SUPPORT OF INNOVATION, EDUCATIONAL SCIENTIFIC-RESEARCH AND RESEARCH-DEVELOPMENTAL WORK ON UNIVERSITIES IN SERBIA

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Abstract

Purpose: The increase in the number of new firms from academic researches and locations science-based industries close to universities is one of the forms of expressing the relation of the Triple Helix in knowledge-based societies. Innovation is increasingly taking the Triple Helix form of relations and actors of new innovation types which are results of inventions. In this paper, the authors show that inexpressible (tacit) knowledge can occur through local research powers and that the global knowledge system can be connected with local conditions if it plays a role in the development process. They are confident that universities function as a bridge between global science flows and technology on one hand and local conditions and economic development on the other hand.

Methodology/Results: The Triple Helix (TH) model includes three main actors: university, industry, and state government. The TH thesis states that university can play a larger role in innovation in knowledge-based societies. A proposal of a general definition of the Quadruple Helix (QH) innovation model is given: it is an innovation cooperation model or an innovation environment in which users, firms, universities and public authorities cooperate in order to produce innovations. These innovations can be anything considered useful for partners in innovation cooperation. This study demonstrates that there are different possibilities for Universities to support and assist QH actors in meeting these challenges and in implementing QH innovation models.

The result of the analysis is the advancement of innovation capacities and innovation culture:

- Encouraging technology-oriented entrepreneurship including academic entrepreneurship.
- Linking between research institutions and the business sector.

Findings: The main lesson from the analysis presented in this work is the necessity of development as well as development of higher education and universities. Sustainable development should be the key determinant of the reform at university that is a condition not only for development but for its subsistence as well.

Research limitations/implications: Educational policy and research in the education field shall support innovation and enable increasing efficiency in case it, together with Government measures, imposes regulatory, institutional and organizational frameworks through: mobilizing stakeholders; review of sectorial regulators from the innovation point of view; organizational charting; strengthening relationships between researches, practice and vocational policy; cooperation among networks, providing support to practical communities; creating a financing model that is adapted to goals and priorities.

Originality/Value of paper: In this paper authors present: activities at the Universities in Serbia for support of innovation, center which is mission to educate and inform academic, research, business and student society at Serbia in order to promote the role of intellectual property and raise awareness about importance of information communication technologies (ICT) in knowledge based society, clusters, science and technological parks, business incubators with the aim to actively participate in the programs of promoting the competitiveness of the industry in the Republic of Serbia, events devoted to promotion of innovation at the Universities of Serbia and the most successful centers/teams.

Keywords: Innovation, Helix models, sustainable development.
1 INTRODUCTION

In the modern world, Universities are not just a social institution for the creation and transmission of knowledge and human capital, but also the community for experimentation, research and innovation, with a systematic, methodologically defined use of the intellect to understand and research reality. The great challenges for the existing function of the University created a new business conditions that impose requirements for the third mission of the university, which is basically entrepreneurship mission. As entrepreneurs, Universities have to find possibilities of entering the market and meeting the needs of its stakeholders. There is a need to define factors affecting the development of entrepreneurial culture, factors that are essential for the development of entrepreneurship at the University. The first step of leadership and management at all organizational levels is to determine the awareness of management faculties, directors of departments, heads of departments and employees on a clearly defined strategy for the development of the University. The research need to conduct at three levels of employees at faculties: managers of faculties, heads of departments and employees with no management function. The differences in responses between the subjects in relation to the function of management could be observed. At the faculties where entrepreneurship is clearly part of the strategy of the faculty, there is noticeable commitment to implement entrepreneurial approach as a model for coordination and integration of such activities.

2 EDUCATIONAL SCIENTIFIC- RESEARCH AND RESEARCH-DEVELOPMENTAL WORK

The “Strategy Europe 2020” is the main strategy of European development for this decade. It is all-encompassing and generally applicable. Therefore, no institution should act on their own: multi-layered government and national reform programs are a necessity. This guides the development of the “Europe 2020” vision in regions and cities of Europe [1]. Therefore, regional and local development. In that context, the following projects are significant for us: Education strategy 2020, Danube strategy 2020, Horizon 2020, Erasmus plus. So, what consists this umbrella strategic document referred to as „Europe 2020”? It can be broken down into three pillars; three „beacons”, so to speak, or guideposts of future development which should also be a guide for education, research, and the transfer of knowledge. The three pillars are smart growth, sustainable growth, and inclusive growth.

