



# Pre-Peer Review of the Hungarian Research and Innovation system

Horizon 2020 Policy Support Facility



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# **Pre- Peer Review of Hungarian Research and Innovation system**

## **Horizon 2020 Policy Support Facility**

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# 1. FOREWORD

## Purpose of the Policy Support Facility

Under the Horizon 2020 legislation, the European Commission (EC) established a Policy Support Facility (PSF) to help EU Member States and Associated Countries improve the design, implementation and evaluation of research and innovation (R&I) policies. To this end, the PSF offers tailor-made expert advice and assistance to public authorities on national R&I strategies, programmes and institutions, specific support (pre-peer reviews, post-peer reviews, ad-hoc requests) and support to the Member States-led mutual learning activities. All these activities respond to the strong need to offer more customer-oriented services for evidence-based policy-making in the EU. The PSF scales up the activities previously undertaken via peer reviews and mutual learning seminars within the European Research Area and Innovation Committee (ERAC).

## Methodology of PSF pre-peer reviews

To prepare for the successful implementation of the PSF, a workshop with the Member States was held in October 2014. The Workshop participants found that introducing *pre-peer reviews* would strengthen the preparatory phase of subsequent peer reviews. Concretely, pre-peer reviews: (i) provide a *first assessment* of the strengths and weaknesses of the host country's R&I system; (ii) identify 3-4 focus areas for the peer review; (iii) suggest peer and independent experts for the peer-review panel (composed of up to 5 peer experts and up to 5 independent experts); (iv) suggest background documentation for the peer review (e.g. R&I strategies, legislative acts, programmes, reports, data, etc.) and identify "missing" quantitative and qualitative information; (v) identify a wide range of relevant stakeholders that should be involved in the peer-review interviews; (vi) outline a roadmap (calendar, guidelines, and instructions) for the peer review; and (vii) propose a questionnaire for self-assessment by the host country in view of the peer-review.

The pre-peer review panel provides to the subsequent peer review panel suggestions for the definition of the peer review scope, including notably a set of potential focus areas<sup>1</sup>. For that purpose, and to build that first assessment of the strengths and weaknesses of the host country's R&I system, pre-peer reviews undertake a first exploitation of the available evidence base, including qualitative and quantitative information, and include a visit to the host country. Pre-peer reviews operate on the basis of limited time and resources, as the panels have a smaller size than those of full peer-reviews, the country visits are fewer and shorter, and the number and scope of meetings with the stakeholders are more compact.

*This report does thus not intend to provide recommendations to the host country, as such recommendations fall within the remit of the full peer review.*

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<sup>1</sup> It should also be noted that this is the first pre-peer review report carried out under the auspices of the PSF. Therefore a set of methodological lessons on the exercise have been drawn by the panel in a parallel exercise, and conveyed to the EC PSF team.



## 2. EXECUTIVE SUMMARY

### The pre-peer review of Hungary – process and results

The Hungarian authorities expressed interest in a pre-peer review to support the efforts being undertaken to design and implement structural reforms of the Hungarian R&I system. In line with this request, such pre-peer review was conducted by a panel of three *high-level independent experts* agreed upon by the EC and the Hungarian authorities: *Dr. Marina Ranga*, Senior Researcher, H-STAR Institute, Stanford University (Rapporteur); *Dr. Raquel Ortega-Argiles*, Rosalind Franklin Research Fellow, University of Groningen, Faculty of Economics and Business; and *Dr. Anthony Bartzokas*, Board member of the European Bank for Reconstruction and Development, Professorial Fellow at UNU-MERIT and faculty at the University of Athens, Department of Economics (see section “About the authors”). They undertook one country visit and met with selected stakeholders, according to an agenda defined prior to the visit (Annex 5)<sup>2</sup>. The Hungarian National Research, Development and Innovation Office and the EC officers supporting the exercise provided qualitative and quantitative input and helped the panel in setting up meetings with key R&I stakeholders (Annex 5).

After a kick-off meeting in Brussels (8 May 2015), which clarified the key issues to be addressed in the pre-peer review and presented the experience acquired from similar exercises of a different nature (peer reviews) conducted in Iceland and Bulgaria, the pre-peer review panel and the EC observers conducted a visit to Budapest (20-22 May 2015) and met with key Hungarian R&I stakeholders. For an effective pre-peer review exercise, the scope and methodology of the process, as well as the specific context and performance of the Hungarian R&I system were thoroughly examined (Section 3). The discussions with the R&I stakeholders during the country visit focused on six main topics of high importance in the current context of the Hungarian R&I system (section 4), which were selected and agreed upon by the pre-peer review panel, and communicated to the Hungarian counterparts prior to the visit:

- (i) *The R&I system* (Structure and policy coordination; National R&I strategies and programmes; Funding (national and EU funding, institutional vs. competitive funding, use of peer-review); Stakeholder involvement in policy-making; Demand-side vs. supply-side innovation policies; Regional innovation policy and the National Strategy for Smart Specialisation). This topic was discussed with representatives of the National Research, Development and Innovation Office.
- (ii) *The public R&I sector* (The Hungarian Academy of Sciences as the largest public research organisation; Implementation of the R&I policy mix and funding of the public R&I sector; Quality of the human resources for the public R&I sector, including researchers' supply and career; Links with the private sector and University-Industry cooperation). This topic was discussed with representatives of the Hungarian Academy of Sciences.
- (iii) *Technology transfer, University-Industry cooperation, entrepreneurship* (Technology transfer and research commercialisation; University-Industry cooperation and promotion of entrepreneurship; Participation in clusters, technological parks). This topic was discussed with representatives of the technology transfer community.
- (iv) *Framework conditions for R&I* (Types of framework conditions for the Hungarian R&I system; Coherence of R&I policy mix). This topic was discussed with representatives of researchers and consultants.
- (v) *The business R&I sector* (Public support to business R&I; Availability of skilled workforce; Obstacles to the creation and growth of innovative firms; Role of framework conditions (financial markets, regulators and technology intermediaries, access to credit and risk capital for innovative projects; Involvement in clusters). This topic was discussed with representatives of the business community.
- (vi) *Venture capital for innovative start-ups* (The state of the venture capital market in Hungary; Support measures for innovative start-ups). This topic was discussed with representatives of the venture capital community.

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<sup>2</sup> Two EC observers of the PSF team supported the panel and facilitated the process: Annamária Németh, DG RTD, coordinator of the Hungary Pre-Peer Review exercise, and Diana Senczysyn, DG RTD, PSF operations team leader.

**For each main topic, the pre-peer review panel identified a set of strengths and weaknesses (highlighted in each subsection of section 4) and four focus areas that are proposed for in-depth examination by the subsequent peer-review: (i) R&I governance and policy-making; (ii) Availability of human resources for R&I; (iii) University-Industry cooperation, technology transfer and entrepreneurship; and (iv) Framework conditions for innovation in the business sector (Section 5).** Both the strengths & weaknesses and the focus areas draw primarily on the panel's own analysis of the Hungarian R&I system in regard to the six main topics above, corroborated with the insights from the stakeholders. The criteria of the self-assessment tool proposed by the EC in 2010 have also been considered when relevant<sup>3</sup>. To that was added a review of other country reports and strategies (e.g. the Research and Innovation Observatory 'RIO' Country Reports 2014 and 2015, the National RDI Strategy and other relevant strategies addressing R&I issues), as well as the expertise of the pre-peer review panel on specific dynamics of the R&I process in Central and Eastern European countries. This multi-faceted process of identification of the strengths & weaknesses and focus areas aims at ensuring a solid internal consistency among the report sections, as well as consistency with other pieces of analytical work on the Hungarian R&I system.

The suggestions on peer and independent experts (section 6.1) are based on two sets of selection criteria (one for countries and the other for experts' areas of expertise), while the suggestions on R&I stakeholders to be involved in the peer review interviews (section 6.2) are based on a set of criteria aimed to ensure representativeness and large attendance numbers: a wide coverage of relevant institutions in the focus areas; a multi-sectoral approach, by research field/specialisation and by industrial sector; a balanced geographic representation of the country, both from Budapest and from the rest of the country; and a balanced representation of public and private institutions. Suggestions on background documentation for the peer review have also been made (section 6.3) and are followed by suggestions on a peer review roadmap (section 7) and a self-assessment questionnaire to be conducted by the Hungarian stakeholders before the peer review (section 8).

## **Conclusions of the report**

The pre-peer review comes in a context of significant efforts that Hungary has been doing to improve its R&I system performance. Recently, these efforts have materialised in the setup of the National RDI Office and in the adoption of a package of measures concerning R&I funding and governance structures. Several national strategies that address R&I issues have been adopted in recent years and reflect a renewed perspective on R&I policies, which is strongly inspired and driven by EU R&I policies. The implementation of these strategies is, however, often hindered by a number of dysfunctions at the operational level.

This report aims at further reinforcing the efforts by the Hungarian authorities to design and implement structural reforms of the national R&I system which increase its quality and efficiency. The panel's work in this exercise has been grounded in a systemic view of Hungary's R&I system, focused on the functionality of key institutions for R&I governance and funding, their linkages with other national and regional R&I stakeholders, linkages between R&I stakeholders internally within the system and also externally with other national and EU partners. This perspective was aimed to redirect the strong perception of linearity in the R&I process observed in the country towards a non-linear, systemic perspective, and redirect the focus from a disciplinary to a multi-disciplinary approach in the R&I policy mix design and funding. This first analysis of the gaps identified in the R&I system functionality signals areas for further consideration in the peer-review process, offering a platform to examine these issues and offer appropriate solutions to the Hungarian R&I authorities.

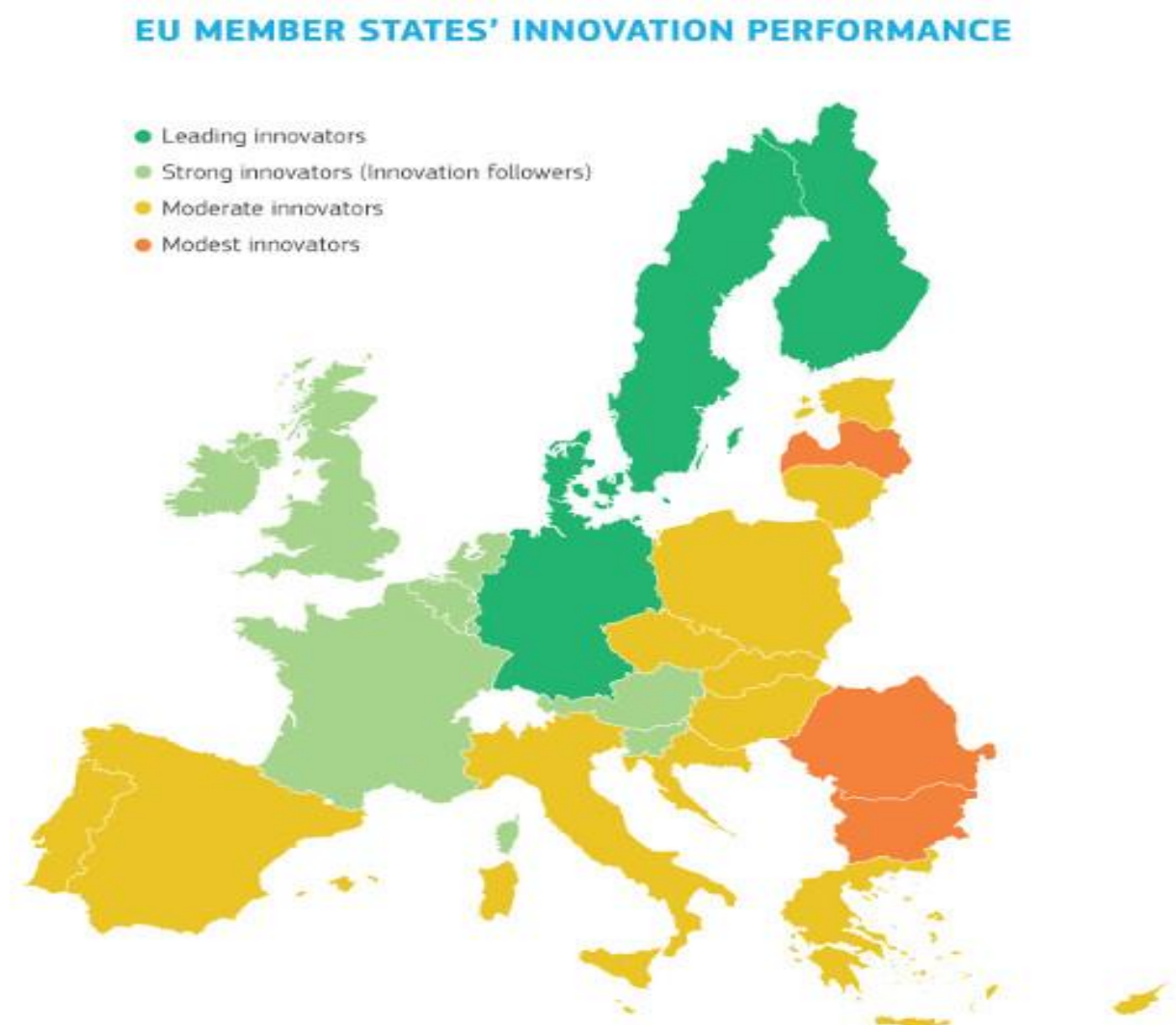
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<sup>3</sup> Self-assessment tool included in [Annex 1 of the Europe 2020 Flagship Initiative Innovation Union](#).

### 3. CONTEXT

The host country context is essential for understanding the purpose of this exercise. The pre-peer review comes in a context of significant efforts that Hungary has been doing for more than two decades to improve the performance of its R&I system which, according to the Innovation Union Scoreboard 2015, is among the Moderate innovators (Figure 1).

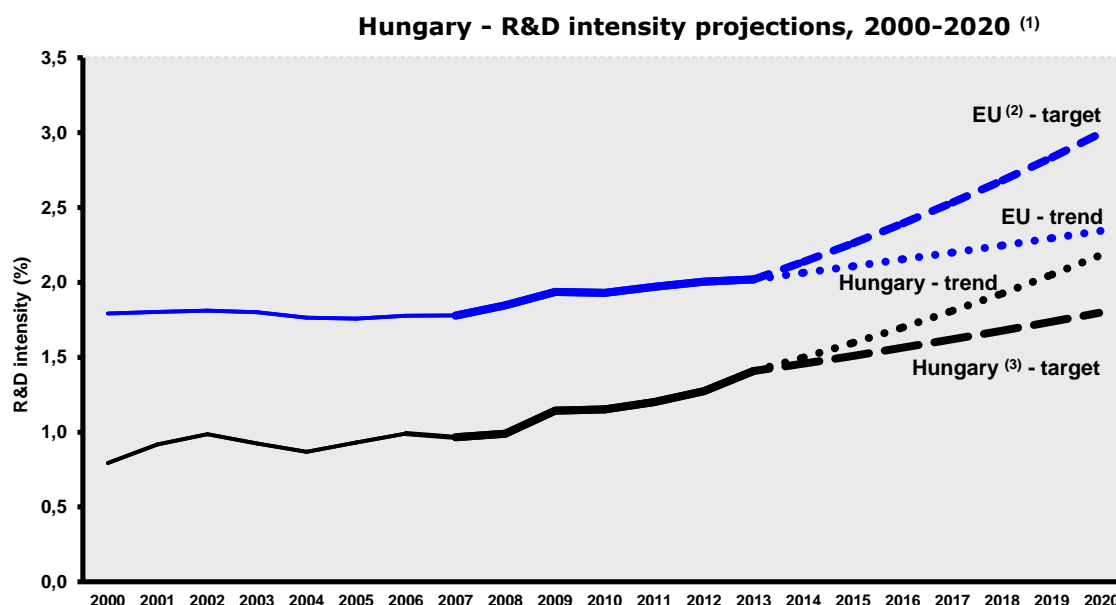
**Figure 1: EU Member States' Innovation Performance**



Source: Innovation Union Scoreboard 2015

Overall, the country's innovation performance has seen a positive trend between 2007 and 2014, in spite of some fluctuations. This performance is closely related to the increasing R&D expenditure (GERD) that has been made in the period 2007-2013, at an average annual growth rate of 6.5%. In 2013, the Hungarian GERD reached its highest value in the last two decades (a 22.6% growth compared to 2010), accounting for 1.41% of the GDP (Dory 2015, p. 7). Although the Hungarian GERD/GDP ratio is still below the EU28 average of 2.01%, it represents an important growth that places Hungary in a good position to meet its ambitious national R&D intensity target of 1.8% of GDP by 2020 and 3% by 2030, as stated in the National Reform Programmes for 2013, 2014 and 2015, as well as in the 2013-2020 National RDI Strategy. Estimates show that if the same high growth rate of the country's R&D intensity is maintained, the EU2020 target could be reached by 2017, as shown in Figure 2.

**Figure 2: R&D intensity projections**



Source: DG Research and Innovation - Unit for the Analysis and Monitoring of National Research Policies

Data: DG Research and Innovation, Eurostat, Member State

Notes: (1) The R&D intensity projections based on trends are derived from the average annual growth in R&D intensity for 2007–2013. (2) EU: The projection is based on the R&D intensity target of 3.0 % for 2020. (3) HU: The projection is based on a tentative R&D intensity target of 1.8 % for 2020. (4) HU: There is a break in series between 2004 and the previous years.

Among the basic R&D indicators (Table 1, Eurostat data), a notable evolution can be observed for GERD (e.g. GERD as % of GDP has grown from 1.14 to 1.41 in the period 2009–2013, and GERD per capita from 106.4 to 142.8 in the same period), although this indicator still remains well below the EU28 average.

Looking to R&D expenditure by sector of performance, we can see highly contrasting trends in the business sector vs. the public sector. Hungary experienced a considerable and continuous increase of the volume of R&D performed in the business sector, as shown by a business R&D intensity increasing from 0.35% in 2002 to 0.48% in 2006, 0.65% in 2009 and 0.98% in 2013. This is related to the use, in the first decade of the 2000s, of strong economic policy incentives, primarily tax policies, to stimulate corporate R&D spending, and allocation of significant grant amounts to the business sector for RTDI purposes from the Research and Technological Innovation Fund and the EU Structural Funds between 2004 and 2009. These incentives had the effect of a "*R&D shock therapy*" to the economy, resulting in a nominal business R&D expenditure that nearly quadrupled between 2000 and 2010 (National Innovation Office 2012<sup>4</sup>, pp. 17–18).

The increase in business R&D intensity contrasts with the decrease in public R&D intensity since 2006, from 0.49% in 2006 to 0.41% in 2013. Both the Higher Education sector and the Governmental sector were affected by this decrease, in similar proportion. In parallel, total public support to R&D increased between 2006 and 2013, thanks to both an increase in direct public funding (by about 50% in nominal terms) and an increase in indirect support through tax incentives. The increase in direct public funding was achieved thanks to the large mobilisation of the European Structural funds.

It is important to note that most of the increase in public support to R&D from 2006 was dedicated to business R&D, explaining that we have at the same time a considerable increase in public support to R&D but a decrease in public R&D intensity. The total (direct+indirect) public support to business R&D reached the very high level of 0.25% of GDP in 2012 (fourth highest in the EU). By contrast, only five Member States have in 2013 a public R&D intensity which is lower than the

<sup>4</sup> National Innovation Office (2012), *Status Report on Enterprise RDI*. Available at: [http://pdc.ceu.hu/archive/00006787/01/HU-innovation-office\\_Status\\_Report\\_on\\_Enterprise\\_RDI-2012.pdf](http://pdc.ceu.hu/archive/00006787/01/HU-innovation-office_Status_Report_on_Enterprise_RDI-2012.pdf)

Hungarian one. Hungary clearly stands out for its willingness to focus its public support towards business R&D to the detriment of public R&D.

The correlation between the increase in the R&D expenditure of the business sector and the decrease of government R&D expenditure, on the one hand, and the number of the country's R&D companies, on the other is noteworthy. Over 70% of the companies carrying out R&D activities are Hungarian-owned and their number nearly doubled between 2003-2010. The number of corporate R&D centres that are 100% or majority foreign-owned also doubled over the same period, creating demand for Hungarian R&D human resources. At the same time, the number of R&D companies majority owned by the state or local governments fell by almost one-third (National Innovation Office 2012, p. 10). The increase in the number of Hungarian-owned R&D units is due to an increase in the number of micro-enterprises (employing 0–9 people), which steadily account for around 42-46% of companies engaging in R&D each year. The number of large enterprise R&D centres essentially remained at the same level, although a slight decrease in their number was observed over 2009-2012. A favourable trend in the period between 2001 and 2010 is that the number of SMEs involved in R&D increased, by about 250 in the group of small enterprises and by 100 in the group of medium-sized enterprises, compared to ten years previously. The increase in the number of R&D businesses clearly occurred in two waves (from 2005 to 2006 and from 2008 to 2009) (*ibid.*, p. 11).

Employment in high- and medium-high technology manufacturing increased slightly between 2009 and 2013 (8.5% in 2013), reaching one of the highest levels in EU-28, above the community average by more than 50% due to several multinational companies employing highly qualified personnel in their manufacturing plants in Hungary. Employment in knowledge-intensive service sectors also grew between 2009 and 2013 (36% in 2013), getting close to the EU-28 average (39.2%).

The number of researchers, particularly in the business sector, grew every year in the past five years, and was not significantly affected by the crisis. After a stagnation between 2001 and 2004, the number of business sector researchers increased by 15% annually on average and 2.5 times during the 2001-2010 period. *By region*, Central Hungary employs 70% of all corporate researchers, especially in large enterprises, where the average number of researchers almost doubled in 2001-2010. The other regions lag behind, but their number of researchers grew significantly: e.g. 2.8 times in Eastern Hungary and 2.6 times in Western Hungary in 2004-2010. *By sector*, the largest numbers of researchers are, by tradition, employed in the pharmaceutical industry, telecommunications, automotive industry and computing services. *By company ownership type*, over 50% of corporate researchers work for foreign-owned companies, while domestic-owned companies employ only 40%. Large enterprises with larger R&D divisions are primarily in foreign ownership, while companies with majority state ownership employ fewer researchers their numbers are in decline (reaching in 2010 one-quarter of the 2003 figures). This weakens considerably the public R&D and innovation performance. *By company size*, micro- and large enterprises nearly doubled their average number of researchers in 2001-2010, while medium-sized companies showed no increase (National Innovation Office 2012, pp. 12-16). However, in spite of these growing numbers, the basic salaries of researchers remained at the level of 2008 without any rise since then (Dory 2015, p. 35).

**Table 1: Basic indicators for R&D expenditure**

Indicator	2009	2010	2011	2012	2013
GDP growth rate	-6.8	1.1	1.6	-1.7	1.1
GERD (% of GDP)	1.14	1.15	1.2	1.27	1.41
GERD (euro per capita)	106.4	112.4	120.6	126.6	142.8
GBAORD – Total R&D appropriations (€ mil.)	426.6	349.3	296.2	337.4	600.9
<i>GERD by source of funds (%)</i>					
Business enterprise sector	46.4	47.4	47.5	46.9	46.8
Government sector	41.9	39.3	38.1	36.9	35.9
Higher education sector	:	:	:	:	:
Private non-profit sector	0.7	0.9	1	0.9	0.8
Abroad	10.9	12.4	13.5	15.4	16.6
R&D funded by business sector (% GDP)	0.53	0.55	0.57	0.6	0.66
R&D funded by Private non-profit (% GDP)	0.01	0.01	0.01	0.01	0.01
R&D funded from abroad (% of GDP)	0.12	0.14	0.16	0.20	0.23
R&D performed by HEIs (% of GERD)	21.7	19.9	20.2	18.4	14.4
R&D performed by government (% GERD)	20.1	18.5	15.7	14.4	14.9
R&D performed by business (% GERD)	57.2	59.8	62.4	65.6	69.4
Employment in high- and medium-high technology sectors as % of total employment	7.9	8.1	8.5	8.3	8.5
Employment in knowledge-intensive service sectors as share of total employment	34.2	35.0	34.5	35.0	36.0

Source: selected from Dory (2015), p. 19-20, based on Eurostat data

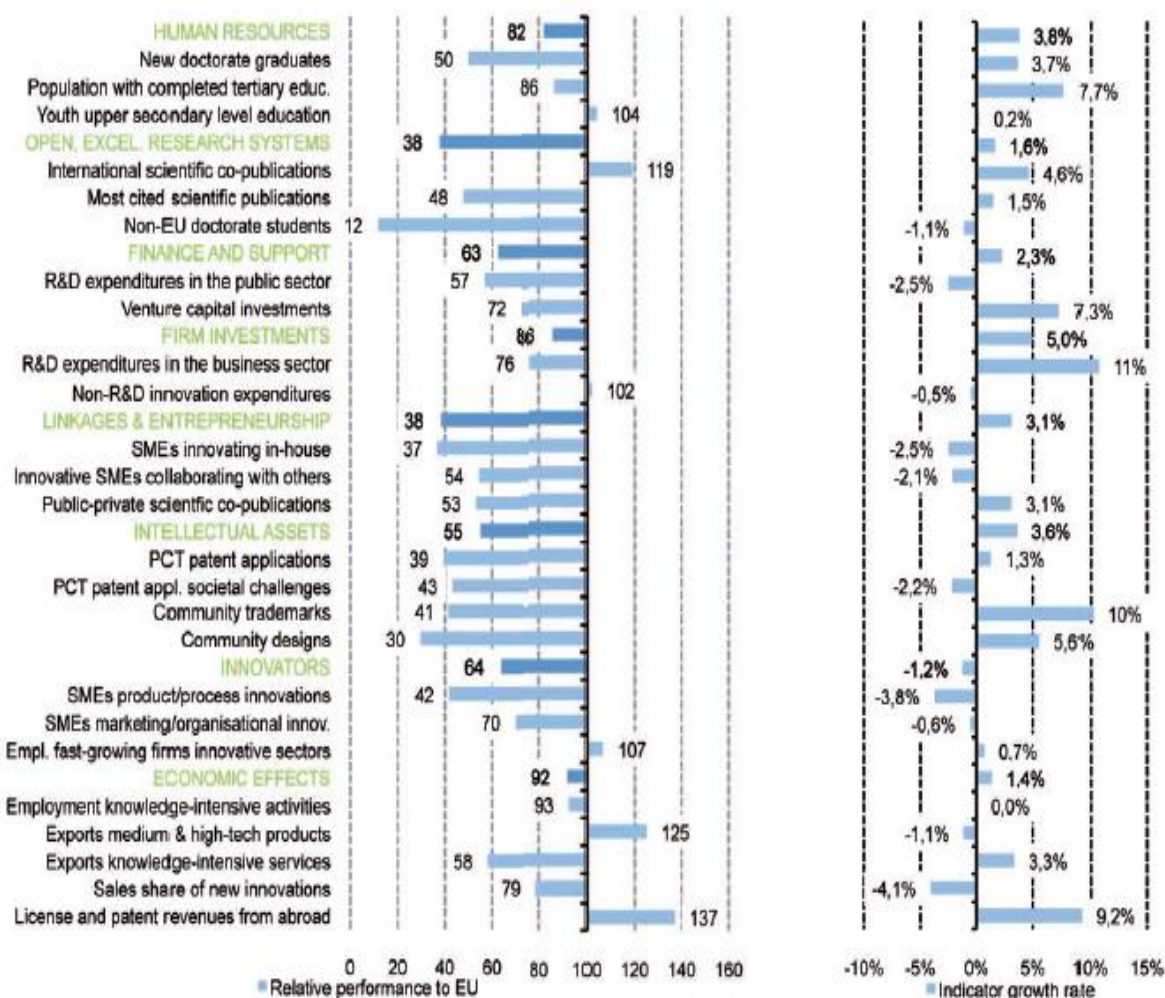
Note: \* Data from 2012

Another important component of the total R&D funding are the Structural Funds, which have been allocated through the Operational Programmes (OPs). The Cohesion Policy Database of the European Commission indicates that Hungary received a total of €2,125.6 million from the Structural Funds to R&D and innovation between 2007 and 2013 (Dory 2015, p. 21). The share of the OPs in R&D expenditure has increased continuously from 2009 to 2013, on a smaller scale in the government sector (from 0.74% in 2009 to 3.39% in 2013) and on a larger scale in the higher education sector (from 2.16% in 2009 to 22.77% in 2013). The business sector has also seen an important increase in OP funding of R&D expenditure, from 5.74% in 2009 to 15.36% in 2013. In nominal terms, the most significant growth of OP funding for R&D has been recorded in the business enterprise sector (from HUF 171.2 billion in 2008 to HUF 291.7 billion in 2013), while the funding for government and higher education remained relatively stable, around HUF 60 billion each) (Source: National Research, Development and Innovation Office, 2015).



