

Regional Role of Higher Education Institutions in Croatia

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Abstract—Development of knowledge based society carries multiple challenges to the higher education system. Some of the challenges laid before the higher education sector of countries which aspire to become knowledge based societies are: the entrepreneurial leadership of the higher education institutions, finding new sources of financing in order to minimize dependence on public resources, creating connections with the labor market, commercial utilization of R&D results, promotion of innovations as well as the overall promotion of science excellence relevant to the economic sector. Within a framework of this paper and its main subject of research, the challenge which is being put before the higher education institutions is an effort of establishing regional mission of higher education through the open collaboration with regional key factors, both private and public. Development of the mentioned collaboration and its contribution to the overall regional development in Croatia is the main subject of empirical research in this paper.

Keywords—Croatia, Higher Education Institutions, Regional Role, Science-Industry Interaction

I. INTRODUCTION

THE overall goal of this paper is to investigate and determine the level of regional orientation and involvement of higher education institutions (HEIs) in Croatia. To achieve this overall goal the empirical research has been conducted on the representative sample of elected higher education institutions and business entities in Croatia. This kind of empirical research is the first one conducted in Croatia and as such it can introduce some important information on this subject.

The empirical research of this paper was conducted with the survey method. Two highly structured web questionnaire templates were used as tools in this survey; one for higher education institutions and one for business entities in Croatia. In the questionnaire templates the elected higher education institutions were assessing the level of their own regional orientation through the predefined indicators of regional involvement and collaboration with regional factors. The selected business entities were assessing the level and means of their collaboration with the higher education institutions in their region as well as the impact of that collaboration on their business activities and innovativeness. The described

concept of conducted survey was chosen in order to gain reciprocal, mutual perspective on the regional mission of higher education sector in Croatia. With that approach this regional mission of higher education sector in Croatia was judged not only by the institutions of that sector but also by the factors without whose involvement and support that mission cannot be fulfilled.

This paper is set out in four chapters. Following the introduction, the second chapter is a review of a theoretical ground on which the regional function of higher education is based upon. The methodology and the results of the conducted empirical research are presented in the third chapter. Fourth chapter is the inclusive reflection on the carried out research.

II. REGIONAL ROLE OF HIGHER EDUCATION INSTITUTIONS

Traditionally, institutions of higher education have been fulfilling two main roles. Those are research and education. With certain exceptions, those institutions have been independent from, or more precisely, isolated from local and regional needs because of their essential orientation to create and develop knowledge significant for national, global economy. Today things are different. Now another equally essential assignment is being put before a higher education system. It is to contribute to economical, social and cultural development of a region, to collaborate with regional economy sector. Thus, the higher education sector is becoming one of the key factors of regional development. These new tendencies are the result of the understanding that higher education system should be in fact the generator of regional development with its power of creation scientific excellence to subserve regional needs. To fulfill this new mission it is necessary for the higher education system to be connected with the key factors in its regional environment.

The collaboration between science and businesses should result with a growth of innovativeness which is, according to modern economic literature, one of the key source of the economic growth. Because of that, the business innovativeness is considered to be one of the central competitive advantages [1]. In order to obtain their competitiveness, business entities today are confronted with the neverending necessity to innovate their products, services and their production capacities. Nevertheless, there is a very small number of business entities which have the capability to manage and carry out their innovative process independently, focused solely on their own sources. The business entities innovative process, from the concept / idea of product to its introduction on the market can and should benefit from the

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source of information, knowledge and technologies coming out from the higher education sector.

That idea is incorporated in a new concept called National innovation system (NIS) as its main characteristics. National innovation system is a concept, introduced in economic literature, which represent the network of public and private sector institutions which by their activities and interaction initiate, import, modify and broadcast innovations across the country [2]. The continuous interaction between the higher education institutions and the business sector clearly requires their geographic closeness. Consequently, from the concept of the national innovation system a concept of regional innovation system has emerged.

