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Abstract

The knowledge–based economy requires that research–development activities contribute to the creation of added value. Innovation, another important component of this type of economy, constitutes, in turn, an indicator of global competitiveness. In the national and supranational processes and strategies to implementation of regional knowledge–based economy, a leading role is played by universities, turned into spaces of the integrated approach of the triangle education–research–innovation. The study aims to analyze the involvement of higher education institutions in the North–West Development Region in the transformation of the local economy. The data collected will allow us to highlight the mechanisms through which partnerships involving academic communities fail to transform knowledge from publications, patents and prototypes in technologies and "services economically and socially assimilated".

Keywords: universities role, knowledge–based economy, North–West Development Region

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1. Introduction

Technological, informatical and communicational evolutions, manifested in the last decades of the twentieth century and early twenty-first century, stand at the basis of an underlying trigger of a complex process of transition from an economy based mostly on material resources in a knowledge economy. Knowledge revolution, we are witnessing now, is founded on strategic intangible resources such as human capital, the information and knowledge. Knowledge, thus, becomes an essential factor of production, key to competitiveness in local, regional, national and global level.[1] The economic progress was permanently under the influence of technological changes determines changes and transformations in society, the development of peak areas of technology, information technology being an emergence of societal precondition. The dynamics of competition in competitive sectors had a direct influence on the actors involved; attention is now focused on knowledge as a resource indispensable and ubiquitous, and the formation of skills involving a high level of knowledge for human resource.[2]

Knowledge can be treated as a process that starts from storage and investigation of objective data and conversion into capital operative in many fields. Knowledge has been defined for a long time by limiting the workforce to qualify as a public or private good rather than a societal level coordination mechanism.[3] Increasingly, many academics, business people and government people, view that mankind is moving towards a knowledge society supported by a knowledge-based economy. Paul David and Dominique Foray[4] identified the factors that contributed to the development of this type of society as being: accelerating knowledge production, increasing productivity of intangible capital at the micro and macro-economic innovation - the dominant activity with variable resources; revolution tools use knowledge. The four factors determine the main features of this new society: the expansion and deepening of scientific knowledge, management and use of existing knowledge in the form of technological and organizational knowledge, production of new technological knowledge through innovation, the emergence of an economy, the innovation process is crucial; unprecedented dissemination of knowledge to all citizens through new media (internet, e-book, e-learning) shape the global community, producing a cultural revolution based on knowledge, need for environmental sustainability by rapid technological adaptations.[5] The new economy developed in such society is an economy of information and knowledge society, being subject to the influences of globalization, the widespread use of information and knowledge, internet access, and increasing workforce knowledge-intensive.[6] In addition, the research focuses on the discovery, acquisition, use and dissemination of knowledge, while education on the formation of that mass communicators and receivers which define an open society, both standing at the national or regional innovation system.[7]

As an important source of knowledge and innovation, the higher education institutions of the twenty-first Century may occupy an important place in the process described above, the three fundamental functions they fulfil being: research, teaching / learning and community service. The regionalization of economies, a natural phenomenon due to concentration of investments, services and production in area type NUTS II, generated the regional competitiveness[8] and economic performance is determined by a mixture of elements. Besides natural resources, infrastructure, business dynamics, regional labor market structure, regional tradition and history, the availability of education, there are several factors that traditionally academic aims: workers' skills and opportunities related to lifelong learning. The university sector was not excluded from any strategy aimed at regions, being considered even a catalyst for their development and reducing disparities. By joining the EU, Romania has assumed the Community strategic objectives and instruments for achieving them, starting with reforms towards a knowledge-based economy and competitive regions.

The study aims to analyze the involvement of higher education institutions in the North–West Development Region in the transformation of the local economy. The data collected will allow us to highlight the mechanisms through which partnerships involving academic communities fail to transform knowledge from publications, patents and prototypes in technologies and "services economically and socially assimilated."[9] The research also aims to analyze the degree of implementation of the proposed models of knowledge transfer specialists or examples of good practice in the field.

