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The Helix Model System as a Challenge and Driver for Rural and Regional Development

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Abstract

The purpose of this research study is to examine theoretical findings and, based on them, to identify the problems in implementing the Quintuple Helix approach for rural and regional development in Latvia. The research was based on the theoretical concepts of the helix model and the data gained from a survey of all Latvia's local governments and rural community representatives, and the experience of Latvia University of Agriculture in using the Quintuple Helix approach for rural and regional development. The main conclusions are that cooperation among institutions of various natures, which is the basic idea of the helix model, leads to positive results; it gives an impulse to increasing economic activities in many rural municipalities of Latvia; the experience of the Technology and Knowledge Transfer Center (TEPEK) of Latvia University of Agriculture shows that there are good practices and successful outcomes from implementing the Quintuple Helix approach.

Keywords: the Quintuple Helix Model; regional development; innovation; local governments; higher education institutions;

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1. Introduction

The Quintuple Helix Model is more comprehensive, implying co-operation among five basic elements; university, industry, government, media and culture-based public and civil society, as well as the natural environments of society. Therefore, the Quintuple Helix stresses the necessary socio-ecological transition of society and economy in the twenty-first century. Within the framework of the Quintuple Helix innovation model, the natural environments of society and the economy also should be seen as drivers for knowledge production and innovation, as well as opportunities for the knowledge economy (Carayannis et al., 2012). "The Quintuple Helix Model is interdisciplinary and transdisciplinary at the same time: The complexity of the five-helix structure implies that a full analytical understanding of all helices requires the continuous involvement of the whole disciplinary spectrum, ranging from the natural sciences (because of the natural environment) to the social sciences and humanities (because of society, democracy and the economy)." (Carayannis, Campbell, 2010, p. 62)

The Quintuple Helix approach could be used as an instrument for government at national and regional/community level to promote innovation, entrepreneurship and facilitate rural and regional development. In addition, in reference to sustainable development, under the aspect of global warming, whether a state government is leading in world politics as well as in the world economy is also being determined by the social (societal) potential to balance new knowledge, know-how, and innovation with nature (Carayannis et al., 2012). The gains from implementing the Quintuple Helix innovation model in practice, engaging stakeholders from public administration, business, civic society, education, and science to tackle the issues essential for developing the territories of regions or municipalities in various areas: employment, poverty and social exclusion, education, establishment of cultural and interest centers, as well as increased public participation in state administration, are especially highlighted.

Universities are one of the most important helix model system elements and they become an important source of regional economic development. The key tasks of higher education is to provide a study process of high quality to prepare professionals according to market requirements and to create new knowledge and technology, and transfer it to the national economy to foster the development of society. Universities are also extending their teaching capabilities from educating individuals to shaping organizations in entrepreneurial education and incubation programs in order to become a source of new firm formation, especially in advanced areas of science and technology. New organizational mechanisms such as incubators and science parks, and the networks among them, become a source of economic activity, community formation, and international exchange (Theoretical framework, 2011).

Universities can fulfill these requirements only in cooperation with other helix model system elements. Nowadays, the further development of this cooperation requires viewing it in a broader sense – in the aspect of the Quintuple Helix approach. One of the most *important problems* concerning rural and regional development in Latvia is the gap between the labor market demand and the potential of higher education to supply qualified specialists of broad profile. There is also insufficient cooperation between Latvia's local governments and other elements of the helix model system, and especially with regional higher education institutions.

The *purpose* of this research study is to examine theoretical findings and, based on them, to identify the problems for implementing the Quintuple Helix approach for rural and regional development in Latvia.

