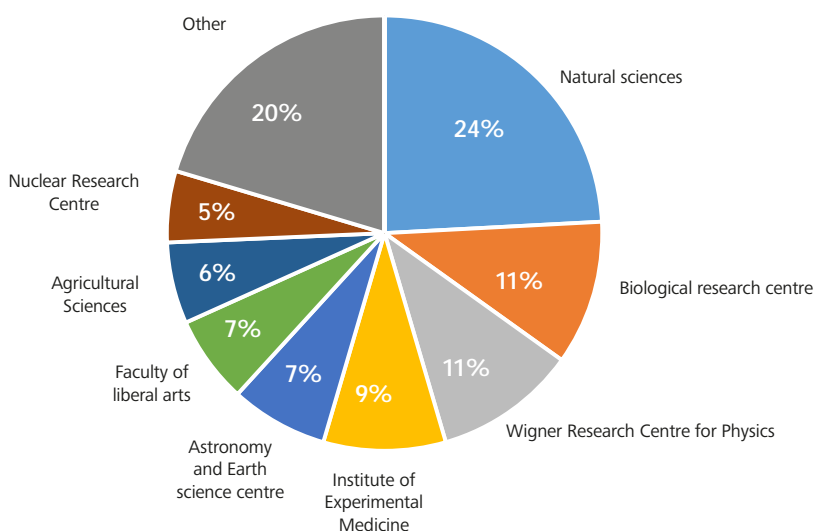


HIGHER EDUCATION SECTOR AND THE HUNGARIAN ACADEMY OF SCIENCES

The most important areas of higher education research are the health sciences, natural sciences and technical sciences. Industry is intensely focussed on development, while the higher education sector collaborated with companies in 37.4% of the more than 2,400 research projects (2014), which is considered high³.

The Hungarian Academy of Sciences (MTA), together with its research institutes and its several university research groups, is a major player in the Hungarian R&D sector. The 52 billion HUF (€167M) budget for R&D expenditure is particularly significant, fifteen faculties share this research portfolio⁴.

SHARE OF THE €167M BUDGET AMONG FACULTIES OF THE HUNGARIAN ACADEMY OF SCIENCES



Others: Centre for Energy Research; Economic and Regional Studies Research Centre; Institute of Linguistics; Centre for Ecological Research; Alfred Renyi Institute of Mathematics; Computer and Automation Research Institute; Social Science Research Centre.

The total expenditure of MTA in 2015 was HUF 67.6 billion (€219 million). The budget is comprised of the following⁵:

- The budget support was HUF 40 billion (€129 million), which is expected to reach HUF 46 billion (€149 million) by the end of 2017. Nearly three quarters of this amount was directly spent on research plans.
- Own revenues amounted to HUF 26.1 billion (€84.5 million), a 2.1% increase on the previous year.

³ National Smart Specialisation Strategy, Nemzeti Innovációs Hivatal, 2014, p. 17

⁴ Source: http://mta.hu/data/cikkek/106/1066/cikk-106693/orszagguylesi_beszamolo_2013-2014.PDF pp.42

⁵ <http://mta.hu/kozgyules2016/no-az-akademia-koltsegvetese-emelik-a-kutato-i-bereket-penzugyi-beszamolo-106428>

COLLABORATION BETWEEN ACADEMIA AND INDUSTRY

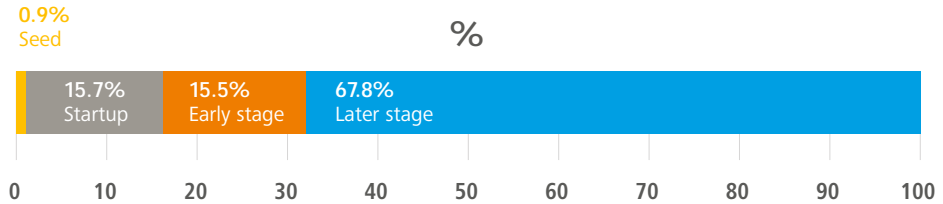
In Hungary, there are R&D-intensive companies which have established close, long-lasting cooperation with universities and play an active role in undergraduate and PhD training.

