

The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2017

Volume 7, Pages 115-122

**ICRES 2017: International Conference on Research in Education and Science**

## RIS3 STRATEGY VERSUS NATIONAL OPEN INNOVATION STRATEGY IN SLOVAKIA

Marian Zajko

Slovak University of Technology in Bratislava

**Abstract:** In December 2016 Austria presented to domestic and international audiences in Vienna the National Open Innovation Strategy as one of the first countries in the world. The underlying ambition of this strategy is to contribute to achieving objectives of Open Innovation 2.0 and thus boost Austria in the group of European innovation leaders. It is not only the content and structure of this vision but also approach to its elaboration and its justification which are worth pondering. Within the Europe 2020 Strategy all EU countries elaborated own Research and Innovation Strategies for Smart Specialization (RIS3) for period 2014 to 2020 and implement them. If both Austria and Slovakia follow implementation of their RIS3 Strategies, is there any need for Open Innovation Strategy in Slovakia as well? Slovakia as a moderate innovator in the EU context struggles to make the triple helix model viable (low indices GERD and BERD as % of GDP) and work properly in its economy and society. Therefore the paper deals with analysis of components of RIS3 Strategy and National Open Innovation Strategy. It recommends to enrich the Slovak RIS3 Strategy with facets of OI paradigm in order to make the quadruple helix concept work in the Slovak economy in the next years and move it up in the group of strong innovators.

**Keywords:** RIS3 strategy, open innovation paradigm, quadruple helix model, open innovation 2.0

### Introduction

The paper will focus on comparison of selected aspects of innovation strategies of Slovakia and Austria. According to the Innovation Union Scoreboard (2016) Austria ranks among the strong innovators whereas Slovakia among the modest innovators. Slovakia lags behind Austria in most of the evaluation dimensions nearly achieving the Austrian level in Human resources and surpassing it in Economic effects of innovations as shown on the Table 1 below.

Table 1 Comparison of Austria and Slovakia by dimensions of summary innovation index

Year 2015	Summary Innovation Index	Human resources	Research systems	Finance and support	Firm investments	Linkages & entrepreneurship	Intellectual assets	Innovators	Economic effects
Austria	<b>0.591</b>	0.650	0.561	0.538	0.517	0.629	0.707	0.647	0.475
EU	<b>0.521</b>	0.575	0.466	0.490	0.426	0.473	0.556	0.526	0.573
Slovakia	<b>0.350</b>	0.642	0.166	0.255	0.267	0.209	0.239	0.415	0.490

Source: Innovation Union Scoreboard (2016).

The reasons of this situation lay in different economic and political development of these countries. Austria had been a market economy in the 20th century and parliamentary democracy from 1918 to 1945. From 1945 until 1955 it was governed by the Allied Commission for Austria. In 1955 it became an independent republic with a neutral status which has been kept up till now. It joined European Union on 1 January 1995 and Eurozone on 1 January 1999. Czechoslovakia was in the period 1948 to 1990 a centrally planned economy and a part of the Soviet economic, political and military bloc. Since 1969 it was a federation of Czech and Slovak Socialist

- This is an Open Access article distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 Unported License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

- Selection and peer-review under responsibility of the Organizing Committee of the conference

\*Corresponding author: Marian Zajko- E-mail: marian.zajko@stuba.sk

Republics. It returned to the market economy and parliamentary democracy again in 1990 and on 1 January 1993 the Czech and Slovak Federal Republic peacefully split into two independent states Czech and Slovak Republics. Both republics became members of NATO on 29 March 2004 and of the European Union on 1 May 2004. On 1 January 2009, Slovakia was admitted in the Euro zone.

## **Problem Statement**

The brief comparison of Austrian and Slovak R&I systems and policies indicates substantial differences in the maturity of the key dimensions of national R&I systems, their strategic ambitions and related long-term focus of R&I policies and their funding which are finally reflected in the R&I performance. Unlike Slovakia Austrian government decided to respond to the challenges of the Open Innovation 2.0 initiative with formulation of the National Open Innovation Strategy as an expansion of its RTI Strategy and RIS3 Strategy.