Regional innovation system (RIS) represent the network of public and private institutions which by acting together and out of their collaboration encourage business entities in region to adopt common ideas, expectations, values, standpoints and practice by which the regional innovation culture is being established [3]. As opposed to the National innovation system, the Regional innovation system is taking into account the uniform, evenly regional development. Not every company or region has the capability to absorb the volume of knowledge and technology which is coming from the large national university centers. Consequently, those inferior business entities or regions are systematically excluded from the national innovation system.

RIS is emphasizing the importance of region as a suitable economic area in which innovations are being generated throughout regional networking of the institutions of higher education, business entities and public sector institutions. For RIS to be fully functional and efficient the educational and R&D institutions have to take over the main role of meeting the needs of regional business sector and perceiving the knowledge useful for regional producers.

Development of higher education institutions' regional mission has also contributed to the development of modern regional policy based on bottom-up approach. It means that every region is becoming responsible for its own growth. Every region for itself is a part of the race for innovations in order to become more competitive and more attractive on the global market. With that approach regional policy has become innovation policy which elemental assignment is a promotion of investments in the infrastructure of knowledge, promotion of small and medium-sized enterprises, promotion of applied research, as well as the improvement of interaction between science and business sector.

Regional innovation policy is imposing specific tasks and expectations to the higher education institutions. These tasks and expectations are referring to the regional mission of the higher education sector. The regional mission of the higher education sector implies the production of knowledge and applied research for the regional economic sector to use and profit from. Therefore, the only way of achieving this regional mission of higher education sector is the open networking with the factors from business and public sector.

III. EMPIRICAL STUDY OF REGIONAL ENGAGEMENT AND ORIENTATION OF HIGHER EDUCATION INSTITUTIONS IN CROATIA

A. Sample Election and Empirical Research Procedure *Definition*

Due to the new challenge that is imposed on tertiary education, the aim of this paper was to determine the development of the regional mission for Croatian higher education institutions. For that purpose, the empirical research was conducted on a representative sample composed from public higher education institutions and selected businesses.

In the referred research as focus group all *public institutions of higher education* in Croatia were selected. This population is composed of the public universities (7) with faculties and university departments as its components (67 faculties and university departments in total), public polytechnics (13) and one (only) school of professional higher education. Another focus group was *250 businesses entities* in Croatia. These were of different sizes and activities and different official seats throughout Croatia.

A survey method was a chosen research method. Conducted survey method was carried out with two highly structured web questionnaires which were sent to two mentioned focus groups. Focus groups were mainly offered the multiple-choice questions in the questionnaire. To achieve previously mentioned primary objective of the empirical research, the indicators of the regional interaction between HEIs, businesses and public entities were defined, as well as the indicators of regional engagement of HEIs.

The survey questionnaires were sent to focus groups on 20th of October 2010, for the first time, followed by several repeated requests. Total of 31 higher education institutions agreed to participate in the survey. 21 of these participants completely filled out the questionnaire and answered all the questions. That represents the response rate of 67.74%, or 26.25% of the total population in Croatia, which is considered acceptable for this type of research. Total of 178 (out of 250 in the sample) business entities agreed to participate in the survey, of which 120 enterprises completely filled out the questionnaire. That represents the response rate of 48%, which is considered acceptable for this type of research.

B. The Results of the Empirical Research – Higher Education Institutions

Empirical research carried out with the survey questionnaire was conducted in order to determine how the higher education institutions in Croatia assess the intensity of its regional orientation and regional engagement.

One of used regional orientation indicators was the level / fashion of incorporation of the regional development contribution within the proclaimed mission / objectives / strategies of HEIs. Out of the 22 institutions that responded to this question, 60% of them answered that they have indeed incorporated the contribution to the regional development in the framework of their mission, goals and / or strategy. The

given responses demonstrate that higher education institutions, from their own perspective, have generally raised awareness to the need for developing its third, so called regional mission.