Smart growth implies the following: education (encouraging people to learn, study and hereby enhance their skills); research/innovation (the creation of new products/services which facilitate growth and provide new job opportunities); digital society (using ICT); and so on. EU politics for achieving smart growth are versatile: the European digital agenda (defining directions of optimal utilization of social and economic potentials of ICT: mainly, the internet, as a vital media of commercial and social activities such as studying, business, work, playing, communication and free expression); the platform of smart specialization (every region should be assisted to assess which activities provide the greatest added value to strength that region’s competitiveness); the union of innovations (to enhance the framework of conditions and the approach to financial means for the research of new products and services which encourage development and provide new job positions); youth in motion (this initiative aims to improve education systems, student mobility and make the labor market more accessible to young people). In conditions of “smart growth”, fast technological changes and widespread automation, the deciding factor of growth and competitiveness is access to a skillful work force. Geopolitical, demographic and economic strengths are affecting the features of the market, as declared by Klaus Schwab, founder and CEO of World Economic Forum. New technology in particular is altering the nature of the work itself, and these changes are making number of sectors and professions redundant and outdated, whilst at the same time creating room for entirely new categories of industries and job positions. According to certain estimations, nearly half of today’s professions could be automated by the year of 2025. Speculation about what will replace them ranges from assumptions about increased work opportunities to dramatically increased unemployment. The first signs of this disarrangement are already visible. Meanwhile, 36% of employers all over the world have stated during the last year (2016), they had difficulties in finding talented employees – this is largest percentage in the past seven years.

As technologies take over work based on knowledge, emphasis in the education system should be put on cognitive skills. Modern schools and universities, in which domineering approaches of learning are in their essence individual and sufficient, should be modified so their focus is shifted to learning how to learn and methods of acquiring acquire new skills in the future which may be needed for better
cooperation with other societies. Universal human skills, such as teamwork, networking and understanding and showing sensitivity to cultural differences will be of crucial significance for businesses in every sector. Since life-long education is becoming an increasingly prevalent aim, numerous companies are actively investing in professional education, retraining and field specialization for their employees.

Business sectors will, therefore, require tighter co-operation with educational institutions in order to ensure that the education system is remaining in touch with the ever changing needs of the labor market. Governments must also take part in creating an environment in which their citizens can fulfill their potential: the importance of investing in education is clearly significant.

3 METHODOLOGY

The growth of new businesses from academic research and locating scientifically based industries close to universities is one method of demonstrating relations of the “triple spiral” in societies based on knowledge. Innovations are increasingly taking the form of the “triple spiral” and agents of these types of innovations, which are fruits of inventions which result through those interactions, and include incubators, science parks and businesses which are investing their capital [2]. The conformation of the “triple spiral” effect usually begins when universities, industry and the state government interact and create reciprocating relationships in which all the participants strength the performances of each other. (According to the interpretation of Reddy [3], the model of „triple spiral“ assigns equal roles in innovation to all of the three agents and disregards differences in sectors or partial attribution to each agent). In discussions regarding innovations, Etzkowitz and Leydesdorf [4] have introduced the model of “triple spiral” which includes: university, industry and state government.

The principle of the „triple spiral“ states that universities can play an expanded role in innovation in knowledge based societies [4]. As an analytic model of innovation, the “triple spiral” model adds to the explanation and to defining the dynamics of institutional arrangements and political models. Etzkowitz and Leydesdorf [4] have described three conjoint dynamics and university-industry-state government interrelations: institutional transformations, evolutionary mechanism and new position and mission of university.

There is a widespread belief that a university fulfills its’ mission in the optimum way by limiting itself only to education and research and by avoiding participation in the broader parts in economic and social development. In compliance with that point of view, university is fulfilling its’ third mission in the best possible way by accomplishing its’ fist and second missions - education and research [2].

Gransson and Brundenius [5] note that the benefit from science and technological politics, and from politics of innovations as well, is more long-term than short-term, more scattered than cumulative, but always vital if the end goal is developing an economy built on the power of production and the use of knowledge. They stress that the available scientific knowledge is sometimes hard to understand and directly apply to the local context without using the “implicit (tacit) knowledge”. Gransson and Brundenius [5] believe that this tacit knowledge can be created through local research powers and that the system of global knowledge can be connected with local conditions, in case it plays a part in the development process. They are confident that universities are operating as a bridge between global streams of science and technology on the one hand, and local conditions and economic development on the other. In today’s business environment there is a growing need for the transfer of knowledge between universities and field experts, via license contracts, mutual research and investment.