Hungary's performance relative to the EU<sup>5</sup> has also seen a positive trend, in spite of some fluctuations, increasing from around 65% in 2007 to 67% in 2014. The country performance by innovation dimension (Figure 3) is below the EU average for all dimensions, and for nearly all indicators, especially for Non-EU doctorate students and Community designs. Relative strengths in terms of indicators are observed in License and patent revenues from abroad, Exports in medium- and high-tech products and International scientific co-publications. A positive evolution is observed for more than half of the innovation indicators, with high growth rates recorded for R&D expenditures in the business sector (11%), Community trademarks (10%) and License and patent revenue from abroad (9.2%). In contrast, negative evolutions are observed in Sales share of new innovations (-4.1%) and SMEs with product or process innovations (-3.8%).

**Figure 3: Hungary's innovation performance by indicators, relative to the EU**



Note: Performance relative to the EU where the EU = 100.

Source: Innovation Union Scoreboard 2015, Hungary Country Fiche

The positive evolution of the innovation indicators mentioned above is related to the performance of the foreign or foreign-dominated multinational and large companies that dominate the Hungarian economy: they account for 56.6% of the R&D expenditures and employ 52.5% of all research personnel (FTE) in the private sector. In contrast, the negative evolution in other innovation indicators is related to the low level of innovation activities in Hungarian companies, especially in SMEs.

The share of innovative SMEs has declined continuously since 1999, reaching an all-time low in the post-crisis period 2008-2012 (Table 2). Large enterprises recorded an increasing share of innovative activities during 1999-2010, but that trend was also reversed in 2010-2012.

<sup>5</sup> The assessment of Hungary's R&I system relative to the EU draws on Hungary Country Profile in the Innovation Union Scoreboard 2015.

**Table 2: The share of innovative companies in Hungary, 1999-2012 (%)**

	1999-2001	2002-2004	2004-2006	2006-2008	2008-2010	2010-2012
<b>Small enterprises (10-49 employees)</b>	20.9	16.9	15.6	16.3	13.3	12.2
<b>Medium-sized enterprises (50-249)</b>	28.0	30.5	31.6	31.3	32.7	26.6
<b>Large enterprises (250- )</b>	44.4	52.4	55.5	55.5	60.7	53.9
<b>Total</b>	<b>23.3</b>	<b>20.9</b>	<b>20.1</b>	<b>20.8</b>	<b>18.4</b>	<b>16.4</b>

Source: Havas (2015)<sup>6</sup> based on Community Innovation Survey (various years).  
Enterprises with technological innovation activities

The opposite trends of declining shares of innovative firms and increasing levels of business R&D expenditure discussed above demonstrate a weak capacity of the R&D conducted in Hungarian firms to significantly contribute to innovation. This is largely due to weaknesses in other innovation drivers, such as the "framework conditions"<sup>7</sup> and socially-embedded tacit knowledge associated to them, as well as other factors that increase the innovative capacity of the firm: 1. Investments in education and ICT; 2. Cooperation of RTDI stakeholders at EU and international levels; 3. Improved science-business cooperation; 4. Development of administrative procedures supporting innovation (e.g. intellectual property rights and regulations on standards and public procurement); 5. Innovation partnerships to manage key societal issues; and 6. Reinforcement of social innovation (National Innovation Office 2012, p. 8).

In Hungary, weaknesses in the above factors determine a generally low innovative environment that fails to ensure the moderating and amplifying effect of R&D on innovative output that is typically found in more established innovation environments that have solid innovation and entrepreneurship culture and support mechanisms. For example, according to the 2008 CIS survey, 29% of Hungarian businesses qualified as innovative companies, which was not only significantly below the 51.6% average of the EU-27 and the figures of more advanced EU Member States, but also lower than the Central European and Portugal average, and only exceeded the Polish figure. In terms of firm size, only a quarter of small enterprises are innovative in Hungary (EU average is nearly double), while among large firms 67% are considered as innovative (EU average 79%). Compared to countries in the same group, the Hungarian figure is about the same as the Slovakian or the Polish one, but falls behind the Czech and Portuguese results (*ibid.*, p. 30). Other statistics of innovation in Hungarian enterprises confirm this picture: the share of SMEs innovating in-house is only 11.4% (one-third of the EU28 average), while the share of product and/or process innovative enterprises, regardless of organisational or marketing innovation, is only slightly higher, at about 20% of all enterprises, with no major change in the last decade. Only 16.8% of Hungarian SMEs introduced product or process innovations, i.e. 44% of the EU28 average (Dory 2014, based on Eurostat data).

By sector, the most innovative sector is pharmaceuticals manufacturing, with 75% of innovative companies. Chemicals manufacturing has a 54.2% share, and transport equipment manufacturing a 51.6% share. In services, ICT enterprises rank first with 48.4% share. Electricity, gas, steam, air-conditioning services have a 39.4% share, while 38.9% of enterprises in financial and insurance activities are innovative. The majority of the innovative enterprises are active in technological (product- or process-innovation) as well as in non-technological (organization- and marketing innovation) innovation<sup>8</sup>.

*By region*, the innovativeness of Hungarian companies also varies significantly, due to variations in the competitiveness and development stage of the country's regions. There are two regions above

<sup>6</sup> Havas, A. (2015), "A Hungarian Paradox? On the potential reasons for a poor innovation performance". Corvinus University of Budapest, 23.05.2015

<sup>7</sup> E.g. the macroeconomic environment, foreign direct capital flows, the economy structure, competitive conditions, the legal environment (both economic legal conditions and the legal framework for the protection of intellectual property), the quality of the training/education system, mobility, the business environment (administration, application of economic laws), entrepreneurial skills and digital literacy

<sup>8</sup> National Innovation Office data (available at: [http://kaleidoszkop.nih.gov.hu/documents/15428/20238/2\\_Where%20are%20the%20innovative%20enterprises](http://kaleidoszkop.nih.gov.hu/documents/15428/20238/2_Where%20are%20the%20innovative%20enterprises))

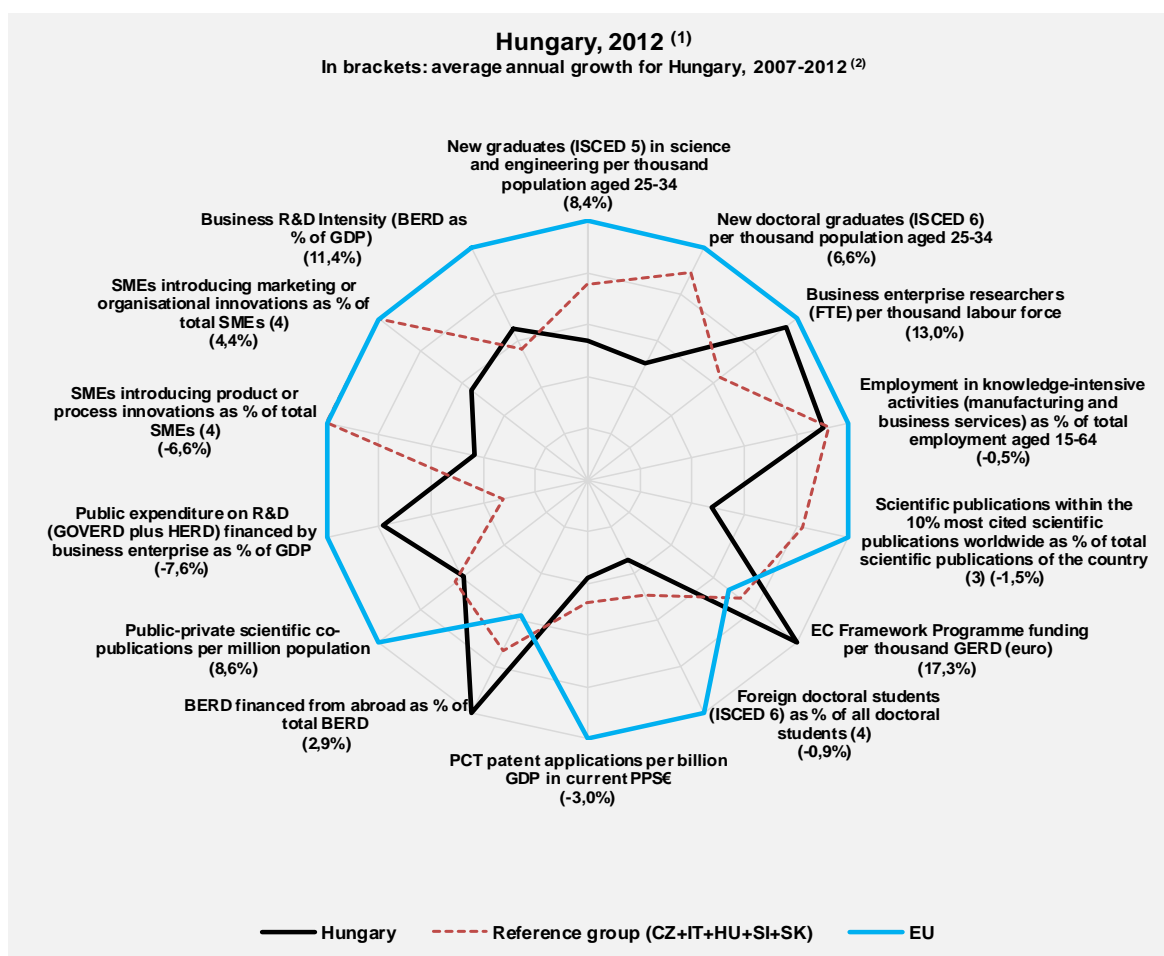


the average, Central Hungary (18%) and Central Transdanubia (17%), while the two regions with the lowest innovation intensity among SMEs are Southern Transdanubia and Northern Hungary (10% each). In every region, the proportion of marketing and/or organizational innovator companies is higher than companies introducing new products/processes. Figures in Central Hungary are the highest for both innovation categories and this region has both the highest number and proportion of innovative companies. Although the proportion of product and/or process innovator companies is the worst in Northern Hungary, the region comes second behind Central Hungary in the proportion of companies implementing marketing and/or organizational innovation (National Innovation Office, 2012, p. 32).

The government adopted several measures to increase the innovative capacity of enterprises. For example, a commitment was made to increase R&D expenditures, especially in the business sector, to make Hungary an R&D- and production centre in the CEE region and support the development of the Hungarian start-up ecosystem. The "*Budapest Runway 2.0.2.0. – A Start-up Credo*" document adopted in November 2013 envisions the Hungarian capital as the start-up centre of CEE within a decade. Also, the Economic Development and Innovation Operational Programme (GINOP) supports cluster development in the period 2014-2020, with innovation vouchers and funding for the improvement of service quality, collaboration among companies and knowledge transfer. Also, some incentives for business R&I have been introduced, such as a tax incentive for employment of PhD researchers in companies, from January 2013. These measures are very recent, and it is still early to observe visible improvements in the system.

Hungary's performance relative to the EU average and countries in the same reference group of Moderate Innovators (Czech Republic, Italy, Slovenia and Slovakia) based on selected indicators is below the EU average for most of the indicators, but higher than the reference group for most of the indicators (Figure 4). A noteworthy performance is in the BERD financed from abroad and EU Framework Programme funding. At the opposite end, below the EU and reference group average are: New doctoral graduates per thousand population aged 25-34, Foreign doctoral students as % of all doctoral students, Scientific publications within the 10% most cited scientific publications worldwide. The number of SMEs introducing product or process innovations is also below the reference group average.

**Figure 4: Performance of Hungary's R&I system relative to the EU and a reference country group**



Source: DG Research and Innovation - Unit for the Analysis and Monitoring of National Research Policies

Data: DG Research and Innovation, Eurostat, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard

Notes: (1) The values refer to 2012 or to the latest available year.

(2) Growth rates which do not refer to 2007-2012 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2007-2012.

(3) Fractional counting method.

(4) EU does not include EL.

Measures to correct these weaknesses have been taken by the government, e.g. by adoption of the new Higher Education Strategy "A Change of Pace in Higher Education". The Strategy sets out two major objectives: make education and training more responsive to the needs of the labour market (better adapt the content of knowledge transferred to students to labour market needs, provide adequate qualifications and sufficient numbers of graduates, introduce new forms of education and training and new skills needed in the labour market, dual higher education, industrial cooperation centres, etc.) and increasing operational efficiency (reducing dropout rates, improving assessment of student competencies, changing the methodology of education, etc.).

## 4. MAIN TOPICS ADDRESSED BY THE PRE-PEER REVIEW OF THE HUNGARIAN R&I SYSTEM

This section has a double objective: to provide first an account of the main topics discussed with the stakeholders during the Budapest visit, and secondly, an assessment of strengths and weaknesses associated with each main topic with a view to feeding into the subsequent peer review. Each of the main topics discussed with the stakeholders is presented in a general context outlined by the pre-peer review panel (in sub-section "Key issues highlighted by the panel") and based on the examination of the available quantitative and qualitative evidence<sup>9</sup> and the panel's own expert knowledge. This is followed by specific views expressed by the stakeholders to the panel (in sub-section "Critical issues raised by the stakeholders") in regard to their own R&I sector. The discussion of each main topic concludes with an analysis of strengths and weaknesses, which draws primarily on the issues highlighted by the pre-peer review panel and those raised by the stakeholders, and to a lesser extent, on the criteria of the above mentioned self-assessment tool.

The main topics discussed with the stakeholders have been selected and agreed upon by the pre-peer review panel members and communicated to the Hungarian counterparts prior to the visit to Budapest. The main topics have been grouped under six headings, each with several sub-headings:

I. **The R&I system** (Structure and policy coordination; National R&I strategies and programmes; Funding: national and EU funding, institutional vs. competitive funding, use of peer-review; Stakeholder involvement in policy-making; Demand-side vs. supply-side innovation policies; Regional innovation policy and the National Strategy for Smart Specialisation). This topic was discussed with representatives of the National Research, Development and Innovation Office (section 4.1)

II. **The public R&I sector** (The Hungarian Academy of Sciences as the largest public research organisation; Implementation of the R&I policy mix and funding of the public R&I sector; Quality of the human resources for the public R&I sector, including researchers' supply and career; Links with the private sector and University-Industry cooperation). This topic was discussed with representatives of the Hungarian Academy of Sciences (section 4.2)

III. **Technology transfer, University-Industry cooperation, entrepreneurship** (Technology transfer and research commercialisation; University-Industry cooperation and promotion of entrepreneurship; Participation in clusters, technological parks). This topic was discussed with representatives of the technology transfer community (section 4.3)

IV. **Framework conditions for R&I** (Types of framework conditions for the Hungarian R&I system; Coherence of R&I policy mix). This topic was discussed with representatives of researchers and consultants (section 4.4)

V. **The business R&I sector** (Public support to business R&I; Availability of skilled workforce; Obstacles to the creation and growth of innovative firms; Role of framework conditions: financial markets, regulators and technology intermediaries, access to credit and risk capital for innovative projects; Involvement in clusters). This topic was discussed with representatives of the business community (section 4.5)

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<sup>9</sup> This section draws to a large extent on the RIO Country Reports for Hungary, editions 2014 and 2015: Dóry, T. (2014), *RIO Country Report Hungary 2013, JRC Science and Policy Report*, JRC, European Commission  
Dóry, T. (2015), *RIO Country Report Hungary 2014, JRC Science and Policy Report*, JRC, European Commission  
Other background documents used are:

- Ministry of National Economy (2013), *Investment in the future. National Research and Development and Innovation Strategy 2013-2020*.
- Government of Hungary (2014), Law LXXVI 2014 Law on scientific research, development and innovation) (approved on 25 Nov. 2014)
- NIH (2014), *National Smart Specialisation Strategy*. November 2014. National Innovation Office, Budapest.
- Government of Hungary (2014), *Changing gears in higher education. Directions of performance based development of higher education*. October 2014.
- Government of Hungary (2015), *National Reform Programme 2015 of Hungary*.
- OECD (2008), *OECD Reviews of Innovation Policy – Hungary*.
- Havas, A. (2011), *ERAWATCH Country Reports 2010: Hungary*
- Havas, A. (2011), "A Hungarian Paradox? Poor innovation performance in spite of a broad set of STI policy measures", Paper presented at the Triple Helix 9 International Conference, 11-14.07.2011.
- Havas, A. (2015), "A Hungarian Paradox? On the potential reasons for a poor innovation performance". Corvinus University of Budapest, 23.05.2015.
- Szarka, L. (2015), Presentation at the meeting with MTA representatives, 21.05.2015.
- Vadasz, G. (2015), Presentation at the meeting with representatives of the venture capital community, 22.05.2015.
- European Commission (2014a), *Research and Innovation performance in the EU, Innovation Union progress at country level 2014*, Brussels (p. 139 for Hungary section).

VI. **Venture capital for innovative start-ups** (The state of the venture capital market in Hungary; Support measures for innovative start-ups). This topic was discussed with representatives of the venture capital community (section 4.6).

## **4.1. The R&I system**

### **4.1.1. Scope**

- a. Structure and policy coordination of the Hungarian R&I system
- b. National R&I strategies and programmes
- c. Funding of the R&I system (national and EU funding, institutional vs. competitive funding, use of peer-review)
- d. Stakeholder involvement in policy-making
- e. Demand-side vs. supply-side innovation policies
- f. Regional innovation policy and the National Strategy for Smart Specialisation

## **A. Structure and policy coordination of the Hungarian R&I system**

### ***Key issues highlighted by the Panel***

The Hungarian R&I system went through a large number of structural and operational transformations since the 1990s (Annex 1). The early 1990s brought about significant turbulence caused by a change in the public funding for R&D, whereby the vast majority of state-financed R&D programmes have been discontinued and the predominant top-down R&D funding was replaced by bottom-up support for individual projects of research institutes and companies. After substantial cuts in the public R&D expenditure in the mid-1990s that led to layoffs and closures in many public research institutes, a new R&D funding system was put in place in the second half of the 1990s, together with the formulation of the first National Development Plan (Széchenyi Plan) and changes in the institutional setting for R&D policy.

The first decade of the 2000s was no less turbulent. The National Development Plan (Széchenyi Plan) that was seen in 2000 as a first attempt at implementing a long-term innovation strategy was revised in 2002, after a change of government. A new National Development Plan was devised, which placed R&D and innovation among the country's policy priorities. At the same time, several changes in the institutional setting for R&I took place, from the revamping of the OMFB Council into the Research and Technological Innovation Council (KTIT) and of the Science and Technology Policy Council (TTPK) into the Science and Technology Policy Advisory Board (TTTT), to the creation of the National Office for Research and Technology (NKTH) in 2004, as the main government body in charge with R&D and innovation policy-making, and the creation of the advisory Research and Science Policy Council in 2009. An overhaul of the STI governance system was intended through the 2007-2010 STI Policy Action Plan approved in 2007, but the Plan could not be fully implemented because of the political turmoil that led to a change of government in 2009.

The second decade of the 2000s saw further R&I institutional and policy changes. On the institutional plane, noteworthy developments include the reorganisation of the Hungarian Academy of Sciences (MTA)'s research network during 2008-2011, with the operational start of the reformed network in 2012. In 2010 the National Innovation Office (NIH) was set up as a new government body responsible for R&D and innovation. The National Development Cabinet (NFK) was created in 2012 as a horizontal coordination body for all major government actions including STI policy decisions, and the National Research, Innovation and Science Policy Council (NKITT) was dissolved, being replaced in 2013 by a new advisory body - the National Science Policy and Innovation Board (NTIT). The management of EU Structural Funds was transferred from the Managing Authorities previously working under the National Development Agency (NFÜ) to dedicated ministries. On the legislative/policy plane, the approval of the new Law LXXVI (25 November 2014) on Scientific Research, Development, and Innovation was a landmark.

The changes implemented through the new Law aiming to create a more stable R&I system. The law stipulates the establishment on 1 January 2015 of the National Research, Development and Innovation Office (NKFI) which integrates the activities of the previous National Innovation Office (NIH) and the ministerial departments responsible for innovation policy, as well as the creation as of 1 January 2015 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). These changes contribute to Hungary's committed efforts to introduce structural reforms and target the improvement of the management and coordination of R&I policies and

funding, and the pursuit of more effective policy-making and implementation, which had been heavily affected in the previous decades by the political turmoil.

The main role in implementing this renewed perspective on R&I is played by the National Research, Development and Innovation Office, which, as the legal successor of the National Innovation Office (NIH), took over some of its tasks and also performs new tasks, all integrated into two main missions:

- (i) *RDI policy-making, implementation and integration into the economy*
- (ii) *Allocation and management of RDI funding, through the National Research, Development and Innovation Fund mentioned above.*

The Office, established under the leadership of a prominent figure of the Hungarian scientific community, Prof. József Pálincás, former President of the Hungarian Academy of Sciences, takes a central position in the R&I system, being placed at the level of ministry coordination (see Dory 2015, p. 5 for an organigram of the current R&I system in Hungary). The legal mandate of the Office and its President are defined in *Act LXXVI of 2014 on Scientific Research, Development and Innovation* (pp. 7-8):

*"Section 6. The NKFI Office shall be a central budgetary organisation operating as a government office.*

*Section 8 (1) The NKFI Office shall be run by a President, who shall represent the NKFI Office in matters of research, development and innovation in front of the Government and Parliament, and represent the Government in matters of research, development and innovation in international organisations.*

*Section 8 (2) The President of the NKFI Office shall be appointed and dismissed by the Prime Minister (...).*

*Section 9 (2) The President of the NKFI Office shall report to Parliament on the activities of the NKFI Office and the use of the NKFI Fund's appropriation (...). On specific request, the President of the NKFI Office shall also inform the relevant parliamentary committee."*

According to Government regulation 152/2014. (VI. 6) the Office is supervised by the Prime Minister's Office, namely by the Minister of Prime Minister's Office.<sup>10</sup> The same Act also indicates the relevant institutions that the Office cooperates with in exerting its mandate:

*"Regarding sectoral research, development and innovation activities, the NKFI Office in the course of performing its duties, shall cooperate with the competent minister, bodies of public administration, MTA and other organisations involved in research, development and innovation."*

The key players in the Hungarian R&I system are organized at several levels:

- *At the political and cross-cutting high level:* the Parliament, through its Education, Science and Research Committees; and the government, with the Prime Minister's Office and the National Development Cabinet. At this level, one can also find the policy advisory body - the National Science Policy and Innovation Board (NTIT) - chaired by the Prime Minister, co-chaired by the President of the Hungarian Academy of Sciences (MTA).
- *At the ministry level:* at this level, one can identify the National Research, Development and Innovation Office in a central position, and next to it, four ministries that are involved in the implementation of Operational Programmes (OPs) of EU Structural Funds in the programming period 2014-2020:
  - o Ministry of National Economy: coordinates the Economic Development and Innovation OP (GINOP), Competitive Central-Hungary OP (VEKOP);
  - o Ministry of Human Capacities: coordinates the Human Resource Development OP (EFOP);
  - o Ministry of National Development: coordinates the Intelligent Transport Development OP (IKOP) and the Environmental and Energy Efficiency OP (KEHOP);
  - o Ministry of Agriculture: coordinates the Rural Development and Fisheries OPAmong the above OPs, only GINOP, VEKOP and EFOP allocate project-based funding for

R&I. Also important at this level is the Hungarian Intellectual Property Office, under the coordination of the Ministry of Justice, which participates in the qualification of R&D activities, elaboration of intellectual property (IP) legislation and IP cooperation, and provides a range of IP services.