However, when asked to answer whether the formation of their strategy involved regional entities from the public and private sectors, the majority of respondents (62%) responded negatively, while only 14.3% gave the positive answer. These answers are showing the lack of cooperation of the key partners within the process of strategic administration of the higher education development according to the needs of regional community. Following previous responses, and at the same time taking into account that isolated activities of HEIs, without the cooperation with key partners from the private and public sector, cannot effectively generate regional development, the actual contribution of HEIs to the development of the region is indeed questionable.

Respondents were asked if there was any involvement on their part in managing of the county's development strategy. Most of the respondents answered negatively (52.4%). These results are just further confirmation that there is a significant lack of cooperation between key regional factors within the process of creating regional development policy.

Given the previous results of the conducted survey, it would be of same value to point out some examples of good European practice regarding the joint creation of long-term strategic objectives by all relevant partners on regional level. That approach proved to be successful in time of crisis on regional level. We can mention the Snowpolis Technology Park in the Kainuu region in Finland. Joint activities of the partners in the Park and the results of their joint activities helped to pull the whole region out of the crisis which arose in the early 2000s [4]. City of Dortmund in Germany is yet another example worth mentioning. The closure of local coal and steel factories in the 1990s led to massive unemployment and economic crisis in the region. Dortmund City launched so-called "Dortmund Project" which represents a joint initiative of the city government, local industry and partners from the scientific and educational institution. The aim of the initiative was to establish conditions for the city to become a centre for micro and nanotechnologies and to create new employment opportunities in wider region [5]. Micro-systems technologies were selected as one of the leading thematic priorities for regional development following a thorough analysis of the scientific, technological and economic potential of the region performed in 1999 [5].

With the objective to determine the perception of higher education institutions to their own orientation towards the needs of regional and / or national labor market, they were asked to answer the following question: Is your main task to serve the needs of regional and /or national labor market? Most of the examinees (76.2%) responded that their main task is to serve both the needs of regional as well as national labor market. Those answers indicate that among the various higher education institutions in Croatia there is no distinction in their orientation; whether it is towards the needs of regional

or national labor market. A trend that is present in most western European countries (such as Finland and the Netherlands) is that universities mostly have both national and international orientation, while the universities of applied research, so called, polytechnics, are more regionally oriented. In Croatia, based on the research sample, such a distinction, does not exist. This can be seen in Table 1. The analyzed answers indicate that polytechnics in Croatia have insufficient awareness of their mission in supporting the regional economic and social development. One of the reasons why various institutions of higher education in Croatia are not aware of their primary (external) objectives can be found in underdeveloped binary system of higher education. Because of that, differences between universities and polytechnics are yet to be clearly established.

TABLE I
 ORIENTATION TOWARDS REGIONAL OR NATIONAL LABOR MARKET'S NEEDS
 ACCORDING TO THE TYPE OF HIGHER EDUCATION INSTITUTION

	Faculties	Polytechnics	Schools of Professional Higher Education
Orientation towards regional labor market's needs	0	2	0
Orientation towards national labor market's needs	2	1	0
Orientation towards both regional and national labor market's needs	12	3	1
The total number of responses			21

One of the indicators that determine regional orientation of higher education institutions is an offer of study programs and adult education programs in accordance with real economic needs in a region. Following the mentioned indicator, HEIs were to answer was there any analysis of regional labor markets preceding the decision to offer new courses and adult education programs. The largest proportion of respondents (47.6%) answered that they have indeed perform such an analysis of regional labor market's needs, while 38.1% of the respondents answered negatively to the same question. The analysis indicates insufficient planning prior to offering and performing the study programs that should be a response to the regional economic needs. In Austria, for example, every curriculum, according to The Law of University Studies, prior to the establishment and implementation, must be presented, not only to the Ministries and Governments of Federal Provinces as employers, but also to associations of industries, chambers of commerce and individual relevant chambers of professions, or other organizations relevant as sectors of economic activity and professions. Those organizations are to submit propositions of change within a certain period of time [6]. Such legislative initiative seems to be missing in Croatia.