2. The trinomial education - research - innovation in regional economies based on knowledge

In a society and a knowledge-based economy there is increased the demand for diversified expertise, accompanied by changing organizational, methodological and disciplinary borders of this knowledge. The result is very dynamic and rapidly expanding the demand and supply of knowledge, which translates into a short life cycle of products, a rapid and global process of standardization, new forms of production

organization, new producer–consumer relationships and new requirements about the risks and safety. Universities must anticipate and meet those needs through a dynamic and active process of knowledge transfer to the economy and society as a whole. Based on these requirements, the international organizations allocated to higher education institutions tasks in the new economy and reserve a central place in sustainable economic development programs, for universities that promote research excellence.

OECD considers that the role of universities in contemporary society is not built by a traditional linear innovation model, where they only provide highly skilled manpower in different areas or forms of knowledge, but attract and generate talent, formal and informal supports, specialized expertise, facilitate research and development companies, mediates their access to knowledge (even if it comes from global networks that universities have gained access to, or developed networks with other social partners).[10] Moreover, these institutions are not isolated from the community, but become "community players" the contribution made to the processes of formation and development, dissemination of knowledge in the network of innovative companies, attracting, and retaining talent generation.[11]

In turn, the World Bank stresses that education for the knowledge economy means fostering flexible and highly skilled human capital necessary for competition in the global market through the following instruments: 1) building a strong human capital based through access to labor skills and high-level skills, which involves fostering lifelong learning and certification of qualifications in accredited institutions, 2) creating a national innovation system by building networks between companies, research centres, universities and think tanks, working with societal needs for assimilating and adapting or creating new technologies. Higher education is, in these circumstances, a "centre of creation of intellectual capacity to produce and use knowledge."[12] Furthermore, the World Bank experts have developed a methodology for assessing national economies in order to determine the overall readiness of states to transition to a knowledge-based economy. According to this methodology, there are used aggregate indicators covering economic incentives and institutional regime, education, innovation and ICT respectively. The ranking presented by the World Bank in 2012, Sweden is situated on the first place, followed by Finland and Denmark, five European countries being mentioned among the top 10, which demonstrates the strategic importance of investment directed to the four pillars of knowledge mentioned above, that the directly concern academic work two.[13]

Moreover, with the declaration of Lisbon, the European Union has defined strategic orientation towards a knowledge society and a knowledge-based economy, and in 2004 the European Commission proposes four ways to transfer knowledge, aimed at involving higher education: 1) unlimited distribution–knowledge produced in universities publicly accessible to all, the end user is not identified due to its high degree of diffusion, 2) marketing–knowledge produced in universities are purchasing through conventional tools, linking universities context of industrial production, 3) the transfer by interactive forms of cooperation between universities and companies aimed at sharing skills and expertise, 4) transfer through the creation of autonomous organizations that are key factors of our knowledge human capital formed in universities.[14] Therefore the traditional universities that dominated European countries 20–30 years ago have undergone to meet the new demands of national economies. His past, thus the production of culture and knowledge through research and education, regulated academic standards and national standards, to focus training activities and research results for developing highly skilled workforce and strengthening research and innovation capacity.[15] Working more closely with the private sector, adopting practices associated with it, the growing importance of private sources for funding universities, developing performance indicators that reflect the educational and research–innovation activities are evidence of entrepreneurial tendencies of higher education.[16] In this context, cross–border flows of ideas, knowledge, information, technologies, products, people and financial capital are factors amending European universities operating environment.[17] At the same time we are witnessing the transformation of universities in key actors to develop and implement European Union policies through various mechanisms for probing, testing and research, the possibility authorized to issue or offer solutions designs and patterns illustrating features of EU citizen and intercultural dialogue.[18]