<sup>10</sup> [http://net.jogtar.hu/jr/gen/hjegy\\_doc.cgi?docid=A1400152.KOR](http://net.jogtar.hu/jr/gen/hjegy_doc.cgi?docid=A1400152.KOR) (Only available in Hungarian)



- *At the R&D funding level:* the National Research, Development and Innovation Fund (OTKA and KTIA funding streams) and the Managing Authorities in the ministries responsible for the OPs, as well as the Hungarian Academy of Sciences, due to its funding function.
- *At the research performers' level:* the Hungarian Academy of Sciences, due to its research performance function, which is exerted by coordinating the largest network of public research organisations in Hungary, higher education institutions and companies. The R&I system counted 3,159 research performers in 2013 (Central Statistical Office KSH, 2014)<sup>11</sup>, of which companies represented 54.2%, and higher education institutions 41.7%. Among them, *public research performers* are mainly represented by the 16 institutes of the Hungarian Academy of Sciences, which perform 71.2% of all public R&D expenditures and employ 60.1% of all public research personnel (FTE). *Private research performers* are mainly represented by multinational and large companies, next to a small share of SMEs and start-ups. Among them, foreign or foreign-dominated companies account for more than half (56.6%) of the R&D expenditures and employ 52.5% of all research personnel (FTE) in the private sector. The leading private R&D performer is the pharmaceutical company Richter Gedeon, which ranked 166th in the 2014 EU Industrial R&D Investment Scoreboard, with €141.4m invested in R&D in fiscal year 2013 (Dory, 2014).

An overall analysis of the R&I system structure and interactions between its key actors yields three observations:

- The establishment of the National RDI Office and of the National RDI Fund that integrates the former OTKA and KTIA funds,<sup>12</sup> place RDI policy-making and funding under a single managing institution. This is considered an important measure to reduce the fragmentation in the system and to support the country's efforts to undertake structural reforms which increase the quality and efficiency from its RDI investments.* At the lower levels of the R&I system, however, the fragmentation remains high among the performing actors. The system displays a relatively large number of institutions, most of small size and limited responsibilities, which makes it difficult to achieve a level of critical mass that would strengthen Hungary's international competitiveness.
- The National RDI Office is at the core of the R&I system and is in the position to implement strong horizontal and vertical coordination mechanisms with other ministries involved in R&I, the National Science Policy and Innovation Board (NTIT), as well as with the R&I performers. However, the actual mechanisms for achieving coordination are insufficiently well defined to ensure effective institutional synergies, integration of R&I policies with other sectoral policies (the policy integration issue is discussed in more detail in the next section "National R&I strategies and programmes"), and involvement of stakeholders.* A first step towards improving the horizontal coordination and policy integration was the establishment of the Innovation Board by the President of the National RDI Office in March 2015. The Board brings together nine senior representatives of different sectors, e.g. business (IT, chemistry and food), Innovation Office, and academia. The Innovation Board aims to develop and evaluate the concept of grants and R&D programmes. These grants are verified by the National RDI Office in form and by the Innovation Board in content. Therefore, based on the suggestions of the Board, entrusted expert groups evaluate and rank the compliance of the grants to the defined selection criteria and on the basis of its results, the Board propose the subsidy for each grant to the President of the National RDI Office. However, it is not clear how it actually operates to provide policy advice, how the policy advice integrates R&I with other sectoral policies, and how that advice is implemented into the broader R&I system.
- Coordination, especially with the R&I performers, is often weakened by limited institutional communication, bureaucracy and strong top-down centralisation.* It is expected that the situation improves after the finalisation of the ongoing internal re-organization of the Office (e.g. some positions still to be filled, new internal regulations and communication routines still to be established). Still, many of these deficiencies require specific attention, as they pertain to a long-lasting institutional legacy and culture that did not place a strong emphasis on openness, collaboration and communication. This slows down the development and accumulation of modern institutional culture and routines, and creates difficulty in policy assessment and policy learning.

<sup>11</sup> KSH (2014), *Research and development 2013*. National Statistical Office, Budapest.

<sup>12</sup> OTKA was the major funding agency for basic research and provider of scholarships, and operated as an independent and autonomous non-profit organisation from 1986 to 2014.

### **Critical issues raised by the stakeholders**

- *Significant system instability and confusion about the new institutional structures, roles of different units, implementation of policies and programmes, etc.* As an example, some see the need for a balance between the above mentioned centralisation process and the preservation of a degree of autonomy for OTKA.
- *Little institutional communication and networking among the R&I institutions and low levels of trust* in the interaction with external partners.
- *Poor performance incentives for civil servants* (e.g. low salaries, limited career development opportunities).

## **B. National R&I strategies and programmes**

### **Key issues highlighted by the Panel**

Hungary has several national strategies addressing R&I (Annex 2), which have been adopted in recent years and take a new perspective on R&I, in line with EU and international policies:

- [2013-2020 National Research, Development and Innovation Strategy “Investment in the Future”](#) (approved in 2013), which aims to raise R&I investments and support the development of a knowledge-based, internationally competitive R&I system that would strengthen the competitiveness of the Hungarian economy
- **Higher Education Strategy “A Change of Pace in Higher Education”** (approved in October 2014), which sets the directions for achieving a competitive higher education system in the coming 15 years.
- [National Smart Specialisation Strategy \(S3\)](#) (approved in November 2014), which aims to improve research capacities in all regions, especially research infrastructures that can accelerate the growth of the Hungarian economy. The Strategy defined the following national priorities: (i) healthy society and well-being; (ii) advanced technologies in the vehicle and other machinery industry; (iii) clean and renewable energies; (iv) sustainable environment; (v) healthy and local food; (vi) agricultural innovation. Also, two horizontal priorities, like: i) ICT and related services; ii) inclusive and sustainable society and liveable environment, have been set up.
- [Research Infrastructures in Hungary](#) (approved in 2014) in order to achieve the RDI objectives envisaged in the National Reform Programme related to the Europe 2020 Strategy.
- [New Széchenyi Plan \(ÚSZT\)](#) is the national strategic reference framework of Hungary that offers a basic action plan for the last 3 years of the 2007-2013 programming period
- [National Reform Programme 2015](#)
- **National Reform programme 2012 ([Széll Kálmán Plan 2.0](#))** defines the mid-term and long term aims of the government and is aligned to the EU2020 documents
- [Széll Kálmán Plan 1.0](#) introduced in March 2011 as a structural reform plan that held as main objectives to reduce the public debt and foster economic growth through 26 objectives.
- The [First National Environmental Technology Innovation Strategy \(NETIS\)](#) approved at the end of 2011 as a framework for eco-innovation within the Hungarian National Reform Programme’s “18<sup>th</sup> measure” on the renewal and implementation of the country’s RDI programme. The government aim is to foster environmental industries and technology, focus on environmental innovation, ensuring a paradigm shift from an “end-of-pipe” approach to environmental issues to prevention of problems.
- [National Energy Strategy 2030](#) (approved in 2012), which provides several objectives to be achieved by 2030 in terms of energy efficiency, increased use of renewable energy and of low CO<sub>2</sub>-emission transport. The Strategy has an Energy Industry Development and RDI Action Plan that was drafted in 2013 in the field of energy RDI in order to support the companies that build intelligent systems facilitating the regulation of electricity networks.
- [National Biodiversity Strategy 2014-2020](#) (approved in 2014), has an objective on genetically modified organisms that is financed by OTKA.
- [National Transport Infrastructure Development Strategy](#) (adopted in 2014), introduces a long-term national transport strategy, which focuses on the development of infrastructure and its economic and environmental sustainability. In modernising the public transport, developing low-cost intermodal hubs and a domestic vehicle manufacturing sector, the Strategy acknowledges the need for using R&D-driven, innovative and environmentally friendly technologies, with special attention to Hungarian patenting.

The objectives of the above strategies are implemented through a large number of programmes (Annex 3) that address different target beneficiaries (e.g. universities, companies in general and start-ups in particular, consortia of universities and companies, and individual researchers) and have different objectives (e.g. research, innovation, infrastructure, etc.). They are funded by national sources (the National Research, Development and Innovation Fund (NKFI) that integrates the Research and Technological Innovation Fund KTIA and the Hungarian Scientific Research Fund OTKA) and EU sources, represented by various Operational Programmes of the Structural Funds with provisions for R&I (see Table 3 in the next sub-section for further funding details).

The evidence-based policy-making process has been strengthened by the participation of the former RDI Observatory of the National Innovation Office (responsible for analysis and evidence-based policy making) in the design of the National RDI Strategy and Smart Specialisation Strategy, to which by the issuance of policy documents such as the RDI Mirror series (on ICT in Hungary, Women in RDI, and Regional aspects of Hungarian RDI) contributed<sup>13</sup>. Currently the Department of Analysis and Information of the National Research, Development and Innovation Office is responsible for these tasks.

Based on the analysis of the above national and programmes that address R&I issues, five observations emerge:

- (i) *A large number of national strategies addressing R&I issues have been adopted in recent years that acknowledge R&I as a key driver and policy instrument for enhancing competitiveness and growth.* These strategies have been strongly driven and inspired by the EU context (e.g. the new Horizon 2020 and other new policies adopted for the new programming period 2014-2020) and have a broad coverage of relevant R&I issues. They are also based on a multi-annual planning, which is expected to improve planning and predictability of funding.
- (ii) *A formal dimension of regional innovation policy has been introduced by the National Smart Specialisation Strategy (S3).* It brings about a focus on current or emerging regional R&I strengths and also tests some soft instruments for innovation financing, like pre-commercial procurement (PcP) and two pilot measures for strengthening University-Industry links.
- (iii) *An emphasis on R&I that goes beyond science and technological research into the development of an innovative ecosystem has been introduced by the National RDI Strategy* and is supported in particular by the EU Economic Development and Innovation Operational Programme (GINOP).
- (iv) *There is a contrast between the high quality of the national R&I strategies, with a modern approach and comprehensive coverage of key R&I issues, and the deficit in the implementation of these strategies,* which comes from several deficiencies in the policy mix structure, formulation of calls for proposals, evaluation and monitoring of proposals, limited and unsystematic consultations with the stakeholders, unpredictability of funding, etc. This contrast reflects a more dynamic process of renewal in the vision and content of the national R&I strategies, and a slower process of reform in strategy implementation by the national R&I structures, where the deficiencies mentioned above are more visible.
- (v) *The mechanisms of integration of R&I policies with other sectoral socio-economic policies are insufficiently well defined to ensure an effective articulation between strategic objectives for R&I and for other economic areas.* As mentioned earlier in section 4.1.1 a, a first step towards policy integration has been taken with the setup of the advisory Innovation Board, which is involved in strategic policy-making and implementation, but some of the actual mechanisms of achieving that role still have to materialise. On the other hand, it has become apparent that a socio-economic strategy of the country that would bring R&I and other sectoral policies into a coherent framework and strategic thinking is lacking. This strategy would ensure appropriate coordination and implementation measures, transparency and efficiency. Therefore, the R&I policy mix has a very limited capacity to correct market and system failures and ensure a more effective use of public money. Instead, it looks more like a collection of stand-alone isolated initiatives, which reduces the effectiveness of R&I policies in spite of appropriate identification of policy goals – the “Hungarian paradox” (Havas, 2011, 2015).

<sup>13</sup> <http://kaleidoszkop.nih.gov.hu/en/-/kfi-tukor-1-az-ikt-szektor-helyzete>  
<http://kaleidoszkop.nih.gov.hu/documents/15428/38972/RDI%20Mirror%202%20Women%20in%20RDI%20FINAL>  
<http://www.s3magyarország.hu/documents/15428/38972/RDI%20Mirror%203%20Regional%20FINAL>



### **Critical issues raised by the stakeholders**

- *Negative effect of unclear, short-term R&I perspectives, strategies and planning.* The short-termism of R&I policies and the lack of medium- and long-term priorities have been reported as a major issue, largely stemming from the instability in the R&I governance structures.
- *Poor policy-design, with many generic and few thematic programmes that have no clearly defined objectives, little use of policy-making tools* like international benchmarking, foresight, technology assessment, Delphi surveys, etc. Such tools have been rarely used and no comprehensive study of strategic intelligence has been published in recent years<sup>14</sup>.
- *Insufficient adaptation of international models to the specific situation of Hungary,* e.g. the Higher Education Strategy was criticised for drawing significantly on the German model that is better suited to countries with significant manufacturing sector rather than to the Hungarian economy and education context.
- *Insufficient support to policy areas related to the transition from research to innovation,* e.g. policies supporting University-Industry links, technology transfer and commercialization, business R&D and innovative firms, research infrastructure, technology strategic thinking, internationalisation of domestic SMEs and access to international export markets, benchmarking exercise to help positioning Hungarian R&I in global networks.
- *Lack of a technology dimension of policy-making and of reliable data and statistics on technology use across various economic sectors, limited use of strategic technology policy instruments,* like technology foresight and technology roadmaps. The limited scope and ineffectiveness of these policies was pointed out as a cause for poor integration of R&I results into the economy and persisting barriers to the economic exploitation of research results.
- *Lack of/incomplete implementation, evaluation and monitoring methodologies.* This was reported in the case of the National RDI Strategy and the Higher Education Strategy, which do not have implementation methodologies yet, while the first Action Plan for the implementation of S3 is expected around mid-2015.
- *Lack of integrated ("packaged") policy instruments to promote synergies and improve the balance between public and private actors, local and global focus, and complement traditional policy instruments that target specific objectives, such as SMEs.*

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<sup>14</sup> An exception can be considered to be the six RDI Sectoral White Books for agriculture, health industry, energy, ICT, environment protection, mobility, vehicle industry and logistics, related to the S3 strategy (Dory, 2014).

## C. Funding of the R&I system (national and EU funding, institutional vs. competitive funding, use of peer-review)

### National and EU funding

#### Key issues highlighted by the Panel

The main funding sources for the R&I system are: (i) national sources, represented by the National Research, Development and Innovation Fund (NKFIA) that integrates, since 1 January 2015, the Research and Technological Innovation Fund KTIA and the Hungarian Scientific Research Fund OTKA that operated separately until the end of 2014), and (ii) EU sources, represented by various Operational Programmes of the Structural Funds with provisions for R&I (Table 3).

**Table 3: Main R&I funding sources**

<b>National funding</b>
<ul style="list-style-type: none"> <li>• <b>The National Research, Development and Innovation Fund (NKFIA)</b> that integrates two funds: <ul style="list-style-type: none"> <li>◦ The Research and Technological Innovation Fund (KTIA) - available to Central Hungary, the region of the capital Budapest (which has no access to Structural Funds)</li> <li>◦ The Hungarian Scientific Research Fund (OTKA)</li> </ul> </li> </ul> <p>Total budget of NKFIA for 2015: HUF74.1b (about €247m).</p>
<b>EU funding</b>
<ul style="list-style-type: none"> <li>• <b>Six Operational Programmes of the Structural Funds co-funded by the central budget, available to the rest of Hungary regions:</b> <ul style="list-style-type: none"> <li>◦ Economic Development and Innovation OP (GINOP) Priority 2: Reinforcement of research, technological development and innovation Total budget (2014-2020): €1,687.9 million</li> <li>◦ Economic Development and Innovation OP (GINOP) Priority 7: Financial instruments to top up R&amp;I support by 10% Total budget (2014-2020): €2,553.2 million</li> <li>◦ Competitive Central Hungary OP (VEKOP) Priority 1: Improvement of companies' competitiveness and development of the knowledge economy Total budget (2014-2020): €202.2 million</li> <li>◦ Competitive Central Hungary OP (VEKOP) Priority 2: Financial instruments and development of services Total budget (2014-2020): €44.1 million</li> <li>◦ Human Resources Development OP (EFOP) Priority 3: Increase research, innovation and smart specialisation in the field of human resources, improvement of the quality of education, etc. Total budget (2014-2020): €898.3 million</li> <li>◦ Rural Development Programme (VP) Priority 1: Knowledge transfer and innovation measures Total budget (2014-2020): €25.3 million</li> </ul> </li> </ul>

### National funding for R&I

The integration of the Hungarian Scientific Research Fund (OTKA) and the Research and Technological Innovation Fund (KTIA) into the National Research, Development and Innovation Fund, since 1 January 2015 has been justified, according to Law LXXVI on Scientific Research, Development and Innovation, by the need to provide a stable institutional background of predictable financing, as well as efficient and transparent implementation of R&I funding. In addition, the integrated fund is aimed to support the financing of the entire innovation chain, from basic research through applied and experimental research.

Before the 2015 integration, the two funds, OTKA and KTIA were two distinct funds providing support to different activities. The OTKA fund was an independent national institution funded mainly by the state budget, which has supported basic (discovery) research of internationally-recognised Hungarian researchers and international knowledge transfer since its 1986 establishment, based on a peer review system involving domestic and international reviewers. This focus was continued under the new National Research, Development and Innovation Fund (NKFI), and OTKA will continue to provide competitive (project-based) financial support through competitive calls to scientific research projects, research infrastructures and publication of significant scientific results. The annual budget of OTKA increased to €26.5 million (HUF7.7 billion) in 2013 and remained at the same level in 2014 and 2015.

The Research and Technological Innovation Fund (KTIA) was based until end 2014 on innovation levies (i.e. 0.3% of the tax base) paid by medium-sized and large companies. From 1 January 2015, according to Law LXXVI on Scientific Research, Development and Innovation, the new fund is mainly based on the innovation levies (same rate as previously, 0.3% of the tax base) paid by large companies (with more than 50 employees) and the contribution paid by the central budget. Companies pay every year about EUR160m (~HUF50b), out of which multiannual projects and new calls are financed.

The two funds, OTKA and KTIA receive public funding for R&D. Total public support to R&D increased between 2006 and 2013, thanks to both an increase in direct public funding (by about 50% in nominal terms, and largely thanks to the large mobilisation of the European Structural funds) and an increase in indirect support through tax incentives. However, most of the increase in public support to R&D from 2006 was dedicated to business R&D, explaining the large decrease in public R&D intensity from 2006 to 2013, that has positioned Hungary as one of the Member States with the lowest public R&D intensity in 2013. The decline in the public R&D intensity of Hungary, combined with the intrinsic difficulties to sustain past trends of increase in business R&D expenditure, raises difficulty in reaching the target set by the government in the National RDI Strategy 2013-2020 to increase the country's R&D expenditure to 1.8% of the GDP by 2020 and 3% by 2030.

## EU funding for R&I

The EU funding for R&I made available through the OPs followed an ascending trend: from HUF 11.63 billion in 2009 to 60.68 billion in 2013. Following this trend, the share of OP funding in the R&D expenditure has increased significantly, from 3.9% in 2009 to 14.44% in 2013. By sector, the lowest shares of OP funding in R&D expenditure have been recorded in the government sector (from 0.74% in 2009 to 3.39% in 2013), while the higher education sector has seen an increase of over ten times in the same period (from 2.16% in 2009 to 22.77% in 2013). The business enterprise sector has also seen important increases, from 5.74% in 2009 to 15.36% in 2013. The largest amounts allocated to R&I (€2.3billion, about HUF 740 billion) come from the largest new operational programme, the Economic Development Operational Programme (GINOP) and, according to the planning documents, will support the development of the knowledge economy (i.e. support of company R&D and research programmes). The EU funding plays a key role as a public funding instrument for R&I. For example, the total funding received from FP7 in the period 2007-2013 amounted to €280.26 million, which accounts for 22% of GERD in 2013 and two-thirds of the combined GOVERD and HERD in 2013 (Dory, 2014).

The funding received under the EU Cohesion Policy goes to two types of regions: (i) "more developed" (with GDP per capita over 90% of the EU average), like Central Hungary, and (ii) "less developed" (less than 75%), a category including all the other regions. Out of the six OPs that Hungary manages in 2014-2020 under the EU Cohesion Policy, four OPs receive funding from the European Regional Development Fund (ERDF) and the European Social Fund (ESF), while two OPs receive funding from the ERDF and the Cohesion Fund. For 2014-2020, Hungary has been allocated €21.9 billion (current prices) in total Cohesion Policy funding, distributed as follows<sup>15</sup>:

- € 15 billion for less developed regions (Közép-Dunántúl, Nyugat-Dunántúl, Dél-Dunántúl, Észak-Magyarország, Észak-Alföld and Dél-Alföld)
- € 463.7 million for the more developed region (Közép-Magyarország)
- € 6 billion under the Cohesion Fund

<sup>15</sup> Source: [http://ec.europa.eu/regional\\_policy/en/information/publications/factsheets/2014/cohesion-policy-and-hungary](http://ec.europa.eu/regional_policy/en/information/publications/factsheets/2014/cohesion-policy-and-hungary)

- € 361.8 million for European Territorial Cooperation
- € 49.8 million for the Youth Employment Initiative

Based on the analysis of the above funding-related issues, the following observations can be made:

- There is an important increase in the funding allocated to R&I from the EU funding that calls for better capacity to absorb and use these funds, especially by the R&I structures at the regional level. To achieve this, both the synergy between the various national strategies and the capacity to design and implement R&I programmes and projects have an essential role to play.*
- The decline in national R&I funding in parallel with the increase of the EU funding for R&I has in some cases led to a perception of a substitution effect of the former by the latter, rather than of the complementarity between the two funding streams.*

### **Critical issues raised by stakeholders**

- *The differentiated eligibility for EU funding among the capital region and the rest of regions creates complexities in ensuring the resources for the operations of the most important R&I capacities of the country that are located in the capital region. There are significant tensions and funding shortage created by the rules of allocating EU funds to Hungary regions, considering the regional distribution of R&I capacities. Central Hungary, the region of the Budapest capital, which concentrates about 70% of the R&I capacity, can only receive funding from the National RDI Fund, but has no access to EU Convergence funds. In contrast, the other Hungarian regions, which are less economically developed and concentrate less R&I capacities, have access to the EU Convergence funding, which is relatively much higher, but they have insufficient R&I capacity to absorb these funds.*
- *The significant drop in the government R&I funding has important negative effects for the functioning of R&I organisations that depend to a large extent on the national funding and dispose of less EU funding accessed through the OPs.*

## **Institutional vs. competitive (project-based) funding**

### **Key issues highlighted by the Panel**

*Institutional public funding for R&I* comes from the central budget and is directed mainly to research units at higher education institutions (HEIs) and public research organisations (PROs), which are largely represented by the research institutions of the Hungarian Academy of Sciences (MTA). This type of funding decreased significantly in recent years. It is provided to HEIs on the basis of a set of specific calculation criteria, and to the PROs, e.g. the Hungarian Academy of Sciences (MTA) and its research institutions on the basis of scientific excellence criteria.

*Competitive (project-based) funding* comes from the two main sources: (i) the National Research, Development and Innovation Fund that integrates the KTIA and OTKA funds, and (ii) various OPs of the Structural Funds that are co-financed from the central budget (Table 2). This type of funding is allocated on the basis of open calls that specify the activities to be carried out, the expected results and the eligibility conditions to be fulfilled by the applicants. The proposals are evaluated by peer reviewers registered with the managing authorities of the respective calls.

The two funding streams followed opposite trends in recent years in the overall budget of public HEIs and PROs: a decline in institutional funding, as a result of severe cuts in the national public funding (from 39.3% in 2010 to 35.9% in 2013, followed by a reduced share not only of institutional funding, but also of project-based funding from national sources); and a relative increase in competitive (project-based) funding from EU funds. The decline of institutional funding has been most visible in HEIs, and could not be sufficiently compensated by project-based funding from the Structural Funds, as the institutional capacity to attract Structural Funds varies significantly from one HEI to another. This capacity is influenced by many specific factors, like the university size and public/private nature, the management and administration procedures in place that may more or less facilitate the operation of research groups mainly financed by R&I projects, the experience in and support to preparing research funding applications, nature of the research field (more or less close to the R&I priority areas), etc. It is estimated that both the HEIs and the largest PRO network, the MTA, are currently funded about half-half from institutional funding and competitive (project-based) funding.

In this context, the improvement of the absorption capacity of EU funds appears as a major objective. It is important to note that solutions to achieve that objective are actively sought, ranging from some efforts to remove management and administrative barriers and improve the

capacity to prepare and evaluate funding applications, to improving the synergy with proposals funded from national sources.

#### ***Critical issues raised by the stakeholders***

- *The negative effects of declining institutional funding and the difficulty to attract competitive (project-based) funding from EU sources.*
- *Insufficient correlation and coordination between national and EU funding, in terms of R&I priorities, national and regional strategic objectives.*

#### **Use of peer-review evaluations for project funding**

##### ***Key issues highlighted by the Panel***

An analysis of the use of peer-review in Hungary showed an extensive practice of domestic peer-reviews involving Hungarian scientists on a voluntary basis in the evaluation of proposals for the OTKA fund, and also by the NIH, the predecessor of the National RDI Office. In contrast, international peer review is comparatively much less frequent. OTKA has made significant efforts to expand the use of this type of evaluation in its funding programmes and to involve a greater number of foreign experts in remote peer review. The use of foreign peer reviewers has been facilitated by the submission of all proposals (with some exceptions) in English since 2009. According to the OTKA self-evaluation report, the percentage of foreign reviewers has continuously grown since 2009, i.e., from 9.51% in 2009 to 28.9% in 2014 (Dory, 2014).

#### ***Critical issues raised by the stakeholders***

- *Need to increase the use of international peer reviewers as a strategy to increase the quality of proposals submitted for funding and the visibility of Hungarian researchers.*

### **D. Stakeholder involvement in policy-making**

##### ***Key issues highlighted by the Panel***

Stakeholder involvement in policy-making has been achieved so far mainly through public consultations with R&I stakeholders. Such consultations took place, for example, in 2012 in the process of defining the National RDI Strategy 2013-2020, in 2013 in the process of defining the National Smart Specialisation Strategy, and in 2013-2014, in the elaboration of strategic documents such as: (i) the National Development 2020. National and Territorial Development Concept; (ii) the Draft Science Policy Strategy 2014-2020; (iii) the new OPs for the planning period 2014-2020. Other forms of stakeholder involvement in R&I policy-making tools for designing concepts and sectoral strategies (e.g. foresight, technology assessment and Delphi-surveys) are rarely used, but their enhanced application is encouraged.

The public consultations have been reported in the discussions with the stakeholders to be insufficient and of limited effectiveness in translating the needs of the R&I community into well-designed policies and funding schemes. As mentioned earlier in sections 4.1.1.a and 4.1.1.b, the establishment of the Innovation Board by the President of the National RDI Office in March 2015 was a first step toward correcting policy integration and stakeholder involvement in policy-making, but the actual ways to achieve that have yet to be materialised. It is therefore important that the efforts towards improving stakeholder involvement in policy-making be continued and expanded, e.g. by adopting some broad principles for participatory mechanisms and more forms of engagement in exchanges with the stakeholder community. This could have positive effect in improving policy legitimacy, ensuring predictability of funding and facilitating the formation and consolidation of long-term partnerships.