The organization of the Quintuple Helix Model emphasizes the importance of people, skills, relationships, interactions and media, as well as the role of basic research, workplace development and low technology sectors. Social networks have become the basic units of modern society. These units still are individuals, groups, organizations and communities, though they may increasingly be linked by networks (Lindberg, Lindgren, Packendorff, 2014). An important issue these days is to achieve balanced

regional and urban development as well as environmental quality (ESPON, 2014), and that is why the authors of the paper also focus more on territorial development problems, strongly associating the problems with opportunities for expanding knowledge, know-how, and innovative activities with nature for more sustainable development. This was expanded with the initiation of the National Research Program (government-funded research project) 'Rural and Regional Development Processes and Opportunities in the Context of Knowledge Economy', one of the key goals of which is the development of a strategy for smart rural and regional development to obtain an integral vision (EKOSOC, 2015).

2. Research methodology and participants

The theoretical basis of the research consists of the helix model conceptions and regional development. One of the ways of contributing to rural and regional development is to foster cooperation among various forces specific to the so-called helix model, the dynamic interaction of which is depicted by the five forces or the Quintuple Helix innovation model that has emerged under today's circumstances. Nowadays the essence and theoretical explanations of the contents of the concepts of helix models are undergoing change, assigning to them a much broader meaning in the context of the Quintuple Helix Model. This makes us look for answers to the questions of how to explain these notions from a theoretical point of view. These findings constitute the first part of the paper.

The second part of the paper describes the experience of implementing the Quintuple Helix approach for smart rural development in Latvia. To obtain a deeper insight into the problem, in 2015 a survey of 123 rural community representatives and authorities in all 110 of Latvia's local municipalities was undertaken by the authors. Replies were received from all 123 rural community representatives and 76 local governments, accounting for more than half of all the municipalities involved in the survey. The survey was analyzed and the data processed by the authors of the paper as part of the current research. In Latvia there are six regional universities. Only one of them, Latvia University of Agriculture (LUA), is directly connected with preparing qualified specialists for different rural industries. Therefore the experience of Latvia University of Agriculture in using the Quintuple Helix approach for rural and regional development in Latvia is analyzed in this research.

3. The evolution of the helix model system

The Quintuple Helix Model should be seen in the context of the development of the helix model system which would allow us to clarify the core concept of the Quintuple Helix Model, which would then form the basis for the practical solution of the research problem. Historically the concept of the helix model should be seen in the context of the communication process. Communication evolves at the beginning in some simple forms; then the same process of communication develops, based on the past activities. It develops further with modifications (Helical Model of Communication/Communication Theory, 2013). The complex social system builds on the interfaces among institutions and functions as different mechanisms of differentiation. After the completion of a system of nations, that is, from approximately 1870 onwards (Noble, 1977), the interactions between institutions and functions could gradually be reconstructed into a knowledge-based system. Because of the increasing knowledge-intensity of the communications, one is increasingly able to experiment with the interaction terms between structures and functions in the organization of social systems. (Leydesdorff, 2001)

To describe the communication process in 1967, Frank Dance proposed a communication model called *Dance's Helix Model*. The word *helical* derives from 'helix', which is defined as an object having a three-dimensional shape like that of a wire wound uniformly around a cylinder or cone. It shows communication as a dynamic and non-linear process. Frank Dance explains the communication process based on this helix structure and compares it with communication. In the helix structure, the

bottom or starting point is very small, then it gradually moves upward in a back-and-forth circular motion which forms the bigger circle at the top and it still moves further. The whole process takes some time to reach. Just like a helix, the communication process starts very slowly and defines a small circle. Communicators share their information only in small portions to their relationships. It gradually develops into the next level, but it will take some time to reach and expand its boundaries to the next level. Later the communicators commit more and share more portions themselves. Dance developed this theory based on a simple helix which gets bigger and bigger as it moves or grows. The main characteristic of helical model of communication is that it is evolutionary. (Helical Model of Communication/Communication Theory, 2013)

