SUSTAINABILITY OF RESEARCH CENTRES IN RELATION TO REDUCING IMBALANCE IN EUROPEAN RESEARCH AREA

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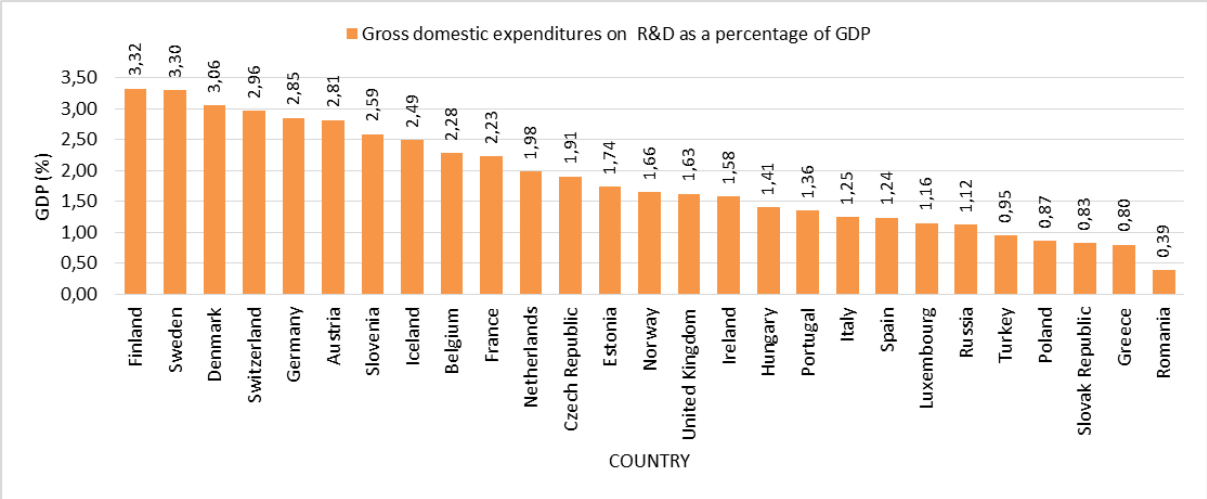
Abstract

Direct application of research centres operational models for their sustainability after the financial support from structural funds ends (e.g. after 2015) represents important issue for their managers. How to implement said models cause enormous discussions well ahead of its time. Time lead of such discussion shows that the issue is not really solved. It is necessary to connect sustainability assurance with an active approach to the actual and predictor risk by following the most important goal – reducing imbalance within European research area while ensuring all-society contribution.

Keywords: *Research Centre, University of Žilina, sustainability, risks, imbalance*

1. IMBALANCE IN EUROPEAN RESEARCH AREA

Countries in Europe pay research and development (R&D) different amount of attention. Some consider it very important part of their economy and allocate appropriate support. Governments can show different forms of support – direct or indirect. Direct support is usually financial in form of percentage from gross domestic product (GDP). Indirect support can be in forms of tax reductions for R&D projects/ grants, support for creating new research positions, government contracts, etc. Percentage of GDP spent on R&D in Europe in 2013 is shown in graph 1.