The active involvement of national governments and the European Union to establish and implement the regional and cohesion policy did not exclude the university sector, the role it plays in developing being one of the pillars of Community and national strategies. The regional engagement of higher education institutions is carried out on several levels: the creation of knowledge through research, innovation and technology transfer; the transfer of knowledge through education and development of human resources; cultural and community development. Thereby, it creates a framework for partnership between regions and universities, where higher education institutions make their contribution by: 1) the creation of knowledge in the region by exploiting the results of research and innovation (spin off, technology platforms, science parks,

specialize companies in which researchers and business people working together and consulting); 2) formation of intellectual capital and knowledge transfer (location learning through internships, employment of graduates in the region, continuing education, professional development activities and lifelong learning); 3) contributions to strengthening social cohesion and sustainable development. In turn, the local community can support: research and innovation objectives of universities, student recruitment, increasing the number of students coming from the local population, supplement income by working with regional business. For factors responsible for regional development, universities can attract investors, generate new business, strengthen local human capital, provide advice and expertise in different areas or participate in cultural programs.[19]

3. Possibilities of academic environment implication in the regional development

The regional and cohesion policy guarantees a smart, sustainable and inclusive growth, promoting at the same time, the harmonious development of the Union and its regions through a reduction of economic, social and territorial disparities. For less developed regions the objectives aims creating new jobs, increasing human capital, competitiveness, economic growth, improving the quality of life and sustainable development. "Europe 2020" aims to reduce the proportion of early school drop below 10%, to increase the number of people aged between 30 and 34 years who have graduated university courses, to investment of 3% of EU GDP in research and development, employing 75% of the segment of the population between 20 and 64 years. European Regional Development Fund, European Social Fund and the Cohesion Fund, representing more than a third of the overall budget, are designed to provide the necessary resources to achieve the objectives, of these funds are financed sectors in which universities play a central role: developing new technology, cutting edge research, business development, skills and trainings.[20]

At the level of local communities or European regions, the partnership relations with academic environment are based on common interests, largely economic. Transition to a more ingenious development that focuses on entrepreneurship and innovation, has determined increased efforts in order to remove the barriers to the application of research results, the development of technological innovation capacities and the facilitating of the interaction between universities and the private sector, or local community. The recent changes in regional policy aimed to transforming each university into an engine of growth by strengthening the role of superior education in regional innovation system and develop the participation of universities in cluster initiatives.[21]

The mutual influence between the regional economic environment, technological progress and social transformation of local communities have created a favourable frame for the emergence of innovation networks, which are composed from organizations, communities, professionals, higher education institutions and research institutes. Stimulating innovation and research through the project's collaborative, important element in enhancing regional competitiveness, requires collaboration between academic environment, privates companies and regional administrative factors. In this partnership, the universities lies another traditional tasks, to provide skills for the regional labor market. In this context, designing human resource training programs focuses on key or complementary areas, specific to the activities within innovation networks.[22]

Clusters, on the other hand, require the existence of interaction between involved actors, the results being outsourced as highly skilled workforce available locally, lower transport costs, external economies of scale, transfer of know–how, etc. Known in the literature as the pole of competitiveness, industrial cluster or industrial district, this type of association is conditioned by territorial proximity of the actors. Regional clusters do not exceed, in importance, the boundaries of the area in which are located the entities involved and getting priority objective economic performance. The success is influenced by access to human resources, knowledge and specialized technologies, by the opportunities, by the collaboration between entities and by the regulations.[23] Depending on the type of knowledge held, in practice are found two types of clusters:[24]

I) Technological clusters, oriented to high-tech, well adapted to the economy based of knowledge, have universities and research centres as a central point of development;

II) Know–how clusters, based on more traditional activities, maintain competitive advantage over a long period of time.