The RIS3 Strategy for Slovakia represents national innovation strategy for the period 2014 -2020. It does not consider any explicit implementation of the open innovation concepts, methods and models. Open innovation concepts, methods and models are not well-known among Slovak enterprises. However, domestic and international collaboration in innovations is quite frequent especially among Slovak large and medium-size companies, since it is required in the government or EU innovation support programmes. It is not the case for the rest of the Slovak SMEs where microcompanies prevail (Zajko, 2013). The largest European innovation support service, the Europe Enterprise Network (EEN), active in Slovakia as well, addresses the innovation challenges of SMEs mainly by organising sector-specific brokerage events or clusters. EEN support services are labour intensive, the available resources are small, so the level of support provided to new company collaborations is limited and they often fail to realise their potential.

Since the knowledge about open innovation concepts, methods and models among company managers and their systematic use in the company innovation activities in Slovakia are underdeveloped they deserve more attention in the documents on R&I strategy and in the implementation policies. Therefore the next section of this paper deals with the scope, measures, institutional background and financing of the National Open Innovation Strategy of Austria in relation to the running implementation of RIS3 Strategy. It leads to recommendations to enrich the Slovak RIS3 Strategy with facets of OI paradigm in order to make the quadruple helix concept work in the Slovak economy in the next years and move the country faster up in the group of strong innovators.

## **Methods**

In the paper there are applied methods of qualitative research in order to explore key characteristics of the Open Innovation 2.0 approach and National Open Innovation Strategy of Austria using the secondary data from websites and related publications.

## **Results and Findings**

### **Open Innovation 2.0**

Since 2008 the Open Innovation Strategy and Policy Group (OISPG) has been uniting industrial groups, academia, governments, and private individuals to support policies for open innovation at the European Commission. OISPG has published annual yearbooks documenting and summarizing current innovation practices in Europe. It distinguishes two development stages of open innovation paradigm. The first stage started in 2003 by H. Chesbrough's formulation of open innovation concept which strategically leverages internal and external sources of ideas and takes them to market through multiple paths. Open Innovation 2.0. (OI 2.0) is a new paradigm based on a quadruple helix innovation model where government, industry, academia and civil participants work together to co-create the future and drive structural changes far beyond the scope of what any one organization or person could do alone. This model encompasses also user-oriented innovation models to take full advantage of ideas' cross-fertilisation leading to experimentation and prototyping in real world setting. In OI 2.0 there is also a cultural shift away from resisting change and toward innovation and the creation of shared value. Besides the quadruple helix innovation further distinguishing features of the OI2 are i) focus on user involvement and user experience, ii) building of innovation ecosystems as networks of formal and informal groupings based on trust, shared resources, shared vision, and shared value, and iii) innovation co-creation and engagement platforms (Curley, M., & Samelin, B., 2013).

## Innovation Policies in Austria

In GCI in the period 2010-2011 to 2016-2017 Austria sank from the rank 15 out of 139 countries with GCI score 5.67 to the rank 19 out of 138 countries with GCI score 5.2. Among its strengths ranks the Innovation pillar of GCI where it holds rank 14/138 with score 5.0 whereas its score in the other GCI pillars ranged from 4.5 to 5.8 (Schwab, K. 2016). Austria has a strong and well-developed research, technology and innovation system at the federal and province levels. The country has been following the Austrian Research, Technology and Innovation (RTI) Strategy for the period 2011-2020 with the ultimate goal to become one of the European innovation leaders. According to its motto “Realising Potential, Increasing Dynamics, Creating the Future: Becoming an Innovation Leader”, the strategy addresses measures to strengthen national research structures with a focus on excellence, to foster the innovative capacity of companies, allow for thematic priority setting, raise the efficiency of governance, and link research, technology and innovation to the education system. The strategy was the result of a planned process of several years of discussions and analyses from the nation-wide Austrian Research Dialogue (2007-2008) of stakeholders on further development of the innovation system and knowledge-based society up to the comprehensive expert evaluation of the Austrian research funding system. Finally, in 2009, the Council for Research and Technology Development made its proposals on further development of the Austrian research and innovation system (“Strategy 2020”). In 2013, ministries responsible for economy and science and research were merged into the new Federal Ministry for Science, Research and Economy which brought increasing prominence of R&I in economic policy.