The helix model system begins from a simple Double Helix Model which includes the contacts between academic circles and entrepreneurs, and establishes a linear relationship. Later, with the development of information and communication technologies, the role of knowledge in society and the need to develop a knowledge-based economy increase. With the deepening of these processes, the importance of expanding the communication process and the government's functions to stimulate network development among nation states and across institutional boundaries has increased. The knowledge base of the economy is thus increasingly a part of the infrastructure of society, and there is the necessity for a proactive role for the state in science, technology, and innovation policies (Leydesdorff, Etzkowitz, 1998). This means that there is the shift from the dominating industry-government dyad in the industrial society to a growing triadic relationship between university-industry-government in the knowledge society (Triple Helix Model). This model improves on the nonlinear model that replaced linear models based on "market pull" or "technology push" (Leydesdorff, 2012). Thus the Triple Helix Model is closely connected with the conception of innovation and economic development in a knowledge society, and its potential lies in a more prominent role for the university and in the hybridization of elements from university, industry and government to generate new institutional and social formats for the production, transfer and application of knowledge. Through subsequent development, a significant body of Triple Helix theoretical and empirical research has grown over the last two decades that provides a general framework for exploring complex innovation dynamics and for informing national, regional and international innovation policy-making (the Triple Helix concept).

Analysis of the international experience has led to the formation of four-element model variants (Quadruple Helix Model), due to the conclusion that the success of innovative changes is also determined by such an element of social system as civil society and one of its organising forces – non-governmental organizations. Thus the Quadruple Helix expands the Triple Helix by adding as a fourth helix: 'media-based and culture-based public' and 'civil society'. The Quadruple Helix already encourages the perspective of the knowledge society, and of knowledge democracy for knowledge production and innovation. In a Quadruple Helix understanding, the sustainable development of a knowledge economy requires a co-evolution with the knowledge society (Carayannis et al., 2012). The Quadruple Helix emphasizes that the role of the individual is paramount – it is a "human-centered" model and only secondarily "institution-oriented". The Quadruple Helix addresses knowledge production and innovation in the context of democracy. (Carayannis, Campbell, 2014)

Human life and activity take place in the common world space, being associated with the economy, the social environment and the steadily declining natural resources. The economic sphere is linked to the social sphere in many complex ways, and human society interacts with the natural sphere in many more complex ways to form a large interdependent system. Individual human beings are, and always have been, completely dependent on the rest of human society and the ecosystem for their economic well-being. Therefore humans perceive their well-being in reference not only to economic outcomes, but also in terms of changes in their social and natural environments. The expanded interrelationships among people, businesses, organizations, social groups, governmental agencies, and other groups brings about very complex economic and social structures that can generate an almost infinite variety of outcomes (Hendrik Van den Berg, 2012). This means that the human life space has to be viewed in interaction with the three systems as, respectively, the economic, social, and natural spheres of

human existence. The quality of life for present and future people depends on the way nature and the environment that provides people with resources and everything they need for life and well-being are preserved. Therefore, nowadays the concepts of helix models encompass five elements by adding to the Quadruple Helix the natural environment factor as the fifth element in the interaction network - leading to the Quintuple Helix innovation model. The evolution of the helix model is given in Figure 1.