KEY PROGRAMMES

- Ericsson Telecommunications Hungary has developed close cooperation with two major universities: Budapest University of Technology and Economics and Eötvös Loránd University. The collaboration allows students and their supervisors to work on industrial problems as part of the MSc and PhD programmes. In addition, the collaboration extends to the fields of software, hardware and microwave networks.
- Dunaújváros College and Hankook Tire Hungary launched a joint Rubber Technology Engineer programme in 2009: while the theoretical education takes place at the college, the practical training is conducted in Hankook's state-of-the-art facilities.
- Kecskemét College has established dual vocational training with Mercedes-Benz Manufacturing Hungary and Knorr-Bremse. The aim of the collaboration is to ensure a highly qualified workforce in the field of mechanical engineering. This is achieved by offering practice-oriented training to the students in addition to the courses at the college.
- The University of Miskolc and the Hungarian Bosch companies founded the Robert Bosch Department of Mechatronics in 2005. The target of the cooperation is to support practically oriented education and research activities in the engineering sciences, placing special emphasis on the wide range applications of mechatronics.
- The more than ten years of collaboration between Audi Hungaria and Széchenyi István University of Győr (SZE) reached a new milestone in 2015 with the establishment of the Audi Hungaria Faculty of Vehicle Engineering at SZE.
- Knorr-Bremse and the Budapest University of Technology have had a joint research programme running since 2011 to develop a method for the qualification of cured rubber products.



VENTURE CAPITAL INVESTMENT IN HUNGARY BY PHASES (2013)



Source: Pre- Peer Preview of Hungarian Research and Innovation System,
Directorate-General for Research and Innovation Horizon 2020 Policy Support Facility, 2015

To boost early, start-up and seed phase projects the Hungarian government differentiated allocation of funds by stage of company life cycle and launched the JEREMIE I and II programmes, the New Hungary Venture Capital Programme, and developed the ecosystem “Budapest Runway 2.0.2.0. – A Start-up Credo”, which envisions the Hungarian capital as the start-up centre of Central and Eastern Europe within a decade. These led to the emergence of start-ups with high growth potential.

There are numerous opportunities for both private and state financed accelerators, one of the key players is Hiventures, which has a €160m budget to invest in incubation, seed, and start-up phase companies. Other main incubation players (with budgets) are: BNL Start Partners Kft.(€2.3m); Creative Accelerator Kft.(€2.4M); EH Invest Zrt.(€2.2m); Első Közép Európai Hardver Akcelerátor Kft.(€2.4m); Negos Tárgyalási Tanácsadó Zrt.(€2.4m); OXO Labs Üzletviteli és Tanácsadó Korlátolt Felelősségű Társaság (€2.3m); Quantum Leap Innovációs és Iparfejlesztési Kft. (€2.3m); Virgo Ventures Technológiai Inkubátor Kft.(€2.4m).

EUROPEAN R&D COOPERATION

EUROPEAN FRAMEWORK PROGRAMMES FOR RESEARCH AND TECHNOLOGICAL DEVELOPMENT

- European cooperation in R&D and Innovation is increasing in scope and importance. Most cooperative R&D projects in Europe are carried out within the European Framework Programmes for Research and Technological Development, such as FP7 (2007-2013) and Horizon2020 (2014-2020). HTungary’s performance in FP7 ranked high among newly accessed member states (EU13):
- 1,602 participants receiving € two hundred ninety million
- Rank in grant awarded: sixteenth (EU28); second (EU13)
- Rank in number of participants: sixteenth (EU28); second (EU13)
- Top collaborative links: Germany; United Kingdom; Italy; France; Spain

HORIZON 2020 (AS OF SEPTEMBER 2016)

- 374 participants receiving € 94,51 m
- 119 SMEs (Small and Medium Enterprises) receiving € 32,71 m
- Ranking in grant awarded: 17th (EU28); 3rd (EU13)
- Rank in number of participants: 18th (EU28); 4th (EU13)
- Top collaborative links: Germany, United Kingdom, Spain, Italy, France

TOP BENEFICIARIES OF THE EHORIZON2020 (AS OF NOVEMBER 2016)

Name	EC financial contribution in € millions
Kozep-Europai Egyetem (CEU)	6.01
Magyar Tudomanyos Akademia Wigner Fizikai Kutatokozpont (Wigner RCP)	4.69
Eotvos Lorand Tudomanyegyetem (Eotvos Lorand University)	4.04
Institute Of Experimental Medicine – Hungarian Academy Of Sciences (IEM HAS)	3.44
Magyar Tudomanyos Akademia Szamitastechnikai és Automatizalasi Kutatointezet (MTA Sztaki)	3.43

EUROPEAN INSTITUTE OF INNOVATION AND TECHNOLOGY / KNOWLEDGE AND INNOVATION COMMUNITIES

The European Institute of Innovation and Technology (EIT), established in 2008 with its seat in Budapest, is the first Europe-wide institution based in Hungary. The EIT is the EU's flagship institute designed to connect European business and research, and to integrate innovation, research and economic growth in Europe. The mission of EIT is carried out through the so-called Knowledge and Innovation Communities (KICs), integrating European innovation platforms of leading European stakeholders from industry, academia, and policy.