There are other types of agreements for research–development–innovation that firms can enter directly with research institutes or universities. The research results, commonly defined as "intellectual property", have both symbolic and economic value. Teachers and researchers can create companies to fund

their own research and to commercialize the results or to assume managerial responsibilities by involving in the Advisory Board or the Board of Directors. Members of the academic community have the ability to produce goods required by the local community in science parks or in incubator type facilities, and at institutional level, university can open technology transfer offices or may contract with corporation for research funding in exchange for the license rights on technology that is generated.[25] Another element that defines the regional economy based on knowledge, human capital, lies to the European Commission, which encourages through grants or projects financed from structural funds, educating a large number of individuals in the area, ensuring that they are engaged when they finish education. Higher education plays an important role here as the answer to the demand for new skills to local employers by providing training courses for continuing professional development or attracting talent from outside the region.[26]

The regional development doesn't refer only to the economic prosperity but also to the development of local community, socially and culturally. Even in this field, the universities can collaborate with numerous stakeholders to generate solutions in order to combat long–term unemployment, to contribute to the reducing of public health problems, to draw different creative talents and contribute to development of creative industries. Also, the higher education institutions can increase the degree of internationalization of the regions, emphasizing their characteristics related to diversity and multiculturalism, as an example of good practice in this respect.[27]

4. Social–Economic Characteristics of the North–West Development Region

The North–West Region (Northern Transylvania) is one of the eight development regions in Romania, consisting of six counties (Bihor, Bistrita–Năsăud, Cluj, Maramureș, Satu Mare and Sălaj) and having an area of 34,160 square kilometres. A gate from Hungary and Ukraine, the region has 403 common 15 municipalities and 28 cities and has more than 2 million hectares of farmland.[28] The most important cities are Cluj–Napoca, Oradea, Baia–Mare, Zalău, Satu Mare and Bistrița, which are both regional poles of economic development and the city with a great cultural and historical heritage. In this region there are two metropolitan areas, organized around Oradea and Cluj–Napoca.[29]

Northern Transylvania is considered to be a developed region with high average national economic performance and a high potential growth, both regional GDP and the per capita increasing from year to year. The sectors economically significant are, in order, services, industry, construction and agriculture. The industry of the region has a relatively low value-added and low high-tech degree, the development relying on cheap labor and imported materials. In Cluj County are reported the growing importance of competitive industries oriented to foreign market, in other administrative entities operating mainly traditional industries. The tertiary sector is the most heavily represented, in 2008 a rate of 46.15% being held by commercial services (trade, hotels, restaurants, transport and storage). These are followed by the financial, real estate, and public services.[30] In 2010 there were 67,871 active local entrepreneurs (majority are micro), geographically distributed especially in Cluj and Bihor.[31] Their activities are circumscribed to extractive industries, food, leather and footwear, furniture, and non–metallic mineral products, metal, machinery and metal products, transport of goods by road. Other areas in which these companies are: research–development, production software and IT services, pulp and paper, pharmaceutical, rubber and plastics, electrical equipment, devices, appliances and instruments, production and supply of electricity, construction hotels, restaurants, financial intermediation, insurance and real estate.[32]

Research–development–innovation activity is supported by 8 research institutes, of which 2 have legal personality and 6 are subordinated to Romanian Academy. Besides these works 7 public universities (4 of them with advanced research) and 9 higher education institutions with private financing, totally 111 faculty works with a valuable human capital and research.[33] At the region level operates over 70 research–development units', of which 67 are private units. The number of doctoral schools is quite high, Cluj and Oradea being the most important universities in scientific research and technological development. In the region operates 3 technology transfer centres' and 3 for information technology, the number of patents situating the region on 4th place in Romania. In the field of creative and cultural industries, in the region operate very small companies vulnerable to economic shocks. The activity of these companies is concentrated in Cluj County, other administrative entities do not having significant contributions in this domain.[34] In addition to these data, the National Institute of Statistics has defined indicators to measure the achievement of the knowledge society; the data collected in 2005–2010 in the North–West Development Region are shown in Table 1.