In December 2013, the newly elected government in its Government Programme confirmed the orientation on the R&I Strategy in order to advance towards the group of the most innovative research countries in Europe as one of its objectives. Within the Europe 2020 Strategy Austria elaborated the Research and Innovation Strategy for Smart Specialization (RIS3) for period 2014 to 2020 complemented by the regional strategies of nine provinces. Only some of these strategies were drafted according to S3 model. As a follow up of the R&I Strategy, an Action Plan for a Competitive Research Area was drawn up by the Federal Ministry of Science, Research and Economy and presented on 25 February 2015. In parallel with it the country was working on the the National Open Innovation Strategy which was presented to domestic and international audiences in Vienna in December 2016. It was the first strategy of this kind in the world with underlying ambition to contribute to achieving objectives of Open Innovation 2.0 and thus boost Austria in the group of European innovation leaders. Development of selected R&D indicators in Austria is represented in the Table 3 below.

Table 3 Selected R&D indicators in Austria

Indicator	2011	2012	2013	2014	2015	EU-28 average (2014)
GERD (as % of GDP)	2.68	2.89	2.96	2.99	3.07	2.03
BERD (as % of GDP)	1.84	2.03	2.1	2.11	NA	1.3

Source: Schuch, K., & Gampfer, R. (2016), adjusted.

Gross expenditure on research and development (GERD) increased steadily from 2.81% in 2012 to 3.07% of GDP in 2015. Only the GERD of two EU Member States (the innovation leaders Sweden and Denmark) exceeded the level of 3.0% of GDP by then. Business expenditure on research and development (BERD) as a share of Austrian GDP stood at 2.11% in 2014, significantly higher than the EU-28 average (1.3%). In terms of R&D financing, the Austrian private sector funded 46.6% of overall R&D expenditure in 2014 and an estimated 47.2% in 2015. The public share in funding of GERD was 37.7% in 2014 and an estimated 37.3% in 2015. The overall RTI policy target in Austria is to invest 3.76% of GDP for R&D by the year 2020 as outlined in the national R&I strategy and achieve the ratio of public funding versus private funding 1:2.

## Research, Technology and Innovation Strategy and Open Innovation Strategy for Austria

The Austrian Open Innovation (AOI) Strategy follows the key current strategic guidelines laid down in RTI Strategy of the Austrian Federal Government. Together with the Start-up Country Strategy, the sixteen open access recommendations made by the Open Access Network Austria (OANA), and further documents under preparation (IP Strategy, Digital Roadmap, Guiding Concept for Public Procurement, Promoting Innovation and the Creative Industries Strategy), it makes a coordinated contribution to the transformation of society, science, business and public administration and to consolidation of Austria’s innovative strength and competitiveness. It expands the triple helix model (science and research, industry, public administration and politics) to a quadruple helix model (that includes civil society) in order to increase the innovative capability of the system and reduce the inherent risk of failure through the early involvement of society and the market.

The AOI Strategy follows three core objectives:

- 1 To open up, broaden and further develop the Austrian research and innovation system and in particular to develop new sources of innovation and strengthen the networking capability of the participating actors and organisations;
- 2 To increase the involvement of citizens (end users) in generating innovation. This may also contribute to significantly raising the value attached to innovation, research and development by the public;
- 3 To increase the efficiency and result orientation of the Austrian innovation system by implementing innovative forms of knowledge transfer and incorporating to a greater extent the needs of society, business and public administration into the research and innovation system.

The development of this strategy followed the open innovation principles as well. It was one-year, open-ended process involving more than 400 stakeholders in formulating the vision for 2025 and strategic tasks related to existing challenges in three key areas of action: (1) “Culture & Competences”, i.e. development of a culture of open innovation and teaching open innovation skills among all age groups; (2) “Networks & Cooperation”, i.e. formation of heterogeneous open innovation networks and partnerships across disciplines, branches of industry and organisations; (3) “Resources and Framework Conditions”, i.e. mobilisation of resources and the creation of framework conditions for open innovation.