#### ***Critical issues raised by the stakeholders***

- *Limited effectiveness and unsystematic nature of consultations with R&I stakeholders in policy-making (design, funding, implementation),*
- *Limited implementation of stakeholder feedback into the policy-making process (e.g. in the formulation of funding calls, of eligibility criteria, of incentives for certain R&I actors, etc.)*

## **E. Demand-side vs. supply-side innovation policies**

### ***Key issues highlighted by the Panel***

The balance between supply-side and demand-side innovation policies is still strongly in favour of the former. Among demand-side policies, a pilot programme to elaborate a *pre-commercial procurement (PcP) strategy* was launched in 2012 by the National Innovation Office (NIH), the predecessor of the National Research, Development and Innovation Office. This strategy encouraged the use of PcP in e-government, ICT, healthcare, defence, new and renewable energies and public transport, as an explicit form of positive discrimination of innovative SMEs in the respective areas that is acknowledged in the National RDI Strategy 2013-2020. Further expansion of PcP use in healthcare, environment protection, energy, education and transport is expected. The National Smart Specialisation Strategy approved in November 2014 includes a *new PcP pilot action* to examine whether the domestic application of international (mainly European) PcP procedures will require amendments to the existing national regulations or the introduction of new legislation. The pilot is scheduled for 2016-2017 and no budget is allocated to it in the S3 document (Dory 2014).

### ***Critical issues raised by the stakeholders***

Taking into account the early stage of developments regarding demand-side innovation, no particular critical issues have been expressed in this respect.

## **F. Regional innovation policy and the National Strategy for Smart Specialisation**

### ***Key issues highlighted by the Panel***

Prior to the adoption of the National Smart Specialisation Strategy, Hungary did not have a formal regional innovation policy, as the regions implemented national innovation policies designed centrally. Policy implementation was achieved by the RIÜNET network of seven regional innovation agencies established in all seven Hungarian regions in 2005. The network was responsible for generating and coordinating regional innovation processes, organising technological innovation networks and providing innovation services to SMEs and start-ups. The regional innovation agencies had, however, limited operational power, as they received minimal government support and relied mainly on EU funding from FP7 and INTERREG.

Formal regional innovation policy measures have been introduced once with the National Smart Specialisation Strategy (S3), approved in November 2014. All the seven Hungarian regions elaborated their S3 strategies in a complex process based on the EC guidelines, and a multi-level governance structure was put in place for the S3 elaboration and implementation. Based on the RIS3 Guide provided by the EC, the Hungarian regions have been classified into three groups, with specific vision and strategic objectives defined according to their level of development, and three national smart specialisations were formulated accordingly: i) systems science, ii) smart production and iii) sustainable society. The S3 defines six national priorities with local, county level specialisations included (see Annex 2 for details).

The S3 is consistent with key planning documents, such as the National Reform Programme, the National RDI Strategy 2013-2020, the Operational Programmes and Horizon 2020. It employs mainly direct instruments and will also test some soft instruments for innovation financing, like pre-commercial procurement (PcP) and two pilot measures for strengthening University-Industry links ("Open laboratories" and "Higher Education and Industry Collaboration Centres" FIEK). The S3 does not introduce new indirect instruments and tax credits. The main funding sources of S3 are the European Regional Development Fund (ERDF) and the two major national R&I funding instruments KTIA and OTKA. The Action Plan for the implementation of S3 is expected around mid-2015.

### ***Critical issues raised by the stakeholders***

As the Action Plan for the S3 implementation is yet to be produced (expected around mid-2015), no particular critical issues have been expressed regarding the S3 at this stage.

## **G. Role of the Hungarian R&I system in international networks. Cross-border cooperation**

### ***Key issues highlighted by the Panel***

International (bilateral and EU) cooperation in R&I is one the main tasks of the National Research, Development and Innovation Office, which took over this task from its predecessor, the National



Innovation Office. Within the Office, a specialised unit is in charge with the coordination of R&I cooperation. This unit also contributes to legislative activity, position papers, coordination of National Contact Points related to the Horizon 2020 Research and Innovation Framework Programme and collaborates with 11 S&T attachés in 9 cities (in Beijing, Berlin, Brussels (for the S&T relations with the EU Commission), London, Moscow, New York, Paris, Tel Aviv and Tokyo).

The S&T attachés network is jointly operated by the National RDI Office and the Ministry of Foreign Affairs, and its costs are covered by the National RDI Office. The S&T attachés support the international and European integration of the Hungarian S&T community by acquiring and disseminating information and by building connections between institutions. The basic tasks of the S&T attachés include<sup>16</sup>:

- To monitor and to analyse the S&T policy and the international relations of the host country, thereby contributing to the formulation of the Hungarian R&D policy; to prepare reports on significant S&T policies and developments in host country;
- To give information in the host country about the Hungarian R&D policy, its implementation and opportunities for cooperation; to identify S&T areas of mutual interest to both countries which are suitable for bilateral collaboration; to explore new areas for S&T cooperation and exchanges;
- To assist Hungarian R&D institutions and organisations in establishing contacts;
- To represent Hungary at S&T meetings and similar activities; to serve as coordinator for significant S&T visits and missions.

At present, various options are considered for expanding the role of the S&T attachés in R&I.

International cooperation is recognized and encouraged by the National RDI Strategy, but the document specifies only general ways of pursuing that objective, such as development of research centres to become part of the "global elite", strengthening the international dimension of the knowledge base by joining large international research networks (in particular ESFRI infrastructures), supporting competence centres of European interest, supporting the mobility of researchers, including the reintegration of researchers, and creating R&I capacities of high standard to get involved in international cooperation of excellence. Also, the National RDI Strategy aims to respond to global societal challenges, but the societal challenges are explicitly addressed only in the priorities of the new Human Resources Development OP.

As regards cross-border cooperation, Hungary currently maintains bilateral science and technology (S&T) intergovernmental cooperation with 36 countries. The National Research, Development and Innovation Office is in charge of coordinating the joint activities. The key objective of the bilateral S&T relations is to support RDI cooperation through call for proposals between the two countries. In addition, the International Visegrad Fund promotes a closer cooperation among the Visegrad Group countries, i.e. the Czech Republic, Hungary, Poland and Slovakia, and aims to strengthen the ties among people in the region through common cultural, scientific, research and educational projects, youth exchanges, promotion of tourism and cross-border cooperation. Most of the grant recipients are NGOs, municipalities and local governments, universities and schools. The NRDI office also takes part in international cooperation related to the EU Strategy for the Danube Region.

### **Critical issues raised by the stakeholders**

- *Insufficient clarity in the definition of priorities and specific objectives for international cooperation, poor correlation with national R&I priorities.*
- *Insufficient funding for effective international and bilateral cooperation.*
- *Insufficient clarity in the definition of S&T attachés' contribution to the promotion of R&I objectives and need for closer communication with the National RDI officers in charge with international and bilateral cooperation to define that.*
- *Insufficient understanding of the relative importance of international R&I programmes to the Hungarian R&I system, in order to prioritize involvement.* For example, an increased presence of Hungarian researchers was considered to be beneficial in international programmes focused on Life Sciences, Biotech, etc., where the national R&I capacity could be better supported by the international cooperation.
- *Poor synergy between national and international R&I programmes, need for better use of use of national funds to support participation in EU programmes*
- *Better use of participation in national and international programmes as a strategy to reverse brain drain.*

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<sup>16</sup> Source: National RDI Office <http://nkfih.gov.hu/international/science-and-technology>

### 4.1.2. Strengths and weaknesses

Based on the key issues highlighted by the Panel and the critical issues raised by the stakeholders on the first main topic of the discussion - the R&I system, and to a lesser extent on the 10 criteria of the self-assessment tool, the following strengths and weaknesses of the Hungarian R&I system have been identified:

Main topic 1: R&I system	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Setup of the National RDI Office as of 1 January 2015 as a strategy to improve policy and funding coordination, integration of R&amp;I policy with other sectoral policies and stakeholder involvement.</li> </ul>	<ul style="list-style-type: none"> <li>• High system instability caused by multiple reorganizations since the 1990s.</li> <li>• Insufficient measures to reduce system fragmentation (e.g. the setup of the National RDI Office needs to be followed by further measures to reduce structural fragmentation and achieve critical mass)</li> <li>• Multiple institutional and organizational deficiencies in the National RDI Office that weaken its governance capacity: low accountability and transparency; rigid top-down governance structure; weak inter-departmental communication and collaboration; ineffective institutional dialogue within the Office and with external partners; under-financing, weak evaluation and monitoring culture; slow and insufficiently informed policy-making and policy-learning processes; little use of modern policy-making tools and of evidence-based policy</li> <li>• Incomplete internal re-organization of the National RDI Office, difficulties in attracting R&amp;I personnel (low salaries, few performance incentives)</li> </ul>
<ul style="list-style-type: none"> <li>• The National RDI Office is at the core of the R&amp;I system and, as such, is in the right position to implement strong horizontal and vertical coordination mechanisms to ensure integration of R&amp;I policies with other sectoral policies</li> </ul>	<ul style="list-style-type: none"> <li>• Unclear mechanisms of horizontal policy coordination among the National RDI Office and other bodies involved in R&amp;I</li> <li>• Unclear mechanisms of policy advice and policy integration provided by the National Science Policy and Innovation Board (NTIT)</li> </ul>
<ul style="list-style-type: none"> <li>• Total public support to R&amp;D increased between 2006 and 2013, thanks to both an increase in direct public funding (by about 50% in nominal terms, largely due to the large mobilisation of the European Structural funds) and an increase in indirect support through tax incentives</li> </ul>	<ul style="list-style-type: none"> <li>• Most of the increase in public support to R&amp;D from 2006 was dedicated to business R&amp;D, explaining the large decrease in public R&amp;D intensity from 2006 to 2013, that has positioned Hungary as one of the Member States with the lowest public R&amp;D intensity in 2013.</li> <li>• The decline in the public R&amp;D intensity of Hungary, combined with the intrinsic difficulties to sustain past trends of increase in business R&amp;D expenditure, raises difficulty in reaching the target set by the government in the National RDI Strategy 2013-2020 to increase the country's R&amp;D expenditure to 1.8% of the GDP by 2020 and 3% by 2030.</li> </ul>
<ul style="list-style-type: none"> <li>• R&amp;I are acknowledged as a key policy instrument to enhance competitiveness and job creation in all the major national strategies and planning documents and are communicated as such to the public</li> </ul>	<ul style="list-style-type: none"> <li>• Poor focus in the National RDI Strategy and its implementation programmes on: <ul style="list-style-type: none"> <li>- market and societal needs/challenges</li> <li>- public sector innovation</li> <li>- the socio-economic use of research results</li> </ul> </li> </ul>



Main topic 1: R&I system	
Strengths	Weaknesses
	<ul style="list-style-type: none"> <li>Largely generic and less thematic funding programmes, little multidisciplinary focus</li> </ul>
<ul style="list-style-type: none"> <li>R&amp;I policy design and implementation steered at the highest political level since 1 January 2015 through the National Research, Development and Innovation Office</li> <li>Multi-annual planning strategies (e.g. 2013-2020 National RDI Strategy, 2014-2020 National Smart Specialisation Strategy, etc.)</li> </ul>	<p>R&amp;I policy design and implementation weakened by:</p> <ul style="list-style-type: none"> <li>All the weaknesses mentioned above</li> <li>Insufficient/ineffective consultations with the stakeholders in priority-setting, policy design, funding</li> <li>Delay/absence of clearly defined implementation methodologies for the key National Strategies</li> <li>Outdated, scattered research infrastructure</li> <li>Short-termism in R&amp;I priority-setting</li> </ul>
<ul style="list-style-type: none"> <li>The National Smart Specialisation Strategy includes policies and instruments exploiting current or emerging national/regional strengths</li> </ul>	<ul style="list-style-type: none"> <li>Unclear synergies between the Smart Specialisation Strategy and National RDI Strategy</li> <li>Implementation plan of the Smart Specialisation Strategy not available yet</li> </ul>
<ul style="list-style-type: none"> <li>The National RDI Strategy acknowledges plans to use innovation policy in a broader sense, beyond technological research and its applications, e.g. for developing an innovative ecosystem, for a sustainable economy, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Policies focused on strengthening innovation in a broader sense (e.g. creation of an innovative ecosystem, University-Industry cooperation) are very new and have no visible positive effects in the system yet</li> </ul>
<ul style="list-style-type: none"> <li>Act LXXVI on Scientific Research, Development and Innovation (2014) acknowledges the importance of stable and predictable funding, and defines the main channels for R&amp;I funding: national (the National RDI Fund) and EU sources (Operational Programmes of Structural Funds)</li> <li>Substantial allocation of EU funding for R&amp;I</li> <li>Excellence recognised as a key criterion in research and education policy and used in the institutional funding of PROs and HEIs, as well as in the competitive R&amp;I funding</li> </ul>	<ul style="list-style-type: none"> <li>Funding unpredictability, some funding schemes discontinued after changes in the R&amp;I system</li> <li>Significant decline of public R&amp;I funding in recent years, reduced share of institutional funding for PROs and HEIs. Insufficient compensation by competitive (project-based) funding, mainly from EU funds.</li> <li>Tensions created by the differentiated rules of access to EU funding for Hungary regions, shortage of funding for the capital region that has no access to Convergence funds.</li> <li>Insufficient correlation and coordination between national and EU funding</li> </ul>
<ul style="list-style-type: none"> <li>Plans for a stronger involvement of S&amp;T attachés in the promotion of R&amp;I objectives</li> </ul>	<ul style="list-style-type: none"> <li>Insufficiently clear role of S&amp;T attachés in the promotion of R&amp;I objectives</li> <li>Insufficiently clear objectives of international R&amp;I cooperation, lack of correlation with the priorities of the key national R&amp;I strategies, lack of correlation in funding for national and international objectives</li> <li>Under-financing of international cooperation</li> <li>Poor prioritisation of Hungary's participation in various international programmes on R&amp;I</li> </ul>

## 4.2. The public R&I sector

### 4.2.1. Scope

- The Hungarian Academy of Sciences as the largest public research organisation
- Implementation of the R&I policy mix and funding of the public R&I sector
- Quality of the human resources for the public R&I sector (including researchers' supply and career)
- Links with the private sector and University-Industry cooperation

#### **Key issues highlighted by the Panel<sup>17</sup>**

The key issues discussed below in regard to the Hungarian Academy of Sciences (MTA) are a relevant reflection of the state-of-play in Hungary's public R&I sector, as the MTA is the largest public research organization. It operates both as a "learned society" (including 11 scientific sections and approximately 15,000 members, including 3,000 MTA doctors and 365 academicians), and as a research network (currently including 15 research institutes and approximately 3,000 researchers). The institution is coordinated by the MTA Secretariat governed by the Assembly and the President.

The current MTA structure is the result of an ample restructuring and downsizing process of 40 different institutes that started with a preparatory phase (2008-2010 and 2010-2011), followed by a main phase in 2011. From 1 January 2012 the new MTA started operations in the new structure that includes a research institute network (10 research centres and 5 research institutes, with approximately 2,500 researchers) and a research group network (89 "Academy" research groups at universities, with approximately 500 researchers). MTA research institutes and research groups are specialized in natural-, life-, and social sciences. They address multidisciplinary problems at local, regional and global levels, are involved in international R&D projects in these areas, and also in various higher education activities (teaching, supervision of bachelor, MSc or PhD students).

The MTA R&D expenditure in 2014 amounted to HUF 56.4 billion, of which nearly 45% came as institutional funding from the central state budget and was allocated to its research centres on the basis of criteria of scientific excellence. The rest was competitive (project-based funding) that came in different proportions from the Hungarian Scientific Research Fund (OTKA), national R&I sources (RDI Fund, the New Széchenyi Plan), enterprises, funding from abroad, other sources and leftover from previous year.

MTA is involved in several programmes aimed to increase the attractiveness of research careers and the efficiency of scientific research, including: the Young Scientists programme (for PhD students at research institutes), Postdoctoral Fellowships (PhD fellows at research institutes and universities), Bolyai programme (pre-PhD support at research institutes and universities), Lendület Excellence Programme (the Brain Gain Programme at research institutes and universities), Subsidized academic research groups at universities, Distinguished Visiting Professor Programme (at research institutes and universities) and The Professor Emeritus programme. Other programmes are aimed at infrastructure development (e.g. Building new homes and labs in Natural Sciences and SSH), special investments (e.g. CERN@Wigner, Permanent reconstruction programme and Instrumental infrastructure development programme), as well as fostering co-operation between research institutes and universities (and between research institutes and companies).

The analysis of the Hungarian public R&I system through the MTA lens highlighted five important features:

- (i) *MTA's ample restructuring process (downsizing from 40 to 15 institutes) creates good premises for improved structure and allocation of resources.* The efforts for improvement are also visible in an increased use of excellence as a criterion in the allocation of institutional and competitive funding, promotion of researchers, etc.
- (ii) *There is a strong perception of linearity in the R&I process. MTA is considered to be a stronghold of "basic research", where "applied research" is regarded with scepticism and mistrust.* The distinction between basic and applied research appeared to be deeply embedded in MTA's researchers' minds. That distinction, however, is not specific to MTA researchers only, and was also observed in the discussions with other R&I stakeholders, especially at the level of R&I funding. This is to a large extent a result of the long existence of the two dedicated funding streams OTKA (for basic research) and KTIA (for applied research) prior to their

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<sup>17</sup> This brief account of MTA activities draws on the presentation made by Prof. László Szarka, Head of the Department of Research Institutes and MTA Secretariat at the meeting with MTA representatives, 21 May 2015.

merger into the National RDI Fund as of 1 January 2015. On a more remote, but still present plane, this is also a reminiscence of the former Soviet style of organizing research capacities (basic research in the Academy of Sciences and its institutes, very little basic research in universities, that were mainly education institutions; applied research in R&D institutes coordinated by the line ministries, very few connections between them, etc.).

- (iii) *MTA has put in place a variety of programmes with different foci, but the multidisciplinary research orientation remains poorly addressed. This observation also holds for the broader public R&I sector, and is in close connection with the weak multidisciplinary orientation of the national funding schemes.*
- (iv) *Institutional communication in the public R&I system, both externally with other partners and internally among researchers and other staff, is often hindered by a relatively rigid top-down structure and high bureaucracy.*
- (v) *Very limited cooperation with industry, except for the pharma industry, high scepticism about the cooperation with companies and a sense of confusion about the meaning of innovation.*

### **Critical issues raised by the stakeholders**

- *Difficulty to change the strong distinction between basic and applied research in the researchers' minds* without significant incentives of various kinds (financial, scientific, organizational, etc.) and solid evidence that a more systemic approach is functional.
- *Social isolation of small research groups* arising to a large extent from the narrow disciplinary research orientation. Researchers belonging to small, highly specialised research groups reported difficulty to find multidisciplinary research projects that could use their expertise (an example was given of applications of space research in aging and elderly care, medical and nursing themes).
- *Limited circulation of ideas and collaboration among MTA researchers and institutions, caused by structural rigidities and bureaucratic burdens.* In some cases, some MTA institutes' efforts to promote specific strategies did not receive adequate support from the MTA Secretariat, suggesting a lack of institutional coherence.
- *Difficulty to evaluate effectiveness of R&I programmes, orientation towards short-term funding,* all caused by the lack of a long-term vision and strategy of the R&I system, instability and frequent restructuring of the R&I governance structures and funding instruments. At MTA, this led to insecurity on continuation of research grants and themes, insecurity of jobs for young researchers, and lack of continued support for successful projects.
- *Insufficient funding for basic research and embedded incentives in the funding rules for overpromising marketable research* to the detriment of basic research.
- *Weak quality of human resources for R&I (including researchers' supply and career)* because of many deficiencies in the education system at all levels, especially in higher education, with impact on the supply of skilled researchers. MTA researchers decried the fact that education and training curricula mainly focus on factual learning and place little focus on student critical and independent thinking, problem-solving skills, project writing and management, team work, neither in secondary nor in higher education. MTA senior researchers pointed out their involvement in various higher education activities (teaching, supervision of bachelor, Master or PhD students) and more contributions of this kind were thought to be useful.
- *Insufficient incentives for R&I careers to improve the quality of human resources and retain valuable human resources.* A major shortcoming highlighted by the MTA researchers was the poor consideration and incentives given to senior researchers wishing to stay in Hungary. This adds up to the negative effects of the strong brain drain and the difficulty in retaining Hungarian researchers at home and in attracting international researchers to Hungary because of non-competitive salaries. Other disincentives identified in the discussion were the high bureaucracy and internal administrative burdens, researchers' impossibility to increase their wages with project-based EU money because of the civil servant status, their relatively low visibility in public institutions and insecure future for both junior and senior researchers.
- *Difficulty in increasing Hungarian researchers' international visibility,* both in publication in high-impact journals, and in attracting ERC grants. Applications for ERC grants also need more support and alternative funding schemes for research proposals that are not successful but are still of high quality. Some noted the existence of a glass ceiling for researchers with high potential who do not belong to groups of excellence.
- *Need for more government programmes encouraging cooperation with industry,* to stimulate the openness to industry and universities and build trust.

## 4.2.2. Strengths and weaknesses

Based on the key issues highlighted by the Panel and the critical issues raised by the stakeholders in regard to the 2<sup>nd</sup> main topic - the public R&I sector, and to a lesser extent on the self-assessment tool, the following strengths and weaknesses have been identified:

Main topic 2: The public R&I sector	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>Ample restructuring of MTA, as the largest public research performer, downsizing from 40 to 15 institutes</li> </ul>	<ul style="list-style-type: none"> <li>Institutional rigidity, lack of transparency, high bureaucracy limiting the circulation of ideas and collaboration among researchers and institutions</li> <li>The number of R&amp;D companies with majority owned by the state or local governments fell by almost one-third<sup>18</sup></li> </ul>
<ul style="list-style-type: none"> <li>Excellence is used in the allocation of institutional funding of HAS and other PROs, as well as HEIs.</li> <li>Excellence is also used in the allocation of competitive R&amp;I funding</li> <li>"Pockets" of research excellence in HAS institutes, especially in natural-, life-, and social sciences</li> </ul>	<ul style="list-style-type: none"> <li>Strong perception of linearity in the R&amp;I process, deeply embedded distinction between basic and applied research</li> <li>Weak multi-disciplinary collaboration, social isolation of small research groups</li> <li>Glass ceiling for high-potential researchers outside of groups of excellence.</li> <li>Lack of long-term vision and strategy</li> <li>Difficulty to evaluate effectiveness of R&amp;I programmes, orientation towards short-term funding caused by frequent restructuring of R&amp;I governance and funding instruments</li> <li>Insecurity on continuation of research grants and themes, insecurity of jobs, lack of continued support for successful projects.</li> <li>Little use of international reviewers</li> <li>Low share of women in top research &amp; management positions</li> </ul>
<ul style="list-style-type: none"> <li>The new Higher Education Strategy recognizes the weaknesses of the education and training system, and provides guidelines for improving them and providing the right mix of skills</li> <li>HAS researchers involved in various higher education activities (teaching, supervision of bachelor, Master or PhD students).</li> </ul>	<ul style="list-style-type: none"> <li>Deficiencies in all education levels, especially in higher education, resulting in a weak supply of researchers for the public R&amp;I sector</li> <li>Education and training curricula mainly focus on factual learning; little focus on critical thinking, problem-solving, team- and project work, project management, in secondary and in higher education</li> </ul>
<ul style="list-style-type: none"> <li>Partnerships between HEIs, research centres and businesses at regional, national and international level recognised in the major national R&amp;I and education strategies as a policy area that needs sustained government support</li> <li>HAS programmes for fostering cooperation between PROs, universities and companies.</li> </ul>	<ul style="list-style-type: none"> <li>Weak partnerships and communication between HEIs, PROs and business, except for pharma industry, confusion about the meaning of innovation, strong lack of trust, skepticism about U-I cooperation, little information about cooperation opportunities.</li> <li>Weak technology transfer and research commercialisation infrastructure</li> </ul>
<ul style="list-style-type: none"> <li>Several HAS programmes aimed to increase attractiveness of research careers and efficiency of scientific research</li> </ul>	<ul style="list-style-type: none"> <li>Poor incentives for R&amp;I careers</li> <li>Brain drain and crowding out of talent</li> <li>Difficulties in increasing the international visibility of Hungarian researchers</li> </ul>
<ul style="list-style-type: none"> <li>Several HAS programmes for infrastructure development and special investments</li> </ul>	<ul style="list-style-type: none"> <li>Outdated research infrastructure</li> <li>Insufficient funding for infrastructure renewal</li> </ul>

<sup>18</sup> Source: National Innovation Office (2012), p. 10

### 4.3. Technology transfer, University-Industry cooperation, entrepreneurship

#### 4.3.1. Scope

- Technology transfer (TT) and research commercialisation
- University-Industry cooperation and promotion of entrepreneurship
- Participation in clusters, technological parks

#### **Key issues highlighted by the Panel**

The main institutional structures for TT and research commercialisation are the *technology transfer offices (TTOs)* and *regional knowledge centres* that have been established at all major universities after Hungary's 2004 accession to the EU. The TTOs have a poor capacity to ensure effective University-Industry links and transfer of research results to companies, as their funding from the university is very limited. Moreover, at the end of the funding initially allocated, they are confronted with the challenge to find new funding sources to sustain their operations, since the university budgets can no longer sustain that, further to a drop on average by one-third compared to 2011. In addition, there is a relatively large number of *intermediary organisations* (e.g. *regional innovation agencies, foundations for enterprise promotion*), but they have no critical mass, neither in size nor in responsibilities. *Four technology incubators* have been accredited in October 2013, but the start of their operations was delayed throughout 2014 by the reorganisation of their promotor, the former National Innovation Office, and could only start (for three of them) in January 2015, after the setup of the new National Research, Development and Innovation Office.

A more consistent policy effort for promoting TT and research commercialisation started in 2013, when the National Innovation Office initiated discussions with key stakeholders in view of formulating a national policy knowledge and technology transfer. A recommendation in that direction was prepared by the end of 2013, but was not published. Since, several policy measures in support of technology transfer have been adopted (Annex 4). For example, the programme "*Start-up\_13*" was launched in June 2013, with the aim to develop the Hungarian start-up ecosystem, in particular by support to technology start-ups exploiting R&D results and potentially able to grow into dynamic international firms. The programme operates in two stages: in the first stage, technology incubators and accelerators that would host the technology start-ups are accredited, and in the second, the most promising technology start-ups are selected in view of incubation and enabling them to enter and grow on international markets. Two specific pilot measures that address University-Industry interaction ("*Open laboratories*" and "*Higher Education and Industry Collaboration Centres*" (FIEK) are foreseen in the National Smart Specialisation Strategy, published in November 2014. Another measure that supports the establishment of 8-10 "*Knowledge Parks*" in collaboration with local governments and universities was adopted in December 2014. In the programming period 2014-2020, the Economic Development and Innovation OP (GINOP), in particular Priority 1, supports the improvement of SMEs' competitiveness by the establishment and further development of business incubators with an indicative budget of €30 million. In addition, GINOP also foresees the further development of *industrial parks and science parks*. It is also important to mention here that the Hungarian Intellectual Property Office (HIPO) collaborates with university TTOs and Chambers of Commerce in almost all counties for supporting the operation of PATLIB centres that offer IP consultancy services and IP training to researchers and local SMEs. Entrepreneurship education and training in university is limited to an elective course (selected from Dory, 2014).