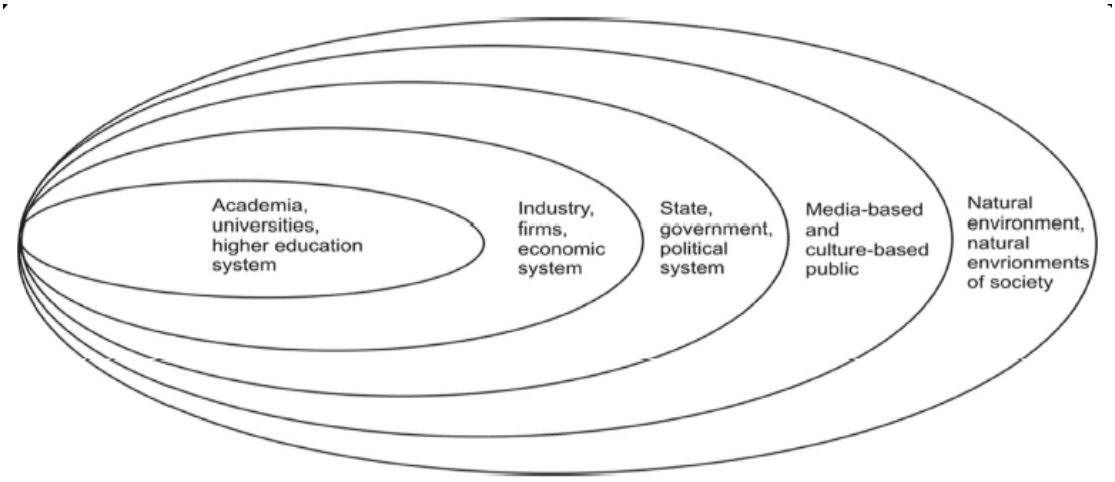

Figure 1. The subsystems of the Quintuple Helix Model. (Carayannis et al., 2012)

Figure 1 shows the following trend in the evolution of the helix model system:

1. *First* Helix: *academia / universities.* Universities (higher education institutions) of the sciences and of the arts as well as students, researchers, academic entrepreneurs, etc. which are the resource for creation of new knowledge and technology, the generative principle of knowledge-based economies. (Theoretical framework, 2011)

2. *Second* – Double Helix: *academia and industry/business.* It consists of the creativity economy and the creative industries where it is possible to apply the recourse of knowledge and to generate new innovation.

3. *Third* – Triple Helix**:** *academia, industry and state/government.* The most important helix element for the creation of a knowledge economy is an effective state/government management policy. The maintaining of sufficient institutional capacity, active mobilisation of stakeholders through governance modes and policy coordination shows the states possibility to create a knowledge economy (European Parliament, 2015). The stable and developed economies can ensure the creation, diffusion and usage of ICT, foster investment in human capital as well as in innovations and stimulate knowledge-intensive enterprises.

4. *Fourth* – Quadruple Helix: *academia, industry, government and media, and culture-based public and civil society: arts, artistic research and arts-based innovation*, that have introduced "knowledge society and knowledge democracy": culture and innovation culture, knowledge of culture and culture of knowledge, values and life styles, multi-culturalism and creativity, media, arts and art universities, multi-level innovation systems with universities of the sciences and arts (the Quadruple and Quintuple Helix innovation systems).

5. *Fifth* – Quintuple Helix that includes: *academia, industry, government, media-based and culture-based public and civil society as well as natural environments of society and economy*. The Quintuple Helix finally frames knowledge and innovation in the context of the environment (or natural environments). Therefore, the Quintuple Helix can be interpreted as an approach in line with sustainable development and social ecology, and imply for eco-

innovation and eco-entrepreneurship that should be processed in such a broader understanding of knowledge production and innovation. (Carayannis and Campbell, 2010; Carayannis et al., 2015)

On the whole, one can conclude that the entire helix model system involves the university element. It means that particularly universities play a key role in order to promote and visualise a cooperation system of knowledge, know-how and innovation for the production of additional value for society in order to lead in the field of sustainable development, as well as successful cooperation among all the Quintuple Helix elements.

4. The experience of a regional university in using the Quintuple Helix approach for smart rural development in Latvia

Regions play an important role in developing innovation by being the home of industrial clusters, competence centers, business incubators, technology parks and many other types of formal and informal innovation spaces in order to tackle many environmental problems, as well as for local know-how on how to prevent and adapt to environmental challenges. Therefore, regional policy is one of the key delivery mechanisms of the Europe 2020 strategy in the regions, becoming one of the main EU policies to foster innovation that responds to the challenges of sustainable energy, climate change and the use of natural resources. (Connecting Smart and Sustainable growth..., 2012)

For the implementation of EU recommendations and the Quintuple Helix approach in rural and regional development in Latvia, there are several kinds of support, such as financial support and non-financial support. The main *financial support* is the following:

- Support from the state owned joint-stock company Latvian Development Finance Institution Altum;
- Risk capital funds: start-up capital funds and venture capital funds for innovative companies that have problems in attracting funding from traditional sources of finance due to the increased risk;
- Support from the European Agricultural Fund for Rural Development for non-agricultural activities (administered by the Rural Support Service) - financial support, available to various enterprises in various sectors.