Regarding the fact that regional mission of higher education institutions manifests itself throughout collaboration with industry, respondents were asked to answer if they have implemented any form of formal and / or informal cooperation with companies from the industry (in the period 2008-2010)

with the aim of knowledge and technology transfer. 81.8% of surveyed HEIs responded positively, which indicates a high degree of cooperation with industry from the perspective of HEIs. It is important to mention that the responses of businessmen to the same question are quite different from the responses of scientists, where only 13.3% of surveyed companies responded positively. The question is why there are rather large differences regarding the mentioned cooperation from the perspectives of the two focus groups. Possible explanations will be presented in the section (C) of the paper.

In the following question the respondents were asked to specify the number of implemented research projects carried out independently from and with collaboration with factors from business and public sector in the last three years (2008-2010). Given answers reveal that the number of completed projects with the economic entities exceeds the total number of independently implemented research projects. That demonstrates that the mayor opinion of Croatian scientists is that Croatian science is in fact in function of economic development of the country. More than 50% of completed projects with the industry refer to regional economic entities. That is not surprising considering that the establishment of serious business collaboration requires face to face interaction. At regional level, the interaction of HEIs with the business sector goes beyond its interaction with local and regional government. Cooperation of HEIs with the public sector, as survey indicates, requires additional efforts.

TABLE II
 NUMBER OF IMPLEMENTED PROJECTS IN THE PERIOD 2008-2010

Indicator	Average number	Total number	Number of responses
The total number of implemented research projects	13.27	199	15
Implemented projects in collaboration with economic entities	18.43	258	14
Implemented projects in collaboration with regional economic entities (within the county and neighboring counties)	13.90	139	10
Implemented projects in collaboration with local and regional government	6.88	55	8

HEIs were also asked, in relation to their previous responses, to independently evaluate the level of their regional engagement and regional orientation. The default interval responses were from 1 (very low) to 5 (very high). The average overall rating for all respondents was 3.14 - medium grade. For comparison, the businessmen evaluated regional engagement of higher education institutions with average scores from 1 (very low) to 2 (low). The above results show that scientists and businessmen differently perceive HEIs' regional performance.

In the last question respondents were invited to assess the contribution of their institution with an emphasis on their contribution to the economic development of the region,

contribution to the strategic guidance of the regional development, contribution to the social and cultural development of the region, employment in the region, development of human capital in the region as well as their contribution to the regional innovativeness of enterprises. The default interval grades ranged from 1 (very low) to 5 (very high). According to the answers of the respondents, the average score for all mentioned components is 3 (medium). With the lowest grade scientists have evaluated their contribution to the regional innovativeness of business entities. Bearing the mentioned scientists assessment in mind, we should state that, according to modern economic theory, regional innovativeness of business entities should in fact be the first and outmost result of the cooperation between science and industry.

Based on the analyzed results of research conducted at HEIs it is difficult to make a single conclusive assessment of the regional engagement of HEIs. That is because there are rather large ranges in the responses of scientists. The objective indicators such as: participation of regional entities from the public and private sectors in creation of HEI's strategies, participation of HEIs in creation of county's development strategies, the analysis of regional labor market needs and the needs of the economy preceding the decision to offer study programs and adult education programs, and orientation towards the needs of national and / or regional labor market, indicate that Croatian higher education institutions have not yet developed a permanent and effective cooperation and clear orientation towards both business and public sector in the region. That by all means stands as an aggravating factor for their regional role. However, the objective indicators such as the incorporation of regional missions in the vision / goals / strategy of HEIs and the number of projects implemented in cooperation with regional economic entities, indicate that Croatian higher education institutions, at least to some extent, are in function of the regional economy. Furthermore, indicators that show the subjective assessment by higher education institutions, such as: the realized form of formal and informal cooperation with companies, the assessment of their own regional engagement and orientation, the contribution of the HEIs to the innovativeness of the regional companies; and the contribution to the strategic guidance of the regional development, demonstrate that scientists assess the referred cooperation and its results with an average (medium) rate (on a scale from 1 - very low to 5 - very high).

Before making a final conclusion on the regional function of higher education institutions, it is necessary to analyze the results of research conducted on business entities in Croatia.