The main observations drawn by the Panel in regard to this topic were that:

- The importance of partnerships between HEIs, PROs and businesses at regional, national and international level is recognised in the major national strategies that address R&I and a number of relevant policies to support this area have been adopted very recently.*
- There is a clearly stated policy focus on the development of TT and technology start-ups initiated in 2013 and continued in 2014, which is supported by the funding from the Economic Development and Innovation OP (GINOP) to SMEs' competitiveness, business incubators, industrial parks and science parks. It is, however, too early to see visible effects in the R&I system.*
- There are several gaps in the implementation of these policies (described by the stakeholders below). They require strong support from the government to ensure success and a sound development of the TT and commercialisation infrastructure and operational mechanisms, which are at a very early stage.*



### ***Critical issues raised by the stakeholders***

- *Major obstacles to TT, research commercialisation, U-I cooperation and entrepreneurship coming from the higher education system.* The nature of higher education in Hungary is very strict and follows closely the German tradition, with little focus on innovation and creativity. Academic activities are mainly focused on teaching and basic research, while the university "third mission" is poorly represented, has few achievements and many gaps. There is strong inertia in the curriculum development, and curricula have not been changed in the past two decades. TT managers striving to gain support and recognition for this area have major difficulty in convincing both the higher levels of university leadership and the academic researchers of the necessity of technology transfer and research commercialization in universities. This demonstrates the difficulty of changing mindsets and the persistence of certain blockages on old patterns even in the minds of the new generations of young researchers.
- *Difficulty to introduce entrepreneurial education.* Given the reluctant attitudes from university leaders and researchers, TT officers placed focus on students, trying to build on the premises that changes in mind set need to start early, in the students who will become the next researchers, academics and entrepreneurs. Nevertheless, the actions performed at this level have not been much more successful, because serious gaps in building an entrepreneurial mind set were present at previous educational levels. Pilot exercises trying to introduce students to the private sector, as well as the efforts to instil entrepreneurial principles in students have been failures. Causes for that include the lack of entrepreneurship tradition in the family environment and also a negative social perception of the entrepreneur.
- *Difficulty in organising TT and entrepreneurship activities,* because of deep lack of trust, lack of clearly defined or broadly accepted organisational structures and procedures by the researchers and university administrators, lack of support services for TT and entrepreneurship. The instability and frequent changes in the structure and governance of the national R&I system have also been counterproductive, by determining budget cuts, funding uncertainty and unpredictability of results, a strong focus on short-term objectives and impossibility to think in the medium- to long-term and engage in high-risk projects. In addition, the lack of cooperation between different university departments and even between different universities made it difficult to promote multidisciplinary projects and inter-university cooperation.
- *Difficulty in promoting TT and entrepreneurship in the broader R&I system,* caused especially by the weak connections between innovation actors and the lack of a critical mass in innovation activities. Support from the Regional Innovation Agencies was not considered significant, since they are currently struggling for survival and are largely ineffective. Neither was the support from MNCs, as they are primarily interested in building R&D labs rather than in exploiting research results or supporting local innovation in Hungary. Business incubators are not functional. These significant gaps in the linkages between key actors in TT, but also more broadly, in the Hungarian R&I system, determined the TT managers participating in the discussion to doubt the very existence of a functional system altogether.
- *Stronger support from the government considered to be of critical importance for encouraging the development of TT and entrepreneurship.* The participants emphasised the need for more calls financed by the National RDI Fund with specific focus on TT that would ensure continued funding for this area, as TTOs from Budapest universities cannot apply for EU money under the Convergence objective. The need to boost private sector demand and start-up creation, the need to increase funding for TT and commercialisation, including proof of concept funding, were also highlighted. Building an innovation and entrepreneurship culture in society was considered as a process of high importance, which involves recognition and respect for the activity of TT managers and practitioners, creation of new role models based on successful entrepreneurs, correction of the negative social perception of academics starting up firms, more tolerance to failure and less risk aversion, identifying appropriate benchmarks and learning from the European and international experience. Government support was also needed for strengthening the role of incubators, in the sense of moving away from their mere functioning as "office space" towards genuine support structures for business development, and in providing adequate incentives for TT and start-up formation (e.g. sabbaticals to develop academic spin offs, tax allowances. Last but not least, the government intervention was also seen as crucial in ensuring greater stability of the R&I system in general and of the TT field in particular, in providing long-term strategies and predictability, not island projects, in building a critical mass for TT and innovation and supporting the internationalization of Hungarian firms.
- *Closer cooperation with the Ministry of Education on matters of TT and entrepreneurial education.* Establishing publicly-funded incubators in universities and helping TTOs provide services to universities, strengthening the university "third mission", stimulating multidisciplinary cooperation between universities and implementing a broad sense of innovation (vertical and horizontal) among researchers, were seen as very important areas for a closer cooperation between the Ministry of Education and the National RDI Office.

### 4.3.2. Strengths and weaknesses

Based on the key issues highlighted by the Panel and the critical issues raised by the stakeholders in regard to the third main topic – Technology transfer, University-Industry cooperation, entrepreneurship, and to a lesser extent on the 10 criteria of the self-assessment tool, the following strengths and weaknesses have been identified:

Main topic 3: Technology transfer, University-Industry cooperation, entrepreneurship	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>Partnerships between HEIs, PROs and businesses at regional, national and international level recognised in the National RDI and Higher Education Strategies as a policy area that needs sustained government support</li> <li>Several policies in support of TT and technology start-ups initiated in 2013 and continued in 2014</li> <li>Support from the Economic Development and Innovation OP (GINOP), in particular Priority 1, to SMEs' competitiveness, business incubators, industrial parks and science parks</li> <li>Four technology incubators accredited in October 2013, but operations delayed until 2015, until set up of the new National RDI Office</li> </ul>	<ul style="list-style-type: none"> <li>Early development stage of TT and research commercialisation; recent policies had no sufficient time to produce visible system effects</li> <li>Weak capacity for TT and research commercialisation</li> <li>Weak partnerships between HEIs, PROs and business, low culture of entrepreneurship</li> <li>Relatively large number of intermediary organisations (e.g. regional innovation agencies, foundations for enterprise promotion), but no critical mass, neither in size, nor in responsibilities.</li> <li>Operational problems faced in the promotion of TT, research commercialisation, U-I links, spin-off creation, caused by insufficient funding and policy support</li> <li>Business incubators not functional yet</li> <li>Instability of the national R&amp;I system, budget cuts, funding uncertainty and unpredictability of results, short-termism and impossibility to engage in medium- to long-term strategies and high-risk projects</li> </ul>
<ul style="list-style-type: none"> <li>Technology transfer offices (TTOs) and regional knowledge centres established at all major universities after Hungary's 2004 EU accession</li> <li>Hungarian Intellectual Property Office (HIPO) collaborates with university TTOs and Chambers of Commerce for supporting the operation of PATLIB centres that offer IP consultancy services and IP training to researchers and local SMEs</li> </ul>	<p><i>Lack of support to TT in universities:</i></p> <ul style="list-style-type: none"> <li>Underdevelopment of university "third mission", strong focus on education and basic research</li> <li>Strong inertia in curriculum design, little focus on innovation and creativity</li> <li>Virtually no entrepreneurship education, failed attempts to introduce students to business</li> <li>Lack of awareness on and little support to TT from university leaders and researchers</li> <li>Difficulty in changing mind sets, persistence of certain blockages on old patterns</li> <li>Deep lack of trust, no clearly defined or broadly accepted organizational structures and procedures by the researchers and university administrators</li> <li>Lack of support services for TT and entrepreneurship</li> <li>Lack of cooperation between university departments or different universities, few multidisciplinary projects.</li> <li>Lack of support to TT in the broader R&amp;I system:</li> <li>Weak connections between innovation actors</li> <li>No critical mass in TT and innovation activities</li> <li>Ineffective Regional Innovation Agencies</li> <li>Little support from MNCs to local innovation</li> <li>Weak private sector demand for start-up creation</li> <li>Low internationalization of HU firms</li> </ul>

## 4.4. Framework conditions for R&I

### 4.4.1. Scope

- Types of framework conditions for the Hungarian R&I system
- Coherence of R&I policy mix

#### **Key issues highlighted by the Panel**

The National RDI Strategy 2013-2020 acknowledges a broad range of framework conditions that the government pledges to improve in order to encourage enterprises to invest in R&I:

- International economic processes and the macroeconomic environment (foreign capital financing, improved economy structure, participation in global processes);
- Institutional stability of the system and policy coordination;
- Predictable and supportive functioning of the legal environment;
- Stability of public funding of R&D;
- Satisfaction of conditions for strong competition (applying competition law, improving the business environment);
- Improvement of entrepreneurial skills and spirit;
- Effective education policy (primarily higher education policy, development of STEM, natural sciences and digital literacy);
- Increasing mobility: both horizontally (cross-border, interregional, intra-sectoral) and vertically (between different sectors and different stages of the value creation process)

In practice, however, there is a broad range of deficiencies in all of the above framework conditions, and little improvement has been achieved in the R&I system further to the measures adopted by the government. As a result, the Hungarian economy's growth performance has declined in recent years, as synthetically explained by Pina (2014: 3):

*"Over the past decade, the growth potential of the Hungarian economy has declined substantially. Trend productivity has ceased to increase, and investment has fallen to historically low levels. To an important extent, the explanation lies in a business environment characterised by high administrative burdens, regulatory volatility, barriers to growth of SMEs and entrepreneurship, and limited competition in major non-tradable sectors, problems which have sometimes become worse in recent years. Under these conditions, many SMEs find it hard to leave semi-informality and grow. Large multinational firms operating in manufacturing often have supplier networks weakly anchored in Hungary, while those in the non-tradable sectors sometimes face little competitive pressure; in both cases, positive spillovers to the domestic economy remain limited."*

As discussed earlier in section 3.1, the coherence of the R&I policy mix and its integration with other sectoral socio-economic policies are poor, and a well-defined socio-economic strategy that would bring these policies together into a unified framework is lacking. Therefore, the R&I policy mix remains only marginally important to the country's economic processes, and looks more like a collection of stand-alone isolated initiatives, although policy goals are appropriately identified– the "Hungarian paradox" (Havas, 2011, 2015).

#### **Critical issues raised by the stakeholders**

- *Institutional stability of the system perturbed by frequent changes in organisational setup and funding mechanisms for R&I.*
- *Policy coordination affected by the lack of coherence in the R&I policy mix and lack of integration between the R&I policy mix and other sectoral policies. The absence of a systemic way of thinking and of a long-term perspective in defining policy strategies and objectives were identified as a major problem. Conflicting assessment rules between the science and innovation communities, and between R&I, education, industrial and trade policies. This conflict has an inhibiting effect on innovation in firms, as well as in the broader society.*
- *Instability of public funding for R&I, contradiction between the priorities declared to be given to certain areas (e.g. R&I, education) and the declining national funding for these areas. For example, although education policy was stated as a priority, with high impact on innovation policy, government funding flows for HEIs are declining*
- *Predictability and supportiveness of the legal environment affected by the negative effect of many taxes applied retrospectively, and additional taxes that hinder the innovation process (lack of transparency, risk)*



- *Absence of sufficient expertise in the public service for the design, implementation and evaluation of R&I policies, in spite of a high centralization in R&I policy-making and governance. For example, evaluation and monitoring procedures have been characterized as weak and ineffective, and the ex-ante evaluations have been seen as not being taken seriously by the government. Policy-making tools like technology foresight have not been applied in Hungary since 1997, and a similar situation exists for technology assessment. Poor combination of R&D statistics with economic data.*
- *Competition rules not sufficiently enforced (dual structure of the economy, dominated by MNCs and banks, string lobbying process of MNCs for tax exemptions, conclusion of 52 strategic agreements with MNCs without a transparent system), perturbations of innovation dynamics*
- *Rules for public procurement perceived as non-transparent.*
- *Lack of a strategy behind start-up creation and growth.*
- *Innovative capacity of the business sector weakened by both exogenous factors (e.g. small scale of firms) and endogenous factors (low technological capacities and capabilities).*
- *Limited horizontal and vertical mobility.*

#### 4.4.2. Strengths and weaknesses

Based on the key issues highlighted by the Panel and the critical issues raised by the stakeholders in regard to the fourth main topic – Framework conditions for R&I, and to a lesser extent on the self-assessment tool, the following strengths and weaknesses have been identified:

Main topic 4: Framework conditions for R&I	
Strengths	Weaknesses
Broad range of framework conditions acknowledged in the National RDI Strategy for government action to encourage enterprises to invest in R&I	<b>Broad range of deficiencies in ensuring the framework conditions:</b> <ul style="list-style-type: none"> <li>• Instability of the R&amp;I system, frequent institutional and governance changes</li> <li>• Incoherence of the R&amp;I policy mix, lack of coordination among the R&amp;I policies, but also with other sectoral policies</li> <li>• No systemic way of thinking, no long-term policy strategies and objectives</li> <li>• Conflicting assessment rules between the science and innovation communities, and between R&amp;I, education, industrial and trade policies, with an inhibiting effect on innovation</li> <li>• Declining government funding flows for HEIs</li> <li>• Insufficient expertise for R&amp;I issues, weak and ineffective evaluation and monitoring procedures of funding institutions, little use of policy-making tools, like technology foresight, technology assessment, poor combination of R&amp;D statistics with economic data</li> <li>• Poor entrepreneurial education and culture</li> <li>• Lack of a strategy behind start-up creation and growth</li> <li>• Flaws in public procurement and preferential access to government funding given to companies close to government circles, especially in constructions</li> <li>• Retrospective application of taxes, new taxes inhibiting the innovation process</li> <li>• Lack of transparency (e.g. the lobbying process of MNCs, tax exemptions), risk</li> <li>• Small scale of HU firms, low technological capacities and capabilities, low internationalisation</li> </ul>

## 4.5. The business R&I sector

### 4.5.1. Scope

- Public support to business R&I
- Availability of skilled workforce
- Obstacles to the creation and growth of innovative firms (effectiveness of current policies)
- Role of framework conditions (financial markets, regulators and technology intermediaries, access to credit and risk capital for innovative projects)
- Involvement in clusters

#### ***Key issues highlighted by the Panel***

A first view on the business R&I sector in Hungary has been conveyed by the business R&I funding indicators discussed in Section 2. In addition, the supply of graduates in science, technology, engineering and mathematics (STEM) appears as a major issue for the business R&I sector. The government adopted several measures to encourage the orientation of younger generations towards STEM studies, such as limitation of support to other specialisations at state HEIs, support for two-thirds of the doctoral scholarships to be conducted in the “hard sciences”, and introduction of “dual education” based on practical training and apprenticeship at companies, but this type of training is currently rather low in demand. Although more emphasis is placed on transversal competences such as critical thinking, problem-solving, creativity, teamwork, and intercultural and communication skills, a successful provision of such skills requires deep changes in the education and training curricula that are rather rigid and difficult to change. Therefore, it is expected that this type of training will not be embedded in standard curricula very soon.

Hungarian companies have a low level of innovation activities, especially SMEs: only about one-fifth of enterprises introduce product or process innovations, with no major change in the last decade. This ratio is even lower for SMEs – the share of SMEs innovating in-house is only 11.4%, one-third of the EU-28 average. Only 16.8% of Hungarian SMEs introduced product or process innovations, i.e. 44% of the EU-28 average. This is not surprising because R&D activities are highly concentrated in large companies and a mere 8% of all Hungarian research units are responsible for half of the business expenditures on R&D (Dory, 2014).

The government encouraged the development of the Hungarian start-up ecosystem in the document entitled “*Budapest Runway 2.0.2.0. – A Start-up Credo*” published in November 2013, which envisions the Hungarian capital as the start-up centre of Central and Eastern Europe within a decade. Four types of measures for building a competitive start-up and innovation ecosystem are proposed: i) education and training, ii) access to funds, iii) taxation and regulation, and iv) enabling environment.

The Government also committed to increase the R&D expenditures, especially in the business sector, in order to make Hungary an R&D centre and a production centre in Central and Eastern Europe. This Objective, initially set in 2010, was expanded further in 2014 by aiming to attract innovation and ICT capacities to Hungary, and aiming that industrial production and export reach the highest share in GDP in Europe. In order to achieve these objectives, the government made 52 strategic contracts (by December 2014) with large domestic and multinational companies, but the conditions under which these contracts have been concluded have been criticised for lack of transparency.

The recent Law on “Scientific Research, Development, and Innovation” supports the RDI-driven competitiveness of companies and the creation of high added-value jobs, while the new Higher Education Strategy includes measures to foster collaborative RDI activities between HEIs and companies, as well as tailoring the curricula toward the needs of the business sector. However, the implementation of these strategies has been delayed by the lack of a clear implementation plan and the reorganisation of the National Innovation Office and the RDI funding system, which froze the calls particularly in the second part of 2014.

The involvement in clusters (currently represented by more than 70 registered clusters and 20 accredited innovation clusters) will be supported in the financing period 2014-2020 by the Operational Programme GINOP, with combined measures, like innovation vouchers and improved quality of services provided by the cluster member organisations. In addition, GINOP also supports the collaboration of companies and knowledge transfer. Government incentives for business R&I include a tax incentive for employment of PhD researchers in companies (introduced in January 2013) (selected from Dory, 2014).

It is evident from the above that several efforts have been made in recent years to improve the situation of business R&I sector, but their effect in the system is still to be seen and assessed.

### **Critical issues raised by the stakeholders**

- *Deficiencies in the public support to business R&I from the higher education sector, such as:*
  - *Very low wages in the education sector* that act as a strong disincentive for attracting quality teachers and affect the quality of the education process.
  - *No mobility across University - Industry borders:* this is also a consequence of the low salaries in the higher education sector. They keep away industry researchers who would want to work partially in the university, but prefer to go and teach in high schools, which benefit of some government funding to support their teaching in secondary education. In this context, the need for higher salaries for university researchers (higher or at least equal to salaries in industry) was highlighted, to motivate industry researchers to work in university.
  - *Ineffectiveness of the doctoral training:* industrial PhDs are hindered by the student's difficulty to publish, as the IP belongs to the company and needs to be patented first. Doctoral schools have some people from industry who are teaching, but these are very few.
  - *No education on project management:* Hungary Biotech Association attempted to fill this gap by providing government-funded training for biotech managers from SMEs, but the training stopped when government funding stopped, and no funding renewal was possible, although the training network and infrastructure are still available.
  - *Heavy administrative burdens:* red tape, high bureaucracy, regulations that are blocking University-Industry collaboration, lack of incentives in this direction. Industrial connections are not very welcome as they are seen as draining money away from the university.
  - *Big inertia:* university is a "state in the state", relationships between departments are highly politicised.
  - *Poor innovation and entrepreneurship culture in universities and in the education to students:* little innovation and entrepreneurship training, very low entrepreneurial drive in faculty. There are no incentives for university professors to create spin offs (e.g. recognition in the assessment of academic performance). Consequently, only few professors have created start-ups and some keep them hidden. Also, the IP system does not facilitate the exploitation of the output of the University-Industry cooperation. There have been some failed attempts to establish incubators in universities because of government failure to fund them or ensure timely funding.
  - *A generation gap between older and younger university professors:* as older professors retire, a huge gap is created by the shortage of young professors.
  - *Low availability of skilled workforce for the R&I sector.* There is an important shortage of qualified labour supply to the private sector in Hungary, especially in experienced engineers. Moreover, there is a decreasing availability of skilled workers for industry, a decreasing level of skills and companies need to invest a long time (about one year) in training young graduates before they start working in the company. The example of automotive industry was given, as a case where basic training for young graduates seems to be missing. The shortage of skilled workers is particularly evident in SMEs, and caused difficulties in large firms' attempts to include SMEs in the supply chain, which failed because of the lack of skills in SMEs.
- *Ineffectiveness of government funding, mismatch in incentives for business R&I, conducting to obstacles to the creation and growth of innovative firms.* The R&I system instability disrupted the communication between business and different R&I stakeholders and created confusion about who is in charge and what programmes are still operational. The Hungarian Biotech Association was given as an example in this sense. Another consequence of continuous changing system are the cash flows problems created especially to SMEs by government delays in the provision of contracted grants. This is a serious perturbation to the SMEs' activity and can even lead to their bankruptcy. The provisions of the Innovation Act have been seen as very positive, but unfortunately they have not been further developed. The incentives for SMEs to grow are not functioning well, because when small firms change scale to medium-sized firms they lose access to all potential funding allocated to small firms.
- *Lack of adequate incentives for University-Industry cooperation,* too many restrictions embedded in the calls for joint projects, shortage of SMEs as partners, unsupportive IPR regime, less favourable funding conditions for the companies and more favourable for universities.
- *Rigidity of the banking sector, low availability of risk capital to SMEs*

- *Stronger government intervention needed in several areas, to improve business R&I:*
  - Increased education focus on project and product management
  - *Better education input, especially in terms of a stronger industrial PhDs, back flow of industry researchers to university and development of mentoring*
  - *Better incentives and motivation to attract and retain people in university and business*
  - *Easier access to government-funded programmes, less paper work and bureaucracy, more clarity in the terms of reference, more user feedback in the design of the calls.*

#### 4.5.2. Strengths and weaknesses

Based on the key issues highlighted by the Panel and the critical issues raised by the stakeholders in regard to the fifth main topic – The business R&I sector, and to a lesser extent on the self-assessment tool, the following strengths and weaknesses have been identified:

Main topic 5: The business R&I sector	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Government support for development of Hungarian start-up ecosystem in "Budapest Runway 2.0.2.0. – A Start-up Credo" (Nov. 2013), which envisions the Hungarian capital as the start-up centre of Central and Eastern Europe within a decade</li> <li>• Government commitment to increase R&amp;D expenditures, especially in the business sector, to make Hungary an R&amp;D- and production centre in CEE (52 strategic contracts concluded by Dec. 2014) with large domestic and multinational companies).</li> <li>• Importance of RDI-driven competitiveness of companies and creation of high added-value jobs recognised in the Law on "Scientific Research, Development, and Innovation"</li> <li>• Increase in the number of Hungarian-owned companies carrying out R&amp;D activities (number nearly doubled between 2003-2010) and in the number of corporate R&amp;D centres that are 100% or majority foreign-owned (number also doubled over the same period), creating demand for Hungarian R&amp;D human resources<sup>19</sup>.</li> <li>• Making public support to R&amp;I in business more simple, easy to access and high quality acknowledged as a policy priority</li> <li>• The Higher Education Strategy includes measures to foster collaborative RDI activities between HEIs and companies, and tailor curricula toward business needs</li> <li>• GINOP support to cluster involvement, with innovation vouchers and improvement of the services quality</li> <li>• GINOP support to collaboration of</li> </ul>	<ul style="list-style-type: none"> <li>• Very recent Government measures in support of business R&amp;I, too early for visible effects</li> <li>• Policy implementation delayed in 2014 by the lack of clear implementation plans and reorganisation of the National RDI Office and the RDI funding system</li> <li>• Low level of innovation activities in companies, especially SMEs</li> </ul> <p><b>Poor public support to business R&amp;I from the HE sector:</b></p> <ul style="list-style-type: none"> <li>• No mobility across U-I borders, unattractive positions in university, very low wages.</li> <li>• Ineffectiveness of the PhD training, no project management education</li> <li>• Heavy administrative burdens, high bureaucracy</li> <li>• No incentives for U-I cooperation, blockages coming from regulations, many restrictions in funding calls, shortage of SMEs as partners</li> <li>• Reluctance to engage in industrial connections</li> <li>• Big inertia, departments highly politicised.</li> <li>• Poor innovation and entrepreneurship education and culture in universities</li> <li>• IP system not facilitating exploitation of U-I cooperation output.</li> <li>• No functional incubators in universities</li> </ul> <p><b>Ineffective government funding and incentives for business R&amp;I</b></p> <ul style="list-style-type: none"> <li>• Cash flows problems, especially to SMEs, caused by government delays in provision of contracted grants</li> <li>• Rigidities in the banking sector, low availability of risk capital to SMEs</li> <li>• Ineffective incentives for SMEs to grow</li> <li>• No appropriate investment in innovative projects</li> <li>• Innovation Act provisions very positive, but not well developed and not modernized</li> </ul>

<sup>19</sup> Source: National Innovation Office (2012), p. 10

Main topic 5: The business R&I sector	
Strengths	Weaknesses
<p>companies and knowledge transfer</p> <ul style="list-style-type: none"> <li>Government incentives for business R&amp;I (e.g. a tax incentive for employment of PhD researchers in companies, introduced in January 2013)</li> <li>Government support for improving the supply of graduates for business R&amp;I, encouraging the orientation of younger generations towards STEM studies, introduction of "dual education" based on practical training and apprenticeship at companies</li> </ul>	<p><b>Obstacles to creation and growth of innovative firms</b></p> <ul style="list-style-type: none"> <li>Administrative burdens, bureaucracy, insufficient clarity and enforcement of competition rules;</li> <li>Low RDI management capacity in most SMEs</li> </ul> <p><b>Low availability of skilled workforce for business R&amp;I, decreasing level of skills</b></p>

## 4.6. Venture capital for innovative start-ups

### 4.6.1. Scope

- The state of the venture capital (VC) market in Hungary
- Support measures for innovative start-ups

#### **Key issues highlighted by the Panel**

Hungary is one of the most active countries in VC investments in Europe due to the EU's VC development programme JEREMIE<sup>20</sup> ("Joint European Resources for Micro to Medium Enterprises"). JEREMIE offers several means of enterprise development, with financial support from the European Investment Bank (EIB) and its venture capital arm, the European Investment Fund (EIF).