For these areas there were formulated the following fourteen measures which can be assigned to one or several action areas:

- 1) Create open innovation and experimental spaces;
- 2) Embed open innovation elements at kindergartens and schools as well as in teacher training;
- 3) Further develop public administration by means of open innovation and greater public involvement;
- 4) Set up and operate an open innovation platform for social/societal innovation and as a contribution to overcoming global challenges;
- 5) Set up and operate an innovation map including a matchmaking platform for innovation actors;
- 6) Build up research competence for the application of open innovation in science;
- 7) Establish incentive mechanisms for research partnerships with non-traditional players in research funding to strengthen open innovation;
- 8) Increase involvement of users and members of the public in RTI funding programmes;
- 9) Develop fair sharing and compensation models for crowdwork;
- 10) Further develop and provide open innovation methods and open innovation instruments specifically for small and medium-sized enterprises (SMEs);
- 11) Develop and implement co-creation and open innovation training programmes;
- 12) Embed principles of open data and open access in research;
- 13) Gear the IP and exploitation strategies of companies, universities, research institutions and intermediaries to open innovation in order to optimise innovation potential;
- 14) Implement a comprehensive communication initiative about open innovation to raise awareness and create networks.

The measures set out in the AOI Strategy will be implemented by the individual ministries in the areas of their competence as well as by various actors at the provincial and municipal level who are urged to do their utmost to bring the strategy to life. The implementation progress and further development of the AOI Strategy will be tracked by a monitoring group and its findings will become a part of the annual Austrian Research and Technology Report which is submitted to the Austrian parliament. The implementation of this strategy will require extensive education of the prospective participants and combination of top-down and bottom-up approaches which will foster the bottom-up ownership and deeper learning. Since there is no mention of any specific funding mechanism it is supposed that this strategy will be funded by the mechanisms stated in the Austrian RTI Strategy. In order to support and encourage the interaction of government authorities with citizens and organisations in the implementation of this Strategy the information portal „Open Innovation – an Initiative of Federal Government“ <http://openinnovation.gv.at/open-innovation/> was set up.

### **Innovation policies in Slovakia**

The area of research and innovations is a weak link within the Slovak economy. It is reflected in long-term adverse trends (1989-2011): (1) Decrease of total expenditure and the number of labour force and especially the decline of enterprise research. The number of employees in research and development dropped from 60,548 to 28,596 and expenditures in research and development as percentage of GDP from 3.88% to 0.68% in the 1989-2011 period; (2)

Increasing share of public funding of research and innovations. The share of enterprises in total expenditures in research and development dropped from 69 % to 34 % in the 1993-2011 period; (3) Loss of target-orientation in

research accompanied by growth of general research without clear thematic priorities. The share of untargeted and general research increased from 38 % to 58 % in the 1993-2011 period; (4) Increasing share of basic research at the expense of applied research: The share of basic research in the total funding of research and development grew from 22.6 % to 48.9 %, while the share of applied research decreased from 49.4 % to 24.6 % in the 1994-2011 period (RIS3 SK, 2013). This has been confirmed also by development of ranking of Slovakia in the Global Competitiveness Index (GCI). In the period 2010-2011 to 2016-2017 where Slovakia sank from rank 60 out of 139 countries with GCI score 4.25 to rank 65 out of 138 countries with GCI score 4.30. The weakest evaluation among twelve GCI (2016-2017) pillars achieved Slovakia in the pillar Innovation with score 3.3 and rank 68/138 whereas its score in other GCI pillars ranged from 3.5 to 6.0 (Schwab, K. 2016).