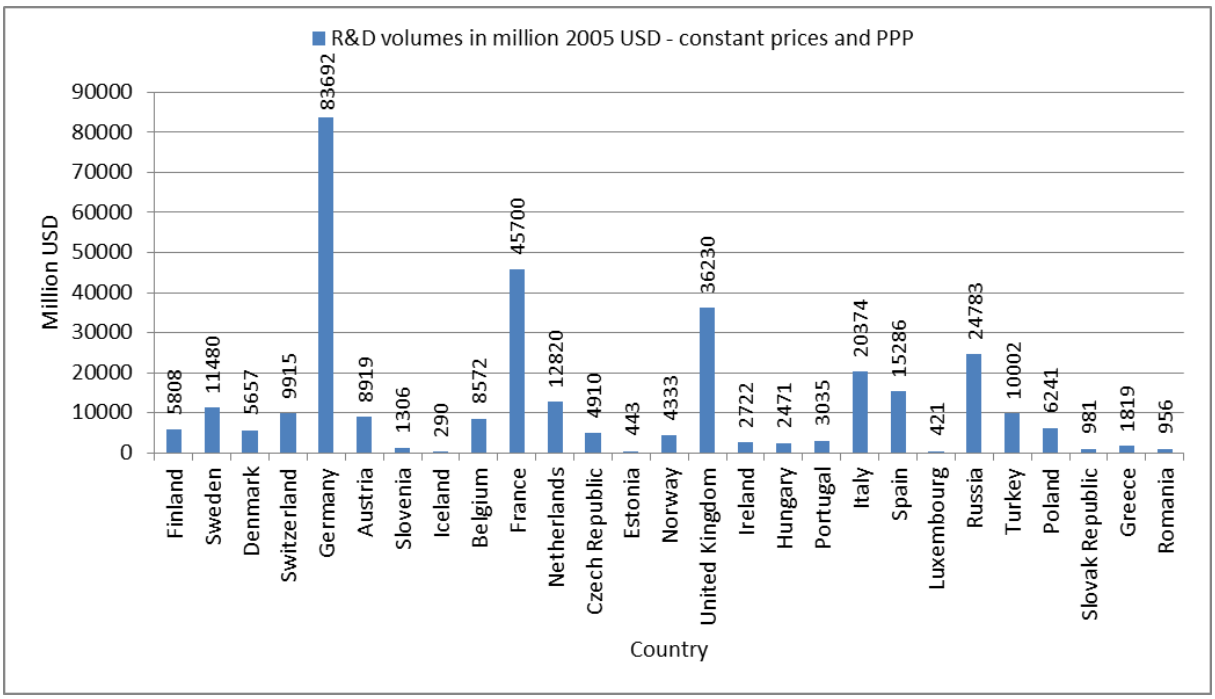


Graph 1. Percentage of GDP spent on R&D in European countries in 2013

(Source: Research and Development Statistics (RDS), OECD, www.oecd.org/sti/rds, accessed April 2015)

For comparison is in second graph shown equal information in millions of 2005 US dollars. These two graphs clearly show the baseline for imbalance in European research area. Highest contributors are Scandinavian countries, Switzerland and Germany. Slovak republic devoted less than 1% of its 2013 GDP to research activities (only 981 million USD). Private funding is still lacking as well as academic and private sector cooperation. It is no wonder then that Slovak R&D is at the bottom of the European

research excellence list. Germany, for comparison, put 2.85 % of their 2013 GDP (almost 84 million USD) and they are leader in various scientific areas.

