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Innovations in the area of research and education at universities in Slovakia

Key words: innovations, research and development, education, modernisation, renewable energy sources

S u m m a r y: The European Commission pays great attention to the need of innovations in the area of research, development and education since this area remains behind in comparison with the advanced countries such as the USA and Japan. The upgrading of education in the way it is stressed by the resolutions of the Bologna Process points up the necessity of increasing the quality by emphasising the linking of science and practice as well as gaining of skills and knowledge for their better application in practice. Therefore it will be necessary, even in the conditions of Slovakia which remains behind significantly as to the support of science and education, to direct the structural funds of the European Union towards modernisation of the universities and other institutions of higher education so that it could be possible to assure the qualities of research and improve the conditions in students' preparation for their better performance in practice. In their paper the authors point to the possibilities of implementing the innovations in the area of research and development by presenting an example of the Research & Development and Information Centre of Bioenergy (VVICB) at Kapušany, and they also demonstrate the practical solutions of these activities.

1. Introduction

The European Commission pays great attention to the need of innovations in education as well as to upgrading the research and development at the universities in Europe. The goal is to approach the level of outcomes in research to the advanced

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countries such as the USA and Japan which have far more patents in the number of a million inhabitants when compared with the countries of the European Union. The necessity of increasing the quality of undergraduates' preparation is also emphasised within the Bologna Process with the aim to prepare the graduates for their better performance in practice. Interconnection of practice with science and research carried out at the universities and other institutions of higher education appears to be one of the possibilities. Therefore it is necessary to break the psychological barrier in enterprise activities at the universities.

Enterprise should be the culmination of educational and research activities and should retrospectively support and finance them. The linking of education and science belongs among the priorities of the University of Economics in Bratislava and is reflected in numerous research projects. One of the projects which will serve as a training scheme for the students and educators of the Faculty of Business Economy in Košice, the Technical University in Košice and the Technical University in Zvolen, has been designed by the workers of the Research & Development and Information Centre of Bioenergy (VVICB) at Kapušany, the educational and research facility which is an inseparable part of the University of Economics in Bratislava.

Education

Research

Enterprise

Outcomes of the University

Figure 1

The aim of enterprise and business activities is closely connected with creation of further opportunities for funding the universities and other institutions of higher education from multiple sources. The year 2009 was declared in the European Union as a year of innovations in the area of education towards enterprise activities. The educational establishments, such as the universities and other institutions of higher education, had and still have enough opportunities to prepare adequately in order to update their institutes within the programme Erasmus Mundus as well as in the framework of the Operational Programme Research and Development. Individual challenges are currently going on within the above operational programme.

Modernisation of the universities should be directed towards the following areas:

- management of the universities and responsibility;
- content and quality of education;
- funding of the universities.

2. Management of the universities and responsibility

In the area of management of the universities and other institutions of higher education it is necessary to focus more extensively on the areas of science and research and their linking with practice. To carry out this linking it will be necessary in educational and research process to apply the activities that will be aimed at the needs and requirements of practice. It will be necessary to strengthen higher education and give this sector greater dynamics. It is also necessary to come to terms with the debt cumulated from the past in the area of facility equipment (deficit in the quality of university equipment causes low level of skills and creativity of students and educators). The directing managements of universities and faculties should support and motivate outstanding scientists and educators, who apply the latest scientific knowledge in their work and have active and very good contact with practice, in a more appropriate manner than they have done so far. The Slovak institutions of higher education remain behind similar institutions in the world, and this is closely connected with certain insufficiencies in their managements. Such managements are not able to offer a flexible response to the needs and requirements of practice and keep to traditional principles and attitudes. It often happens that such managements declare a support for innovations in science and research in their wording, nevertheless, the reality is rather different. The appreciation of those scientific workers who are behind the achievements in the area of science and research, is in most cases negligible either from moral or financial points of view. Such workers frequently appear to be a burden for a conservative management of the university, they are not motivated and supported adequately because they might cause some problems and additional work for the management. It is conservatism in particular, being the first and most important cause of the fact that no Slovak university is ranking among the best 500 world universities. The dynamics of development should be the priority of every university or institution of higher education, and it should stimulate and develop duality of mutual collaboration of school and practice.