The Slovak R&I system is highly centralised and funded mainly from the government and business resources. Central government has been a major provider of research funding through several agencies in 2000s. Since 2007 responsibilities for the R&I policies have been divided between the Ministry of Economy and the Ministry of Education, Science, Research and Sport. In this year government also passed the Innovation strategy of Slovakia for the period 2007 – 2013, which was specified in more detail in Innovation Policies in 2008 and then in 2011. In contrast to the original intention this first Slovak innovation strategy was not allocated sufficient financial resources and was funded predominantly from the EU Structural Funds. In spite of negative impacts of the economic and financial crisis the structure of the national system of innovation management and financing was set up and the EU Operational Programmes helped build linkages between the academia and industry sectors and technology transfer offices at universities. However, the share of domestic innovative enterprises remained at the level of about 30%, R&D system was underfunded and planned regional innovation centres were not set up which weakened the regional innovation policies. The main directions of the current development of R&I were set out anew in the RIS 3 Strategy for the Slovak Republic passed in 2015 which is analysed in the further section of this paper. Development of selected R&D indicators in Slovakia is represented in the Table 2 below.

Table 2 Selected R&D indicators in Slovakia

Indicator	2011	2012	2013	2014	2015	EU-28 average (2014)
GERD (as % of GDP)	0.67	0.81	0.83	0.89	1.18	2.03
BERD (as % of GDP)	0.25	0.34	0.38	0.33	NA	1.3
R&D (in %) with foreign funding	14.2	18.6	18.0	23.7	39.8	NA

Source: Baláž, V., & Žifčiaková, J. (2016)., adjusted.

According to Baláž, V., & Žifčiaková, J. (2016) the Slovak GERD made 1.18% of GDP in 2014 (2012: 0.81% of GDP). The 2014 National Reform Programme for the Slovak Republic set modest but realistic targets for GERD to 1.2% and for the BERD to 0.8% in 2020. There were some significant increases in business research spending since 2008 (albeit from a lower base). The public funding of R&I has been prevailing compared to the business and private funding in the period 2014 to 2008. The business and private-non-profit research bodies funded 32.7% vs. 34.7%, HEIs 2.0% vs. 0.3%, government 41.4% vs. 52.3% and foreign funders vs. 23.7% vs. 12.3% of the total research funding in these years. The business funding of innovations is very low, one of the lowest among countries that joined the EU in 2004. Since 2010 business funding from abroad (European Commission) significantly increased in importance. The Eurostat data on business research spending indicated that the foreign owned businesses performed 78% of the total intra-mural research in the Slovak Republic in 2011 (latest available data). The overall R&I policy target in Slovakia in GERD is to invest 1.2% of GDP for R&D and in BERD 0.8% of GDP by the year 2020 and achieve the ratio of public funding versus private funding 1:2.

### RIS 3 Strategy for Slovakia

The Slovak Republic is a small and very open economy. Its size is comparable to the size of regions in large EU countries. Therefore the concept of smart specialisation was applied only at national level and not in a regional dimension as well. The basis for the Slovak RIS 3 Strategy for period 2014-2020 are analyses of strengths and weaknesses in export trends, innovation environment, business sector, R&D potential, research and science areas, and human resources in Slovakia. This led to identification of four key areas of economic specialisation: a) automotive and mechanical engineering industries; b) consumer electronics and electrical equipment; c) information and communication technologies and services, and d) production and processing of iron and steel, as well as some areas of prospective specialization. The vision of the RIS3 was formulated in general terms, as “to drive a structural change of the Slovak economy towards growth based on increasing innovation capability and R&I excellence to promote sustainable growth in income, employment and standard of living.” It was translated into four strategic objectives: (1) Deepening integration and embeddedness of key major industries increasing

local value added through the cooperation of the local supply chains and turning local supply chains into embedded clusters. (2) Increased contribution of research to the economic growth via global excellence and local relevance. (3) Creation of a dynamic, open and inclusive innovative society as one of the preconditions for the increase in the standard of living. (4) Improvement of the quality of human resources for an innovative Slovakia.

Each of these objectives was specified by several partial objectives and related measures to achieve it. However, there is no explicit mention of any open innovation concepts, methods and models neither among the partial objectives nor the measures. Open innovation concepts would fit in well in the measure 1.1 on development of innovative capacities through cooperation between enterprises and research institutions in key sectors of the Slovak economy and foster realization of the measure 1.3 on support for building research and innovation capacities in Slovak enterprises. Moreover, open innovation concepts tie in well with the following measures: 2.3 on linking universities, Academy of Sciences, research institutions with business partners, 2.4 on support and stimulation of international cooperation in science and technology, 3.4 on support of open and inclusive society, 3.5 on support of dynamic business environment favourable to innovation, and 4.5 on stronger emphasis on education in fields relevant to the RIS3 priority areas.