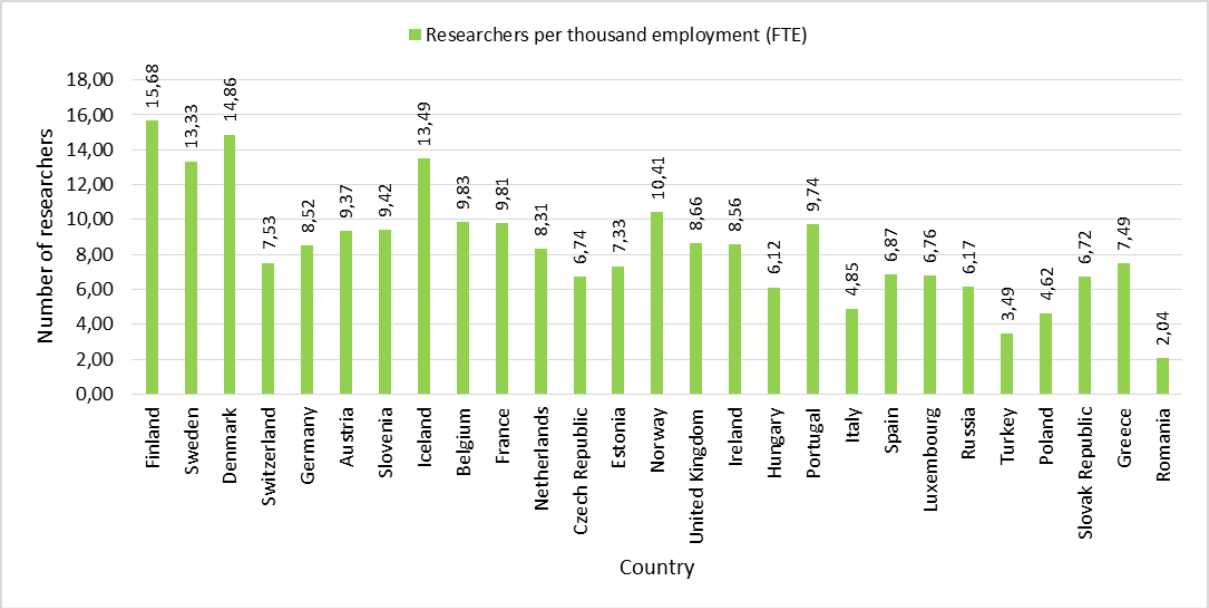


Graph 2. Spending on R&D in million USD in Europe in 2013

(Source: Compiled from "Gross domestic expenditure on R-D by sector of performance and source of funds", OECD.StatExtracts, http://stats.oecd.org/Index.aspx?DataSetCode=GERD_FUNDS, accessed April 2015)

Leaders in R&D don't rely only on government funding. Also models for close cooperation of academic sphere with praxis are common. Slovak Republic rely almost solely on structural funds, there are missing managerial models for industrial grants and cooperation with praxis is only in its beginning. Moreover, with structural funds comes great amount of bureaucracy. All of the spending must go through public procurement which is very long and complicated process. It usually takes months to conduct a public procurement and even after that, procurers have to wait another few months for approval from controlling body. That means that sometimes it takes more than a year to buy necessary equipment on which the research is to be conducted. In order to ease the process of reducing imbalance and ensuring sustainability, simpler legislation must be implemented. Also new platforms for industrial grants must be developed and cooperation between academic and private sector must be enhanced.

Another point of view shows how many human resources are devoted to research although quality must be taken into consideration as well. Graph 3 shows how many of thousand employees were researchers throughout Europe in 2013. Scandinavian countries (as highest percentage of GDP as well) including Iceland employ the highest number of researchers.



Graph 3. Number of researchers per 1000 employees in Europe in 2013

(Source: Research and Development Statistics (RDS), OECD, www.oecd.org/sti/rds, accessed April 2015)

In order to reduce imbalance European Union introduced structural funding through various operational programs. These were aimed at every aspect, not only R&D. Thanks to Operational Programme Research and Development, more than 410 million € was allocated to Slovakia to fund creation of 13 university science parks and research centres (USP and RC). They are aimed to create excellent background for research activities in academic and academic collaborating with private sector. For them to be able to fulfil their goal sustainability must be assured and risk management must be implemented.

2. WHAT IS THE RESEARCH CENTRE OF THE UNIVERSITY OF ŽILINA?

One of newly created centres is Research Centre of the University of Žilina (Research Centre; RC ZU). After its completion it will be a unique workplace for research and development established by the University of Žilina. Its function is to operate as a regional centre of applied research integrating decisive research activities and thus reaching synergistic effect in application and increase of research potential of the University of Žilina. At the same time the prime social commitment will be assured, which is the research implementation with direct impact on everyday life. **Research centre aims to conduct research for people.** For fulfilling this message and function, it connects activities of several science-and-research working units. It involves the 5 crucial faculties of the University of Žilina, 13 departments and institutions included. There is also a strong connection to industrial partner – Transportation Research Institute, which with its 60-years history represents one of the crucial elements in frame of private activities in chosen segments of transport research.

The main research areas the RC ZU is focused on are the areas where the University of Žilina is established at an excellent level within the frame of EU and plays an important role on a world-wide scale.

Crucial activities can be described as follows:

1) Research and development in the area of control and evaluation of transportation infrastructure condition.