In Latvia there are several kinds of *non-financial support* too. The main activities involve:

- Measures to encourage innovation and business start-ups (the Motivation Program for Innovative Entrepreneurship) – the EU structural funds program implemented by the Investment and Development Agency of Latvia (LIAA);
- Business incubators, technology transfer contact points and the mentoring movement;
- The Enterprise Europe Network in Latvia (EEN Latvia);
- The Latvian Rural Advisory and Training Centre (LLKC);
- The Latvian Country Tourism Association (Rural Traveller) and craftsmen;
- NGO support – such as that from the Latvian Rural Women's Association and others.

The most important helix model system component is higher education institutions and their human capital. Universities are active promoters of innovation culture at regional and international level by increasing the synergy between education, research and innovation. The most important challenge the academic environment faces in the new economy is to bridge the gap between the

political decision, the governance and the labor market, offering innovative solutions and developing intellectual capital to address various issues of the knowledge economy. (Muresan, Gogu, 2010)

Nowadays, the role of regional universities is considerably increasing, owing to the necessity of promoting the growth of a knowledge-based economy in rural areas and preserving the natural environment in order to provide people with resources and everything for their life and well-being. Therefore higher education institutions should be considered as an element of change, and an agent that does not just stimulate and encourage the interconnection of learning, research and innovation: it should be considered as a necessity to develop knowledge and innovation infrastructure which could ensure this interrelation and the transfer of knowledge into the economy.

The main task of higher education is to provide a study process in a way that, along with preparing high-qualification professionals, opportunities are created for them to build their entrepreneurial competence so that they are able to generate innovative ideas and commercialize them, and transfer this to the regional economy - especially in advanced areas of science and technology. However, it requires re-orienting the study process towards entrepreneurial education, integrating the elements of entrepreneurship education in all study programs (courses) focused on building entrepreneurial competences, and involving students in the new training modules such as university-based business incubator activities, science parks, academic spin-offs, inter-disciplinary centers, venture capital firms and firm-formation projects, etc. Thus it is consequently achieved that students become not only the new generation of professionals in various scientific disciplines, business, culture etc., but they can also be trained and encouraged to become entrepreneurs and founders of firms, contributing to economic growth and job creation in a society that needs such outcomes more than ever. (The Triple Helix Concept; Rivza, Bikse&Brence, 2013)

Entrepreneurial education in higher educational institutions has been addressed in European Union policy documents, which have proposed that universities should approach entrepreneurship education systematically and integrate entrepreneurship in the curricula. The EU Entrepreneurship 2020 Action Plan (European Parliament, 2012) presents university administrators and faculty with a task to ensure that the key competence “entrepreneurship” is embedded into curricula across higher education before the end of 2015.

Real life experience indicates that universities in Latvia are gradually starting to introduce new training modules of entrepreneurial education and are involving students in the new organizational mechanisms such as university-based business incubators, technology transfer contact offices, innovation centers, and the networks among them. According to research conducted by Diana Pauna and Maija Kale (2015) on implementing entrepreneurial education at universities in Latvia, it was found that Riga Technical University, Turiba University and Latvia University of Agriculture (LUA) have been the most successful in implementing such activities. In Latvia, among six other regional universities only LUA is directly connected with preparing qualified specialists for different rural industries. Therefore, the authors will analyze the uses of the Quintuple Helix approach for rural and regional development at Latvia University of Agriculture.