Table1. *Indicators for achievement of the knowledge society in North–West Development Region*

Indicator	2005	2006	2007	2008	2009	2010
Employees in RDI activities at the end of the year (number of people)	2690	3484	3923	4146	4185	4018
Turnover from innovation (% of total turnover by economic sector)		19.1		15.3		21.7
The innovative enterprises having placed on the market new or significantly improved products (number)		949		506		496
Total R & D expenditure as GDP share (%)	0.26	0.29	0.38	0.43	0.34	
GDP share of R & D expenditure of business enterprises (%)	0.1	0.1	0.11	0.07	0.1	
GDP share of R & D spending on in the public sector	0.16	0.19	0.27	0.36	0.24	
The share of people with higher education (%)	9.1	9.6	11	12.1	12.1	13

Source: National Institute of Statistics, http://www.insse.ro/cms/files/IDDT%202012/index_IDDT.htm, accessed in November 2013

The region is characterized by a high share of the population graduated from high school and a large number of students (second position on national level), the rate of school dropout being low. The problem facing the region is the loss of highly skilled population, a phenomenon evident in the specific level of specialization such as medicine and informative, affected by the more attractive external offers. The civil active population is concentrated in 50% in Cluj and Bihor, urban activity rate being significantly higher than that recorded in rural areas. The job offers are concentrated in urban environment, the rural unemployed do not having available a large area of employment, occupations and industries.[35]

5. The contribution of universities from the North–West Development Region on the knowledge–based economy

Since 1999, the universities or research institutions from Northern Transylvania are involved in preparing the regional profile and social programming documents provided by the EU candidate countries.[36] The Regional Development Plan, developed in order to identify priorities for national or European funding programs, is based on evidence provided by the Regional Planning Committee. In this structure there are six groups of experts, in which activates specialists co-opted from major universities or research institutes in the region. Also, we find members of the academic in Regional Consortium, an organization that works under the Phare 2001 TVET component–technical, vocational and educational training. Together with representatives of the County Agencies for Employment, the County Councils, the County School Inspectorates and the Regional Development Agency (RDA), the higher education institutions are called upon to identify measures of integrated education and training, and to initiate pilot projects in this regard.[37] Furthermore, since 2002, five universities from the region will be part of the coordination structures of working groups of the Monitoring Committee of Regional Development Plan.[38] For contributing to the work of these bodies, in 2005, two representatives of the regional academic environment received the title of Honorary Member of RDA North–West. We refer to Gabriel Bădescu, Head of the Department of Political Science, University "Babeş-Bolyai" Cluj–Napoca and Stelian Brad, coordinator of the Centre for Research in Innovation Management and Engineering, director of the Office of Technology Transfer, Technical University of Cluj-Napoca.[39]

In the same year, was completed a database with all universities and research centres from the region,[40] thus having a complete picture of local human and material resources with potential involvement in activities of research–development–innovation (RDI). The information gathered aims ability, orientation, degree of cooperation, and experience of RDI structures. Considering all these factors, the universities are situated on the first place, followed by research, development and innovation institutes, and companies

working in the area. Also, most of the research structures functioning in public institutions, a small part being developed within national companies or agencies. If we use as performance indicators, the number of ISI articles and patents, until 2006, Cluj–Napoca is a top regional leader, followed by Oradea and Baia Mare. Regarding the patents registered at State Office for Inventions and Trademarks, they were obtained mostly by individuals.[41]

The closure of the European budget exercise 2000–2006, was an opportunity for all actors to balance regional development and to plan action for 2007–2013. Based on experience in previous years, and on the strategies launched at European level concerning the construction of the economy based on knowledge, there are now set regional targets which stimulate increased valuing of strategic partnerships, both external–with regional neighbours and internal–with local government, universities and business sector associations. Therefore, it is intended to raise the involvement of expertise of local academic, and to stimulate the innovative potential of the region. One of the first collaborations is initiated with the Faculty of Geography, University "Babeș-Bolyai" Cluj–Napoca in order to update the chapter of intra and inter–regional disparities to develop planning documents for 2007–2013, the academics being providers results of studies and analyzes presented at the international conference "Regional disparities: typology, impact, management". Another area which requires the expertise of the university is the urban regeneration, for it is signed a "Strategic University Partnership" to provide data needed for the development of regional and sectorial programming documents for 2007–2013. In fact, there are elaborated terms of reference for the feasibility studies necessary to integrated projects of sustainable urban development in Northern Transylvania.[42]