C. Results of Conducted Empirical Research – Business Entities

Second part of the empirical research was conducted on the sample of elected business entities in Croatia. The reason for such approach, as previously stated, was to verify if there is a compliance between the information obtained from the higher education institutions and the business sector in Croatia. In

other words, the level of regional involvement of the higher education sector was evaluated from the perspective of business entities in Croatia.

In the questionnaire, the elected business entities were asked if there was, within the observed period of time, any kind of achieved organized collaboration with some of the subject of higher education sector aimed to improve their business efficiency and innovativeness. Only 13.3% of respondents answered positively, while 56.7% of them gave a negative answer. The comparison of mentioned answers with the responses gained from the higher education institutions has shown a huge disparity because as much as 81.8% of the higher education institutions gave the positive answer to the same question. How to explain such a large discrepancy? A possible explanation lies in the fact that the most of the existing collaboration is generally only formal in nature, not specifically focused on achieving the increase of innovativeness of companies, development of new products, services and processes.

What is the number of realized innovations and registered patents incurred as a result of the collaboration with the higher education institutions in region was the second question for the sampled business entities. The answer to that question can be a direct indication of the impact of the referred collaboration on the innovativeness of business entities in Croatia. Given responses are shown in Table III.

TABLE III
NUMBER OF REALIZED INNOVATIONS AND REGISTERED PATENTS IN CROATIAN COMPANIES (IN THE PERIOD 2008-2010)

Indicator	Average number	Total number	Number of responses
The total number of innovations in a company ^a	9.93	1.321	133
The number of innovations developed as a result of collaboration with HEIs in the region	0.63	69	109
The number of registered patents	0.39	43	110
The number of registered patents, developed in collaboration with HEIs in the region	0.03	3	109

^aThe total number of innovations in a company include: new or significantly improved product or service introduced on the market, new or significantly improved production process introduced in a company, new or significantly improved process of supply of goods / services, expansion on new markets (domestic and / or outside the country), implementation of new or significantly changed business strategy and changes in organizational structure.

The number of innovations resulting from the referred collaboration in region within the observed period is only 5.2% of total number of realized innovations in companies from the sample. Obtained information indicates that the Croatian higher education institutions have very little impact on innovativeness of regional economic entities. This is supported by the fact that only 6.97% of the total number of registered patents resulted from the collaboration with the higher education sector, in the referred period. For comparison, the higher education institutions assessed their contribution to the regional business innovativeness with 2.19.

The last part of the questionnaire for the elected business entities included an assessment of the various statements. With their answers respondents assessed (graded) various statements referring the cooperation with the higher education institutions within the region (county with its neighboring counties). As mentioned before, default interval of grades was set from 1-very low to 5-very high as it can be seen in Table IV.

TABLE IV
ASSESSMENT OF THE INTENSITY, QUALITY AND RESULTS OF COOPERATION WITH HIGHER EDUCATION INSTITUTIONS AT REGIONAL LEVEL (IN THE PERIOD 2008-2010)

Indicator	1 very low	2 low	3 medium	4 high	5 very high	I do not know
The intensity of cooperation of your company and regional HEIs	54	26	22	3	4	11
The quality of cooperation between your company and regional HEIs	51	18	25	8	5	13
The commercial cost effectiveness of the cooperation with regional HEIs	54	30	16	7	0	13
The impact of the referred cooperation on the company's innovativeness	55	28	17	4	2	14
The influence of the referred cooperation to the employment growth in the company	67	29	14	4	1	14
The impact of the referred cooperation on improving the financial results of company	63	22	17	2	2	14
The total number of responses						120

The intensity of the cooperation between regional businesses and the higher education institutions was graded with the overall average grade of 1.7 (low). The quality of cooperation between regional businesses and the higher education institutions was graded with the overall average grade of 2.04 (low). The commercial effectiveness of the referred collaboration was graded with the overall average grade of 1.77 (low). With the identical grade (1.77 (low)) businesses entities rated the impact of the referred collaboration on their innovativeness. The influence of the referred collaboration to employment growth in regional businesses was rated with 1.69 (low), while the improvement of financial results, as another outcome of the same collaboration, was rated with 1.66 (low).