VC investment first appeared in Hungary after the political transformation of the early '90s and rose to 0.09% of GDP in 2005 (a share that was higher than in the neighbouring countries Poland, the Czech Republic, Slovakia and even Austria, and close to the 34 European countries' average of 0.12%). From 2005, a declining trend was observed, with VC investments going down to 0.02% of the GDP in 2010, mainly due to the economic and the financial recession started in 2008 (National Innovation Office, 2012). Act CXX of 2001 regulating the launch and operation of private VC funds had a moderate impact, as state VC funds were already in operation. A more significant take-off of private VC emerged in 2007, once with the start of operations for several new funds, and a real breakthrough only took place with the launch of the *New Hungary Venture Capital Programme*. However, it took several years to consolidate this development, and the JEREMIE programme started in 2009 reversed this trend (Dory 2015, p. 43).

In Hungary, JEREMIE started with three financial programmes (Low-cost Micro Loan and SME Loans; Credit guarantee; and Venture Capital), totalling HUF 200 billion/EUR 700 million (92% planned to be spend outside the Central Hungarian Region). Among them, the Venture Capital programme (HUF 35 billion/EUR 128 million) aimed to improve the capital of Hungarian SMEs in the early (seed and start-up) and growth stage. It involved eight competing VC funds in two different frameworks (Domestic Funds and Co-investment). Domestic Funds invest all over Hungary, except the country's Central Region, with the condition that no more than 70% of the funding comes from the EU; the rest of 30% is provided by private investors. The Co-investment fund operates only in the Central Hungarian Region. Profits from the investments are channelled back into the SMEs<sup>21</sup>.

The first eight VC funds (JEREMIE I) were set up in Q2 2010, and were planned to continue until the end of the programme in 2013. At the end of Q1 2013, 93 investments had been funded with a total of HUF 32 billion, and the first successful exit, namely the sale of the investor's stake, took place in September 2012. Due to the success of JEREMIE I, the National Development Agency invited the second, third and fourth JEREMIE VC tenders under the name of *New Széchenyi Venture*

<sup>20</sup> JEREMIE is an EC initiative that uses EU Structural Funds to finance SMEs using equity, loans or guarantees. The investments are done through a revolving Holding Fund acting as an umbrella fund and involving private capital. The companies should not be older than 5 years old and they must be registered in Hungary.

<sup>21</sup> <http://www.novinex.hu/news/12-jeremie-funds-available-in-hungary-the-jeremie-capital-program>



*Capital Programmes* in the following years<sup>22</sup>. In 2012 the National Development Agency already announced JEREMIE II - the creation of 10 new VC and seed investment funds with a total of €145 million (HUF 40.7 billion) to invest in seed and growth stage start-ups, to start in 2013 and continue until end 2015<sup>23</sup>. JEREMIE II was divided in three different investment categories: seed funding, growth I and growth II, which reflects a differentiated allocation of funds by stage of company life cycle.

The funds of JEREMIE III (eight funds totalling HUF 34.2 billion) and JEREMIE IV (two funds totalling HUF 8.6 billion) started their operation only at the end of 2013 but there is no empirical evidence about their performance. Thus, altogether, a total of 28 JEREMIE funds have been established between 2010 and 2013 that significantly improved the access to early-stage innovation funding, e.g. from 9-10 investments per year in 2009 to 110 investments in 2014, but the later stages of innovation, in particular the "valley of death" stage still remain largely uncovered (Dory, 2015, p. 25; Vadasz, 2015<sup>24</sup>). Growth in VC investments in Hungary has been the highest of all EU Member States in 2012 (0.069% of the GDP) when most of the JEREMIE funds were launched, but this trend was reversed in 2013, when it fell back to 0.018% of the GDP (*ibid.*, p. 21). At present, Hungary offers some of the most favourable provisions for financial engineering instruments such as loans, guarantees and venture capital in the Economic Development Operational Programme (GOP) of the New Széchenyi Development Plan. According to the report published by the Hungarian National Bank in January 2015, 70% of the VC invested in Hungary was connected to one of the JEREMIE Funds in the period January 2010-end June 2014. (*ibid.*, p. 43).

The investment period of JEREMIE ends at the end of 2015, and there is a certain level of uncertainty about the VC market after this moment, as the JEREMIE II programme will not be followed by a new operation cycle. This decision has been largely determined by the low rate of investment, which also determined some changes in the duration of the four phases of the programme. For example, JEREMIE I was originally planned to operate until the end of 2013, but it was prolonged until the end of 2015, as 82 investments had been made within this programme (including 37 companies in IT and communication, and 16 in biotech and healthcare industry). One reason for the slow operations is the low number of VC-ready companies, suggesting that the VC demand is too small for the amount of capital accumulated in JEREMIE. Harmonized government efforts in areas, like business incubation and development of entrepreneurial ecosystem are necessary for the progress of VC industry (Fazekas, 2014)<sup>25</sup>.

The main question is about the ways in which the growing start-up ecosystem will be funded, under the circumstances of increasing shortage of capital. A possible answer to this question is expected to come from the *Innovation Ecosystemprogramme* of the Hungarian government, where co-funding (approx. €200,000-250,000) is provided for the starting phase of some of the start-up accelerator projects. The main customers for such projects are firms that there are still in the accelerators and need capital for innovation or second round deals that did not succeed under the JEREMIE programme. The Corvinus Venture Capital Fund is already involved in such transactions, providing second round deals for companies initially funded by JEREMIE. Further to gap analyses performed in-house, as there are no trusted sources on the market, the Corvinus Fund accepts various risk margins, ranging for 20% to 40%.

Business angels and angel networks are new phenomena in Hungary, starting in 2007 under the INNOSTART initiative. Although this initiative was a milestone, in February 2007 the so-called Business Angel Network was founded, with more than 50 members. According to Makra and Kosztópulosz (2004)<sup>26</sup> there were about 1000-2000 angels in Hungary already in 2000, and the Innostart Initiative together with the Hungarian Association for Innovation founded the so-called Business Angel Club in 2000 (*ibid.*, p. 136). After 2008, the growth of the Hungarian start-up ecosystem accelerated and this contributed to the further evolution of business angel networks. After INNOSTART stopped its activities, events were re-launched with the *Startup Underground* in October 2012 to establish a forum where business angels could discuss potential investment opportunities and start-ups could seek advice for early stage investments. No specific taxation regime is available in Hungary for business angel investments (Dory, 2014). Since then a number of mobilising events have taken place: Startup Spring 2014 (NIH), Hackathon-in-the-Boks

<sup>22</sup> [http://www.hvca.hu/wp-content/uploads/2014/01/final-HVCA\\_position\\_paper\\_EN-02-01-2014.pdf](http://www.hvca.hu/wp-content/uploads/2014/01/final-HVCA_position_paper_EN-02-01-2014.pdf)

<sup>23</sup> <http://www.whiteboardmag.com/hungary-top-5-european-countries-vc-investments/>

<sup>24</sup> Vadasz, G. (2015), Presentation at the meeting with representatives of the VC community, 22 May 2015.

<sup>25</sup> Fazekas B. (2014), Government interventions in the venture capital market – How Jeremie affects the Hungarian venture capital market? Available at <http://steconomiceuoradea.ro/anale/volume/2014/n1/097.pdf>

<sup>26</sup> Makra, Z. and Kosztópulosz, A. (2004), *The world of Venture Capital*, Aula, p. 135, 147.



competition, First Monday, Mentor Clubs of the Design Terminal and the National Innovation Office, CEE Start-up Competitions (Invendor), Startup Sauna Budapest, and the Hungarian Innovation Tech Show (since 2009).

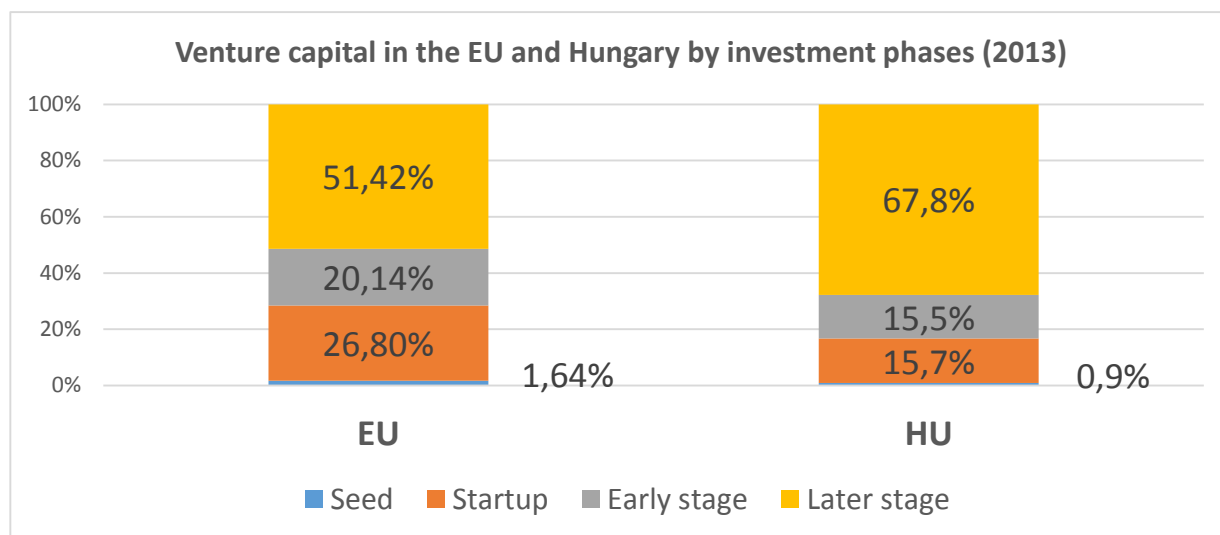
### **Critical issues raised by the stakeholders**

The discussion with the representatives of the VC community encompassed both the perspective of VC investors (the investment manager of Corvinus Venture Capital Fund Management Ltd and the Director of the Hungarian Venture Capital Association) and the perspective of an entrepreneur.

*From the perspective of the VC investor:*

- *Major effect of the JEREMIE programme on VC growth in terms of transactions in recent years, mainly due to subsidies provided to start-ups from traditional and more established industries, presenting lower investment risks.*
- *Underdeveloped funding sources for early-stage innovations as angel financing, limited capital accumulations of private individuals to assist the development of own projects or the ideas of others (Figure 5). Therefore, the state and/or the EU are at present the only players who can fill this gap, and the provision of seed capital to these projects is considered to distort market much less than providing non-repayable grants. Public spending for seed capital can come from national sources or from the EU through financial instruments. The decision-making process at state-owned institutions can be designed according to the "market economy operator principle", a practice already applied at the Corvinus Capital Fund by inviting two external members from the private market to the 3-member board.*

**Figure 5: Venture capital investment in the EU and Hungary by investment phase (2013)**



Source: European Venture Capital Association (2014), cited in Vadasz (2015)

- *Cooperation with other countries in terms of VC neither contemplated, nor supported. Too much focus on public money for science-based start-ups, and too little on commercialization to encourage innovation.*

*From the perspective of the entrepreneur:*

- *Investment of public money to support innovation seen not just a waste of money, but also an impediment to innovation, which is thus slowed down by the reduced exposure of the supported product or service to market demand and supply forces. Getting the investment money becomes thus the goal, rather than bringing the innovation to the market.*
- *Ethical problems arising from the lack of accountability for the public money invested in innovation; accountability to users should come much earlier, but is delayed by the public VC funding. Therefore, the role of the government should rather be focused on the provision of competition regulations and investment in education, in order to develop the entrepreneurial spirit from an early age, in combination with sciences and use of role models. This also includes support for a better monitoring and evaluation system to control the use of public money, as accountability for public money is key to a successful investment process.*

From both the VC investors and the entrepreneur's perspectives, several key areas for stronger government intervention have been identified, including:

- *Provision of professional advice and networking for start-ups, in addition to capital*, resulting in „smart money“ if they are combined. Accelerators (incubators) are the ideal vehicles for combining state funding with the knowledge of successful entrepreneurs.
- *More transfer of international knowledge to Hungarian start-ups (and VCs)*, as local knowledge is still limited. This could be done by spending a few months at major international start-up hubs (e.g. Silicon Valley, London, Berlin, Tel-Aviv, Singapore), as well as by bringing key figures to Hungary.
- *Co-investment with foreign professionals/entrepreneurs for long-term development and exits*. The VC managers' opinions indicated that in this particular model the grant principle followed in the „Innovation Ecosystem“ programme should be replaced with the „money for a minority stake“ principle
- *Improvements in higher education, investment in entrepreneurs' education*: initiatives like the *Innovation days* have demonstrated their usefulness, but that is not enough. Other schemes focused on mentoring, coaching, etc. should also be put in place.
- *Changing the IP law to make it less restrictive for the creation of university spin offs*.
- *Stronger rule of law and enforcement of competition rules, no delays in VAT returns less bureaucracy*.
- *Better communication between government and market institutions*, approaching Hungarian companies and start-ups to act as intermediates.
- *More stable taxation and tax allowance for start-ups complementing the ones appearing already such as the "Runway Budapest" initiative*.
- *Stronger support to marketable research than to basic research in grant schemes*.
- *Provision of grant schemes adequate to all the innovation chain stages*.

#### 4.6.2. Strengths and weaknesses

Based on the key issues highlighted by the Panel and the critical issues raised by the stakeholders in regard to the sixth main topic – Venture capital for innovative start-ups, the following strengths and weaknesses have been identified:

Main topic 6: Venture capital for innovative start-ups	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Favourable provisions for financial engineering instruments such as loans, guarantees and venture capital in the 2014-2020 Economic Development Operational Programme (GOP) of the New Széchenyi Development Plan</li> </ul>	
<ul style="list-style-type: none"> <li>• Positive effects of the JEREMIE I and II programmes, growth in VC investment, differentiated allocation of funds by stage of company life cycle</li> <li>• Important effect of the <i>New Hungary Venture Capital Programme</i></li> </ul>	<ul style="list-style-type: none"> <li>• Later stages of innovation, in particular the „valley of death“ stage, still remain largely uncovered</li> <li>• Uncertainty about the VC market after the end of the JEREMIE programme at end 2015</li> </ul>
<ul style="list-style-type: none"> <li>• Government support for development of the Hungarian start-up ecosystem in <i>„Budapest Runway 2.0.2.0. – A Start-up Credo“</i> (Nov. 2013), which envisions the Hungarian capital as the start-up centre of Central and Eastern Europe within a decade</li> <li>• Emergence of some start-ups with high growth potential</li> </ul>	<ul style="list-style-type: none"> <li>• Underdeveloped funding sources for early-stage innovations</li> <li>• Little accountability for public money and accountability to users</li> <li>• Weak role of government in provision and enforcement of competition regulations and investment in VC education</li> <li>• IP law restrictive for university spin offs</li> <li>• Weak rule of law</li> <li>• Poor communication between government and market institutions</li> <li>• No cooperation with other countries in terms</li> </ul>

	of VC <ul style="list-style-type: none"> <li>• Public funding put mostly in science-based start-ups, not on commercialization to encourage innovation.</li> <li>• Bureaucracy, red tape, delays in VAT reimbursement</li> </ul>
<ul style="list-style-type: none"> <li>• Business angels and angel networks started in Hungary in 2007 under the INNOSTART initiative, relaunched by the <i>Startup Underground</i> in 2012</li> <li>• No specific taxation regime available so far for business angel investments</li> </ul>	<ul style="list-style-type: none"> <li>• Little business angel financing, only government and EU sources able to fill finance gap</li> </ul>

## 5. SUGGESTIONS ON FOCUS AREAS FOR THE PEER-REVIEW

This section presents the four focus areas that are proposed for further in-depth examination by the peer-review panel. These focus areas resulted from a complex analysis of the Hungarian R&I system conducted by the pre-peer review panel and centred on the six main topics discussed in section 3.

In this analysis, the pre-peer review panel used multiple inputs from a variety of sources:

- (i) The general context of the Hungarian R&I system outlined by the pre-peer review panel (in “Key issues highlighted by the panel”), based on the examination of the available quantitative and qualitative evidence and the panel’s own expert knowledge.
- (ii) The specific insights provided by the Hungarian stakeholders during the Budapest visit (in “Critical issues raised by the stakeholders”);
- (iii) The strengths and weaknesses of the Hungarian R&I system discussed in section 3 and their convergence with the strengths and weaknesses identified in other country reports and strategies (e.g. the RIO Country Reports 2014 and 2015, the country profile in ‘Research and Innovation performance in the EU: Innovation Union progress at country level 2014’, the 2013-2020 National RDI Strategy);
- (i) The expertise of the pre-peer review panel members regarding specific dynamics of the R&I process in CEE countries.

This multi-faceted process of identification of the focus areas ensures thus a solid internal consistency among the report sections, as well as consistency with other pieces of analytical work on the Hungarian R&I system (see section 5.3 “Background documentation” for details).

The selection of the focus areas is grounded in the pre-peer review experts’ *systemic* view of Hungary’s R&I system, whereby the main focus has been placed on the functionality of the key institutions that ensure R&I governance, funding and coordination, their linkages with other national and regional R&I stakeholders, the linkages between R&I stakeholders internally within the system and also externally with other national and EU partners. The gaps thus identified in the functionality of the R&I system in these respects are signalled as areas of further consideration by the peer-review. Furthermore, for each focus area, a number of related questions are also brought to the attention of the peer review panel, to document the depth of the proposed focus areas and justify their selection for policy reform. The peer review process offers a unique platform to examine these issues and offer appropriate solutions.

### FOCUS AREA 1: R&I GOVERNANCE, FUNDING AND POLICY-MAKING

This focus area synthesises several R&I system zones that require attention, such as:

- The system stability, which has been heavily perturbed by numerous changes since the 1990s
- The sustainment of Hungary’s public R&D intensity against the backdrop of the target set by the government in the National RDI Strategy 2013-2020 to increase the country’s R&D expenditure to 1.8% of the GDP by 2020 and 3% by 2030.
- The horizontal and vertical coordination of the National RDI Office with other R&I stakeholders
- The overall organizational functioning of the National RDI Office. Possible questions:
  - *What performance incentives for the employees can be introduced?*
  - *How to reduce institutional rigidity and improve institutional communication and collaboration?*
- The R&I policy mix: internal coherence, integration with other sectoral policies, design, implementation, evaluation and monitoring, consultation with stakeholders. Possible questions:
  - *How to reduce the linearity of the R&I process and the deeply-embedded basic vs. applied research distinction?*
  - *How to design multidisciplinary research themes and programmes, promote more thematic and less generic programmes?*
  - *How to introduce modern policy-making tools (e.g. foresight, technology roadmaps, international benchmarking, etc.) and technology strategic thinking, policy and data in policy-making?*
  - *How to ensure a longer term perspective in the policy mix and funding instruments? How to improve synergy between R&I policies and other socio-economic policies, especially higher education, labour and ICT policies?*

- *How to improve evaluation and monitoring methodologies?*
- *How to improve the effectiveness of consultations with stakeholders?*
- The efficient use of funds national and EU funds. Possible questions:
  - *How to streamline the selection processes and correct diverging (market) incentives?*
  - *How to improve the correlation between national and EU funding?*
  - *How to correlate the priorities of the National RDI Strategy with those of the National Smart Specialisation Strategy and other significant national strategies that address R&I issues, and provide adequate funding?*
- International R&I cooperation. Possible questions:
  - *How to create better synergy between national and international R&I programmes?*
  - *How to make the role of S&T attachés more attuned to the R&I objectives?*
  - *How to prioritise among various international R&I programmes?*

## **FOCUS AREA 2:      AVAILABILITY OF HUMAN RESOURCES FOR R&I**

The availability of skilled labour has been one the cornerstones of industrial development with the inflow of foreign capital in Hungary. During the country visit, the pre-peer review panel came across several critical issues for the quality and availability of human resources for R&I, such as:

- Supply and demand mismatch and appropriability of incentives for increasing the attractiveness of R&I careers. Possible questions:
  - *How to improve the existing incentives and what new incentives could be introduced to reduce brain drain, attract international researchers to Hungary and retain Hungarian researchers who want to stay in the country?*
  - *How to use brain-gain as a role model (e.g. in light of the MTA Momentum Programme)?*
  - *How to ensure continuation of successful research grants and themes to improve job security and retention of both young and senior researchers?*
  - *How to reduce bureaucracy and internal administrative burdens in the public sector?*
  - *How to increase the visibility of HU researchers in public institutions, high-impact journals and provide more support to researchers applying for ERC grants?*
- The role of the higher education system in providing an adequate supply of skilled graduates and researchers. Possible questions:
  - *How to improve the cooperation with higher education authorities to ensure a higher quality of graduates?*
  - *How to increase mobility across U-I borders, especially the backflow of industry researchers to university for teaching and research purposes?*
  - *How to improve the quality of industrial PhDs and of other forms of training skilled workforce for public and business R&I?*
  - *How to improve the education focus on critical and independent thinking, problem-solving skills, project writing and management, team work?*
  - *How to involve more MTA senior researchers in PhD supervisions?*
- The role of higher education system in providing a stronger entrepreneurial education and culture in universities. Possible questions:
  - *How to improve the entrepreneurial education for students and increase their exposure to the business environment?*
  - *How to ensure the involvement of entrepreneurs in the education process (e.g. in curriculum design, mentoring, coaching, entrepreneurs-in-residence)?*
  - *How to improve the education focus on project and product management in the curriculum?*

## **FOCUS AREA 3:      UNIVERSITY-INDUSTRY      COOPERATION,      TECHNOLOGY TRANSFER AND ENTREPRENEURSHIP**

A well-structured U-I dialogue and technology transfer are always instrumental in order to improve the efficiency of public investment in research, to improve communication between the scientific and the business communities, and reduce the lack of trust and the lack of information on potential cooperation opportunities. In the case of Hungary, the university “third mission”, technology transfer and entrepreneurship are in a very early stage and a sound further development of these areas critically depends on building a solid TT infrastructure with embedded capacity for technological intermediation, building an entrepreneurship culture, and surpassing cultural legacy challenges. The focus of the peer review process on the set of issues detailed below is expected to have strong demonstration and institutional learning effect to shareholders in universities and in industry.

- Incipient university “third mission”. Possible questions:
  - *How to increase funding and diversify support mechanisms for TT, research commercialisation and start-up formation?*
  - *How to increase the awareness of university leaders and researchers on these issues?*
  - *What measures should be taken to introduce business incubators in universities and ensure adequate funding for their operations?*
  - *How to remove administrative burdens, like red tape, high bureaucracy, regulations blocking U-I cooperation and lack of incentives?*
  - *How to make the IP system more favourable to U-I cooperation?*
  - *What incentives can be introduced to create more university spin-offs?*
  - *How to stimulate multidisciplinary cooperation between universities for TT and entrepreneurship?*
- Weak U-I dialogue, lack of trust and lack of information on potential cooperation opportunities
- Weak market perspective in the funding instruments. Possible questions:
  - *How to introduce more calls focused on TT and entrepreneurship financed by the National RDI Fund?*
  - *How to boost private sector demand and start-up creation?*

#### **FOCUS AREA 4:    FRAMEWORK   CONDITIONS   FOR   INNOVATION   IN   THE BUSINESS SECTOR**

The National RDI Strategy 2013-2020 acknowledges a broad range of framework conditions for innovation that the government pledges to enforce in order to ensure innovation-driven growth in Hungary. Such framework conditions include international economic processes (foreign capital, improved economy structure, participation in global processes), institutional stability and policy coordination, predictability and appropriateness of the legal environment, stability of public funding for R&D, competition, entrepreneurial skills and spirit, effective education policy, horizontal and vertical mobility. However, in practice, most of these areas are confronted with a lot of challenges, and the growth potential of the Hungarian economy has declined substantially over the past decade. By focusing on these issues, the peer review process will increase awareness among policy-makers and stakeholders on institutional inefficiency, funding gaps and the risks incurred by the system if these challenges are not properly addressed. The consideration of policy instruments and policy mix configurations in countries facing similar technological upgrading challenges will further enhance the policy relevance of the peer-review process. This focus area could address the following:

- Public support to business R&I from the higher education sector. Possible questions:
  - *How to improve the number and quality of graduates supply for the business R&I sector?*
  - *How to improve the effectiveness of the PhD training and project management education?*
  - *How to remove restrictions for industry partners in public funding calls and improve the shortage of SMEs as partners in these calls?*
- Government funding and incentives for business R&I. Possible questions:
  - *How to correct cash flows problems created to companies, especially to SMEs, by government delays in the provision of contracted grants?*
  - *How to reduce rigidities in the banking sector and increase availability of risk capital to SMEs?*
  - *What incentives can be provided for SME's growth?*
  - *How to increase investment in innovative projects?*
- Obstacles to the creation and growth of innovative firms. Possible questions:
  - *How to reduce/remove administrative burdens, bureaucracy?*
  - *How to ensure a stronger clarity and enforcement of competition rules?*
  - *How to improve the RDI management capacity in most SMEs?*
  - *How to improve access to credit for innovation-related corporate investment?*
  - *How to improve market conditions facilitating competition and mobility of firms?*
  - *How to better align market trends, grant schemes and policy priorities aiming at technological upgrading?*
- Venture capital and other forms of support to innovative firms. Possible questions:



- *How to remove obstacles for angel financing, private equity and VC investors and make risk capital more available to SMEs?*
- *How to increase public investment in technological intermediation and commercialization to encourage incremental innovation?*
- *How to stimulate investment in entrepreneurs' education, e.g. mentoring, coaching schemes and short stays at major international start-up hubs?*

## **6. SUGGESTIONS ON PEER AND INDEPENDENT EXPERTS, STAKEHOLDERS AND BACKGROUND DOCUMENTATION FOR THE PEER-REVIEW PANEL**

### **6.1. Suggestions on peer and independent experts**

This section presents suggestions for peer and independent experts who could contribute to the peer-review exercise, as well as countries where these experts could come from and areas of expertise they could have.