For the implementation of the Quintuple Helix approach at Latvia University of Agriculture (LUA), a Center of Technology and Knowledge Transfer (TEPEK) was established in November of 2005. It was initiated and supported by EU funds and the Latvian Ministry of Economics within the framework of the national support program ‘Establishment of the Technology Transfer Contact Point’. The goal of the center is to promote cooperation between researchers and businesses and other helix model system elements. To achieve this goal, the center’s main activities are as follows: to gather together the intellectual property of LUA and foster its commercialization; to identify the research fields necessary to entrepreneurs, both in Latvia and abroad; to offer research and scientific competence services, and to hold cooperation seminars, conferences and/or contact exchanges, as well as cooperation with industry, Jelgava City Council, Jelgava District Council, Zemgale Planning Region, Zemgale Region Human Resource and Competence Development Center, EEN Latvia, business

incubators and university technology transfer contact offices or innovation centers. (The Center..., 2015)

The Technology and Knowledge Transfer Center (TEPEK) offers innovative solutions to the university, mainly in its study directions and research fields – agriculture and rural engineering, and regional and rural development. An analysis of the experience of TEPEK at Latvia University of Agriculture shows that there are good practices for implementing the Quintuple Helix approach. The center created inventions that were commercialized into new goods or services, technologies, solutions and processes, mainly developing eco-innovative products, food technology and eco-entrepreneurship. In cooperation between business and researchers of the LUA Faculty of Food Technology and TEPEK, different kinds of eco-innovative products were created, such as: *BioGraph* candies, *Fruit Cubes* produced from ecological berries and fruit by adding ecological sugar and natural fruit pectin and cereal mixes *Musli Graci* which are rich in nutrients.

The composition of the muesli *Graci* is unique, because it contains not only usual muesli ingredients, but also triticale, hulless barley, spelt, linseed, black currants, pumpkins and artichokes. The processing of the ingredients is unique, making the product very valuable – the muesli contains sprouted and chopped whole grain, rolled and micronized whole grain, as well as dried and cut fruit. Other products are biological *Floral Water* produced from a hydrolate of flowers and leaves (herb extracts) and is offered for beauty care products such as face tonic, hair care, eye compresses, aftershave lotions and sauna procedures; *Processed Potato Products* which is produced from Latvian bio-vegetables without E-substances, using a specific technology: peeled and cut vegetables are steamed in their own juice in the vacuum packaging. The advantage of the technology includes preserving the vegetable quality, taste and intensity of color, as well as a comparatively long expiry date of the product which is up to 180 days at room temperature. *Dry Food Rations* is produced for the Latvian National Armed Forces, and has been used for two years. The product has been awarded the Diploma of Appreciation.

Bio-vegetable baby food *Rudolfs* is produced from high quality, healthy organic ingredients for infants 6 months and older. Recipes and technologies have been developed in cooperation with local institutes of fruit-growing and Latvia Agricultural University's TEPEK. The idea of producing bio-vegetable baby food was initiated by the personal experience of business woman Egija Martinsone. After the birth of her son, she found out that ready-made baby food was not produced in Latvia and that the range of products imported from abroad often caused an allergic reaction. Consultations with pediatricians pointed to the importance of babies being fed the food from their geographic region, especially after the age of six months, when solid food starts to be a part of their diet in addition to milk. As there were no such products in Latvia, an idea germinated to start this business. The product was awarded the prize Eco-product of the Year 2012 in Latvia.

Thus an analysis of the experience of the Technology and Knowledge Transfer Center (TEPEK) of Latvia University of Agriculture shows that there are good practices for implementing the Quintuple Helix approach which considerably contributes to eco-entrepreneurship and regional development in Latvia, as well as cooperation with local governments. The functioning of the helix model gave an impulse to increasing economic activities in many rural municipalities of Latvia, especially in the municipalities where their local governments were involved in a cooperation network, as the activities of national institutions shape the overall situation in the country, while local governments create favourable local conditions.