In the field of governance and management of implementation of the RIS3 Strategy there were set out the following tasks (1) merging eight R&I government agencies into two and change of support to basic and applied research from current ratio of 2:1 to 1:2 by 2020, (2) introducing ‘mandatory indicator of the state support to R&D as percentage of GDP in the State Budget Law’, and (3) reorganisation of HEIs and transformation of the Slovak Academy of Sciences. In line with (4) the Slovak Government in the meantime renamed the Agency for the Structural Funds of the EU (ASFEU) to the Research Agency which RA should, inter alia, create conditions for participation of the Slovak research teams in the European Research Area and the Slovak Innovation and Energy Agency to the Technology Agency charged with coordination of implementation of the RIS3 Strategy. The strategy is clearly orientated to the triple helix innovation model without considering citizens as end users in generating innovation as well as further features of the Open Innovation 2.0 approach, though in the concluding section there is a formal reference to quadruple helix model.

The Strategy will be implemented by means of two-year action plans. The most important was the „Action plan for the RIS3 implementation for the years 2014 – 2016“ which specified necessary operational programmes (especially Operational Programme (OP) for R&I, OP Human Resources and other), financial frameworks with indicative allocations by measures, sources of financing and types of financial instruments, and basic legislative changes necessary to achieve the RIS3 objectives. The Standing Committee of Government Council for Science, Technology and Innovation is responsible for the monitoring of implementation progress of the RIS3 Strategy. Monitoring of relevant measurable outputs, results and impact indicators, tools and measures for RIS3 is carried out by the Analytical Unit of the Government Office of the Slovak Republic in cooperation with central state authorities, especially the Ministry of Economy and the Ministry of Education, Science, Research and Sport of the Slovak Republic. However, the document does not state the periodicity and format of reporting the monitoring results to the Slovak parliament and to the public.

This strategy was supported by the elaboration of the Slovak start-up strategy in the document 'Concept paper for the support of start-ups and the development of the start-up ecosystem in the Slovak Republic' passed by the Slovak Government in June 2015. It set out the following measures: a) developing legal concept of start-up in Slovakia; b) passing government strategy on start-ups; c) introducing new form of business entity, with basic capital of 1 euro; d) introducing tax reliefs for start-ups and business angels; and (e) introducing start-up visa for the third country nationals in Slovakia. Another support measure – the tax reliefs for R&D entered into force on January 1, 2015. However, their implementation is limited and administration-intensive. The Slovak Government has not set up any internet portal to inform the public about the implementation progress of the RIS3 Strategy or even encourage professional and public discussions and citizen involvement on this topic.

## **Conclusion**

At present there is not a single country that has a national open innovation strategy, not even among innovation leaders. However, in several countries there can be observed a trend towards embedding open innovation in strategies and also involving civil society. This is the case in Germany, Finland, the United Kingdom, Sweden, Spain, Hungary and the USA, where open innovation methods and principles are referenced in key innovation policy strategy documents and where there is at the same time a relatively strong tendency towards the quadruple helix model. “Transparency and Participation” are two key pillars of the German High-Tech Strategy (2014), the USA also stress in its latest Innovation Strategy (2015) the orientation towards the principles of open innovation in accordance with the open government focus already initiated in 2012. The Hungarian innovation strategy (2013) likewise describes involving users through open innovation as one instrument to intensify the exchange

of knowledge in the country. The Spanish innovation strategy also expresses an intention to strive towards open innovation and provided for submitting comments on the draft strategy in an open consultation process.