Siegel, Waldman, Atwater, and Link [6] conducted research which included 98 structural interviews of the key agents in the process of technology transfer between university and commerce (UITT): university scientists who are discovering new technologies, technological managers at universities, and administrative staff viewed as mediators between academics, businesses and industries (entrepreneurs). The research was conducted at fie research universities in two USA regions goal being to define recommendations for effective and efficient UITT processes. The authors reached the conclusion that participants of the research have differing perspectives regarding the desired outcomes of the process of technology transfer and that the most common obstacles are: conflict culture, a rigid bureaucracy system, underdeveloped rewarding system and inefficient management of University’s office for technology transfer. Results of the research indicate significant space for efficiency improvement within the commercial knowledge transfer between universities and businesses. Siegel, Waldman, Atwater and Link [6] are recommending the following directions to develop a successful UITT process: (1) Eradication of cultural and informational obstacles which
interfere with the technology transfer process, (2) Designing flexible politics regarding the technology transfer to universities, (3) Improvement of staff training provided by the office of technology transfer, (3) Providing additional resources for the UITT process, (4) Increasing rewards for conducting the UITT process, (5) Encouraging informal relationships and social networks.

Entrepreneurial behavior by faculty professors includes decisions regarding collaboration with industries, patent applications and spin-off companies (businesses created within a mother organization, which later became independent).

Numerous obstacles which impede entrepreneurship at faculties and universities are closely related to their inherent and essential characteristics [7]: (1) Time dimension and need for immediate results, (2) Impersonal nature of the exchange, (3) Rigid hierarchy, (4) Need for control, and blind rule and procedure following as its’ consequence, (5) Conservative corporate culture, (5) Lack of entrepreneurial talent, (6) Inadequate methods of compensation.

Most of the academics see themselves fulfilling the roles of teacher and researcher, but not entrepreneur. University managers, on the other hand, believe that the inclusion of leading academics into entrepreneurial activities will have a negative effect on their research results. Aghion et al. in their review [8], investigated the connection between managing universities and their performance. The study of the World Bank [9] observed the structure, processes and activities included in the process of planning and managing institutions of high education, with a special focus on strategy, financing and governing.

Dunn and Dunn [10] dealt with the issues regarding university’s management. They put their focus on the procedures which should strengthen administrative and faculty-related skills and understanding, and create a close bond between managing style and good performance in task and goal accomplishing. Alongside of managing style, authors consider that the key issues are: designing an efficient staff selection and employment programs, enhancing faculty’s motivation, enhancing the skill of time management, improving the grading system by creating relevant criteria, developing new evaluation approaches and instruments.

When it comes to assessing and measuring innovations, Reddy [3] points to differences between universities and industry in terms of their orientation and values as guide points of academic and industrial research: innovations based on university research are rated by criteria such as (1) knowledge improvement, (2) providing the resources for new research, and (3) improved or deepened understanding of processes (“knowing how”, “knowing why”, “knowing what”). On the contrary, domineering values in assessing and measuring commercial innovations are more concerned with market success, rather than originality and novelty.

3.1 Implementation of Triple and Quadruple Helix innovation

The future development of industry relies on interaction between universities, private sector and local economic development. Becoming an entrepreneur and nurturing entrepreneurial qualities, by transforming curriculum according to current market needs, should be taken as an imperative for students, employers and local communities. The link between education in industry and employment indicates to which extent the curriculums at universities are aligned with market needs. The progress of industry relies on competent and skillful graduates in economy, organizational and technical sciences. Therefore, the main objective is to facilitate and accelerate the coordination between universities, private sector and government, by forming a platform, based on Triple Helix concept, that links multidisciplinary education (economy, organizational and technical sciences) based on entrepreneurial values and employability in the industry. There is a need to report on the existing gaps between university, industry and government.

Indicators of progress: (1) Identified gaps and potentials for improvement in implementation of Triple Helix (University-Industry-Government) “Fig. 1” and Quadruple Model in industry, (2) Enhanced innovation processes and cooperation culture within university-industry-government spheres, on the road to sustainable knowledge society, (3) Determination of levels and competencies in local/regional/national innovation systems in industry, (4) Detecting the number of creative and innovative agro-entrepreneurial small-sized firms incorporated into the Triple and Quadruple Helix model of support (eg. Industrial incubator model, Industry – Technology Transfer Office, Entrepreneurship Expert Center, Interactive Data Map for Business), Capacity building trainings for Triple and Quadruple Helix cooperation between university-industry-government spheres, (5) Increased number of university-private sector-government bilateral-multilateral contracts of cooperation.

4 RESULTS

In current “innovation institutionalization” the extent to which the innovation process is dependent on the availability of new and impressive knowledge is higher than ever [12]. Innovations are and will continue to be founded on science, and they will be the fruit of contribution of different scientific disciplines – the catching up of different scientific and technological knowledge in the mutual innovation process, which is expressed by the acronym NBIC (Nano Bio Info Cogno). Hybrid technologies and the convergence of nanotechnology, biotechnology, information-communication technologies and cognition-technologies are enhancing the central role of university. The longer the chain of knowledge transmission between research institutions and the business world, the harder it is to accomplish effective transmission of all the different components of scientific and technological information (both explicit and tacit knowledge).