2) Research and development in the area of progressive materials for building the transport infrastructure and production of the means of transport.

3) Research and development in the area of design, construction and control of intelligent buildings and renewable energy sources.

There are more than **110 employees** participating in these activities, **including 9 professors, 13 docents and 48 post graduates (PhD.).** To boost the educational process, various activities and actions are performed for an even more intensive involvement of students on all levels (including PhD. Students) during their studies.

Research Centre of the University of Žilina also supports clever people with good ideas and is building its own incubator for spin-off and start-up projects. This enables a simpler and much faster commercialization of research results and developments; an active look-up for potential spin-off and start-up projects as well as it supports the creation of new innovative business companies.

Another part of Research Centre, Regional Centre for Knowledge and Technology Transfer and Science Popularization is engaged in popularization of research results in laic and professional community. Its aim is to acquire customers for research and development activities at national and international level, to identify potential application of the results reached in research and development, to enhance their transfer to praxis and to build up the system for effective commercialization of reached results**.** There is also a department for dealing with regulation and active protection of spiritual property in relation to actual output.

In June 2014 a construction of so called **„intelligent building“** started, using the low-energy construction methodology (with thermal energy consumption under 15 kWh/(m2.year)), applying the higher standard of the building equipment concerning a variety of thermal, cold and energy sources, from the point of view of energy demands regulation, safety and services in the building.

The building itself and its integral technological environment in combination with its real use, will provide preconditions for research activities in area of energy demand, control of heat gain, operating algorithms optimization or for example settings of the optimal heat comfort for the users.

In frame of common research activities, the Research Centre of the University of Žilina organizes events, such as „**Research Forum**“ or „**Research star**“ for fellow scientists and researchers.

3. SUSTAINABILITY = DEMAND

Every subject not managed by adequate grant (either on regional, national or higher level) has to come up with additional means of funding to become self-sufficient for operation and further development. Financial mechanism for newly created university science parks and research centres is based primarily on idea of zero or minimal dependency on founder (universities or Slovak academy of sciences). Based on these premises, question of sustainability is much more than relevant.

The basic element of sustainability is **demand for ones services and products**, which directly influences viability and determinates the role of the subject in frame of research-and-development as well as all-society environment. Although we primary consider the demand in relation to its satisfaction from the point of view of financial incomes for relevant research-and-development subject, the social demand occurs more and more often, which we can define for example by:

- Interest to cooperate from top-level professionals,
- Need of existence of such subjects that are able to efficiently interlinks educational and research activities in academic area or
- In the form of all-society commissions that do not generate financial income and do not thus contribute to direct financial sustainability of existing subjects.

When the forms of demand are known, it is possible to start focusing on relevant risk factors and to create tools to regulate them.

4. RISK FACTORS FROM THE RC ZU POINT OF VIEW

Risks in relation to specific organizations of research and development such as USP and RC can be divided into 2 basic groups: **general and specific.**

General risks represent a group of circumstances, which influence the very existence, operational capability, financial independence and competitiveness of all subjects (all newly created USP and RC) without exception. We can include here:

- existence of national forms of support for USP and RC (direct grants and stimuli),
- legislative and programme barriers and arrangements disabling an active entry into the economic market conditions,
- all-society attitude to further support for USP and RC in relation to the state and prediction of development of national and European economics.

Specific risks are unique influencing factors related individually to each one of USP and RC. It is a group of factors that arise for example from:

- Reallocation of research-development capacities in the frame of professional fixation and relevant region (amount and quality of competitive subjects),
- Existence of mid-term and long-term demand partners (regular customers),
- Access to high-quality supraregional basis of human resources,
- Efficiency of using own unique infrastructure,
- Possibilities for active and stable binding to important research organizations on international level and engaging in common activities of R&D,
- Efficiency of integrating other R&D subjects under its own regulation.
- Range and quality of actual activities aiming to financial sustainability (indirect grant schemes for USP and RC, for example Slovak Research and Development Agency, local grants and amount of irregular income, for example in form of contractual research), including the questions of founding and operating the start-ups and spin-offs.