The current innovation strategies of Austria, Bulgaria, Denmark, Estonia and the Netherlands make no explicit mention of open innovation, but there are indications of efforts to involve civil society here, e.g. the Estonian strategy points to the need to improve public participation without suggesting any strategic approaches how to achieve this. In the current relevant strategy documents of countries Lithuania, Croatia, Romania, Switzerland, Singapore, Slovakia and Slovenia, there is neither a mention of open innovation, nor clear statements on development towards a quadruple helix model. It is surprising for the innovation strategies of such advanced innovation-driven countries as Switzerland and Singapore. Although Switzerland stresses the importance of cooperation and networking with other countries, it makes no mention of civil society involvement. Singapore likewise focuses solely on the transfer of knowledge between industry and science (Austrian RTI Strategy, 2011).

## Recommendations

1 Formulation of fourteen measures stated in the Austrian Open Innovation Strategy can serve as an inspiration on how to consider the Open Innovation 2.0 approach in the objectives and measures of the Slovak RIS3 Strategy.

2 The complementary elaboration of the Open innovation strategy as an expansion of the Slovak RIS3 Strategy including supporting funding mechanisms would a) open up for Slovak businesses and organizations of Slovak science and research sectors as well as citizens and public institutions, b) foster collaboration and co-creation options for faster implementations of ideas of quadruple helix innovation model and higher innovation performance of the country.

3 The Slovak RIS3 Strategy needs systematic reporting of the monitoring results on an annual basis. Inspiration: the Federal Ministry of Science, Research and Economy publishes the Austrian Research and Technology Report annually.

4 The prerequisite of efficient implementation of quadruple helix innovation model is a networking and communication platform for interested citizen and organisations powered by an information portal operated on behalf of the government ministries by the Slovak Innovation and Energy Agency and complemented by the use of social media.

## References

- Innovation Union Scoreboard (2016). Retrieved April 14, 2016 from <http://ec.europa.eu/DocsRoom/documents/17823>
- Schwab, K. (2017). Global Competitiveness Report 2016-2017. World Economic Forum. Retrieved April 14, 2017 from <http://reports.weforum.org/global-competitiveness-index/>
- RIS3 SK. (2013). Research and Innovation Strategies for Smart Specialization for Slovak Republic. Retrieved April 14, 2017 from <http://www.economy.gov.sk/strategia-vyskumu-a-inovacii-pre-inteligentnu-specializaciu-sr/142232s>
- Austrian RTI Strategy (2011). Retrieved April 14, 2017 from <https://era.gv.at/directory/158>
- Schuch, K., & Gampfer, R. (2016). Rio Country Report 2015: Austria. EUR 27874 EN; doi:10.2791/432438 Retrieved April 16, 2017 from <https://era.gv.at/object/document/2642>
- Baláž, V., & Žifčiaková, J. (2016). Rio Country Report 2015: Slovak Republic. EUR 27860 EN; doi:10.2791/751866 Retrieved April 15, 2017 from <https://rio.jrc.ec.europa.eu/en/country-analysis/Slovakia/country-report>
- Zajko, M. (2013). Possibilities of development of international collaboration of the Slovak small and medium enterprises in research, development and innovations. 7<sup>th</sup> ICEBE and 5<sup>th</sup> ICIE, Shijiazhuang University of Economics, Hebei, China, 13 – 15 October 2013
- Curley, M., & Samelin, B. (2013). Open Innovation 2.0. A New Paradigm. Retrieved April 18, 2017 from <https://ec.europa.eu/digital-agenda/node/66731>
- BMFWF & BMVIT. (2015). Open Innovation Strategy for Austria: Goals, Measures & Methods. Federal Ministry of Science, Research and Economy & Federal Ministry of Transport, Innovation and Technology. Retrieved April 18, 2017 from [https://www.bmvit.gv.at/en/innovation/policy/open\\_innovation\\_strategy.html](https://www.bmvit.gv.at/en/innovation/policy/open_innovation_strategy.html)
- Leimueller, G. (2016). Developing a National Open Innovation Strategy: Five Lessons Learned from the Austrian Example. Retrieved April 18, 2017 from <https://ec.europa.eu/digital-single-market/en/news/developing-national-open-innovation-strategy-five-lessons-learned-austrian-example>

MŠVaŠ SR & MH SR (2015). *Akčný plán implementácie Stratégie výskumu a inovácií pre inteligentnú špecializáciu SR na roky 2014 – 2016* . September 2015.