Caraca, Lundvall and Mendonca [13] are claiming that science will remain as a fundamental source of innovation and that the interaction of science and industry is a significant aspect of innovation ecology. In the future, increasingly greater parts of industry will directly depend on science and its’ strategic input in innovations. They are also warning that it would be wrong to subject universities and basic research to the market or political dictation. According to their opinion, when current political leaders assume that science is the direct or even the only source of innovation, they tend to put enormous pressure on science and also universities. Unless the results are fulfilling their excessive expectations, they tend to assume that universities are “ivory towers”, and they then aim to transform them into equally unacceptable “business towers”.

The report of the educational network “Euridika” from 2008 specifically dealt with politics, official regulations, rights and responsibilities in managing institutions of higher education [14]. This report identified a general trend across Europe towards less strict regulation frameworks and stated that
different models in different countries are developed in the framework of their respective academic self-government and external liability.

4.1 Activities at the Universities in Serbia for support of innovation

The main objective of collaboration universities with industries, patent applications and spin-off companies is to provide: (1) an understanding of the basic concepts and practice of entrepreneurship and entrepreneurial human potential in agro-industry, (2) understanding of the importance of entrepreneurship and innovation to new demands of various segments of the economy, (3) understanding of the process of converting business ideas into entrepreneurial ventures.

The main goal is to provide all students with: (1) necessary entrepreneurial characteristics and skills, (2) an understanding of the creation of an entrepreneurial environment in enterprises regardless of their structure, size and economic activity and to enable them to understand the prerequisites of starting their own business.

There is a need not only to react appropriately to the changes in our society and environment in smart and innovative ways, but also need to become a part of them. The University of Novi Sad has, by employing smart strategic thinking, by being active, engaged and by making wise choices, managed to accomplish significant results.

This is visible in many fields: investments (new University building, technology parks I and II, foundations), internationalization, international projects, transfer, clusters, excellency centers.

There are many examples of activities, ranging from the direct linkage of our University with commerce through usage of the latest technologies, to remarkably developed international cooperation, which combined put the University of Novi Sad high in the global market ladder. Special emphasis needs to be directed towards on the university’s centers of excellency. They represent teams of distinguished researchers who are combining their knowledge, resources and international contacts in order to answer to realistic and common issues present and future issues of humanity.

Internationally acknowledged research centers are a structural part of broader concept of “smart specialization” developed by EU, whose goal is to use specific advantages of each region in the most efficient way, with appreciation of its’ priorities and resources. In terms of science and technology, it implies multi-sector research and focus on commercializing the innovations, while in terms of commerce and entrepreneurship it implies providing support for cluster development and ensuring that every cluster thrives from specific advantages of its’ region. Related to that, the University is the initiator and co-founder of several successful clusters (the ICT cluster of Vojvodina, Metal cluster of Vojvodina, Creative industry cluster of Vojvodina, and Organic agriculture cluster of Vojvodina) [15].

A competence and cluster development center has been founded to actively participate in programs for promoting collaboration with industry; the university center for intellectual property has a mission to raise awareness regarding the significance of intellectual property and society based on knowledge, and also to help protect intellectual property. The center has the goal of supporting the transferring and commercialization of knowledge. The Center for applied statistics is making statistical-mathematical analyzes for the needs of the business world.

5 CONCLUSIONS

The main obstacles to innovations have been identified as economic and financial factors, plus a lack of support from the state. Government support is a necessity and its task is to design innovation politics with measures and recommendations in the following areas: (1) Education and human potential, research and development, (2) Innovation funding, (3) Informing and public dialog, (4) Regional development, (5) Entrepreneurship development, specifically technological development of popular small and medium businesses, (6) Acting in line with educational and science and technological policies, entrepreneurial development politics and industrial politics in total.

Improvement of innovation capacities would enable: (1) Broader usage of existing resources (faculties, science-research centers, technological infrastructure) in order to promote technologically oriented entrepreneurship, including academic entrepreneurship, (2) Better quality of relationships between research institutions and business sector, (3) Integration of innovative businesses into wider industrial networks/clusters.
It is justified to stress that the values and ethical principles are the core and main strength of the European universities. With this they are enabling a healthy environment for sustainability and profitable activities of higher education in terms of education, research and serving society [16]. Quality mechanisms and processes are pointers to what is valuable in the higher education and what is not; the maintaining value system should be a foundation of ethical and strategic choices, as they have the potential to strengthen creativity and innovation. If we expect our universities to be more innovative, flexible, adjustable and agile, then we need to root out all the obstacles to agility and to shape their agile processes. Shaping those processes requires innovation and agility itself.

REFERENCES