With the start of the European financial exercise 2007–2013, at the level of North-West Development Region, are reinforcing previous partnerships with local academics and researchers, those are referred to as areas of excellence in the region, distinguished by their innovative potential and the capacity in higher education, adult education and training, recognized internationally. Thus, in the composition of the new Regional Committee for Strategic Assessment and Correlation enters also academics (Ioan Horga–University of Oradea, Paul Șerban Agachi–"Babeș-Bolyai" Cluj–Napoca, Mircea Loboțiu–North University of Baia Mare), which with delegates from unions and business represent the regional socio–economic environment.[43] Another important step to increase the competitiveness of the region was made with the establishment of Regional Institute of Education, Research and Technology Transfer (RIERTT). Organized as a joint stock company, its main objective accounts the engagement of competent human resources in "knowledge triangle". Among the founding members there are also important institutions of higher education, namely: "Babeș-Bolyai" Cluj–Napoca, Technical University of Cluj–Napoca, University of Agricultural Sciences and Veterinary Medicine Cluj–Napoca, University of Medicine and Pharmacy "Iuliu Hațieganu" Cluj–Napoca, University of Art and Design Cluj–Napoca, University of Oradea and North University of Baia Mare. A bridge between public authorities, academic and business environment, the Institute provides education, research and technology transfer, such as: document drafting for recognition and accreditation of new occupations; development of curricula focusing on adult education; vocational training and retraining for the jobs required in the labor market; joint development of new service packages for post-graduate education; development of a regional platform for e-learning, technology transfer and innovation support through new products, materials and services.[44]

Regarding the implementation of the regional strategy for innovation, in October 2005 the GREENET project is started, funded by the research program of the PNCD CEEX I, which aimed mainly the construction, development, integration and consolidation of innovative network of excellence research. Together with other partners, Procema Research Center Cluj–Napoca, contributes to identifying ways to ecological and sustainable management of mineral resources for the construction and exploitation of the eco - industrial North-West Development Region.[45] A year later it is launched the REGIS-NW, to increase the attractiveness and competitiveness of the region by creating a support system for regional innovation and promoting a culture of innovation. In the project actions (analysis of regional needs in terms of technology transfer, development of the Regional Innovation Strategy, identifying pilot projects aimed at implementing the Action Plan and support structure for regional technology transfer) were included, both members of local academics for advisory activities and research centres that have signed collaboration contracts.[46]

In 2008 it is launched the project BISNet Transylvania, in which are partners the Technical University Cluj–Napoca and the Technology Transfer Center Research Institute for Analytical Instrumentation, Cluj. Coordinated by North–West RDA, the project creates a network support for business and innovation in Transylvania macro-region, which provides services particularly for the regional SMEs. Increased competitiveness and innovation capacity thereof is encouraged by tools like: information; business cooperation and internationalization; innovation, technology transfer and know-how; assistance to SME participation in the Framework Program for Research of the European Commission. The methods of delivery

and development of these services will ensure access and geographic proximity to European instruments for the development of networks and resources. Opening Science and Technology Park in Cluj Metropolitan Area is another example, in which academic involvement is directed towards specific targets aimed at increasing regional capacity for research and innovation. "Babeș-Bolyai" University Cluj–Napoca, Technical University of Agricultural Sciences and Veterinary Medicine Cluj–Napoca, University of Medicine and Pharmacy Cluj–Napoca, University of Art and Design Cluj–Napoca and Research Institute for Analytical Instrumentation Cluj, along with 6 other institutions and organizations offering their support for achieving an agglomeration of highly specialized human capital and for hosting and running of activities that comprise services and high competitiveness technology. Pole of competitiveness thus created will be the basis of a polycentric concept for support of innovation through the establishment of excellence pole in Oradea, Baia Mare and Satu Mare.[47]