3. Content and quality of education

The world financial crisis offers perhaps the best laboratory and research environment for seeking the new solutions of old as well as new problems. It is necessary to distract from the grooved ways and get rid of the used cliché as far as the content and quality are concerned. It is necessary to direct in a flexible way towards the needs of business companies in individual branches and regions at keeping to certain principles. It is undesirable to continue in old rules and dogmas the validity of which is groundless. Due to rather low activities of professors and associate professor at the universities these institutions of higher education are not prepared to respond adequately to the current needs and trends. A change in the content of

education in the area of training and instruction of managers means to educate and respond in a flexible way to the necessities of contemporary business environment and solve the problems of business companies. However, the present practice shows that the future managers lack skills and habits as well as resistance to helplessness and stress. Business companies and people lack time and money to train the graduates, at least for some period (6 months, a year) after their leaving the academic institution, how to apply, e.g., the marketing principles in practice, how to manage a firm or how to sell the company's products in the market. Our graduates consider this to be a big deficiency as they do not have the possibility of testing and verifying their theoretical knowledge. From the side of universities and other institutions of higher education it is necessary to convince the business companies of the fact that collaboration with academic institutions is inevitable and it can bring progress in the graduates' preparation, and at the same time it can save the company costs for the training of its employees. Our knowledge in this direction is unambiguous and convincing.

3.1. Universities and the Bologna Process

The universities in Slovakia should respond to the challenges resulting from the Bologna Process and should begin applying the "3T" System aimed at:

- talent;
- technology;
- tolerance.

This system was discussed at the meeting of the EU delegates and the representatives of institutions of higher education on 25 January 2007 in Bratislava within the newly originated innovation centre. If the 3T System is applied at our universities, together with the sense and heart, the system of innovations within the European Union will develop further on. That is simply to say that such interdisciplinary collaboration of technical and economic universities is required which will simultaneously deal with technical as well as economic and social issues.

3.2. Funding of the universities and other institutions of higher education

Funding of the universities and other institutions of higher education is as important as management of the universities and the quality and content of education. The reason for this follows from the fact that science cannot be carried out without funding. This is accounted for by the results in the area of the evaluation qualification framework. According to this criterion 53 patents fall on a million of inhabitants in the European Union, 179 patents in the USA, and even 219 patents in Japan. The difference in funding the academic institutions in the advanced countries and in Slovakia is enormous. The last presentation of the Minister of Education of the Slovak Republic brings no better predictions. On the contrary, out of the funds al-

located from the EU structural funds for science and research, the Government intends to use certain financial amount for the construction of highways in Slovakia. At the present time the expenses for the development of science and education in Slovakia constitute only 0.67% of GNP, whilst in the USA it is 2.3%, and 2.7% of GNP in Japan. The European Union gives 1.6% on average, whilst some countries reach higher average than the EU one. Lack of funding for science and research brings about insufficient equipment of the universities and a low level of innovations. This produces insufficiencies in the students' preparation for the new challenges of global economy.

4. Support of the European Union for development of science and research

Despite these problems the European Union has offered generous funding to support research and development at the universities and other institutions of higher education not only in Slovakia but also in the entire European Union within the Operational Programme OPaV 2008/5, 1/02—SORO (Research and Development) as well as within the Operational Programme OPvaV 2.1/02—SORO (Research and Development). It is a great chance for the universities in Slovakia to update the equipment of their laboratories and research facilities.

4.1. Why to build up and develop the Research & Development and Information Centre of Bioenergy at Kapušany as the EU facility?

The high rate of unemployment and significant disproportions in the development of disadvantaged regions of North-East Slovakia and a part of Southern Slovakia particularly cause immigration of top university graduates from these regions. It is necessary to maintain the inhabitation of these regions according to the examples of Austria, Germany and Poland and prevent from their depopulation by developing new activities and upgrading the access to innovations in the area of information and communication technologies which will bring new opportunities for the development of small and medium-sized enterprises. These activities also include the exploitation of renewable energy sources that has become the main task to be accomplished by the above Research & Development Centre.

At present there is a deficit in new impulses and themes for the enterprise development. Therefore this subject appears to be a challenging issue for our efforts to deal with. Who is to establish successful business companies, particularly with high sophisticated production, if not professors, researchers, postgraduate and undergraduate students? This fact may increase the university prestige and will contribute to the higher quality of graduates' preparation and their managerial capabilities.

4.2. Collaboration of the university with practice

Current collaboration of the university with practice and its development lacks:

- *legislation*—clear rules and limits of collaboration have to be established for bilaterally advantageous collaboration for both universities and business companies;
- *marketing*, i.e. mutual communication—business companies and universities do not use much marketing in their activities. More communication could significantly contribute to the better approach and gaining the trust between partners;
- *interlinking element*—there is a lack as to the interlinking element in carrying out the innovative steps;
- *orders*—business companies consider orders and effective activity to be an important fact what is a frequent problem of collaboration. On the other hand the companies have to trust more in universities and their potential. The VVICB Kapušany will mainly direct its activities towards this kind of problems, that is to say, to solve the technical and economic problems at the level of research and to offer ready solutions for practice;
- *official possibility to be in business*—until now there is no official possibility for the university workers in Slovakia to be in business at the university within science and research. Therefore these workers usually have a small business licence or form business companies outside the terms of the university. It requires making the necessary steps in this direction and to legalise enterprise activities;
- *adequate services concerned with taxes, audits, economic and administration activities*. Doing business at the institutions of higher education in the area of science and research requires solving the above legislative steps and procedures to carry out enterprise activities within the law.