It is necessary to mention here that even though both risk groups act externally as separate factors on USP and RC projects´ sustainability, it is not possible or right to compare their importance, separate them completely from each other and approach them without solving the secondary risks caused by them.

4.1 Control of General Risks by RC ZU

It is not possible to create and apply tools for managing general risks by an individual subject like RC ZU, considering the volume and character of the factors entering their development process. From the projects´ sustainability point of view, USP and RC identify the primary problem as the **missing definition of any further support** from initiating subject (in this case the Ministry of Education). There is a serious assumption that after the 2013-2015 period (period with financial support from initiating subject), a new period will follow where USP and RC will have to redirect from activities for stabilization in economic environment and demand base creation to „lifesaving activities“. It is highly possible that some of USP and RC will not be able to find sufficient tools to survive until the new supporting systems are defined and will have to cease to exist or will need considerable help from founder institutions. Then the questions of efficiency of investing the financial resources for their creation occur, which will logically cause scepticism for future support.

USP and RC also have to directly confront **legislative and programme barriers**. These on one hand „dictate“ duties in form of activities for its sustainability, but on the other hand they limit the forms of financial support in the frame of monitored period (by the year 2020) to minimum and thus limit the possibilities of equalization with market subjects. The sooner suitable legislative precautions come, not

just in form of internal (institutional regulations of the University of Žilina) and national legislation, but mainly on the part of programme adaptation (*Operational Programme Research and Development* and *Operational Programme Research and Innovation*), the sooner it will be possible to find an optimal model of its own functioning in relation to the question of sustainability.

The last mentioned general risk is the amount of public acceptance of ongoing and future support for USP and RC projects considering the economic situation and direct impact of actual R&D activities for public benefit. This risk factor is generated through the whole society and even though it acts externally like some unimportant factor of sustainability, when considered in detail its role is extremely important. The reason is its ability to accelerate or completely stop the sustainability of these projects. Considering creation of 13 USP and RC subjects, there were more than **400 million €** allocated for the 2013-2015 period. This amount represents an extreme expense for economy and a massive obligation to final recipients of services and products of actual R&D activities (the society), while their amount and quality is directly transformed in form of feedback into one of the indicators reflecting the need of sustainability of USP and RC. In case that society will not create demand for provided products and services, it will be necessary to reconsider tools applied for preserving sustainability and to redirect financial help to other economy sectors outside research and development. From the economic contribution point of view, it is possible to discuss the subject of USP and RC sustainability and their influence on economy, while declaring that R&D sector contributed to economic growth. Thus the expended financial means will prove to create benefits (both financial profits and social benefits) and a direct motivator to provide tools for preserving sustainability of USP and RC in future period will occur.

4.2 Managing Specific (Individual) Risks of RC ZU

This group of risks is characteristic by quite open possibilities of direct risk management by applying the right tools at the right time.

The idea of RC ZU was drafted in form of a subject that disposes of certain elements of uniqueness and competitiveness in order to simplify implementation of sustainability tools. Areas of research and development originate from historic background so they are focused on transportation and related topics. The University of Žilina as the founding institution profiles itself in a long-term horizon as a centre of transportation research in Slovakia, with stable position in European area. RC ZU project realization contributes to this profiling.

Meanwhile the competitive advantage occurs in form of favourable regional and supraregional localization in comparison to other research-and-development subjects, that could directly threaten (or weaken) demand for RC ZU´s services and products completed with very specific acquired and used infrastructure.

Great deal of attention according to RC ZU management model is dedicated to activities concerning acquiring and preserving the strong partnerships with demand entities from industry or society (including the environment providing educational process). With industrial partners it means to conduct such research activities that are interesting for their own applicability into praxis. Reaching this goal will help not only to create higher level of demand from said partners but will also lead to much required financial stability for further innovations and operation. One of the examples is signing several general contracts of cooperation even before finishing the actual building of RC ZU own research facility.