Presented results from the perspective of business entities in Croatia clearly indicate that the existing forms of collaboration between these entities and the higher education institutions have extremely low overall impact on the regional business sector. The level of constructive regional engagement

of the higher education sector judged through the positive effects on regional business trends is, without any doubt, extremely and consistently low. Based on the objective indicators, such as low percentage of innovations resulting from the collaboration with the higher education sector as well as the negligible number of registered patents as an outcome of referred cooperation, both of the survey focus groups have assessed the level of their interaction as an unsatisfactory.

IV. CONCLUSION AND RECOMMENDATIONS

In order to increase the competitive advantage of businesses it is extremely important to increase companies' innovative abilities. Cooperation and correlation with the institutions of higher education should greatly contribute to achieving this objective. Achievement of continued cooperation and correlation requires geographic closeness of participants in that process. That imposes a new task on the institutions of higher education. This new task refers to the implementation of the regional function by which the HEIs should achieve the effective collaboration and cooperation with industry and contribution to the regional economic development.

In order to gain insight into the regional engagement of higher education institutions in Croatia, empirical research was conducted on a sample composed from HEIs and businesses. The conducted empirical research, the first one of that kind carried out in Croatia, has resulted in some more detailed insight into the subject matter. Therefore, the information gained can be used for some further analysis and research.

Analysis of the empirical research results has indicated that there is a significant lack of planned and sustained correlation and cooperation between HEIs and industry. There are only some few isolated and sporadic cases of such cooperation. Furthermore, the perception of the intensity and quality of referred cooperation varies between scientists and businessmen, even to a degree of contradiction. The answers of the businessmen demonstrate that the cooperation of HEIs and industry is quite rare and definitely unsatisfactory. The average scale of 1 to 2, on a scale of 1 to 5 is more than a sufficient indicator in support of this conclusion. On the other hand, the answers obtained from the second focus group speak in favor of the conclusion that referred collaboration, its intensity and quality, is at medium level. The obtained overall results indicate that Croatian higher education institutions have not yet developed a permanent and efficient cooperation with companies in their regional surroundings. Consequently, HEIs in Croatia, at this time, do not contribute enough to the innovative abilities of regional business factors. Altogether, HEIs regional role in Croatia is yet to be developed to a level which can be consider as satisfactory, especially in comparison with European standards.

Responses of HEIs suggest that there is much to be done to improve the level of cooperation between HEIs, local and regional governments and industry in defining strategic goals for significant regional development. Examples of such

cooperation and achieved results can be found in some regions in Finland (Kainuu region), Netherlands (Twente Region), Germany (Dortmund Region), Italy (Piemonte Region) and some others.

Following these conclusions certain recommendations appear as a logical. Croatia needs to change its legislative and strategic policy framework regarding the higher education sector. Higher education policy should determine and highlight more clearly the differences between universities and polytechnics, in line with other European countries which have adopted the binary system of higher education. At present moment actual application of Croatian binary system of higher education leaves too much space for ambiguity in determining a real mission for the higher education institutions, which primarily relates to Croatian polytechnics. A legal framework of higher vocational education in Croatia should explicitly emphasize the importance of its regional mission. HEIs in Croatia should be more strongly obliged to build relationships with the labor market, which should be one of its prescribed legal obligations set by the legislative framework. That implies the orientation on market demand while offering new higher education qualifications, which should become an imperative for higher education. Building a relationship with the labor market implies the commercialization of research activities. Following this objective, establishment of a department (or some other form/body of action) responsible for planning and exercising close business correlation with the labor market and business sector within the HEIs appears to be necessary. Furthermore, aiming to contribute to the regional economic development HEIs should constitute appropriate institutional forms which will link together representatives from educational, business and public sector. Their joint efforts will more easily respond to the developmental challenges posed by the development of a knowledge society and global economy.

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