HUNGARIAN PARTICIPATION IN ESTABLISHED KICS

- Climate-KIC: Central Hungary hosts a regional implementation and innovation centre
- EIT Digital has an Associate Partner Group consisting of two universities (BME and ELTE) and their industrial partners (consortial partners: Ericsson Hungary, Magyar Telekom; cooperating partners: Cisco Systems Hungary, Nokia Solutions and Networks, and General Electric Healthcare).
- KIC InnoEnergy has an Accelerator HUB in Budapest
- KIC Health has a regional office in Budapest and four Hungarian Innostar partners: GE Healthcare, Semmelweis University, University of Debrecen and the National Healthcare Service Center



KEY DEVELOPMENTS IN RESEARCH AND INNOVATION IN 2015

- Establishment of the National Research, Development and Innovation Office (NKFIH) that integrates the activities of the previous National Innovation Office and ministry departments responsible for innovation policy (January 2015).
- Establishment of the National Research, Development and Innovation Fund that integrates the Hungarian Scientific Research Fund (OTKA) and the former Research and Technological Innovation Fund (KTIA) programmes (January 2015).
- Establishment of the Innovation Body that consists of nine distinguished members representing both the economic and scientific spheres. The main goal of this body is to ensure the effective use of financial instruments available for research and innovation (March 2015).
- Launch of new research measures funded by the Operational Programmes (i.e. GINOP, VEKOP, EFOP) co-funded by the Structural Funds.

● SUCCESS STORIES FROM THE R&D SECTOR

PREZI.COM

The Company provides cloud-based presentation software and a presentation database. It started in 2009 and has expanded its user base rapidly year by year. By the end of 2015, the number of registered users exceeded seventy five million, and the number of presentations created is already beyond two hundred and sixty million. With these figures, Prezi.com is the world's biggest open presentation database. It received a US\$ fifty seven million investment in November 2014, which indicates the huge potential of the development.

USTREAM

Founded in 2007. Provider of an open live video streaming platform with the capacity to host one and a half million simultaneous viewers. In the last two years, it has increased profits and turnover by 400%. At the end of 2014, it achieved a monthly average of fifty million users. In 2008, Doll Capital invested USD eleven million into Ustream, and in 2010, Softbank injected USD 20 million of capital into the company. Ustream was acquired by IBM in 2016, in a deal valued at \$ one hundred and thirty million (price not confirmed by IBM).



3DHISTECH

3DHISTECH develops and manufactures high speed digital slide scanners that create high quality brightfield and fluorescent digital slides, digital histology software and tissue microarray machinery. The company is one of the market leaders in the field of digital pathology with more than eight hundred systems sold worldwide to large pharmaceutical companies such as Roche and Sanofi-Aventis and to leading research institutes such as Harvard Medical School and Vanderbilt University. Founded in 1996 by European Inventor Award finalist Dr. Béla Molnár, 3DHISTECH employs one hundred and twenty people and realises a turnover of EUR eight million.

LogMeIn

LogMeIn Inc., founded in 2003 in Budapest, is a provider of software as a service and cloud-based remote connectivity services for collaboration, IT management and customer engagement. The company's products give users and administrators access to remote computers. There are over three hundred million devices connected through LogMeIn servers, ranked as the most reliable remote access tool. The company employs more than eight hundred people around the world. LogMeIn completed an IPO in 2009 and has a market capitalisation of \$2 billion.

NEXT generation production systems

NEXT is the biggest initiative ever undertaken in Europe in the production systems area. This project integrates the complete value-chain for the European production machinery sector with the aim of determining the machines of the future and the sector's new business models contributing to the transformation of the manufacturing industry. The project involved 25 partners, including the Technical University of Budapest as a key contributor, and a budget of 24 million euros. Europe's knowledge and innovative drive powered the industrial revolution, introducing machines into the production process and changing society forever.

The consortium developed a new business paradigm for the customer-machine builder relationship, transforming it into a long-term partnership based on sharing risks and increasing mutual benefits. The project made significant contributions to the manufacture and use of production machines, providing substantial reduction of environmental impact as well as enhanced machine performance via automation and new materials usage. The team developed a new era of 'green machines' that use less resources in the manufacturing process, consume less energy and water during operation, and are designed to be dismantled and recycled at the end of their useful lifespans, hence they may be the beginnings of the next machine revolution, providing a major competitive edge to Europe in a huge global market.