In second case, where the attention is concerned with society interests, the goal of RC ZU is to transform its own activities into the form that brings direct effect to society, for example connecting research activities with educational process. Direct use of gained knowledge is meant here, in frame of actual R&D activities included into educational process, mainly at the University of Žilina.

Another decisive element that directly influences the RC ZU sustainability is ensuring the available basis of employees who dispose of relevant professional and managerial abilities. That is the reason why we approach creation of research teams in a highly professional manner, choosing people by committees, while the innovation and competitiveness of approach of the person is emphasised. This

system is partly supported by strengthening the teams with post docs. Right now there are taken steps to integrate the students of bachelor and engineering degrees into the actual research-and-development process of RC ZU as well. The goal is not just to enhance their knowledge basis but also to determine their innovation potential.

A clear, well established system greatly eliminates personal risks and uniquely determinates the position and duties of each member of research groups and managerial teams, which reflects itself in efficiency of decisive and specific R&D activities.

Research-and-development environment is quite often confronted with insufficient level of using one's own infrastructure. This level is mainly influenced by the correct prediction of demanded services and products in combination with operational costs and personal capacities needed for the direct R&D activities. When the idea of RC ZU was forming, the emphasis has been put on unique equipment, thus preventing the impact of aforementioned risk. At the same time, modularity and compatibility of some parts of infrastructure have been taken into consideration. It means the efficiency in cooperation with already existing infrastructure of University of Žilina, especially already existing excellence centres of research and development and the ones that the RC ZU will probably cover in the future. Even in spite of the system adaptation, the risk is connected mainly with preserving its operational ability after completing the direct funding schemes and possible growth of competitive subjects, which may dispose of similar equipment.

Strong institutional partner support from important research-and-development organizations in Slovakia as well as Europe creates preconditions for participating in common activities that bring important and wanted effects, including the financial gains. RC ZU integrates activities consisting of regulating such relations and makes an effort to increase their benefits for the needs of actual sustainability. It acts as an active partner for international initiatives like **HORIZON 2020, COST, EEAGRANTS, Visegrad FUND** or direct notices on the part of regional partners (Danube Region). At the same time it supports widening of researchers database by activities in the frame of **Marie Curie models.**

RC ZU also takes adequate steps in order to achieve financial sustainability. It mainly concerns of the active approach for receiving grants from Slovak Research and Development Agency, Research Grant Agency, subsidies from the Ministry of Economy SR, etc. At the same time it **forms specific Regional Centre and Incubator,** e.g. organizations that are supposed to help in an active way by gaining customers, protecting and spreading intellectual property and support the innovative ideas in form of spin-off projects.

4.3 Risks related to Regional Centre and Incubator

When talking about Regional Centre and Incubator, one has to pay attention to risks that are specific to only these parts of newly formed USP and RC. Research and development from other divisions rely on Regional Centre to provide necessary administrative support in form of project proposals preparation and administration, dealing with questions of intellectual property rights or commercializing R&D outcomes. Incubator, on the other hand, is supposed to nourish innovative ideas and turn them into profitable projects.

First and probably the biggest part of work done in Regional centre is **project proposals preparation**. Employees have to know exactly what are researchers working on in order to properly scan all calls and choose only suitable ones. This part of work is endangered when **lack of communication** occurs. A chance to miss the call suitable exactly for work done in RC is very real then. Another problem lies in choosing proper partners for projects. As it happens, some partners don't communicate as necessary or provide incomplete information and details. This might lead all the way to missing a deadline for project submission. As stated in official dataset from Horizon 2020[1], from almost 2400 approved projects only 41 include Slovak partner at all. From 41 successful subjects, only 4 were made coordinators of projects, others are only participants. Newly created USP and RC are yet to be

[1] "CORDIS - EU research projects under Horizon 2020", European Union Open Data Portal, https://open-data.europa.eu/en/data/dataset/cordis-h2020-projects, accessed April 2015

established as strong partners, which makes it very difficult to be accepted into consortiums. And without strong consortiums it is very difficult to get any projects approved.