The expertise and innovation capacity of regional academic and research environment is put again in value by CLUSTHERM project funded by the European Commission through 7 Framework Program. Coordinated by Great Plain Northern Hungary Innovation Agency, the thermal energy cluster brought together 12 partners from 4 countries (Hungary, Romania, Croatia and Austria), along with, the University of Oradea runs activities to gathering and centralize data in the field of thermal waters use.[48] The project will be expanded in 2010 through the establishment of Water Cluster in Romania, those 16 partners (local authorities, universities and firms in related fields of water) joining forces aiming to exploit water and attract funds to finance research projects in field.[49] Professors from the Faculty of History, Geography and International Relations, University of Oradea, Faculty of Geography, University "Babes-Bolyai" Cluj–Napoca are co–opted to the Plan4al project to harmonize spatial data under the INSPIRE Directive. The 24 partners from 14 European countries aim to create an European network of best practices for interoperability of spatial planning data that is made available to investors and decision–makers for the harmonious development of real estate sector and to create a favourable and attractive investment climate.[50]

Another dimension of academic staff members' involvement is materialised in programs aimed cross–border, transnational and territorial cooperation. One such project is being developed by 11 countries in Eastern Europe and funded by the INTERREG IVC Program. NEEBOR–*Networking for business in the eastern border of the European Union* aims to promote cross–border business cooperation and development of innovative partnerships, the universities being involved in study the challenges, elaborate strategies and identify key actors who influence the development and innovation processes in the SMEs located the partner regions. The three representatives of public universities from Northern Transylvania, invited to participate in roundtable discussion at the annual conference NEEBOR, have brought their contribution to improving the implementation of regional development and innovation.[51] Area of renewable resources is another domain in which there were used the infrastructure and the human resources of the research centres from the region. Along with business representatives and public authorities, Technology Transfer Centre of the National Institute for Analytical Instrumentation Cluj established a *Transnational Cluster in Renewable Energy Field* in order to create a platform for collaboration between actors attracted or interested to produce energy and use alternative methods based on the principle of sustainable development. The project provides concrete opportunities for the implementation of research results and the inclusion of innovation into production, while being an opportunity to facilitate internationalization.[52]

In figures, the involvement of universities form North–Western Romania in regional economies based on knowledge would materialize as:[53]

- of those 6 accredited entities for activities of innovation and technology transfer, 3 are technology transfer centers and 2 centers for technology information, which operating within academic and research environment in region;
- of those 4 regional structures of State Office for Inventions and Trademarks, one is hosted by the Technical University of Cluj–Napoca;
- of those 4 scientific and technological parks, national accredited in 2011, in the North-West Development Region there is none, the project, started in 2011 at Cluj-Napoca, is in process to obtaining accreditation;
- in 2010 were published 1326 ISI articles, most authors originate from among teachers affiliated to university centres Cluj-Napoca and Oradea;
- 12 regional journals are ISI, of which: 3 have real profile (mathematics and computer science), 4 are in the chemistry–biology field, 1–regional studies, 1–public administration, 1–psychology, 1–medicine, 1–religion ;
- 8 of the 12 ISI journals are published in Cluj–Napoca, 2 in Oradea and 2 in Baia–Mare ;