4.3. A Proposal of VVICB philosophy and current activities

PROFIL—the Centre of Bioenergy Research is coming into existence in connection with solving the project “New Technologies for Environmentally and Economically Effective Improvement of Biomass for Energy Uses”, ITMS code: 26220220063, within the Operational Programme Research and Development in the years 2007–2013.

VVICB will be directed towards the following tasks and issues:

1. Solving the scientific and technical projects, grants and research tasks in the area of exploitation of alternative energy carriers, with the emphasis on solar radiation and biomass;
2. Projecting the new progressive energy equipment and systems;
3. Updating of already existing energy equipment with an emphasis on the increase of their effectiveness, operation and the optimum use of the energy content of fuels;

4. Projecting the synergic technologies in the area of exploitation of renewable energy sources;
5. Developing the progressive energy systems for the use of secondary fuels and non-traditional energy raw materials;
6. Monitoring the environment in connection with the operation of energy systems and equipment, e.g. the Biogas Station at Kapušany;
7. Economy of the exploitation of natural resources;
8. Creative support for the education of university student;
9. Research and verification of the results achieved in research and practice within the projects of the universities in Eastern Slovakia;
10. Demonstrations of individual energy carriers.

The Operational Facilities of the Centre are as follows:

1. The biogas station with a cogeneration unit of 180 KW/h output;
2. The solar energy laboratory—photovoltaics and water heating by solar collectors;
3. The laboratory and workplace of dry matter improvement and its processing into formed fossil fuels (briquettes, pellets);
4. The laboratory and workplace of liquid fuels for biooil and bioethanol production;
5. The physical and chemical laboratory of biomass testing.

5. Conclusions

The Bologna Process, which all the countries of the EU refer to, and accordingly the Slovak Republic as well, makes high demands on innovations of research and education at the universities. It will not be possible to assure the effective processes of learning without high quality research as this could have unfavourable results for the EU in remaining behind the advanced world in research and development for this and next centuries. These two activities are crucial from the view of the fact that progress is impossible without them as well as the assurance of high standard of living. Therefore all those who take part in these processes at the universities and other institutions of higher education must not allow the failure in this area so that it could become a stigma, on the contrary, the innovation processes must become a challenge for further development.

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Inovácie v oblasti výskumu a vzdelávania na univerzitách na Slovensku

Abstrakt: Európska komisia venuje veľkú pozornosť potrebe inovácií v oblasti výskumu, vývoja a vzdelávania. Pretože v tejto oblasti je Slovensko stále pozadu v porovnaní s vyspelými krajinami, ako sú USA a Japonsko. Modernizácia vzdelávania, ako sa zdôrazňuje v uznesení bolonského procesu je nutnosť zvyšovania kvality s dôrazom na prepojenie vedy a praxe, ako aj získavanie zručností a znalostí pre ich lepšie uplatnenie v praxi. Preto bude nutné, a to aj v podmienkach, Slovenska prispieť významnou mierou k podpore vedy a vzdelania. Mala by k tomu prispieť podpora štrukturálnych fondov Európskej únie na modernizáciu vysokých škôl a ďalších inštitúcií vyššieho vzdelávania, aby bolo možné zabezpečiť kvalitný výskum a zlepšiť podmienky v príprave študentov na ich lepšie uplatnenie v praxi. Autori vo svojej práci poukazujú na možnosti realizácie inovácií v oblasti výskumu a vývoja tým, že predstavujú príklad Výskumno – vývojového a informačného centra bioenergie (VVICB) na Ekonomickej univerzite v Bratislave pracovisko Kapušany. To centrum výskumu a vzdelávania ma prispieť k prenosu idey využitia obnoviteľných zdrojov energie do praxe a tiež ukázať praktické riešenia týchto aktivít.

Táto vedecká práca bola vytvorená realizáciou projektu „Nové technológie pre ekologicky a ekonomicky efektívneho zlepšenia biomasy na energetické využitie“, ITMS, kód projektu 26220220063 na základe podpory Operačného programu veda a výskum, financovaného z Európskeho fondu regionálneho rozvoja.

Kľúčové slová: inovácia, výskum a vývoj, vzdelávanie, modernizácia, obnoviteľné zdroje energie