Actual approval of project proposal doesn't mean the end of the problems. Thanks to different rules and guidelines for financing among project partners, **financial risks are present** and problems often occur. If there is a long period between paying off expenses and their reimbursement by competent organisation, the cash flow might be negatively affected and entire financial solvency of RC could get uncovered. In order to become self-sustainable, RC has to get additional funding and the best and easiest way to do so is by being successful with projects. This also helps to establish the name of Research Centre in research area which is necessary to become more successful with projects approval.

Another way to become self-sustainable is to secure **commercial R&D projects**. Communication with private sector is also a task for Regional Centre. Main risk present here is **the lack of interest from private companies**. This may be caused for example by inadequate communication mix. After securing private projects, there is always a risk with not being able to actually conduct given R&D task.

Preserving intellectual property rights is very challenging and difficult process. There is always a **question of protection scope** to be considered. For example, if the subject can afford to file intellectual property claim (patent or utility model) only for Slovak republic, anyone from any other country can steal the know-how and patent it elsewhere. Also with only slight changes to the original design, one can claim innovation.

Incubator is supposed to **provide creative environment for innovative ideas** in order to transform them from their very beginning into a successful and profitable projects. First task for Incubator is **screening for ideas** amongst researchers as well as outside parties. Person responsible for screening and picking ideas must be very open-minded and have great range of knowledge as well as overview of the actual market and trends in order to choose perspective ideas. It is quite risky to leave it in the hand of one person. Better option is to provide opportunities such as competition "Research Star" where anyone can enter and the ideas are evaluated by committee consisting of experts on different topics. **Risk of choosing unprofitable ideas** decrease significantly this way. However, there is always a **possibility of change in industrial climate** (great example is switching from analogue to digital systems) that can lead to irretrievably lost financial and other infrastructure resources.

One of requirements for USP and RC projects approval was building Regional centre and Incubator. This means that in the last two years, **13 new regional centres and incubators were established** in such a small research area as Slovak republic surely is. While every UPC and RC is focused on slightly different research area (nanotextiles, transportation, intelligent buildings, materials, etc.), the goal of their incubators is basically the same. They all seek new ideas and thus they create **very competitive environment**. In order to succeed, one must fully accommodate demands from ideas creators, or they just move elsewhere.

5. CONCLUSIONS

Due to various economic and historical developments, substantial imbalance of European countries was developed. One of EU goals is to reduce it by channelling its help and assistance to those countries, which struggle. Many programmes and projects were established and enormous amount of money were redistributed. In order to continue, sustainability must be secured. It is not possible to leave sustainability of such important and specific projects like USP and RC (with their huge infrastructure and personnel) up just to themselves. Not even in spite of ambition to apply such managerial models that aim mainly for financial stability in mid-term and long-term horizon without being dependent on other forms of direct or indirect support (grants, subsidies, stimuli, etc.). This statement is based mainly on a short-time period needed for building the USP and RC facilities as well as implementing specific research-and-development activities, where the elements of unique services and products are formed and the position in frame of open market economy is stabilized.

It is necessary to realize that until given time period expires (the end of year 2015), there will be 13 unique research-and-development institutions in Slovakia, but most of them will be only in its initiatory stage. That means at a zero point or in its proximity. There is an assumption that without more of the direct support from the founding institutions, these new USP and RC projects will end in similar scenarios of development that happened in last seven years, when the excellence centres of research and development have been built from the infrastructural and personal aspect, while the need of their short-term sustainability was not reflected in implementation of specific stabilization activities at research and economy space. That has been transformed afterwards into undesirable pattern and one of the goals for newly established USP and RC is the use of their potential, which will directly contribute to increase their competitiveness and reduce imbalance in European research area.

It is possible to directly apply the aforementioned statements to Research Centre of the University of Žilina. The managerial model tries to approach each of the risks, which can influence the efforts to provide actual sustainability, in a way that establishes Žilina as a science city in mid-term to long-term horizon. An important precondition to reach this goal is following the basic pillars of success: to conduct a unique, specific research and development activities, to follow trends in demand and to conduct the research for society, the research for people.

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