In the process of identifying potential peer and independent experts, as well as the countries they could come from, two sets of criteria have been considered:

#### **a. Criteria for the selection of peer and independent experts:**

- 1.** Conformity to the definition of “peers” and “independent experts” set by the PSF, i.e.
  - *Peer experts* are officials in public administrations of Member States and Associated Countries having the necessary expertise and best practice advice for the R&I related topic.
  - *Independent experts* are “non-peer” experts who have expertise in specific topics related to the research and innovation policy design, implementation and/or evaluation
- 2.** Expertise in the proposed peer-review focus areas and on R&I in the New EU Member States (e.g. structure and governance of the R&I systems, characteristics of the socio-economic context in the transition process).
- 3.** Prior involvement (teaching, research and/or consultancy) with Hungarian HEIs or PROs, good networks with Hungarian researchers or authorities.
- 4.** Experience in peer review exercises, report writing or work for organisations conducting peer reviews (e.g. UN-ECE, OECD, European Investment Bank, etc.)
- 5.** Balanced panel representation of academic and non-academic experts (including civil servants, policy-makers as peers, academics and private sector as independent experts)

#### **b. Criteria for the selection of countries:**

- 1.** *Balanced geographical coverage in Europe:* a balanced representation of Northern, Western, Central and Eastern, and Southern Europe
- 2.** *Involvement of Central and Eastern Europe (CEE) countries* that have gone through similar reform processes in the past and have experience in the challenges now faced by Hungary, being also more advanced in R&I in the CEE: for example, Slovenia is the fastest growing Innovation Follower according to Innovation Union Scoreboard 2015, and Poland is recognised as a best practice case in absorbing EU Structural Funds, with virtually 100% absorption of the €68 billion allocated in the programming period 2007-2013. The Czech Republic and Slovakia could also be considered, as countries in the same reference IUS reference country group of “Moderate Innovators”.
- 3.** *Involvement of European countries that underwent similar reforms in the past,* like Spain and Portugal, who are also in the same IUS reference country group of “Moderate Innovators”.
- 4.** *Involvement of European countries with strong expertise in the CEE countries’ transition processes:* for example, Germany’s Fraunhofer Centre for Central and Eastern Europe in Leipzig, Austria’s Centre for Social Innovation SZI in Vienna, which has comprehensive expertise in CEE and Southeast Europe countries, or the UCL School of Slavonic and East European Studies (SSEES) in London, UK
- 5.** *Involvement of European countries with high performance in specific R&I areas,* as recognised by the Innovation Union Scoreboard 2015:
  - Human resources: Sweden, Ireland, Finland, UK
  - Open, excellent and effective R&I systems: Netherlands, Sweden, Denmark
  - Finance and support: Estonia, Denmark, Finland, Sweden
  - Firm investments: Germany, Sweden, Estonia and Finland
  - Linkages and Entrepreneurship: Belgium, UK, Denmark
  - Intellectual assets: Sweden, Denmark, Finland and Germany
  - Innovators: Ireland, Luxembourg and Germany
  - Economic effects: Ireland, Denmark and Luxembourg.

Corroborating these two sets of criteria, for each of the four focus areas independent experts and peer countries are proposed for the peer review and provided to the Hungarian authorities (Annex 6).

## **6.2. Suggestions on stakeholders**

Relevant stakeholders proposed for interviews in the peer-review exercise include representatives of a broad range of institutions in the Hungarian R&I system, which have been selected on the basis of four main criteria in order to ensure representativeness and large attendance numbers:

- (i) A wide coverage of relevant institutions in the focus areas;
- (ii) A multi-sectoral approach, by research field/specialisation and by industrial sector;
- (iii) A balanced geographic representation of the country, both from Budapest and from the rest of the country.
- (iv) A balanced representation of public and private institutions.

The large groups of institutions listed below have been identified on the basis of an analysis of background documents available to the pre-peer review panel, the input provided by the PSF team, and desk research performed by the pre-peer review panel (e.g. examination of websites of the National RDI Office and various other institutions, academic papers and reports, conference presentations, etc. available on the internet).

The selection below is by no means exhaustive or limitative, and could be further refined or enriched in the preparatory phase of the peer-review, including through communication between the PSF team and the contact person(s) that are envisaged to be delegated in the major Hungarian institutions or at the national representation to the EU in Brussels in order to help the officer with the coordination of peer-review operations in Hungary. The local contact person(s) could provide important insights regarding the local visibility or importance of one or another institution or individuals relative to the focus areas, help ensure a balanced representation of stakeholders in terms of age groups, gender, etc. and thus help in further refining the selection.

### **a. Stakeholders from government and other high level political institutions**

- National RDI Office: President, Vice-President, other officials involved in R&I policy-making and coordination, management of the National RDI Fund (integrating the OTKA and KTIA funds) and of EU funds, international cooperation
- Other political bodies involved in R&I coordination, e.g. relevant Parliament Commissions on education and science, budget and finance, economic policies, etc.
- Prime Minister's Office and the National Development Cabinet
- Policy advisory body National Science Policy and Innovation Board (NTIT)
- Other ministries involved in the implementation of EU Operational Programmes (OPs):
  - o Ministry of National Economy: coordinates the Economic Development and Innovation OP (GINOP) and the Competitive Central-Hungary OP (VEKOP);
  - o Ministry of Human Capacities: coordinates the Human Resource Development OP (EFOP);
  - o Ministry of National Development: coordinates the Intelligent Transport Development OP (IKOP) and the Environmental and Energy Efficiency OP (KEHOP);
  - o Ministry of Agriculture: coordinates the Rural Development and Fisheries OPAmong the above OPs, only GINOP, VEKOP and EFOP allocate project-based funding for R&I.
- Hungarian Intellectual Property Office (coordinated by the Ministry of Justice)

**b. Stakeholders from the public R&I sector:**

- **From the Hungarian Academy of Sciences (MTA):** Secretariat, Library and Information Centre, Department of International Relations and the network of MTA's Research Centres and Institutes<sup>27</sup> that are listed here by research field in order to provide a multi-sectoral view:

<b>MTA Centre for Agricultural Research</b>	<ul style="list-style-type: none"> <li>○ Agricultural Institute</li> <li>○ Institute for Soil Science and Agricultural Chemistry</li> <li>○ Institute for Veterinary Medical Research</li> <li>○ Plant Protection Institute</li> </ul>
<b>MTA Research Centre for Astronomy and Earth Sciences</b>	<ul style="list-style-type: none"> <li>○ Geodetic and Geophysical Institute</li> <li>○ Geographical Institute</li> <li>○ Institute for Geological and Geochemical Research</li> <li>○ Konkoly Thege Miklós Astronomical Institute</li> </ul>
<b>MTA Szeged Research Centre for Biology</b>	<ul style="list-style-type: none"> <li>○ Institute of Biochemistry</li> <li>○ Institute of Biophysics</li> <li>○ Institute of Genetics</li> <li>○ Institute of Plant Biology</li> </ul>
<b>MTA Institute for Computer Science and Control</b>	
<b>MTA Centre for Ecological Research</b>	<ul style="list-style-type: none"> <li>○ Balaton Limnological Institute</li> <li>○ Danube Research Institute</li> <li>○ Institute of Ecology and Botany</li> </ul>
<b>MTA Research Centre for Economic and Regional Studies</b>	<ul style="list-style-type: none"> <li>○ Institute of Economics</li> <li>○ Institute for Regional Studies</li> <li>○ Institute of World Economics</li> </ul>
<b>MTA Centre for Energy Research</b>	<ul style="list-style-type: none"> <li>○ Institute for Atomic Energy Research</li> <li>○ Institute for Energy and Environmental Safety</li> <li>○ Institute of Technical Physics and Materials Science</li> </ul>
<b>MTA Research Centre for the Humanities</b>	<ul style="list-style-type: none"> <li>○ Institute of Archaeology</li> <li>○ Institute for Art History</li> <li>○ Institute of Ethnology</li> <li>○ Institute of History</li> <li>○ Institute for Literary Studies</li> <li>○ Institute of Musicology</li> <li>○ Institute of Philosophy</li> </ul>
<b>MTA Research Institute for Linguistics</b>	
<b>MTA Rényi Institute of Mathematics</b>	
<b>MTA Institute of Experimental Medicine</b>	
<b>MTA Research Centre for Natural Sciences</b>	<ul style="list-style-type: none"> <li>○ Institute of Cognitive Neuroscience and Psychology</li> <li>○ Institute of Enzymology</li> <li>○ Institute of Materials and Environmental Chemistry</li> <li>○ Institute of Molecular Pharmacology</li> <li>○ Institute of Organic Chemistry</li> </ul>
<b>MTA Institute of Nuclear Research</b>	
<b>MTA Wigner Research Centre for Physics</b>	<ul style="list-style-type: none"> <li>○ Institute for Particle and Nuclear Physics</li> <li>○ Institute for Solid State Physics and Optics</li> </ul>
<b>MTA Centre for Social Sciences</b>	<ul style="list-style-type: none"> <li>○ Institute for Legal Studies</li> <li>○ Institute for Minority Studies</li> <li>○ Institute for Political Science</li> <li>○ Institute for Sociology</li> </ul>

<sup>27</sup> Source: <http://mta.hu/articles/hass-research-institutes-105811>

- **From public universities:** rectors, deans, heads of departments and centres, individual researchers, etc. A list of all public universities in Hungary located both in Budapest and in the rest of the country<sup>28</sup>, is provided below for consideration (in alphabetical order). The four universities that are listed in the QS World University Rankings 2013/14 are highlighted<sup>29</sup>, for acknowledging their higher performance.

<b>In Budapest</b>	<ul style="list-style-type: none"> <li>o Academy of Drama and Film in Budapest</li> <li>o Andr�ssy University Budapest</li> <li>o Budapest Business School</li> <li>o Budapest University of Technology and Economics</li> <li>o <i>Corvinus University of Budapest (ranked 651-700)</i></li> <li>o <i>E�tv�s Lor�nd University (ranked 551-600)</i></li> <li>o Hungarian University of Fine Arts</li> <li>o Liszt Ferenc Academy of Music</li> <li>o Moholy-Nagy University of Art and Design</li> <li>o National University of Public Service</li> <li>o Semmelweis University</li> <li>o �buda University (formerly Budapest Polytechnic)</li> </ul>
<b>In the rest of the country</b>	<ul style="list-style-type: none"> <li>o Sz�chenyi Istv�n University, Gy�r</li> <li>o Szent Istv�n University, G�d�ll�</li> <li>o <i>University of Debrecen, Debrecen (ranked 601-650)</i></li> <li>o University of Kaposv�r, Kaposv�r</li> <li>o University of Miskolc, Miskolc</li> <li>o University of Pannonia, Veszpr�m</li> <li>o University of P�cs, P�cs</li> <li>o <i>University of Szeged, Szeged (ranked 501-550)</i></li> <li>o University of West Hungary, Sopron</li> </ul>

- **From university technology transfer centres established in universities:** technology transfer managers, patenting and licensing experts, etc. The following centres could be considered both from Budapest and from the rest of the country:

<b>In Budapest</b>	<ul style="list-style-type: none"> <li>o Technology Transfer Office and Demola Budapest at Budapest University of Technology and Economics</li> <li>o Centre for Innovation, Technology Transfer and Grant Affairs at E�tv�s Lor�nd University</li> <li>o Innovation Centre at Semmelweis University</li> <li>o Office of Proposal Development and Technology Transfer at �buda University (formerly Budapest Polytechnic)</li> </ul>
<b>In the rest of the country</b>	<ul style="list-style-type: none"> <li>o Knowledge Management Centre at Sz�chenyi Istv�n University, Gy�r</li> <li>o GND Technology Transfer Office at the University of Debrecen</li> <li>o Technology Transfer Office at the University of P�cs, P�cs</li> <li>o Innovation and Technology Transfer Centre at the University of Miskolc, Miskolc</li> </ul>

### c. Stakeholders from the private R&I sector:

- **From multinational/large companies**, by industry/sector<sup>30</sup>:
  - o **Automotive:** this is one of Hungary's core industries, generating almost 21% of total exports. Suggested companies: large Original Equipment Manufacturers ("OEMs") with production facilities, like Suzuki, Audi, Opel, Daimler, Mercedes-Benz, and Audi; multinationals with R&D centres developed in collaboration with educational and academic institutions like Audi, Bosch, Knorr-Bremse, Thyssen-Krupp, Arvin Meritor, Denso, Continental, Visteon, WET, Draxlmaier, Edag, Temic Telefunken, and ZF.
  - o **Electronics:** this is one of the largest industrial sectors in Hungary, accounting for 22% of total Hungarian manufacturing production. The country is the largest electronics producer in CEE, providing 26% of total regional production. Suggested companies: top Electronic

<sup>28</sup> Source: [https://en.wikipedia.org/wiki/List\\_of\\_universities\\_in\\_Hungary](https://en.wikipedia.org/wiki/List_of_universities_in_Hungary)

<sup>29</sup> Source: <http://www.topuniversities.com/where-to-study/europe/hungary/guide>

<sup>30</sup> Source: selected from <http://eugo.gov.hu/key-facts-about-hungary/main-industries>

Manufacturing Services (“EMS”) providers like Jabil, Flextronics, Foxconn, Sanmina, Zollner and Videoton. Multinationals with R&D centres include: National Instruments and Jabil.

- **Pharmaceuticals & Medical Technology:** this is a sector with century-long tradition in Hungary and one of the most successful sectors of the economy. Hungary has the most developed pharmaceutical and biotechnology sectors in CEE. Most companies are located around four life-sciences clusters: Budapest, Debrecen, Szeged and Pécs. Suggested companies: Richter Gedeon Nyrt. as the largest biotechnology and pharma company in Hungary.
  - **ICT:** this sector accounts for 10% of total Hungarian GDP. The Hungarian ICT market has grown fast in recent years and leads the CEE region in computer assembly and communications equipment manufacturing. Suggested companies: software companies in Budapest (e.g. Ericsson, Oracle and Gameloft), hardware companies in the country (NOKIA in Komárom, IBM in Vác).
  - **Food industry:** this sector remains one of the most important of the economy (generates 6% of the country’s exports), in spite of its declining share in the output of Hungarian industry over the past decade. Suggested companies: Bonduelle, Bunge, Givaudan, Globus, Mars, Nestlé, POPZ, and Unilever.
- **From SMEs, by industry/sector<sup>31</sup>:**
- Hungary counted in 2013 a number of 525, 917 SMEs that accounted for 99.8% of all enterprises in the country and for 71% of all employees. The most important sectors for SME performance include:
- **ICT:** SMES in this sector account for the largest share of ICT employees (about 70% in 2013) and recorded a significant growth (17% in value added and 3% in the number of employees) during 2009-2013, despite the generally weak performance of SMEs in the country. ICT-related R&D represents more than 25% of total R&D expenditure. Hungarian SME software developers achieved international success in fields like virus protection, bioinformatics, and IT security. Suggested SMEs: AITIA International Ltd. (telecom, speech recognition, web services), Attrecto Innovations (smartphone solutions), BalaBit, (IT security solutions), Digital Reality (video games), Invictus Games (video games), IP Systems (IT solution provider), Key-Soft (software), NeocoreGames (video games), Prezi (software), Puli Space Technologies (space industry), Zen Studios (video games).
  - **Professional activities:** SMEs in this sector also showed an outstanding performance, increasing their value added and employment by 24% and 11%, respectively, in 2009-2013. Much of this sector’s success is due to business relationships with the *shared service centres (SSC) of multinational companies*, which created thousands of new jobs and attracted projects of high added value to Hungary. Currently, there are over 80 SSCs employing more than 30,000 people. They provide centralised business services primarily at regional, and also at a global level in some cases. Typical services include finance and accounting, procurement, logistics, IT and human resources and involve transactional roles as well as complex, high-end, value-add activities. No specific suggestions for SMEs in this sector.
  - **Manufacturing:** SMEs in this sector increased value added by 12% in 2009-2013, indicating performing on average slightly better than the entire Hungarian business economy. In contrast, the number of employees declined by 4%, because of high labour and tax costs. Suggested SMEs: Evopro Systems Engineering Ltd (Industrial automation, nearshore and offshore, mobile computing, building wiring and automation systems)
  - **Wholesale and retail trade:** SMEs in this sector account for 26% of SME employment and 22% of the value added of all SMEs. Suggested SMEs: Vill-Impex Ltd. (export-import in lighting, electrical installation materials and equipment), Gegeszoft Kft (leading wholesaler of mobile phone accessories and spare parts in Central Europe).
- **From innovative start-ups:** Digitalfactory, Graphisoftpark, Ustream Hungary Ltd., Prezi, Eutecus Ltd., Bionic Innovation Park, Biotech Knowledge Centre, MFB (Hungarian Development Bank, financial instruments), Walrus Digital Imaging Ltd., That’s My Tour, Xdroid Kft., Arató Akusztikai Fejlesztő és Tervező Ltd., NGStress

<sup>31</sup> Source: selected from [European Commission \(2014b\)](#), 2014 SBA Fact Sheet. Hungary. DG Enterprise and Industry.



- **From VC companies:** Corvinus Venture Capital Fund Management Ltd. PortfoLion, Euroventures, DBH Venture Capital, Central Invest, Finext and Biggeorge's.

**d. Stakeholders from various associations<sup>32</sup> (e.g. business, entrepreneurs, venture capital, advocacy, etc.), NGOs**

- o ICT Association of Hungary
- o Hungarian Biotechnology Association
- o Hungarian Association for Innovation
- o Hungarian Business Incubator Association
- o Hungarian Science and Technology Park Association
- o Hungarian Spin-off Company Association
- o Federation of Technical and Scientific Societies
- o Association of Industrial, Science, Innovation and Technology Parks
- o Association of Hungarian Inventors
- o Foundation for Renewing the Hungarian Research and Development
- o Scientific Associations of Technical Inventors
- o Hungarian Development Institute
- o Hungarian Industry Association
- o Hungarian Chamber of Commerce and Industry
- o Hungarian Foundation for Enterprise Promotion
- o Young Entrepreneurs Association Hungary (FIVOSZ)
- o HVCA (Hungarian Venture Capital Association)
- o Hungarian Manufacturers' Association (MAGYOSZ)
- o Hungarian European Business Council (HEBC)
- o Hungarian Association of Young Scientists
- o Hungarian Regional Science Association
- o Association of Hungarian Women in Science
- o Hungarian Chamber of Patent Attorneys

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<sup>32</sup> Source: National RDI Office <http://nkfih.gov.hu/hungarian-innovation/advocacy-organizations-150128> and PSF input

### 6.3. Suggestions on the peer-review's background documentation

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[Görg, H., A. Hijzen and B. Murakozy \(2009\)](#), The role of production technology for productivity spillovers from multinationals: firm-level evidence for Hungary, Kiel Working Paper no. 1482.

[Novotny, A. \(2014\)](#), Motivation and Success of Academic Spin-Offs; Evidence from Hungary, *The Annals of the University of Oradea*, Vol. XXIII, pp. 1212-1219.

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[Deloitte \(2014\)](#), *Hungary Corporate R&D Report*.

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Vadasz, G. (2015), Presentation at the meeting with representatives of the venture capital community, 22 May 2015.

## 7. SUGGESTIONS ON A ROADMAP FOR THE PEER-REVIEW

Steps	Who	Month
<b>A. Preparation phase</b>		
<b>1. Self-assessment of the Hungarian R&amp;I system based on the self-assessment questionnaire</b>		
<p><i>Rationale:</i> the self-assessment process serves to provide the R&amp;I community in Hungary the opportunity to discuss and define the main issues at stake on the basis of the self-assessment questionnaire. The self-assessment report is based on discussion meetings (or one self-assessment workshop divided into sessions corresponding to focus areas as proposed by the PPR report) gathering stakeholders from different parts of the system, including both policy-makers and representatives from HEIs, research institutions and private companies. This phase is used as an occasion for spreading the information about the peer review process in the country (awareness of the process, communication), but also allows the Hungarian host institutions to take full ownership of the peer review and refine / confirm its focus.</p>		
<ul style="list-style-type: none"> <li>– Dissemination to key R&amp;I stakeholders of the self-assessment questionnaire based on the focus areas proposed by the PPR panel</li> <li>– Centralisation of results at the National RDI Office and invitation of stakeholders for the self-assessment workshop</li> <li>– Self-assessment workshop organised into sessions that correspond to the focus areas (3-4 sessions) and gather different stakeholders at the same meeting (researchers, business stakeholders and policy makers) allowing all actors of the R&amp;I system to meet together (internal peers) and discuss main challenges in view of the peer review.</li> <li>– Preparation of the self-assessment report by a “peer review team” from the National RDI Office, summarizing the main outcomes of the discussions at the workshop/ replies to the questionnaire.</li> <li>– Expected outcome of the self-assessment questionnaire/workshop:               <ol style="list-style-type: none"> <li>1. Confirm or refine up to four focus areas for the peer review, in accordance with the four focus areas proposed by the PPR panel;</li> <li>2. Prepare all the actors of the Hungarian R&amp;I system for the full peer review (internal discovery process) and pave the ground for their involvement in the full peer review.</li> </ol> </li> </ul>	HU authorities	MO
<p><b>Recommendations:</b></p> <p><i>a. Start the self-assessment in Fall 2015 (preferably in October) in order to capitalise on the momentum created by the PPR panel’s visit to Budapest, which will be still fresh in the memory of key stakeholders, and take advantage of the calm political situation in the country (e.g. no elections expected in the near future, no political turmoil).</i></p> <p><i>b. Open a dedicated space on the webpage of the National RDI Office and other ministries responsible with R&amp;I for sharing information on the peer review.</i></p> <p><i>c. Use the self-assessment, which is aimed at gathering input from different stakeholders on the peer review focus areas (focus areas-based questionnaire and workshop) to further refine the definition of the proposed focus areas.</i></p> <p><i>d. Include the self-assessment report in the background documentation for the peer review panel.</i></p>		

2. Selection of the peer review panel		
<ul style="list-style-type: none"> <li>– Identification of countries (among ERAC members) and experts to participate as peer reviewers</li> <li>– Selection of up to 5 peers and of 5 and independent experts from selected countries, having expertise in specific topics related to the focus areas of the peer review (including the Chair and the rapporteur)</li> <li>– Sending out invitation letters (official letters from DG RTD)</li> <li>– Signing of contracts with the experts (DG RTD)</li> </ul>	H2020 PSF team in agreement with HU authorities	M1
<p><b>Recommendations:</b></p> <p><i>a. In the selection of countries and experts (both peer and independent experts), consider the criteria presented in section 5.1 above.</i></p> <p><i>b. In the selection of experts (both peer and independent experts), consider both the focus areas identified by the PPR panel and those identified by the self-assessment exercise conducted in Hungary, and identify the specific areas of expertise of the experts in accordance with both these perspectives. For this reason, the selection of experts should come in M1 after the completion of the self-assessment exercise in M0.</i></p> <p><i>c. In the invitation letters to the experts (both peer and independent experts), provide a clear definition of their roles, of the peer-review as a process and its outcome, of the length of the assignment and estimated periods requiring work abroad/outside their institution. This is very important in order to avoid a possible decline of the invitation caused by potential clash with teaching (in the case of academic experts) or other duties arising from the regular work programme in the public administration (in the case of peers).</i></p>		
3. Kick-off meeting in Brussels		
<ul style="list-style-type: none"> <li>- Present background of the peer review (presentations by DG RTD, Hungary authorities, and the rapporteur of the PPR panel)</li> <li>- Present the peer-review focus areas based on the PPR suggestions and the self-assessment exercise</li> <li>- Refine and agree timetable (deadlines)</li> <li>- Define division of tasks (contact persons) and communication policy</li> <li>- First exchange on the first interview phase programme (key stakeholders and roll-out of the sessions)</li> </ul>	H2020 PSF team in agreement with HU authorities	M2
<p><b>Recommendations:</b></p> <p><i>a. Provide the peer review panel with a set of background documentation (including that suggested in section 5.3 above) prior to the kick-off meeting in Brussels and allow sufficient time for them to read it and become familiar with the R&amp;I system in Hungary</i></p> <p><i>b. Delegate a contact person in the major Hungarian institution or at the national representation to the EU in Brussels that will be involved in the peer review, who will help the H2020 PSF officer in charge with the project and will ensure the coordination of peer-review operations in Hungary in collaboration with the H2020 PSF officer.</i></p>		

Steps	Who	Month
<b>Preparation phase</b>		
<b>4. Further preparation of the peer review phase:</b>		
<ul style="list-style-type: none"> <li>- Send official invitation letters to relevant stakeholders for the group meetings and/or individual interviews</li> <li>- Prepare set of background documents for peer review panel's visit including H2020 PSF input, pre-peer review report, country's input (self-assessment report)</li> <li>- Translation of necessary documents</li> <li>- Prepare final agenda for the first peer-review session (3 days)</li> <li>- Prepare a list of issues/questions for the stakeholders taking part in the group meetings and/or interviews to focus their presentations/input in each session</li> <li>- Organisation and communication of logistical aspects (meeting facilities, informing the peer review panel)</li> </ul>	<p>HU authorities in agreement with the panel and H2020 PSF team</p> <p>H2020 PSF team</p> <p>H2020 PSF team, panel experts and HU authorities</p> <p>Panel experts</p> <p>HU authorities in collaboration with H2020 PSF team</p>	M2-M3
<p><b>Recommendations:</b></p> <p><i>a. Ensure timely send-out of official invitation letters to the stakeholders and provide clear explanation in the letter about the peer-review exercise as a process and its outcome, the peers' roles, the objectives of the meetings/interviews, as well as on expectations from the stakeholders).</i></p> <p><i>b. Cover a broad range of stakeholders in terms of geographical coverage of the country, public and private institutions, specialization areas, age groups, gender representation, etc. of in order to ensure representativeness and large attendance numbers.</i></p> <p><i>c. Seek representation at close hierarchical levels, in order to avoid inhibition of lower rank stakeholders by their superiors of other higher rank stakeholders</i></p> <p><i>d. Invite stakeholders to bring with them or send in advance documentation that they consider that can be important for the peer review exercise.</i></p>		
<b>B. Actual peer review</b>		<b>M3-M4</b>
<b>1. First interview phase</b>		
<ul style="list-style-type: none"> <li>- Preparatory meeting of the peer review team</li> <li>- Actual peer review: meetings/interviews with stakeholders, over 2 days, organised around focus areas, chaired by the peer review panel Chair and moderated by different peer-review panel members (to be agreed in advance) including short 10' presentations from selected stakeholders</li> <li>- Debriefing meeting of the panel (at the end of each day)</li> <li>- Preliminary conclusions</li> <li>- Preliminary structure of the report</li> <li>- Next steps and distribution of work &amp; deadlines</li> </ul>	All	M3