At the same time, however, at the universities of Latvia entrepreneurial education is implemented insufficiently. It is usually fragmentarily implemented and not systemic in nature (Bikse, Riemere & Rivza, 2014). According to research studies, both at government level and at the universities there is no strategy regarding entrepreneurship education, therefore there is no common understanding of entrepreneurship education; entrepreneurship studies are provided to non-business students at only a few faculties; entrepreneurship education does not have specific and clearly defined goals and measures to achieve these goals etc. (Pauna, Kale, 2015; Bikse et al., 2014)

According to the survey, cooperation was identified between Latvia's 76 local authorities and regional higher education institutions (HEI); only 24 or 31.6% of local governments had very good cooperation, medium cooperation – 21 or 27.6%. A good example of cooperation is the cooperation between Latvia University of Agriculture and the Development Council of Zemgale region, engaging students and new scientists (doctoral students) in researching problems of the local labor market. The Development Council compiles a list of local problems that need to be researched, and thereby makes recommendations for studies. LUA students choose appropriate research topics for their course papers, bachelor's papers, master's papers or doctoral dissertations. Eventually, both sides benefit. The young individuals are more motivated to study, to go into the region's problems, learn theoretical issues, get an understanding of and develop skills in how to apply their knowledge in practice. Local governments, on the other hand, may use the findings made by students in fostering the region's economic growth and in tackling social problems.

At the same time, the survey results show that 31 or 40.8% local governments had no cooperation with institutions of higher education at all. Similar assessments were given by the 123 rural community representatives questioned about municipal cooperation and the establishment of business contacts with local entrepreneurs for dealing with problems that are important for both parties. According to the data, only 26.8% of the respondents were evaluated at a high level; 36.6% – at a medium level, and 31.7% of the respondents were evaluated at a low and very low level. This indicates the low activity of municipalities in contributing to cooperation not only with higher education institutions, but also with local entrepreneurs.

When answering the question on the opinion of local government about the performance of higher education institutions and future cooperation with these institutions, closer cooperation in the designing of study programs that would contribute to the preparation of professionals necessary to the local region, as well as cooperation in the fields of scientific and practical research (including research by students and doctoral students) and of designing new products, were regarded as the most essential.

5. Conclusions

As a result of the research, it was concluded that the cooperation among institutions of various natures - which is the basic idea of the helix model - leads to positive results, especially if this cooperation is oriented towards fostering innovative actions, regardless of whether it involves large-scale production or the fields of individual and small entrepreneurship.

For implementing the Quintuple Helix approach for rural and regional development in Latvia, there are possibilities to receive financial support and non-financial support. These kinds of support gave an impulse to increasing economic activities in many rural municipalities of Latvia to implement practical coordination of all the Quintuple Helix Model components, in the interest of a common goal for developing the territories of regions in various areas.

The results indicate that, in general, universities are increasingly becoming the source of regional economic development, and academic institutions are being re-oriented or founded for this purpose. New organizational mechanisms such as business incubators, technology transfer contact offices, innovation centers, and the networks among them, become a source of economic activity and community formation offered by the universities and the Technology and Knowledge Transfer Center of Latvia University of Agriculture (TEPEK). At the same time, the research concerning entrepreneurship education in Latvia indicates that most of the students have not had the opportunity to take part in the new training modules of entrepreneurial education, or to develop their personal qualities and skills (competences) during their studies, and hence in the future to become employers or the self-employed.

The results of the survey show that cooperation between the majority of local governments and regional higher education institutions (HEI) and entrepreneurs is implemented at a very good or

medium level. However, 40.8% of the Latvian local authorities have no cooperation with regional HEI, in addition 31.7% have insignificant cooperation with entrepreneurs. Thus, in practice, this helix cooperation is still not fully working in Latvia for the implementation of the Quintuple Helix approach for smart rural development and for the creation of a knowledge economy.

The most essential recommendations for education policy makers, regional HEI and others which are aimed at the management of entrepreneurship education are: to improve this process and to ensure the integration of the elements of entrepreneurship education in all study programs (courses) focused fon building entrepreneurial competences, and involving students in the new training modules and in the new organizational mechanisms; for local governments: to continue the present cooperative activities with regional universities and enterprises, to focus on and place greater emphasis on joint research and the preparation of specialists (study directions, programs) needed for the regions, on the basis of which partnership may be developed further, as well as to include student practical work as commissions from private firms or government institutions, based on the needs in the regional economy, so that the learning outcomes and good ideas are not wasted.

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