- in the period 2007–2011, in total there were 223 patent registered on State Office for Inventions and Trademarks, of which 125 were issued to Cluj County, followed by Maramureş and Bihor;
- on the two calls (2007 and 2008) of *Program 4–Partnerships* , part of applied research national programme, were submitted and implemented a number of 161 projects and have attracted 304.4 million lei in the region, a particular interest being manifested in the fields of agriculture, food safety and security, health, materials, processes and innovative products. All projects were conducted by teams of professors and researchers from Cluj–Napoca;
- on the *Program 5–Innovation*, Module 1–*Developing of product–system with role in supporting technology transfer of technological research results and innovation and supporting recovery patents by companies*, were won and implemented 29 projects, all in partnership with RDI structures, Technical University of Cluj–Napoca developed most collaborations in this regard;
- in a ranking of the number of funded projects by *CEEX Program*, University of Medicine and Pharmacy, Cluj–Napoca is the regional leader;
- Technical University of Cluj–Napoca and the University of Medicine and Pharmacy Cluj, are leading in the ranking projects developed through *Impact Program*;
- university centres from Cluj–Napoca and Oradea attracted most funds through grants funded by National Research Council;
- universities from Cluj–Napoca have managed to attract about 73 million lei by the *Sectorial Operational Program "Increase of Economic Competitiveness" 2007–2013* , Priority 2–*Increasing economic competitiveness through RDI*, most of the projects being research in partnership university–enterprise, respectively high scientific level research–development with the participation of specialists from abroad;
- 2 projects of international consortium type, funded by the European Commission *FP6 Program*, were coordinated by the "Babeş-Bolyai" University and the Technical University of Cluj–Napoca.
- in all the municipalities County residence act Universities, Cluj–Napoca being the most specialized university centre in the region;
- at the level of the year 2012 there were declared 5094 university graduates and of postgraduate education.

6. Conclusions

The knowledge society is a complex concept, which covers all aspects of the contemporary economy, and where research and development activities contribute to the creation of added value. Innovation, another important component of this type of economy, constitutes, in turn, an indicator of global competitiveness. In the national and supranational processes and strategies to implementation of regional knowledge–based economy, a leading role is played by universities, turned into spaces of the integrated approach of the triangle education–research–innovation. Flexible and at the same time open to the external environment, the higher education institutions are important partners for innovation and technology transfer. In an area limited to the regional level, the existence of an infrastructure for research–development–innovation, appropriate to the needs of emerging local economy constitutes a factor to improve the national, European or international competitiveness. The results of the efforts made by universities, companies and local authorities to increase regional competitiveness have finality in society, by increasing the standard of living and welfare of the region's population.

In this context, the North–Western Development Region has 4 advanced research universities, 70 research and development units, of which 67 are private entities, two university centres of scientific research and technological development (Cluj–Napoca and Oradea), technology transfer centres, centres of information technology. There is an increasing attention given to the preparation of the high level of human resource in the region operating 31 doctoral schools where trained 26% of all doctoral students in Romania area. The University tradition is doubled by the scientific one, in 2010 being recorded 12 ISI Journals, a rate of 17% of ICI Romanian articles and a significant number of patents. Cluj–Napoca is the most important university centre of the region, focusing a large part of the infrastructure of the RDI and the largest number of educators and researchers involved in NGOs engaged in such activity. The second pole of excellence is Oradea, where function the 6 research centres within the University, and the third Baia–Mare. That order is kept also in funds raised through projects financed with the research and development component. However, the degree of innovation and technology transfer remains under the regional academic potential. Other weaknesses are not harmonizing application data with the offer of RDI, low productivity of SMEs with research and development activities, small number of innovative enterprises and reduce level of expenditure

on innovation. The lack of high-skilled labor in the areas with a potential for cluster is another issue that must be addressed with the help of academic expertise. To this is added the lack of partnerships between companies and providers of training courses which lead to a lack of connection between demand and offer on the training market. Regarding indicators of standard of living and welfare, they are still below the EU average.

The solutions are not simple. We face with an inadequate use of the universities capacity of involvement in regional development, with a concentration of excellence research in few university centres (Cluj–Napoca, Oradea, Baia–Mare) and with mismatch between the supply and the demand of regional business environment. Examples of good practice provided by developed European countries, where the infrastructure and human resources in universities and research centres are utilized to their true capability, can be adapted to the realities of the North–West region and successfully implemented. They're all solvable at the strategic level by increasing partnerships between the actors of regional knowledge-based economy.

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