<b>2. Follow-up to the first interview phase: draft peer-review report</b>		
<ul style="list-style-type: none"> <li>- Preparation of the final structure and main messages of the draft report, peer approval of key points</li> <li>- Detailed individual contributions of peer reviewers sent to the Panel Chair and the rapporteur</li> <li>- Draft report integrating contributions from the panel as well as possible contributions from DG RTD services, peer approval of key points</li> <li>- Circulate the draft report to HU national authorities and H2020 PSF team. PSF team can further involve an independent Sounding Board to give opinion on the draft</li> <li>- Draft agenda and structure of the second interview phase, on the basis of the draft report and selection of stakeholders</li> </ul>	<p>Chair/rapporteur</p> <p>Peer review panel</p> <p>Rapporteur with approval of the Chair</p> <p>Chair /rapporteur</p> <p>Peer review panel</p>	M4
<b>3. Second interview phase</b>		
<ul style="list-style-type: none"> <li>- 1 day meeting 1-2 weeks before the second country visit to be organised in Brussels to discuss the draft report and any open questions.</li> <li>- Second peer review meetings/interviews with stakeholders, over 2 days, organised around focus areas as assessed in the draft report; chaired by the peer review panel Chair and moderated by different members of the peer-review panel (to be agreed in advance) aimed at fine-tuning the draft report</li> <li>- Debriefing meetings of the panel (at the end of each day)</li> <li>- Preliminary conclusions and next steps</li> </ul>	All	M5
<p><b>Recommendations:</b></p> <ul style="list-style-type: none"> <li>a. Avoid use of overly academic terms and technicalities in the discussion with the stakeholders</li> <li>b. Ensure a good division of labour among the peer review panel in covering specific tasks related to the meetings with the stakeholders</li> <li>c. Assign a peer to coordinate specific stakeholder group meetings based on their expertise and background.</li> <li>d. Prepare a draft outline of the report in advance in order to facilitate the work, use clear terms of reference, correlate sections with the specific expertise of the peers.</li> <li>e. Consider organizing sessions of the country visits around challenges (possible short kick-off presentations of 3-5 slides of selected stakeholders)</li> </ul>		
<b>C. Reporting phase</b>		
<ul style="list-style-type: none"> <li>- Final contributions from the peer review panel, as well as possible contributions from DG RTD services.</li> <li>- Discuss the draft report with HU and H2020 PSF team before finalizing it</li> <li>- Circulate the draft final report to HU national authorities and H2020 PSF team.</li> <li>- Submit final report with concrete recommendations addressing each focus area, and including possible case studies or descriptions of instruments in other EU countries as provided by the peer reviewers, the</li> </ul>	<p>Peer review panel</p> <p>Chair/rapporteur in relation with H2020 PSF team and HU authorities</p> <p>Chair/rapporteur in relation with the panel</p> <p>Peer review panel</p>	M6 or after, as agreed with HU authorities

<p>independent experts or RTD services, as annexes or text 'boxes'</p> <ul style="list-style-type: none"> <li>- Submit the final report to the HU authorities</li> <li>- Feedback mission to present/discuss results to peer reviewed (national authorities; stakeholders) with a press conference on the peer-review outcome</li> <li>- Circulation of report to ERAC, followed by presentation and discussion at ERAC plenary meeting</li> <li>- Final report uploaded/shared on the PSF/RIO Library (upon agreement of the peer reviewed country) and possible dissemination activities</li> </ul>	<p>H2020 PSF team with peer review panel and Chair/rapporteur</p> <p>H2020 PSF team</p>	
<p><b>Recommendations:</b></p> <p>a. <i>Ensure broad dissemination of the final report among R&amp;I stakeholders, especially those involved in the peer-review exercise, through specific activities at the respective institutions, e.g. workshops, websites, etc.</i></p>		

## 8. SUGGESTIONS ON A QUESTIONNAIRE FOR THE HUNGARIAN SELF-ASSESSMENT

The questionnaire for the Hungarian self-assessment in view of preparing the peer-review includes 15 questions designed in correlation with the focus areas proposed for the peer-review:

### ***Focus area 1: R&I policy-making and governance:***

- Q1: What improvements would you make to the current set of R&I policies in order to increase quality, effectiveness and performance output of Hungarian R&I?
- Q2: What are, in your opinion, the top 3 priorities for the public funding of R&I (national and EU funding) in view of more efficient use of financial resources?
- Q3: How could the national and EU funding be better correlated?
- Q4: What changes in the evaluation criteria would you consider as the most important for improving the selection of RDI proposals for public funding?
- Q5: What measures would you consider necessary to reduce administrative bureaucracy and rigidity in the National RDI Office and the major R&I institutions in Hungary?

### ***Focus area 2: Improving the supply of human resources for R&I:***

- Q6: What measures would you consider necessary in higher education to improve the quality and employability of graduates?
- Q7: How could young researchers be encouraged to participate more actively in international research and innovation projects?
- Q8: What incentives could be adopted for researchers to stay in Hungary and come to Hungary from abroad?

### ***Focus area 3: Improving University-Industry cooperation, technology transfer and entrepreneurship:***

- Q9: What should the government, the universities and the companies do, in your opinion, to improve University-Industry cooperation?
- Q10: What measures are necessary to strengthen TT and research commercialisation?
- Q11: How could entrepreneurial education for students and start-up founders be improved?

### ***Focus area 4: Improving framework conditions for innovation in the business sector:***

- Q12: What measures could be adopted to improve the economic context for R&I (e.g. in terms of foreign capital financing, economic structure of the country, internationalization of Hungarian firms)?
- Q13: What should the government do to ensure more institutional stability and predictability of public funding for R&I?
- Q14: What measures should be adopted to strengthen competition in the private sector?
- Q15: What measures could be adopted to increase availability of funding for innovative firms?

## 9. ANNEXES

### Annex 1: Main changes in the Hungarian R&I system since the 1990s

<b>Main changes in 2014</b>
<ul style="list-style-type: none"> <li>- Approval of the new Law LXXVI (25 November 2014) on "Scientific Research, Development, and Innovation", which stipulates the establishment of: <ul style="list-style-type: none"> <li>o The National Research, Development and Innovation Office (NKFI) that, from January 2015, integrates the activities of the previous National Innovation Office (NIH) and ministry departments responsible for innovation policy</li> <li>o The National Research, Development and Innovation Fund in January 2015 that integrates the Hungarian Scientific Research Fund (OTKA) and the former Research and Technological Innovation Fund (KTIA)</li> </ul> </li> <li>- The Prime Minister's Office overtakes the role and responsibilities of the National Development Agency (NFÜ) responsible body for distribution of the Structural Funds <ul style="list-style-type: none"> <li>o Dedicated ministries became successors of the managing authorities previously working under NFÜ</li> </ul> </li> </ul>
<b>Main Changes in 2013</b>
<ul style="list-style-type: none"> <li>- Set up of a new advisory body - the National Science Policy and Innovation Board (NTIT)</li> <li>- National Development Agency works within the Prime Minister's office and is supervised by a government commissioner</li> </ul>
<b>Main changes in 2012</b>
<ul style="list-style-type: none"> <li>- Reorganisation of the research network of the largest PRO, the Hungarian Academy of Sciences (MTA)</li> <li>- Set up of the National Development Cabinet (NFK) that co-ordinates all major governmental development actions including STI policy decisions and dissolution of the National Research, Innovation and Science Policy Council (NKITT)</li> </ul>
<b>Main Changes in 2010</b>
<ul style="list-style-type: none"> <li>- Establishment of the National Innovation Office (NIH) as a new governmental body responsible for research, development and technological innovation</li> <li>- The Research and Science Policy Council created in September 2009 was dissolved on 15 December 2010 and the National Research, Innovation, and Science Policy Council (NKITT) is set-up as an advisory body to co-ordinate governmental STI policy decisions</li> </ul>
<b>Main changes in 2009</b>
<ul style="list-style-type: none"> <li>- A government decree, approved on 28 March 2009, introduced some elements of the STI Policy Action Plan for 2007-2010. Only one organisational change was implemented: abolition of the high-level coordination body for STI policy- the Science and Technology Policy Council (TTPK), headed by the Prime Minister. The other measures could not be implemented because of the PM's resignation in April 2009.</li> <li>- In April 2009, a new government was formed, and the position of a minister without portfolio, responsible for coordinating R&amp;D, technological innovation, and science policies, created in 2008, was dissolved. Law on the Hungarian Academy of Sciences (MTA) was amended to increase MTA's financial autonomy.</li> <li>- The Research and Science Policy Council was created in September 2009</li> </ul>
<b>Main changes in 2008</b>
<ul style="list-style-type: none"> <li>- Early 2008, the President of NKTH takes again responsibility for the allocation of the Research and Technological Innovation Fund.</li> <li>- Creation in May 2008 of a new position for a minister without portfolio, responsible for coordinating R&amp;D, technological innovation, and science policies (further to a major government reshuffle). The new minister without portfolio was tasked with supervising the NKTH.</li> </ul>
<b>Main changes in 2007</b>
<ul style="list-style-type: none"> <li>- In January 2007, an amendment of the Law on the Research and Technological Innovation Fund, entitles the Minister of Economy and Transport to take operational decisions regarding the use of the Fund, significantly expanding the minister's power;</li> <li>- Approval of the STI Policy Action Plan for 2007-2010 on 29 August 2007, which stipulates that the STI governance system should be overhauled</li> </ul>
<b>Main changes in 2006</b>
<ul style="list-style-type: none"> <li>- NKTH goes under the supervision of the Minister of Economy and Transport who replaced the Minister of Education in this function.</li> </ul>

#### **Main changes in 2004**

- Creation of the National Office for Research and Technology (NKTH), in January 2004, as an independent agency with responsibilities on R&D and innovation policy-making, technology policy, management of international bilateral and multilateral R&D cooperation, supervision of the network of Hungarian S&T attaches. Its main function is to manage the Research and Technological Innovation Fund established in January 2004 to ensure more stable financing of R&D.
- Approval of Law CXXXIV (2004) on R&D and Technological Innovation, a framework legislation that Promotes the sustainable development of the Hungarian economy through Research and Development (R&D) and Technological Innovation (TI). It aims at increasing the competitiveness of enterprises and at the effective exploitation of both regional R&D and regional innovation potentials. The act encourages the creation of high value added workplaces, and fosters improvement of both professional skills and the recognition of researchers' performance. The law sets out the tasks of the government in supporting R&I, what should be supported from public funds, how to promote the exploitation of IP, etc.

#### **Main changes in 2003**

- The OMFB Council was re-established and renamed the Research and Technological Innovation Council (KTIT) under the Law on the Fund for R&D and Technological Innovation (Act XC of 2003).
- In April 2003, the Science and Technology Policy Council (TTPK), the highest-level co-ordination and consultation body for S&T policy established under this name in 1999 was reformed, and the Science and Technology Policy Advisory Board (TTTT) was established as an expert committee comprised of members of the research and business community to aid the TTPK.

#### **Main changes in 2002**

- Revision of the Széchenyi Plan, after general elections in May 2002, when the new coalition government, faced with budgetary constraints, cut back on some of the Plan's activities. A new National Development Plan was drawn up, declaring R&D and innovation a policy priority, aiming for achieving a knowledge society/economy.

#### **Main changes in 2000**

- The Széchenyi Plan becomes a first attempt towards an innovation strategy with a long-term view. It includes Science and Technology Policy 2000, summarising S&T policies and planned actions.
- In January 2000, the OMFB Council became an advisory body to the Minister of Education and lost decision-making power.

#### **Main changes in the 1990s**

- *Early 1990s*: abandonment of nearly all specialised state-financed R&D programmes and replacement of previously dominant top-down funding system for R&D by a bottom-up approach and support for individual projects by research institutes and companies. This was complemented by institutional funding for major public research institutions (essentially universities and the MTA).
- *Mid-1990s*: 1995 fiscal stabilisation programme led to substantial public spending cuts, including public expenditure on R&D, which fell to an all-time low of 0.67% of GDP in 1996. Layoffs and closures in many public research institutes. The National Committee for Technological Development (OMFB) is the government body that co-ordinates R&D strategy, international relations, technology development funds and programmes.
- *Second half of the 1990s*: formulation of the first National Development Plan (Széchenyi Plan), changes in the institutional setting for R&D policy, and creation of a new research funding system.

Source: selected from Dory (2014), Havas (2011), OECD (2008)

## Annex 2: Main national strategies for R&I

Main national strategies
<ul style="list-style-type: none"> <li>• <b>The National Research, Development and Innovation Strategy (2013-2020) "Investment in the Future"</b> approved by government decree in 2013. Aims to raise the R&amp;I investments and strengthen the competitiveness of the Hungarian economy. The strategy sets the target to raise the amount of R&amp;D expenditures to 1.8% of GDP and the BERD/GDP ratio to 1.2%, and increase the number of researchers from 37,000 in 2012 to 56,000 by 2020. It addresses the priorities of the EU and the Horizon 2020 programme, as well as the importance of smart specialisation and market developments. It supports the development of a knowledge-based, internationally competitive R&amp;I system, where specific targets are: stimulation of RTDI demand, establishment of an efficient support and funding system, and development of the start-up ecosystem. The vision, objectives and instruments of the National RDI strategy are considered in the elaboration of sectoral strategies and S3 strategies.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>The Higher Education Strategy "A Change of Pace in Higher Education"</b> introduced in October 2014, sets the direction of the higher education system for the coming 15 years. It focuses on key issues for a competitive higher education, such as: performance-based teaching and learning, world-class research, involvement of higher education in urban and regional development, institutional changes, innovative management and funding of higher education. It aims to achieve world-class education and research by focusing on a limited number of research areas and establishing RDI networks among HEIs, companies and foreign HEIs and research centres. The strategy also aims at having at least one Hungarian university to qualify as a member of the League of European Research Universities (LERU) by 2025.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>National Smart Specialisation Strategy (S3)</b> adopted by the government in November 2014 aims to improve research capacities in all regions, especially research infrastructures that can have significant impact on the growth of the Hungarian economy. A multi-level governance structure was established for the elaboration of the S3, as a result of which the following national priorities were defined: (i) healthy society and well-being; (ii) advanced technologies in the vehicle and other machinery industry; (iii) clean and renewable energies; (iv) sustainable environment; (v) healthy and local food; (vi) agricultural innovation. In addition, a few horizontal priorities have been set up: i) ICT and related services; ii) inclusive and sustainable society and liveable environment.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Research Infrastructures in Hungary</b> adopted by the government in 2014 in order to achieve the RDI objectives envisaged in the National Reform Programme related to the Europe 2020 Strategy.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>New Széchenyi Plan (ÚSZT)</b> is the national strategic reference framework of Hungary that offers a basic action plan for the last 3 years of the 2007-2013 programming period.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>National Reform Programme 2015</b></li> </ul>
<ul style="list-style-type: none"> <li>• <b>National reform programme 2012 (Széll Kálmán Plan 2.0)</b> defines the mid-term and long term aims of the government and is aligned to the EU2020 documents</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Széll Kálmán Plan 1.0</b> was introduced in March 2011 as a structural reform plan that held as main objectives to reduce the public debt and foster economic growth through 26 objectives.</li> </ul>
<ul style="list-style-type: none"> <li>• The <b>First National Environmental Technology Innovation Strategy (NETIS)</b> adopted by the government at the end of 2011 as a framework for eco-innovation within the Hungarian National Reform Programme's "18<sup>th</sup> measure" on the renewal and implementation of the country's RDI programme. The government aim is to foster environmental industries and technology, focus on environmental innovation, reduce primary material use and encourage reuse and recycling, ensuring a paradigm shift from an "end-of-pipe" approach to environmental issues to prevention of problems. The Strategy uses a targets-based approach (17 targets to be achieved by 2020). The finance for these measures comes from EU research, agricultural, cohesion and structural funds, and the Norwegian Financial Mechanism, which is available through Norway's membership of the European Economic Area (EEA).</li> </ul>
<ul style="list-style-type: none"> <li>• <b>National Energy Strategy 2030</b> provides several objectives to be achieved by the country by 2030 in terms of energy efficiency, increased use of renewable energy and of low CO<sub>2</sub>-emission transport. The Energy Strategy envisages several energy mix scenarios and recommends a Nuclear-Coal-Green scenario for the future. The Strategy has an Energy Industry Development and RDI Action Plan that was drafted in 2013 in the field of energy RDI in order to support the companies that build intelligent systems facilitating the regulation of electricity networks. The Action Plan contributes to domestic employment and the production of exportable products and services (nuclear supply, nuclear training, designing, implementing and operating intelligent systems).</li> </ul>
<ul style="list-style-type: none"> <li>• <b>National Biodiversity Strategy 2014-2020</b>, approved in 2014, has an objective on genetically modified organisms that is financed by OTKA.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>National Transport Infrastructure Development Strategy</b>, adopted in 2014, introduces a long-term national transport strategy, which focuses on the development of infrastructure and its economic and environmental sustainability. In modernising the public transport, developing low-cost intermodal hubs and a domestic vehicle manufacturing sector, the Strategy acknowledges the need for using R&amp;D-driven, innovative and environmentally friendly technologies, with special attention to Hungarian patenting.</li> </ul>

Source: selected from Dory (2014) and websites of the National RDI Office/[National Strategies](#), Ministry of Rural Development.



### Annex 3: R&I programmes for 2015 funded by the National RDI Office

Call for proposal	Target	Focus	Financial source*			Main eligible groups		
			GINOP	VEKOP	NKFIA	compa nies	acad emy	individ uals
Excellence in R&D labs	academy	research	x	x			x	
R&I infrastructure support and networks	academy	infrastructure	x	x			x	
Bilateral international scientific and technological cooperation	academy	research			x		x	
Research topics	academy	research			x		x	
Support of business RDI processes (grant+credit)	companies	innovation	x			x		
Prototype, product, technology and service development	companies	innovation	x	x		x		
Support of HU participants in international SME competitions	companies	<i>special</i>			x	x		
National RDI programmes	cooperation	research, innovation			x	x	x	
Support of business RDI processes	cooperation	innovation	x	x		x	x	
Innovation voucher	cooperation	innovation	x		x	x		x
Excellence in competitive R&D cooperation	cooperation	research, innovation	x		x	x	x	
Development of international R&D partnerships	cooperation	research, innovation	x			x	x	
Cooperation of higher education institutions and the industry	cooperation	research, innovation	x		x	x	x	
Pre- and post-doctoral fellowship	researchers	research			x			x
ERC Hungary	researchers	research			x			x
Protection of intellectual property	<i>special</i>	<i>special</i>	x		x	x	x	x
ELI-ALPS (phase 2)	<i>special</i>	research	x			ELI		
Small calls supporting Hungarian H2020 participation	<i>special</i>	<i>special</i>			x	x	x	
Innovation ecosystem – start-ups and spinoffs	Start-up companies	innovation	x		x	x		

GINOP = EDIOP (Economy Development and Innovation OP)

VEKOP = CCHOP (Competitive Central Hungary OP)

NKFIA = National Research, Development and Innovation Fund

Source: National Research, Development and Innovation Office (2015)

#### Annex 4: Policy measures in support of technology transfer

Policy measure	Purpose
<i>"Start-up_13" – development of the Hungarian start-up ecosystem</i>	Support for the development of technology start-ups exploiting R&D results and. Two-staged programme.
<i>"Open laboratories" Pilot measure in S3</i>	Establishment of public research labs and corporate labs for the public and other companies and SMEs. These open labs would facilitate networking between public research centres, technology centres, large companies and SMEs and support the innovation activities of those actors of the R&I system that have no research capacities and equipment. The expected benefit of the measure is to help companies that are currently non-innovating to engage in some innovation activity with the help of open labs. Also, the open labs could play a "living lab" role.
<i>"Higher Education and Industry Collaboration Centres" (FIEK) Pilot measure in S3</i>	Centres that aim to support broad University-Industry cooperation, develop sectoral training and RDI activities in a coordinated way, aligned with economic interests. Based on the "quadruple helix" model, several HEIs, research institutes, sectoral large enterprises and SMEs are expected to participate in cooperation activities. FIEK participants aim to jointly develop curricula and education methods on subjects that meet the technological needs of industry, harmonise their accreditation activities, and develop a common structure and practice-oriented (dual) education.
<i>Knowledge Parks</i>	The Knowledge Parks aim to support of strategic collaboration between HEIs and their partners; long-term development of knowledge transfer and RDI services; development of RDI priority activities in the context of the National RDI strategy and S3 strategy, as well as monitoring and evaluation methodologies; and development of institutional collaboration.
<i>Business incubators, industrial parks and science parks</i>	Supported by the Economic Development and Innovation OP (GINOP), in particular Priority 1 in view of increasing SMEs' competitiveness

Source: selected from Dory (2014)

## Annex 5: Agenda of the Budapest visit (20-22 May 2015) and participants

DAY 1 – 20 May 2015	
Venue: National Research Development and Innovation Office, 1061 Bp, Andrásy út 12.	
<b>09:30 - 11:00</b>	<b>GOVERNANCE &amp; SCOPE OF POLICY</b> <ul style="list-style-type: none"> <li>• Structure, governance and policy coordination of the Hungarian R&amp;I system</li> <li>• National R&amp;I strategies and programmes</li> <li>• Stakeholder involvement in policy-making</li> <li>• Demand-side vs. supply-side innovation policies</li> <li>• Regional innovation policy and the National Strategy for Smart Specialisation</li> </ul>
<b>11:30 - 13:00</b>	<b>PUBLIC FUNDING SYSTEM</b> <ul style="list-style-type: none"> <li>• Funding of the R&amp;I system (national and EU funding, institutional vs. competitive funding, use of peer-review)</li> <li>• Support to business R&amp;D</li> </ul>
<b>13:00 - 14:00</b>	<b>Lunch break</b>
<b>14:00 - 16:00</b>	<b>PUBLIC FUNDING SYSTEM (cont.)</b> <ul style="list-style-type: none"> <li>• EU funding of R&amp;I</li> <li>• Role of the Hungarian RDI system in international networks. Cross-border cooperation</li> </ul>
<b>16:00 - 17:30</b>	<b>MEETING WITH PROFESSOR PÁLINKÁS, PRESIDENT OF THE NATIONAL RESEARCH DEVELOPMENT AND INNOVATION OFFICE</b>
<b>17:30 - 18:30</b>	<b>PANEL ONLY SESSION: WRAP-UP OF THE DAY</b>
DAY 2 – 21 May 2015	
Venue:	
Morning - Hungarian Academy of Sciences, 1117 Budapest, Magyar tudósok körútja 2.	
Afternoon - European Commission Representative Office, 1024 Bp. Lövház u 35, 3rd floor	
<b>09:30 - 13:00</b>	<b>PUBLIC RESEARCH ORGANISATIONS: HUNGARIAN ACADEMY OF SCIENCES</b> <ul style="list-style-type: none"> <li>• The Hungarian Academy of Sciences as the largest public research organisation</li> <li>• Implementation of the R&amp;I policy mix and funding of the public R&amp;I sector</li> <li>• Quality of the human resources for the public R&amp;I sector (including researchers' supply and career)</li> <li>• Links with the private sector and University-Industry cooperation</li> </ul>
<b>13:00 - 14:30</b>	<b>Lunch break</b>
<b>14:30 - 16:30</b>	<b>TECHNOLOGY TRANSFER, SCIENTIFIC PARKS</b> <ul style="list-style-type: none"> <li>• Technology transfer and research commercialisation</li> <li>• University-Industry cooperation and promotion of entrepreneurship</li> <li>• Participation in clusters, technological parks</li> </ul>
<b>16:30 - 18:00</b>	<b>CONSULTANTS, RESEARCHERS</b> <ul style="list-style-type: none"> <li>• Coherence of R&amp;I policy mix</li> <li>• Framework conditions for R&amp;I</li> </ul>
<b>18:00 - 19:00</b>	<b>PANEL ONLY SESSION: WRAP-UP OF THE DAY</b>
DAY 3 – 22 May 2015	
Venue: European Commission Representative Office, 1024 Bp. Lövház u 35, 3rd floor meeting room.	
<b>09:30 - 11:30</b>	<b>Business R&amp;I</b> (Representatives of SME's, multinationals, innovative firms) <ul style="list-style-type: none"> <li>• Public support to business R&amp;I</li> <li>• Availability of skilled workforce</li> <li>• Obstacles to the creation and growth of innovative firms (effectiveness of current policies)</li> <li>• Role of framework conditions (financial markets, regulators and technology intermediaries, access to credit and risk capital for innovative projects)</li> <li>• Involvement in clusters</li> </ul>
<b>11:30 - 13:00</b>	<b>Start-up ecosystem, venture capital</b> <ul style="list-style-type: none"> <li>• Venture capital market in Hungary</li> <li>• Innovative start-ups</li> </ul>
<b>13:00-13:30</b>	<b>Panel only session: wrap-up of the day</b>
<b>14:00-15:00</b>	<b>Wrap up of the country visit</b>

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## SUMMARY

As part of the activities of the Horizon 2020 Policy Support Facility (PSF), a pre-peer review of Hungary's research and innovation (R&I) system was conducted during May-September 2015 by a panel of three high-level independent experts: Dr. Marina Ranga, Senior Researcher, H-STAR Institute, Stanford University (Rapporteur); Dr. Raquel Ortega-Argiles, Rosalind Franklin Research Fellow, University of Groningen, Faculty of Economics and Business; and Dr. Anthony Bartzokas, Board member of the European Bank for Reconstruction and Development, Professorial Fellow at UNU-MERIT and faculty at the University of Athens, Department of Economics.

The pre-peer review panel focused on six main topics of high importance in the current context of the national R&I system: (i) The R&I system; (ii) The public R&I sector; (iii) Technology transfer, University-Industry cooperation and entrepreneurship; (iv) Framework conditions for R&I; (v) The business R&I sector; and (vi) Venture capital for innovative start-ups. For each main topic, the panel identified a set of strengths and weaknesses and four focus areas that have been proposed for in-depth examination by the subsequent peer-review: (i) R&I governance, funding and policy-making; (ii) Availability of human resources for R&I; (iii) University-Industry cooperation, technology transfer and entrepreneurship; and (iv) Framework conditions for innovation in the business sector. In addition, the pre-peer review panel made suggestions on peer and independent experts, on R&I stakeholders to be involved in the peer-review interviews, on background documentation for the peer review, on a peer review roadmap and on a self-assessment questionnaire to be conducted by the Hungarian stakeholders before the peer review.

The pre-peer review panel's work was conducted with a systemic perspective of Hungary's R&I system, focusing on the functionality of key institutions for R&I governance and funding, their linkages with other national and regional R&I stakeholders, linkages between R&I stakeholders internally within the system and also externally with other national and EU partners. This first PSF analysis of the Hungarian R&I system's functionality indicates four specific areas for further consideration in the peer-review process, which offers a platform to examine these issues and provide appropriate solutions to the Hungarian R&I authorities.